

Making Informed Crop Insurance Decisions

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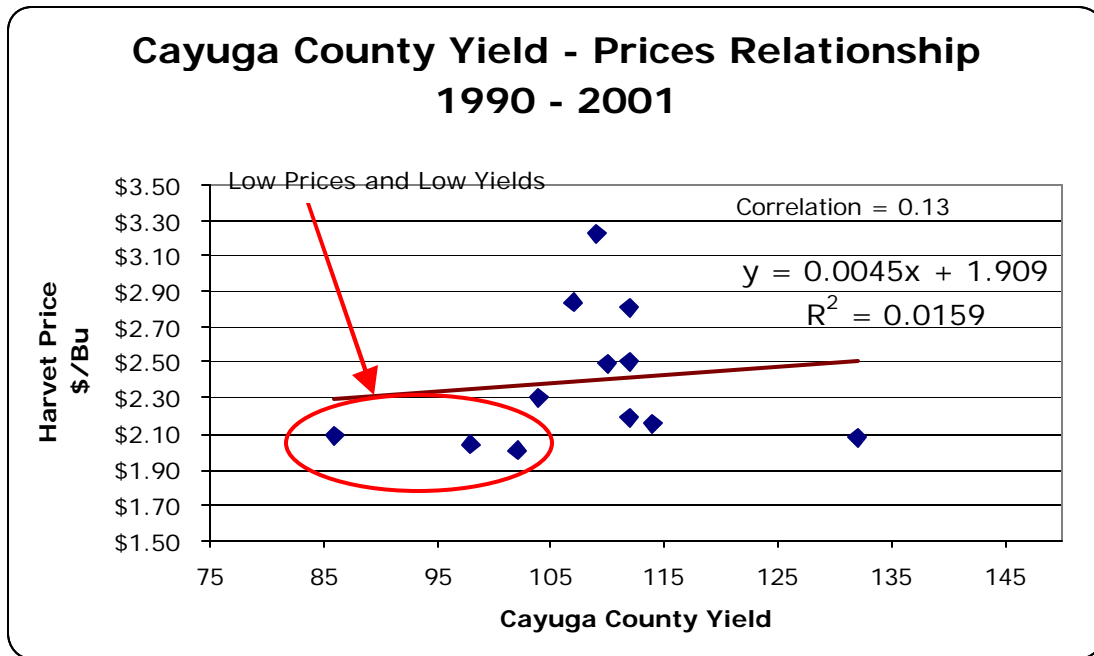
The Crop Insurance Decision

Although potentially quite important, crop insurance decisions can be particularly difficult. This decision is critically dependent upon the financial characteristics of your farm, your financial needs, and the risks that you face. If you decide that you need risk protection, choices regarding products and coverage level remain. The purpose of this article is to help you make informed crop insurance decisions.

In order to make informed crop insurance decisions, you should understand how revenue variability arises from changes in prices, yields or both. Yield and price relationships are particularly important because prices and yields tend to move independently for New York grain producers. This means that New York grain producers are not typically beneficiaries of the “natural hedge” provided by the marketplace.

The natural hedge refers to the revenue stabilizing impact that results from the negative relationship between crop yields and prices. In general, where the natural hedge is strong, high yields result in low prices and low yields result in high prices. As a result revenue is stabilized. Because New York is not a large producer of grains and because New York yields are often impacted by different weather than the major grain growing regions of the world, New York yields and prices do not exhibit a strong negative relationship. This is demonstrated in Figure 1 which shows the relationship between Cayuga County average corn yields and harvest time corn prices for 1990 to 2001. One can see that Cayuga County growers have experienced at least 3 years of low yields and low prices in the past 12 years.

Figure 1. The Relationship between National Corn Prices and Cayuga County Corn Yields



Because the natural hedge tends to be weak in New York this provides some motivation for considering the protection provided by various crop insurance products. The purpose of crop insurance products is not to dramatically improve expected profits, but to insure that your operation produces revenue that is adequate to meet your financial goals when undesirable events such as low yields or low prices or both occur. To assist you in making these decisions, we have identified a three step process and a toolbox of decision aids. The fundamental questions that you must address are:

- 1) What are the consequences if your operation experiences a revenue shortfall?
- 2) How likely is it that a revenue shortfall will occur?
- 3) Including their costs, how do various crop insurance products alter the likelihood of such a shortfall?

Before presenting the framework which addresses these questions, it is useful to briefly describe our characterization of risk and how one might protect against risk. For purposes of making crop insurance decisions we feel that it is useful to view risk as variability in cash flows. Production and price variability have the potential to place downward pressure on revenue, which may lead to cash flow problems. The benefit of crop insurance is that it establishes a safety net for your operation that provides an inflow of cash when factors outside your control negatively impact your revenue through either low yields or low prices. However, the benefits of crop insurance do not come without cost, so an informed decision is required.

Undesirable events such as a hail storm affect your operation's stream of revenue because either low prices or low yields directly reduce revenue generated by your operation. Although changes in costs, such as unplanned increases in fertilizer prices, can also impact your operation's financial well-being, the focus of this article is on revenue risk. Several crop insurance products

can now protect against the risks of low prices, low yields or both. Therefore these crop insurance risk management tools are capable of reducing your operation's exposure to both of these sources of revenue risk.



The decision to purchase crop insurance can appear to be very difficult because it is based on your estimate of the likelihood that undesirable events occur combined with your estimate of the impacts of these events on the financial well-being of your operation. For example, if you had a “crystal ball” that revealed you were going to experience a disastrous hail storm the crop insurance decision would be a lot easier. However, you can only estimate the likelihood that such an event will occur. You must then also assess what impact such an event will have on your financial situation. Perhaps the occurrence of such an event while not desirable would not place the operation in serious financial jeopardy or would not affect future plans that you have for your operation. In this case one might want to “self insure” against these risks.

The dilemma in making an informed decision is that you do not have all the information on when and how frequently undesirable events will occur. As a result you can only estimate the likelihood of such events. For instance, if you have only experienced a flood once in the last fifteen years, it would seem reasonable that the chances of a flood occurring are low. In other words, the probability of it occurring is unlikely. Because estimating the probability of these events can be difficult, a good approach to dealing with this situation is to begin by assessing the impact that an “undesirable event” would have on your operation if it did occur. In some cases, your operation might be able to easily deal with such an occurrence. In others, it might put your operation in a serious financial crisis. Here, it is important to examine the likelihood of such an event occurring and the cost of insuring against such an event. You should examine several insurance products because they offer protection against risks of different magnitudes and likelihood of occurrence. The cost of these products should correspond to the amount of risk that they protect against.

Crop Insurance Decision Tool Box
Financial Statements ? Statement of Cash Flow ? Income Statement ? Balance Sheet
Crop Information ? Crop Budgets ? Yield history ? Price history
Insurance Information ? Insurance products fact sheets ? Premium calculator
Case Farm Workbook ? Partial budgeting approach to estimating a crop insurance safety net on farm financials

Our approach to making crop insurance decisions is based upon assessing the ability of various crop insurance products to secure a critical level of cash flow. This approach ties your decision-making process to the primary objective of insurance: provide your operation with financial protection when undesirable events occur. The key point is that your decision to buy crop insurance depends upon your operation's cash obligations, its critical level of cash flow and your financial goals. You must determine how important it is that you have a safety net and how high this safety net is placed below your expected cash flows. Keep in mind that the higher you set the net, the more expensive the net and the lower your expected profits.

The following three step process should assist you in organizing your decision making process. It should lead you to a decision regarding the usefulness of crop insurance as a risk management tool for your operation. The process will also assist in identifying what crop insurance product is best for your operation and what coverage level will adequately provide the targeted safety net. As you work through this process, keep in mind that you are looking for how significant your operation's financial risks are and what risks different crop insurance products reduce.

In order to assist you in making these decisions we have developed a spreadsheet tool that utilizes these steps. The tool, *cropinsurance.xls* is available at the website, <http://AgRisk.cornell.edu>. The spreadsheet utilizes a set of coordinated financial statements and a crop budget to assess the impact of various crop insurance products. A user manual is currently being prepared, but decision makers comfortable with spreadsheets should find use relatively straightforward. The tool allows one to examine the impact of the crop insurance products on both per acre and whole farm bases. It also develops graphs of cash flow levels for various price and yield combinations. The following text will help guide you through the information required to make a solid assessment of your crop insurance needs.

Assessing cash flow needs

? **Goal:** To determine your operation's level of critical cash flow

? **Information to Consider:** Sources of and uses of cash

? **Tools:** Crop Budgets, Statement of Cash Flow, Income Statement, Balance Sheet

Determining how much value a safety net has for your operation starts with an understanding of your operation's sources and uses of cash. For example, your operation's sources of cash income include crop sales revenue (current year and inventory), borrowing, savings, etc. Uses of cash include direct operating costs (seed, fertilizer, chemical, etc.), debt service, overhead, insurance, taxes, family living withdrawals, health insurance, college fund, etc. It is also important to keep in mind your future plans for your operation. For instance, would a financial shortfall place expansion or retirement plans on hold?

A set of coordinated financial statements are the most important tool that you can use in assessing your financial situation. You should consider a statement of cash flows, an income statement, and a balance sheet¹.

As with any management situation, the better your historical records, the more easily the situation is analyzed. Because cash expenses are generally easier to estimate (past experience on your operation's expenses provide a useful reference point), start by defining expenses that tie directly to your operation. We have developed a workbook to assist you in this process for

Below are a section from numerous references on the following:

¹ *Farm Financial Statements:* Iowa State University:

<http://www.extension.iastate.edu/Publications/FM1824.pdf>

creating an income statement². The workbook has several sheets. The first of which is a data entry sheet. Cells in red require that you enter a value for your operation. In some cases we have provided calculators that should assist you in determining these values. Finally, blue cells perform calculations based upon the values that you enter.

The first section of the data entry sheet asks you to estimate your expenses. Calculators are provided to help you estimate your fertilizer, chemical, interest (on operating note), labor, and land rent expenses. Expenses that we have omitted can be directly entered on the income statement in the next worksheet. A calculator is also included to estimate unpaid labor and management charges. We have included three products, CAT, APH and CRC insurance at various coverage levels. You can enter your premiums for each product in section 4 of the data entry worksheet. Once these values are entered the calculator will calculate your total crop insurance bill.

The next section in the data entry sheet gathers information necessary to estimating revenue. This is accomplished by combining estimated revenue from the current year crop with planned sales and holdings of past year's crop inventories. The primary components of estimated revenues are prices and yields. A good starting place for estimating prices is the Chicago Board of Trade (CBOT) future market for your crop's harvest month³. A good estimate for your crop's targeted production is an average of your historical yields. In completing this section, you will also want to account for the effect of government payments have on your operation's stream of revenue. The workbook contains several calculators that are based upon our interpretation of the Farm Security and Rural Investment Act of 2002. In order to forecast payment receipts you must provide various program details such as base acres, program yields, forecasted harvest prices, etc.

The fourth section of the data entry sheet asks you to estimate your required living withdrawals (such as family living, college expenses, personal taxes, etc.) as well as off farm sources of income (such as wages, interests, and rents). Given the completion of these steps, the workbook we have provided will generate an income statement, crop budget, and statement of cash flow that can be used in the following crop insurance decision making steps.

Finally, beginning balance sheet data is entered in section 5. The worksheet will calculate your end of year balance sheet data based upon the revenue and expense information that you have provided.

You should also note that the financial dashboard at the top of the data entry page summarizes several key financial measures for the base situation that you have just entered. You might also page over to the other worksheets in the workbook to examine your base situation. For instance, a pro-forma income statement is shown in the next workbook. This financial statement summarizes the projected profitability of your crop enterprise. A crop budget is found on the next worksheet. This budget shows several key items. The middle yield column shows a per acre budget for the situation that you have identified as your most likely yield situation. The

² *Case Farm Workbook* (including detailed financial statements): Cornell University: <http://www.AgRisk.Cornell.edu/>

³ *CBOT Market Prices*: <http://www.agweb.com/>

columns to the left and right show the impact of a 50 % decrease and increase in your base yield respectively. The next worksheet displays a cash flow and final balance sheet. New projected borrowings are shown in the middle of the cash flow statement. Projected borrowings are based upon an assumption that the ending cash balances (current assets) are required to be in excess of \$10,000. If this condition is not met, additional borrowings are made.

At this point you have a working budget to analyze your crop insurance decisions. In completing this information, it is likely that you experienced the most difficulty estimating your operation's revenue. That is understandable because cash inflows are often more difficult to estimate because yields and prices tend to be more variable than expenses. For that reason, Step 2 will address the question of how susceptible your operation's financial security is to the variability in production and prices that is likely to be experienced.

② Perform a sensitivity on cash flow

- ? **Goal:** To determine the likelihood of not achieving your critical level of cash flow
- ? **Information to Consider:** Variability in prices, yields and input costs
- ? **Tools:** Statement of Cash Flow, Crop Budget, Yields and Price History

Sensitivity analyses can be quite useful when conducting budget analyses. A sensitivity analysis is an approach used to understand how “sensitive” a result is to a select number of influential factors. This goal is accomplished by altering the values of several key budget variables. Most often, it is easiest to make these analyses by changing only one variable at a time, but it is also possible to change more than one at a time, it is just more difficult to summarize the results.

In this case, performing a sensitivity analysis on the profitability of your operation will help you describe and better understand how your operation's profitability responds to changes in different estimates of prices and yields. A key point in applying this technique is that while both yield and prices have the same relative impact on revenue, one can be more variable than the other. The result is that over time, the one that has greater relative variability will tend to have a greater effect on your operation's revenue thereby exposing your operation's financial well-being to more risk.

Your operation's past yields and prices are useful inputs into this analysis because they provide realistic reference points for extreme highs and severe lows. Because you are performing several different scenarios, utilizing a spreadsheet tool, like the workbook we have provided, will assist you by removing the manual drudgery of performing calculations and generating reports. The workbook's crop budgets and the statement of cash flow can be used to build scenarios of yields and prices at high, low or combinations of highs and lows. Keep in mind that the purpose of this approach is to assist you in determining the likelihood of not achieving your critical level of cash flow at different levels of prices and yields.

Table 1. An Example of Historical Prices and Yields Sorted from High to Low.

10 Years of History	Yield	Prices
<i>High</i>	145	\$ 3.08
	143	\$ 2.84
	125	\$ 2.73
	125	\$ 2.70
	120	\$ 2.68
to	100	\$ 2.59
	99	\$ 2.57
	85	\$ 2.51
	76	\$ 2.46
	72	\$ 2.40
<i>Low</i>	43	\$ 2.32
Average	103	\$ 2.63

Determining the selection possible yields and prices for ‘what if’ scenarios is as much an art as it is a science. One useful approach is to sort the past 10 years of yields and prices from high to low. An example of such data is shown in Table 1. These data are fictitious and should not be used for your budgeting purposes. Another alternative is to organize the data by high to low revenue. This approach would help account for potential correlation between yields and prices.

The next task is to run several “what if” scenarios. We propose performing 7 “what if” scenarios that contain combinations of highs, lows, and average yields and prices. In performing these scenarios, it is important to remember that extreme highs and severe low are less likely (in frequency) to occur than yields and prices that are closer to the averages. Table 2 shows several possible scenarios that might be constructed from the data in Table 1.

Table 2. Some Possible Combinations to Consider in a Sensitivity Analysis

Scenario	Yield	Prices
1	High (145)	High (\$ 3.08)
2	Low (43)	Low (\$ 2.32)
3	Average (103)	High (\$ 3.08)
4	Average (103)	Low (\$ 2.32)
5	Average (103)	Average (\$ 2.63)
6	High (145)	Average (\$ 2.63)
7	Low (43)	Average (\$ 2.63)

In performing these scenarios, you will want to record the impacts that prices and yields have on your operation's financial health (liquidity, solvency, profitability and efficiency). The workbook we have provided contains a "financial dashboard" of key financial ratios⁴ to assist you in understanding the implications of those different levels of prices and yields have on the financial performance of your operation.

Identifying your operation's critical level of cash flow is a bit more challenging than it sounds. To better understand this challenge, further exploration of your operation's expenses is required. Another way of considering direct and overhead expenses is to describe these costs as cash and unpaid economic costs. For example, cash costs include cash rents, input expenses, taxes, etc because they must be covered every year for your operation to cash flow. If cash costs are not met, borrowing will be required to satisfy your creditors. On the other hand, unpaid economic costs such as depreciation do not require annual repayment, but eventually your operation will need to provide a return to meet those expenses. Otherwise, it will be difficult to make required machinery and equipment replacements. The point is that in the short term, failing to meet unpaid economic costs will not require additional borrowing, but the financial vitality of your operation will suffer if unpaid economic costs are continually unmet. This analysis will also assist you in understanding your operation's likelihood of meeting all costs (cash and unpaid economic costs) in times of severely low yields and/or grain prices.

In order to perform such a sensitivity analysis you simply need to change the yield and price variables in the data entry worksheet. You should also consider the impact of purchasing different crop insurance products in these experiments. This can require that you run a number of crop insurance scenarios. This is especially true if your sensitivity analysis shows that there are times when your operation is placed in an uncomfortable financial situation.

This prepares you for the final step in this decision making process. Given your understanding of how variability in yields and prices affects your operation's financial health, you are ready to go to you insurance agent to gather more information on the risk protection that different crop insurance products provide and the cost of those products in the form of insurance premiums.

③ Evaluate the types of risks that crop insurance products cover

- ? **Goals:** To determine the appropriate crop insurance product/coverage level
- ? **Information to Consider:** Crop insurance product information and premiums
- ? **Tools:** Case Farm Workbook⁴

The last step in this process is to sufficiently understand the different crop insurance products, their availability for your crops and the risks they protect your operation against. Some products such as CAT and APH protect only against low yields, while IIP and CRC protect against low yields as well as low prices (farm revenue). This understanding needs to also be overlaid with the fact that CAT and IIP are whole farm insurance, while APH and CRC provide flexibility of segmenting the farm into optional units⁵. Segmenting your operation into optional units may be

⁴ *Financial Ratios:* <http://www.extension.iastate.edu/agdm/wholefarm/html/c3-56.html>

⁵ *Crop Insurance Product Information:* Cornell University: <http://www.AgRisk.Cornell.edu/>

useful if you observe that your farm's yields have a tendency to be quite variable from field to field, but this additional flexibility needs to be weighed with its higher cost in the form of higher premiums. Given this basic understanding on crop insurance products, you are ready to evaluate how appropriate different crop insurance products are in reducing revenue risk for your operation.

We realize the number of scenarios and financial data that this process creates can feel overwhelming, so the workbook we have developed provides charts that summarize the safety nets that different crop insurance products provide. Examples of these charts are shown in Figures 2 and 3. These charts use the data that you have entered to graphically summarize return over direct cash costs for several price and yield combinations and several insurance products. In Figure 2 you see that return over direct cash costs is \$0 to \$200 in the maroon band of prices and yields. For example, at a price of \$2.32 per bushel the yield required to meet direct cash costs is approximately 76 bushel per acre. Of course the results for your farm will differ from those shown in this example.

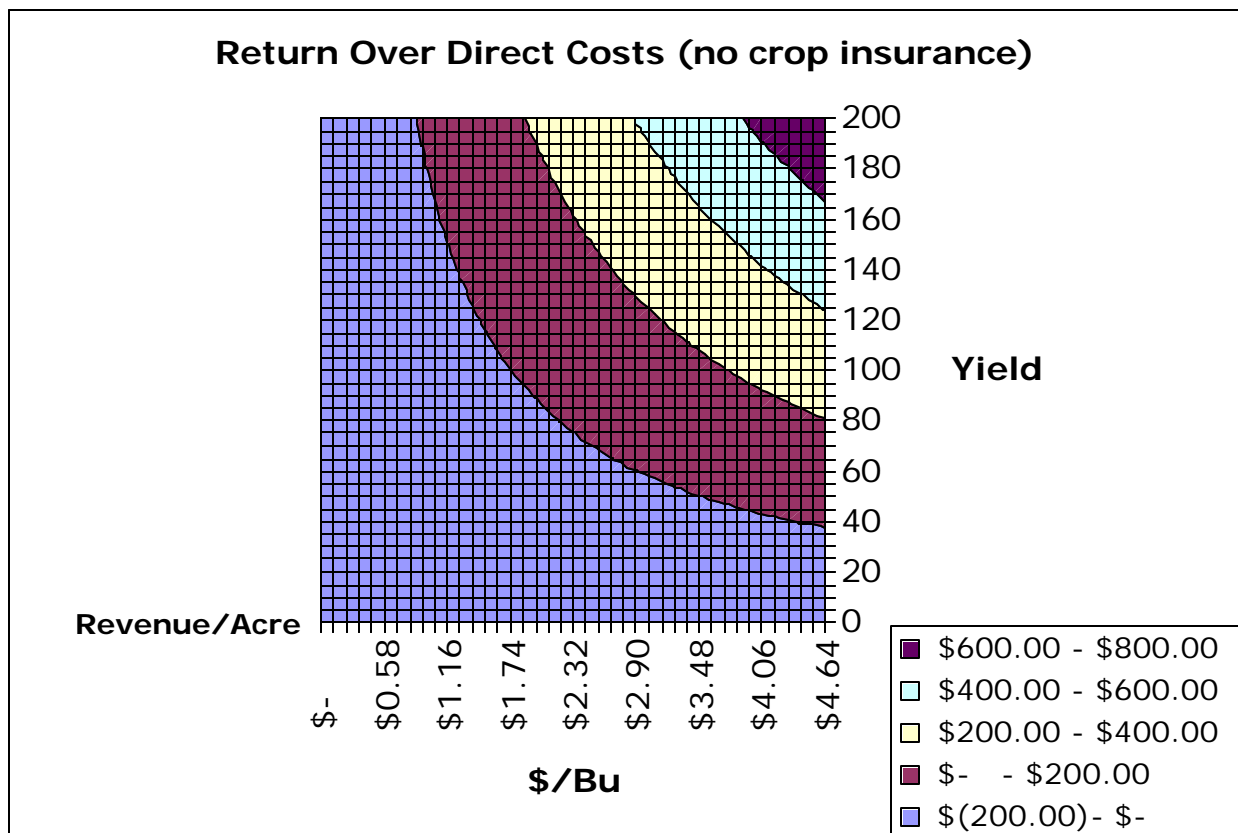


Figure 2. Return Over Direct Cash Costs per Acre without Crop Insurance.

The next figure illustrates the effect of APH crop insurance on the per acre returns over direct cash costs. Here one can see an expansion in the maroon area as crop insurance indemnities compensate the grower for yields below 75 bushels per acre. Our assumptions included a 100 bushel per acre APH yield and a \$2.00 MCPI corn price. You should also look for changes in

the areas of positive returns. Because no crop insurance indemnities are paid in times of high yields the returns in these states of nature are reduced from the no insurance case by the amount of the premium. You might use these graphs to narrow your choice of a crop insurance product. Then go back to the data entry page and examine how purchasing these products would impact your projected income statement, balance sheet, and cash flows.

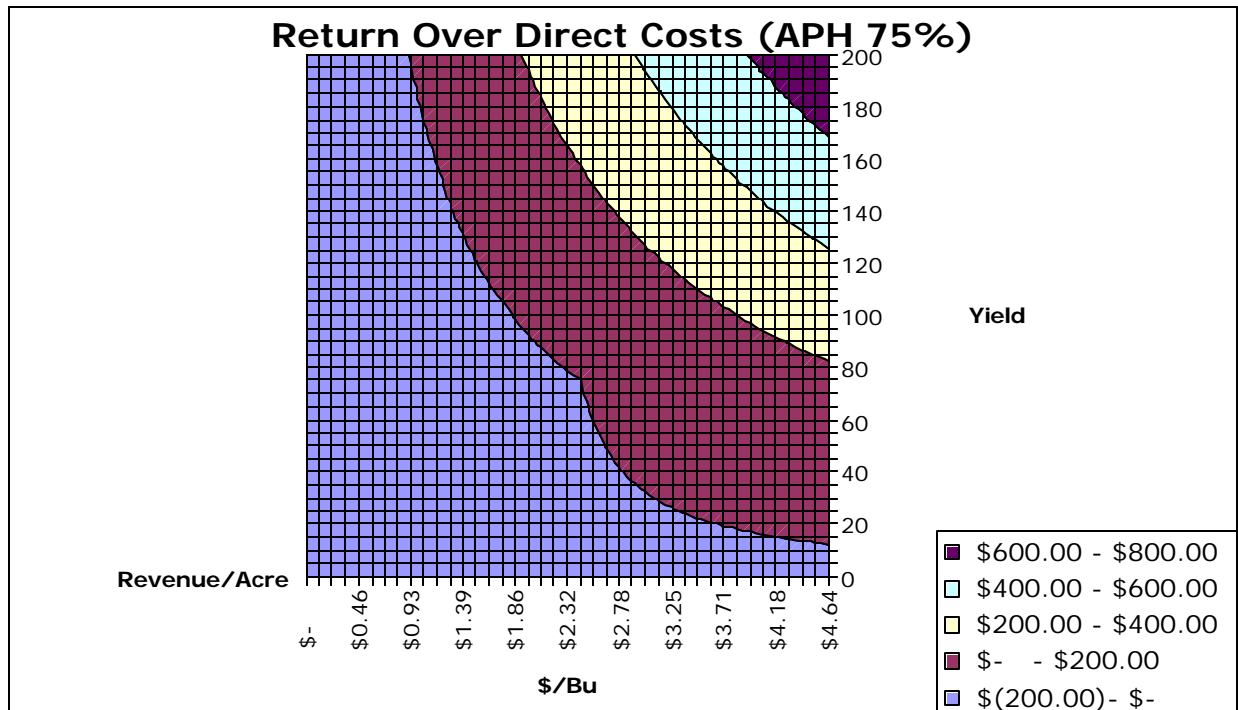


Figure 3. Return Over Direct Cash Costs with APH Crop Insurance – 75% Coverage.

The crop insurance product and coverage level that you choose should establish a safety net for your operation to meet its critical level of cash flow even in times of severely low yields and prices. Your decision on making informed crop insurance is complex. It entails a thorough understanding of your operation’s financial condition, the responsiveness of yields and prices to your bottom line, and a general understanding of the likelihood that you operation will experience low yields and/or low prices. Making an informed crop insurance decision is challenging, but not impossible task.