Corn Production after Corn
Planning Budget and Guide for 2007
(AEC 2007-04)

Introduction:

The market for corn and other grains has increased dramatically in the past few months from historical levels. This rise in the market can be seen graphically in Figure 1 which shows the December 2007 (fall crop) corn futures from the Chicago Board of Trade (CBOT®). In recent years the price of corn has averaged around $2.30-2.50 per bushel. At the beginning of 2006, the market price was just above the $2.50 level, and started to increase slowly until leveling off in the summer. The market began to surge upward in mid-September and eventually increased above the $4.00 per bushel mark. Much of this increase can be attributed to additional demand for the production of ethanol as well as expanded markets in southeastern Asia.

However, prices dropped sharply with the release of the USDA's Prospective Plantings Report on March 30. This report showed that farmers intended to plant an additional 12 million acres of corn in 2007. Much of the increased corn acres came at the expense of soybeans, with a decline of 8.4 million expected acres.

This news resulted in a drop of $.36 for corn and a drop of $.13 for soybeans after three full days of trading. Prices have stabilized somewhat near pre-report levels since this initial shock. However, the changes in prices for corn and soybeans have now altered the dynamics of the decision between these two crops.

Figure 1 – December 2007 CBOT® Corn Futures (week ending 4/27/07)

It is important to note that the USDA's report surveyed farmers during a period where fall 2007 futures prices heavily favored corn production. It is also important to note that many of these acres have not actually been planted. Many of the same farmers who

indicated they were going to switch a significant portion of their cropland from soybeans to corn still have the option of going back to soybeans if the market conditions justify this change (unless they already "locked in" the bulk of their intended corn plantings). Conversely, there may still be producers who are considering a switch from soybeans to corn this year.

The purpose of this publication is to help facilitate these decisions and to assist producers in the evaluation of their options. Multiple budget scenarios are used to help producers identify the situations under which continuous corn (defined here as two or more years) may be profitable. The key question to answer is at what relative price levels for corn and soybeans would this prove advantageous?

However, to fully evaluate these decisions, producers will need to account for changes in productivity and costs that occur with continuous corn. These considerations are described in the following section. A financial comparison is then presented using this information to compare the production of continuous corn with soybeans in rotation.

Agronomic Considerations:

Yield Penalty:
Corn following corn will generally yield 5-15% less than corn following soybeans ("Corn after Corn: Yield Penalty," University of Kentucky, Corn and Soybean News, vol. 7, issue 2). There is some evidence to suggest the yield penalty increases on poor ground and decreases on good ground. Overall, the yield decrease is highly variable and generally occurs regardless of management practices employed. Yields should increase slightly over time, but will still be less than corn following soybeans. The rotation penalty should be factored into budgets as it will result in a substantial difference in net returns.

Nutrient Requirements:
The University of Kentucky recommends a range of nitrogen application depending on the soil type, tillage system, and previous crop grown (AGR-1). Corn following corn generally requires an application rate in the higher end of this range, while corn following soybeans does well in the lower end of the range. Nitrogen applied above the recommended rates will not overcome the rotation penalty and should not be employed.

Pest Control:
Pest control for corn following corn will depend on the number of years the field has been in continuous corn. Advanced problems with insects don't usually occur until the third year. The primary insect associated with continuous corn is corn rootworm. If corn rootworm is present, then an insecticide treatment will be needed. Insecticide rates for corn rootworm are usually higher than rates for other insects.

Continuous corn, especially in a no tillage or conservation tillage situation, provides a continuous food source for pathogens. Several diseases can be more active under

continuous corn, particularly those caused by pathogens that survive in crop residue or in the soil. Diseases include gray leaf spot, diplodia ear rot, anthracnose stalk rot or die-back, Pythium seedling diseases, leaf blights and stalk rots. Advanced problems with diseases can start to occur in the second year of continuous corn. However, they are more likely to become serious problems in the third year and beyond.

Hybrids with high yield potential and with tolerance and/or partial resistance to the various diseases are recommended for corn after corn. Prepare to spray a foliar fungicide if weather conditions appear to be favorable for disease.

As the number of years in continuous corn increases, weed populations may shift toward species that survive the continuous corn system. Producers should not rely on one herbicide program (or one mode of action). Instead, producers should rotate herbicides with different modes of action to help avoid selection for herbicide-resistant weeds. Producers will need to scout fields for weeds and take note of these possible shifts.

Till vs. No-Till Planting Systems:
Intensive tillage is an option to reduce pathogen pressure. Tillage with a moldboard plow is the most effective method to reduce pathogen levels. Disking will show intermediate results compared to plowing. However, tillage will encourage soil erosion, destroy soil structure and reduce soil organic matter. In addition, studies at both Lexington and Princeton, Kentucky have shown tillage to reduce continuous corn yields compared with no-tillage. No-till farmers planting into corn stubble should consider using row cleaners to move residue away from the seed furrow while keeping as much residue above the soil surface as possible. The analysis that follows makes no assumption on tillage type – the parameters used will be an average of till and no-till operations.

Financial Returns:

Corn and soybean prices are derived by taking the respective futures contracts and subtracting a basis of -$.30 for corn and -$.40 for soybeans. These basis levels were derived by comparing recent forward contracting elevator prices in the "Kentucky Livestock and Grain Market Report" (KY Dept. of Agriculture) with respective futures prices. The final prices used for this publication came from futures prices trading on Friday April 27 which resulted in estimated "elevator" prices of $3.40 for corn and $7.25 for soybeans.

Average potential corn yields of 125, 150, and 175 bushels were thought to be most representative for Kentucky soil conditions. An important point is that these base corn yield estimates are for corn planted in a typical corn-soybean rotation. A 10% yield penalty was levied against corn after corn for all production levels, thus lowering the effective corn yield. Soybean yields are derived from corn potential yields based on historical yield ratios between the two crops. The ratios used in this analysis vary from 2.9 to 3.3 bushels of corn compared to the soybean yield. For example, a yield ratio of 3.0 for a corn yield of 150 bushels would result in a soybean yield of 50 bushels.

Generally, the higher the corn yield, the higher the yield ratio will be. These ratios are averages and may vary considerably from year to year depending on weather.

Overall costs for corn after corn are slightly higher than corn in a conventional rotation. For the purposes of this analysis however, the more important differences are the costs of continuous corn compared to soybeans. Seed costs are estimated to be about $10 higher for corn. Nitrogen is obviously not needed for soybeans, so there is a significant cost savings favoring soybeans. It is assumed that producers will primarily use either anhydrous ammonia or liquid nitrogen, and thus the cost on a per unit basis is an average of the two nitrogen types. It is further assumed that 155 pounds of actual nitrogen will be required (an average for till and no-till operation recommendations). P, K, and lime costs are very comparable for the two crops at their relative yield ratios. Recommended herbicide and insecticide costs are also comparable. Cost differences for drying and trucking favored soybeans by an amount of $27 to $38 depending on yield levels.

Machinery costs are assumed to be the average custom rates for Kentucky conditions. Using these rates resulted in a $10 increase in machinery costs for corn compared to soybeans. These custom machinery rates include fuel, lube, repairs, labor, overhead, and depreciation costs, but do not include input costs which are listed separately in the budgets.

Budget Results:

Table 1 shows the final planning budgets and the estimated returns generated from this analysis for the two crops for 2007. Net returns presented in this analysis equals total grain revenue less all costs except land-related charges (land rent, opportunity cost of land, property taxes, etc.). Land rents and other measures of land opportunity cost are highly variable in Kentucky and so they were not included here. Government payments were also not included in this analysis on the assumption that they would balance out between corn and soybeans. In other words the "true profit" from the crop could be estimated by subtracting out the going land rent from the net return presented here and adding in your expected government payment.

The differences in net returns ("corn advantage") for the scenarios presented here were calculated. Positive returns favor the production of corn after corn and negative returns favor a traditional corn-soybean rotation. The further away the net return is from zero, the stronger the result favors the particular production system. Net returns near zero mean that there will be little difference in net returns between continuous corn and the corn-soybean rotation.

For the 2007 planning year, differences in net returns were estimated to be -$38, -$6, and +$30 at corn yields of 125, 150, and 175 bushels. These results show that corn after corn has an advantage over soybeans only on the best ground in Kentucky at current price ratios. The difference in net return on the 150 bushel ground was essentially the same as a return rotation to soybeans.

Conclusions:

In general, the returns in Table 1 show that rotations favoring continuous corn production are only likely to prove profitable on the highest productivity corn ground in Kentucky during 2007 with the current price mix. Each producer needs to look at the question of planting corn-after-corn on a field by field basis. The results presented from this analysis are based on specific yield ratios and yield penalties. However, these parameters can vary considerably and producers should try to evaluate their specific conditions and make adjustments to the model results where appropriate.

Finally, this analysis used the most current pricing information available at the time of publication. The current market, however, is highly volatile and price swings of $.10-.20 a day can easily occur. Thus producers should check the most current futures prices (as well as factor in their specific location basis) and adjust the prices used in the analysis. Each $.10 change will impact net revenue by $.10 per bushel. Thus if the price of corn decreases $.10 for a 150 bushel expected yield, there will be a decrease in corn net revenue as well as the "Corn Advantage" of $15.

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Table 1 - 2007 Planning Budget for Corn After Corn vs. Soybean Decisions								
Corn/Soybean Yield Ratio	**2.9**			**3.1**			**3.3**	
Yield Penalty Continuous Corn	10%			10%			10%	
Final Yield Ratio	2.6			2.8			3.0	
	Corn	**Soybeans**		**Corn**	**Soybeans**		**Corn**	**Soybeans**
Yield and Price:								
Expected Yield (Rotation)	*125*	*43*		*150*	*48*		*175*	*53*
Expected Yield (Continuous)	*113*			*135*			*158*	
Expected Price	*$3.40*	*$7.25*		*$3.40*	*$7.25*		*$3.40*	*$7.25*
Total Revenue	$383	$313		$459	$351		$536	$384
Inputs:								
Seed	$49	$39		$49	$39		$49	$39
Nitrogen	$54	$0		$54	$0		$54	$0
P, K, and Lime	$20	$19		$23	$21		$26	$23
Herbicides	$23	$25		$23	$25		$23	$25
Insecticides	$8	$0		$8	$0		$8	$0
Total Inputs	$154	$83		$157	$85		$160	$87
Machinery and Labor:								
Custom Machinery Charge	$80	$71		$80	$71		$80	$71
Other:								
Drying Grain	$17	$0		$20	$0		$24	$0
Trucking Grain	$11	$4		$14	$5		$16	$5
Operating Interest	$9	$6		$9	$6		$10	$6
Total Other	$38	$10		$43	$11		$49	$12
Total Revenue	***$383***	***$313***		***$459***	***$351***		***$536***	***$384***
Total Costs	***$272***	***$164***		***$281***	***$166***		***$289***	***$169***
Net Revenue	***$111***	***$149***		***$178***	***$184***		***$246***	***$216***
Corn Advantage	***-$38***			***-$6***			***$30***	
Soybean Price to Equal Corn	***$6.37***			***$7.13***			***$7.82***	

Notes: Costs are till and no-till avg. Net revenue includes all costs except land-related charges such as land rent, opportunity cost, and property taxes. Thus the user should use these budgets for comparison purposes only. Machinery and labor costs are based on custom machinery rates that include all costs including fuel, lube, depreciation, overhead, labor. Direct or cyclical government payments are not estimated or included. Expected price = respective futures price with a -$.30 basis for corn and -$.40 for soybeans.

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Publications and References (most are available at County Extension Offices):

ID-139: A Comprehensive Guide to Corn Management in Kentucky
http://www.ca.uky.edu/agc/pubs/id/id139/id139.htm

AGR-1: Lime and Fertilizer Recommendations:
http://www.ca.uky.edu/agc/pubs/agr/agr1/agr1.pdf

AGR-6: Weed Control Guide Recommendations for Field Crops:
http://www.uky.edu/Ag/Agronomy/Weeds/agr-6.htm

ENT-16: Insecticide Recommendations for Corn:
http://www.uky.edu/Ag/PAT/recs/crop/pdf/Entfact-16.pdf

Custom Machinery Rates Applicable to Kentucky (2007):
http://www.uky.edu/Ag/AgEcon/pubs/ext_aec/2007-01.pdf