



## Section 9

# Economics of the Intensively Managed Wheat Enterprise

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**W**inter wheat is an important part of many Kentucky farmers' crop rotations. As discussed earlier, wheat yields have increased greatly over the past half century (see Figure 1-1 in *Section 1—Introduction*). Likewise, as with other crops, wheat has experienced annual variability in yields. Yields have declined in some years, but this was due to some type of environmental problem or conditions that favored extensive insect or disease development. The greatest decline in the past 10 years was caused by the devastating freeze of 2007. This freeze resulted in a dramatic decrease in state average wheat yields of 22 bushels per acre as reflected in Table 9-1 which shows the Kentucky annual state average wheat yields as well as

**Table 9-1.** Comparative wheat yields by geographical area, 1999-2008.

Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	9 Year Avg. 99-07
	(bushels/acre)										
Kentucky <sup>a</sup>	60	57	66	52	62	54	68	71	49	71	59.9
KFBM State Avg <sup>b</sup>	74	64	78	60	69	58	79	81	35	NA	66.4
Purchase Area <sup>b</sup>	50	56	57	45	61	56	82	72	50	NA	58.8
Pennyroyal Area <sup>b</sup>	77	64	81	62	70	58	79	83	31	NA	67.2
Ohio Valley Area <sup>b</sup>	71	75	75	50	68	58	74	75	35	NA	64.6

<sup>a</sup> Source: Kentucky Agricultural Statistics, various years.  
<sup>b</sup> Source: Kentucky Farm Business Management Program (KFBM), Annual Summary Data, Various years, University of Kentucky, Department of Agricultural Economics.

**Photo 9-1.** Grain bin storage can be a valuable component to a farming operation, allowing a producer more flexibility in marketing grain.

the annual yields achieved by cooperators in the Kentucky Farm Business Management (KFBM) program at the state level as well as for three areas of the state.

This yield variability, both over time and across geographical areas, is shown in Table 9-1. The statewide differences over time are attributable to general growing conditions throughout the growing season. However, the yield differences between geographical areas can be attributed to the general wheat production potential of the different soil types across the Commonwealth. A comparison of yields achieved by KFBM cooperators in the Purchase<sup>1</sup>, Pennyroyal<sup>2</sup>, and Ohio Valley<sup>3</sup> areas indicate that the Pennyroyal and Ohio Valley are more adapted to wheat production than is the Purchase area. Consistently, wheat yields in these areas have been greater than state average yields or yields in other areas of the state.

### The Competitive Position of Intensive Wheat Enterprise in Kentucky

Historically, the wheat enterprise has been looked upon as one of the more profitability challenged enterprises in the Kentucky crop complex. The discussion of the wheat enterprise in our previous version of this manual suggested this view was often warranted.

However, it appears that this era may be at an end! The dramatic improvement in wheat yields has helped to increase the potential profitability of the intensively managed wheat enterprise. Table 9-2 presents a comparison of the relative profitability of the major crop enterprises (corn, soybeans, and wheat) over the period 2001 to 2005 as experienced by KFBM cooperators.

The measurement of profitability used in Table 9-2 is Management Returns. Management return is essentially the amount that remains after all costs of the enterprise, including a return to equity capital investment and unpaid family and operator labor, are deducted. It is the residual after a charge for unpaid operator labor is deducted from operator's labor and management income from the enterprise.

Management returns are most often negative numbers for agricultural enterprises as reflected in Table 9-2 since it is describing a situation where all costs of production have been paid. Therefore, there is seldom room in the margins for any agricultural enterprise to generate positive management returns. If the returns are positive for any period of time, the operators in the relatively free market will bid the price of inputs up to the point where there are no positive management returns. Therefore, one should not be skeptical of the numbers in this table. They are simply a method of comparing agricultural enterprises on an equal footing.

**Table 9-2.** Management returns by enterprise, Kentucky Farm Business Management Program cooperators, 2001-2005.

Enterprise	2001	2002	2003	2004	2005	5 Yr. Avg.
	(dollars)					
Corn	-26.60	-71.99	-11.81	-21.07	-103.50	-46.99
Soybeans	-51.57	-63.92	24.33	-33.00	-35.40	-31.91
Wheat	12.53	-35.56	3.40	-86.64	-25.08	-26.27
Double crop soybeans	-20.78	30.55	109.91	30.85	-19.62	26.18
Wheat & double crop soybeans	-8.25	-5.01	113.31	-55.79	-44.70	-0.09

*Source: Rogers, Jennifer and Craig Gibson, 2005 Enterprise Analysis: Snapshots of Selected Crops, Kentucky Farm Business Management Program, Department of Agricultural Economics, University of Kentucky, Agricultural Economics—Extension No. 2007-12, May 2007.*

Looking at the management returns experienced by KFBM cooperators during the period 2001 to 2005 shown in Table 9-2, most were negative. However, they can easily be used to compare the relative performance of the enterprises over the period. Wheat performed very well over the period. Only Double Crop Soybeans (DCSB) generated a better average over the five years than did wheat. Wheat performed better than either corn or soybeans during the five years. The five year average performance suggests that wheat is quite competitive when compared to either the corn or soybean enterprises that have been the historically dominant crops across the commonwealth.

Further, when wheat is combined with DCSB, as is the standard practice, the wheat-double crop soybean combination would be even better. This performance also suggests there may be a problem about how the costs of production are accounted for between wheat and DCSB when the returns are computed. Why did DCSB outperform full season soybeans (FSSB)? It is assumed that DCSB yields are consistently less than FSSB. Therefore, why did DCSB provide a higher management return over the five years than did FSSB? If there is a problem with the allocation of costs between the wheat and DCSB enterprises, maybe wheat is doing better? Possibly, the DCSB enterprise is not paying its "fair share" of the combined cost of production.

Regardless of these potential cost allocation problems, it should be readily apparent that the combination of wheat and DCSB deserve serious consideration as being a viable part of the standard crop rotation of Kentucky crop producers. This combination performed the best in three of the five years and resulted in a superior performance over the five years when the average results are compared.

The combination of wheat and DCSB provides a more accurate accounting for all costs of production for the combination. It also provides for a more intensive use of farm resources since it produces two crops in one production period. This also provides additional risk protection since two crops are being produced in two different time periods.

## Wheat Enterprise Economics

To examine the economics of the Kentucky intensive wheat enterprise, an intensively managed wheat enterprise budget for 2009 was adapted from an existing wheat budget developed by Dr. Greg Halich<sup>4</sup> which is shown in Table 9-3. It reflects the intensively managed wheat production situation in Kentucky using the most appropriate agronomic recommendations.

The enterprise budget assumes the use of intensive management in the wheat enterprise, meaning all inputs are used on an as-needed basis in a timely manner and reflecting the need for Kentucky wheat producers to achieve above-average yields to remain competitive. This assumption results in an expected wheat yield that is above the state's historical average yield over the past 10 years as shown in Table 9-1. The budget also assumes that the intensively managed wheat enterprise is part of a double cropping system with a similarly managed double crop soybean enterprise. This results in a sharing of common inputs such as fertilizer, lime, and the land resource which should lower these costs for both enterprises.

It should be noted that this budget was developed using the best information available at the time it was developed. However, it is immediately out of date when it is finished. Further, it reflects the situation of the typical producer, and does not reflect the conditions that you and your farm business may face. To download a budget, visit <http://www.ca.uky.edu/agecon/index.php?p=29> on the University of Kentucky Department of Agricultural Economics website.

**Table 9-3.** Intensively managed wheat enterprise, no-tillage, estimated enterprise costs and returns for 2008 - 2009.

	Qty	Unit	Price		Total	
<b>Gross Returns Per Acre</b>						
Wheat	70	bu	\$4.25		\$297.50	
Direct Gov't Payment	1	acre	\$20.00		\$20.00	
Total Revenue					\$317.50	
<b>Variable Costs Per Acre</b>						
Seed	120	lbs	\$0.35		\$42.00	
Nitrogen <sup>a</sup>	100	lbs	\$0.85		\$85.00	
Phosphorous (P <sub>2</sub> O <sub>5</sub> )	35	lbs	\$1.00		\$35.00	
Potassium (K <sub>2</sub> O)	20	lbs	\$0.75		\$15.00	
Other Fertilizer	0	lbs	\$0.00		\$0.00	
Lime - Spread	0.20	ton	\$20.00		\$4.00	
Herbicides	1	acre	\$20.00		\$20.00	
Insecticides <sup>b</sup>	1	acre	\$0.00		\$0.00	
Fungicides <sup>b</sup>	1	acre	\$0.00		\$0.00	
Fuel and Lube	1	acre	\$13.34	Calculate Machinery Related Costs? Y	\$13.34	
Repairs	1	acre	\$16.42		\$16.42	
Hired Labor	1	acre	\$0.00		\$0.00	
Operator Labor (Var. Only)	1	acre	\$15.62		\$15.62	
Machinery Rental	1	acre	\$0.00		\$0.00	
Custom Work	1	acre	\$0.00		\$0.00	
Drying: LP, Elec, M & L	1	gal. LP	\$2.30	Pts Removed	1.0	\$3.30
Crop Insurance <sup>c</sup>	1	acre	\$12.00		\$12.00	
Cash Rent (Pro Rate if DC) <sup>d</sup>	1	acre	\$0.00		\$0.00	
Other Variable Costs	1	acre	\$5.00		\$5.00	
Operating Interest	\$246	dollars	8.0%	# Months	8	\$13.10
<b>Total Variable Costs Per Acre</b>					<b>\$279.78</b>	
<b>Return Above Variable Costs Per Acre</b>					<b>\$38</b>	
<b>Budgeted Fixed Costs Per Acre</b>						
Operator Labor (Fixed Only)			\$0.00	See Question Above	\$0.00	
Machinery Depreciation and Overhead			\$23.96		\$23.96	
Taxes and Insurance	1	acre	\$5.00		\$5.00	
Other Fixed Costs	1	acre	\$5.00		\$5.00	
<b>Return Above All Specified Costs</b>					<b>\$4</b>	
Breakeven Yield at \$4.25 /bu	66	bu per acre to cover variable costs				
Breakeven Cost at 70 bu/acre	\$4.00	per bu to cover variable costs				
Breakeven Cost at 70 bu/acre	\$4.48	per bu to cover all specified costs				
<p><i>a</i> Assumes urea (NH<sub>2</sub>). Adjust as needed for other forms of nitrogen.  <i>b</i> Scout to detect any insect or disease problems and control as required.  <i>c</i> Crop insurance varies substantially by policy type and coverage level.  <i>d</i> Cash rent varies substantially by productivity level and region in Kentucky.</p>						

The budget was developed using the Excel spreadsheet program. If you have the Excel program, you can load the wheat budget spreadsheet to your computer and change most of the numbers to more accurately reflect your actual conditions. You can use your experience and actual records to produce a more accurate wheat budget for your situation. You can also update the budget to reflect changing conditions as you get closer to seeding time.

Looking at the budget in Table 9-3 one can see that the potential profitability of the wheat enterprise for 2009 did not look good. In fact, it looked dismal! This budget does not include any land cost. The Return Above All Specified Costs of \$4.00 per acre would include a return to land as the budget stands. It must be noted that this budget was developed during a very volatile time for both input and output markets in agriculture. Wheat prices had just hit historic highs earlier in the year and had fallen by more than 50 percent when this budget was developed. Also, input costs had risen in a similar fashion during the early part of 2008. They had not come down when this budget was developed. Fuel costs had declined a bit, but fertilizer prices had not. Therefore, wheat producers were looking at a dismal outlook for the wheat enterprise as depicted by this budget.

Again, this points out the need for every producer to develop a budget to fit their exact situation. Some producers may have been fortunate to forward contract some of their 2009 wheat crop at a relatively good price. Others may have a less costly source of fertilizer for use on their crop. If any of these conditions were true, then your wheat budget may look much better than the situation depicted in Table 9-3. Also, if you develop your own wheat budget and it does not look favorable, you may be able to avoid a bad experience in the real world. If plans do not seem to work with the enterprise budget you are considering, then they are not likely to be any better in the real world. You can avoid those “real losses” by making the decision to not produce before you actually make the commitment in the real world.

To reflect an attempt to “better manage” the wheat enterprises in the risky environment we seem to be experiencing, this budget includes provision for the use of crop insurance and integrated pest management (IPM) crop scouting. While use of these risk management tools is the decision of the farm business manager, they are included here as a reminder that the risk environment in agriculture has changed and producers need to strongly consider the use of these tools in the future.

The economic results for the intensively managed wheat enterprise budget shown in Table 9-3 indicated that total specified variable costs of \$279.78 per acre can be covered, leaving a return above variable costs (RAVC) of \$38 per acre as a contribution to all fixed costs. Deducting \$34.00 to cover depreciation, housing, and other such costs leaves a return to land, capital and management of \$4 per acre.

**Historical Reference Note.** This level of variable costs of \$280 per acre is about 224 percent higher than the same cost of \$125 per acre when our original Kentucky wheat manual was developed in 1997. This should indicate the extreme difficulty wheat producers are facing when they are making the decision to produce wheat.

In this budget, all specified costs of production have been covered, with \$4 per acre remaining to cover the unspecified costs. This \$4 could be considered a return to land, capital and management. As such, it may seem low, but one must remember that the intensively managed wheat enterprise is assumed to be part of a double crop system with soybeans. Therefore, when this \$4 per acre is combined with the returns from the soybean enterprise, the combination has a greater chance of being profitable for Kentucky producers than wheat alone.

Table 9-4 provides some insights as to what would happen with various wheat prices and yields while the costs of production are held constant. It depicts the per-acre RAVC for various combinations of wheat yields and prices resulting from the budget shown in Table 9-3. This table is useful for examining “what if” situations concerning various levels of prices and yields.

A particular concern that could be addressed by Table 9-4, for example, is the need for a greater return to land to help justify the production of wheat on your farm. Assum-

**Table 9-4.** Per acre returns above variable costs at various prices and yields, intensively managed wheat enterprise, 2009.

	Yield, Bushels Per Acre						
	40	50	60	70	80	90	100
\$/Bu	\$/acre						
3.50	-118	-84	-49	-15	20	54	89
3.75	-108	-71	-34	3	40	77	114
4.00	-98	-59	-19	20	60	99	139
4.25	-88	-46	-4	38	80	122	164
4.50	-78	-34	11	55	100	144	189
4.75	-68	-21	26	73	120	167	214
5.00	-58	-9	41	90	140	189	239
5.25	-48	4	56	108	160	212	264
5.50	-38	16	71	125	180	234	289

ing you are looking at the base budget situation described in Table 9-3, which shows a return to land of \$4, if you can improve your yield to 80 bushels per acre, the return to land jumps to \$80. Moving up the yield chart each 10 bushels, at the price of \$4.25 per bushel, adds \$42.50 to your return to land, assuming your variable costs of production do not increase.

Table 9-4 can also be used to examine the risk inherent in most agricultural enterprises. This is reflected in yields and prices that are less than those expected in the budgeted situation in Table 9-3. For instance, should your yield prove to be only 40 bushels per acre, rather than the 70 forecast in Table 9-3, the enterprise would not cover variable costs. In fact, it would cost you \$88 per acre for the experience of growing wheat. If the wheat price was \$3.50 per bushel rather than the \$4.25 projected in the base budget and the yield was only 40 bushels per acre, then the returns fall \$118.00 per acre short of covering all variable costs. Again, these possible outcomes reflect the need for improving management in the intensively managed wheat enterprise of the future.

As indicated by Table 9-4, many outcomes are possible with a wheat enterprise. The possibilities cover a wide range and are highly dependent on land production capabilities, weather and general growing conditions, and the level of management devoted to the enterprise. As shown in Table 9-4, the expected return above variable costs might be expected to range from -\$118.00 to \$289 per acre. The more favorable outcomes shown in Table 9-4 certainly could be used to justify the production of wheat in Kentucky. The main emphasis must be placed on intensive management of the enterprise to achieve higher than average yields while maintaining close control of production costs.

## Growing Wheat on Rental Land

One question that may be of interest to wheat producers is: "Can wheat be profitably produced on rented land?" Based on the results presented earlier, it would seem that it may be difficult to justify growing wheat on rented land. The return of \$38 per acre above variable costs would not seem to make it feasible to pay much cash land rent under current conditions. However, as stressed earlier, this depends on yields, prices, costs of production, rental arrangements, the level of management devoted to the enterprise, and many other factors. This is particularly true when the intensively managed wheat enterprise is combined with a soybean enterprise and the land rental cost is shared between the two enterprises.

According to the National Agricultural Statistics Service, USDA<sup>5</sup> the Kentucky state average crop land cash rental rate for 2008 was \$82 per acre. Using this as a reference point, results for an \$80 per acre cash rent (with \$40 allocated to the intensively managed wheat enterprise) situation is investigated in Table 9-5. Results indicate that at the projected price of \$4.25 per bushel, the yield would have to be at least 80 bushels per acre to be a feasible option for Kentucky producers with the production costs shown in Table 9-3. If the situation depicted in Table 9-3 is correct, the wheat price would have to be at least \$5 for the \$80.00 per acre cash rent (with \$40 allocated to the wheat enterprise) option to be feasible.

A survey of land values and rental rates across Kentucky during October 2007<sup>6</sup> indicated the average crop land rental rate in West Kentucky was \$108 per acre. Using this as an additional reference point, results for a \$120 per acre cash rental rate (with \$60 allocated to the intensively managed wheat enterprise) situation is investigated in Table

**Table 9-5.** Per acre returns above all budgeted costs, various prices and yields, intensively managed wheat enterprise, \$40/ac cash rent allocated to wheat enterprise 2009.

\$/Bu	Yield, Bushels Per Acre						
	40	50	60	70	80	90	100
	\$/acre						
3.50	-194	-160	-125	-91	-56	-22	13
3.75	-184	-147	-110	-73	-36	1	38
4.00	-174	-135	-95	-56	-16	23	63
4.25	-164	-122	-80	-38	4	46	88
4.50	-154	-110	-65	-21	24	68	113
4.75	-144	-97	-50	-3	44	91	138
5.00	-134	-85	-35	14	64	113	163
5.25	-124	-72	-20	32	84	136	188
5.50	-114	-60	-5	49	104	158	213

**Table 9-6.** Per acre returns above all budgeted costs, various prices and yields, intensively managed wheat enterprise, \$60/ac cash rent allocated to wheat enterprise 2009.

\$/Bu	Yield Per Acre						
	40	50	60	70	80	90	100
	\$/acre						
3.50	-216	-181	-146	-112	-77	-43	-8
3.75	-206	-168	-131	-94	-57	-20	17
4.00	-196	-156	-116	-77	-37	2	42
4.25	-186	-143	-101	-59	-17	25	67
4.50	-176	-131	-86	-42	3	47	92
4.75	-166	-118	-71	-24	23	70	117
5.00	-156	-106	-56	-7	43	92	142
5.25	-146	-93	-41	11	63	115	167
5.50	-136	-81	-26	28	83	137	192

9-6. Table 9-6 indicates how difficult it is to profitably grow wheat under current conditions. Both of these tables indicate that it is feasible to rent land for wheat production in both situations, but only with higher yields and prices.

### Summary and Conclusion

Winter wheat has been an important part of the crop rotation for Kentucky farmers and will continue to be part of the crop mix. As indicated by the intensively managed wheat enterprise budget and an investigation of various yield and price scenarios based on it, there are opportunities to make profitable levels of return with an intensive wheat enterprise in Kentucky.

Historically, wheat and the wheat-double crop soybean combination proved to be quite competitive with other crop enterprises in Kentucky. However, most producers will have to improve management of their enterprises, in terms of both production and marketing to be able to earn these returns in the current economic environment.

### Notes

1. Includes Ballard, McCracken, Marshal, Calloway, Graves, Carlisle, Hickman, and Fulton counties.
2. Includes Livingston, Lyon, Trigg, Crittenden, Caldwell, Christian, Todd, Muhlenberg, Logan, Butler, Warren, Simpson, Edmonson, Allen, Barren, Metcalf, and Monroe counties.
3. Includes Union, Webster, Hopkins, Henderson, McLean, Daviess, Ohio, and Hancock counties.
4. Halich, Greg, Wheat and Wheat Double-Crop Soybean Budgets 2008-2009, Department of Agricultural Economics, University of Kentucky, October 22, 2008.
5. Land Values and Cash Rents—2008 Summary, National Agricultural Statistics Service, United States Department of Agriculture, August 2008.
6. Trimble, Richard L., "Kentucky's Land Values, Fall 2008", Agricultural Situation and Outlook—Fall 2008, Department of Agricultural Economics, University of Kentucky, ESM-34, October 2008.