Variability and Risk in Indiana Agriculture

George F. Patrick
RISK MANAGEMENT IN AGRICULTURE:

Variability and Risk in Indiana Agriculture

Purdue University Cooperative Extension Service • West Lafayette, Indiana
Variability and Risk in Indiana Agriculture

George F. Patrick, Extension Economist

Introduction

Farmers make decisions in a risky, ever-changing environment. The consequences of their decisions are generally not known when the decisions are made, and their outcome may be better or worse than expected. Variability of prices and yields are major sources of risk in agriculture. Changes in technology, legal and social concerns and the human factor itself also contribute to the risky environment for farmers. Risky situations of concern are typically those in which 1) there is a high probability of adverse consequences and/or 2) the adverse consequences, should they occur, would cause significant disruptions.

Farmers and other business people generally do not get into risky situations unless there is a probability of making money. It is to their advantage that these risky but potentially profitable situations be managed as carefully as possible. Effective risk management involves anticipating possible difficulties and planning to reduce their consequences, not just reacting to unfavorable events as they occur. The two primary aspects of risk management are: 1) anticipating that an unfavorable event may occur and acting to reduce the probability of its occurrence and 2) taking actions which will reduce the adverse consequences should the unfavorable event occur.

For example, risk management in the machinery area might involve a complete overhaul of an old tractor before the busy season to reduce the chances of a major breakdown. Also, during planting and harvesting, most farmers keep some key spare parts readily available. These parts do not prevent a breakdown from occurring, but the unfavorable consequences are reduced. However, risk management techniques—no matter how effective—cannot resolve serious, chronic cash-flow difficulties.

Individuals are not the same, nor are their personal and financial circumstances. This series of publications is designed to help farmers develop their own risk management strategies, ones appropriate to their attitudes and circumstances. Included in this series of publications are the following three publications.

EC-647, Decision-Making in a Risky Environment, discusses goals and risk attitudes which differ among individuals. Factors important in decision-making under risk are explained. These include probabilities, measures of variability, expected values and expectations. This publication is intended to help farmers recognize some of the factors underlying the decision-making process and also to provide background information to facilitate understanding of the other publications in the series.

EC-648, Variability and Risk in Indiana Agriculture (this publication), identifies sources of risk in agriculture and discusses producers' views of the importance of different sources of variability in crop and livestock production. Data on the historical variability of prices and yields of the primary Indiana commodities are presented, and some managerial implications are discussed.

EC-649, Risk Management Strategies, examines production, marketing and financial responses farmers use to deal with risk. Producers' views of the importance of these risk responses and their use of them are reported. The concept of risk balancing is introduced, and the need for an integrated risk management strategy combining production, marketing and financial responses is discussed.
Variability and Risk

Low product prices, declining land values and high real interest rates have made farmers very much aware that decisions can have adverse consequences. Decisions may also have outcomes which are better than expected. The variability of outcomes is associated with many of the risks which producers face.

Risks can be classified in several ways. One useful classification is to consider business and financial risks. Business risks are those associated with farming which are independent of the farmer’s financial circumstances. These would include variable yields, fluctuating prices and many other factors which make the consequences of a decision unknown. Financial risks are the additional risks faced by a farmer who has less than total equity in the farm operation. Availability of loan funds and the costs of credit are some examples of additional financial risks. Less than full equity in the farming operation may magnify the good or bad consequences of decisions, affecting the individual’s capacity to bear risks.

This publication first discusses a number of sources of variability or risk in agriculture. Producers’ views of the importance of sources of variability in crop and livestock production are also discussed. Information is then presented on the historical variability of prices and yields of the primary Indiana commodities to help farmers assess the magnitude and range of the variability they face.

Sources of Risks

Business risks for the farm operator are classified according to their sources.

Market or price risk is associated with the purchase of inputs as well as the sale of commodities. Fluctuations in input and output prices cause income gains or losses. These fluctuations can be within a marketing year as well as between years. Net worth may also be affected if prices of assets such as land and machinery change. Availability of inputs is also a risk. And, in the longer run, the variability of prices, interest rates and relative prices are risk factors which influence many decisions.

Production risk is the random variability inherent in a farm’s production process. Weather, diseases and pest infestations lead to production risk in crop and livestock activities. Fire, wind, theft and other casualties are also sources of production risk.

Technological risk is the potential that current decisions may be offset by dramatic technological improvements in the future.

There is the risk that durable assets will become obsolete. The rapid change in confinement swine facilities in the late 1950’s is an example. Rapid developments in personal computers and farm-related software are a current concern. Developments in the non-farm sector can also affect farming; for example, more sensitive instruments to detect residues may change production practices.

Legal and social risks include things like government price and income programs, tax, trade, credit and environmental policies, which all have impact on the operating environment. These risks may increase as firms get larger. New risks may result from new developments. Forward contracting, for instance, introduces the risk associated with the integrity of the contractor.

Human sources of risk are associated with the labor and management functions in farming. Health problems of key individuals can severely disrupt farm performance. Furthermore, changing objectives of individuals and family members can have major effects on a farm’s long-run changes and viability.

Producers’ Views of Variability

To determine which sources of variability are important and how the importance differs geographically, a study was conducted in 12 states. A small number of producers were asked to indicate what they considered to be the most important sources of variability in crop and livestock production. Weather and output prices were selected the most important sources of variability in crop production. Livestock prices were the leading source of variability in livestock production, with operating input costs being slightly more important than weather.

Midwestern farmers considered diseases and pests as more important sources of variability in livestock production than in crop production. This was generally in contrast to other areas of the country. The midwestern farmers gave greater importance to safety and health, family plans, inflation and the world economic and political situation than producers in the other regions. Government commodity programs as well as government laws and regulations were considered less important by midwestern producers as a source of variability.
variability in crop production than by producers in other areas.

Producers' views of the importance of different sources of variability also differed with their individual circumstances. Farmers operating primarily rented land considered changes in the availability of land and conditions of leasing as much more important than farmers who operated primarily owned land. The availability and cost of credit, as would be expected, were more important as sources of variability for farmers with considerable indebtedness than for those with little or no debt.

Information to Improve Decision-Making

Individuals commonly differ in their judgments about possible outcomes and their probability assessments of these outcomes. The information presented on historical price and yield variability of the principal Indiana commodities is intended to help farmers in their assessments of the future. To help farmers gain a better perspective, adjustments have been made for inflation and yield trends. This information is intended for use only as a guideline to what has occurred and does not represent predictions for the future. Individuals will want to make adjustments and assessments based on their own experience and information.

Price Variability

Table 1 summarizes information on the average annual prices received by Indiana farmers for selected products in the 1960-72, 1973-85 and overall 1960-85 periods. The prices for 1985 used in this analysis are estimates based on partial year information. All of these prices are "real" prices, expressed in terms of dollars with 1985 buying power. Corn prices did not average $3.26 per bushel during the 1960s, but the purchasing power of the average price was equivalent to $3.26 in 1985.

Coefficients of variation express variability as a percentage of the average. Larger numbers indicate greater variability. If underlying prices were distributed like the bell-shaped normal curve, two-thirds of the time the price would be expected to be in a range of plus or minus the coefficient of variation. For a further discussion see EC-647, Decision-Making in a Risky Environment.

Two things come through strongly in Table 1. First, with the exception of beef, eggs and turkeys, average prices were higher, and in some cases considerably higher, in 1973-85 than they were in the 1960-72 period. Beef prices were slightly lower in real terms during the second subperiod, but eggs and turkeys were substantially lower. Second, with the exception of turkeys, the variability of prices (indicated by the coefficients of variation) was much higher in the 1973-85 period than for 1960-72. Although real prices were generally higher, the variability of real prices was much greater in the second subperiod than the first.

Figures 1-10 graph the annual average prices received by Indiana farmers in nominal and 1985 dollars. Nominal prices are those prices actually received by farmers. Prices in 1985 dollars reflect constant purchasing power. These prices do not include any adjustments

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn (bu.)</td>
<td>3.26</td>
<td>10.3</td>
<td>3.68</td>
<td>25.9</td>
<td>3.47</td>
<td>21.1</td>
</tr>
<tr>
<td>Soybeans (bu.)</td>
<td>7.49</td>
<td>10.0</td>
<td>9.20</td>
<td>26.8</td>
<td>8.35</td>
<td>25.8</td>
</tr>
<tr>
<td>Wheat (bu.)</td>
<td>4.49</td>
<td>26.2</td>
<td>4.82</td>
<td>34.4</td>
<td>4.86</td>
<td>30.6</td>
</tr>
<tr>
<td>Oats (bu.)</td>
<td>1.98</td>
<td>10.7</td>
<td>2.38</td>
<td>17.8</td>
<td>2.18</td>
<td>17.7</td>
</tr>
<tr>
<td>Hay (ton)</td>
<td>88.48</td>
<td>6.4</td>
<td>80.20</td>
<td>23.8</td>
<td>74.46</td>
<td>14.0</td>
</tr>
<tr>
<td>Hogs (cwt.)</td>
<td>55.50</td>
<td>13.4</td>
<td>63.33</td>
<td>23.8</td>
<td>59.50</td>
<td>20.5</td>
</tr>
<tr>
<td>Beef (cwt.)</td>
<td>68.89</td>
<td>5.9</td>
<td>67.33</td>
<td>19.2</td>
<td>68.11</td>
<td>13.8</td>
</tr>
<tr>
<td>Milk (cwt.)</td>
<td>13.85</td>
<td>7.5</td>
<td>15.86</td>
<td>8.4</td>
<td>14.85</td>
<td>10.5</td>
</tr>
<tr>
<td>Eggs (doz.)</td>
<td>0.85</td>
<td>13.4</td>
<td>0.79</td>
<td>21.4</td>
<td>0.87</td>
<td>19.1</td>
</tr>
<tr>
<td>Turkeys (lb.)</td>
<td>0.64</td>
<td>12.5</td>
<td>0.55</td>
<td>11.8</td>
<td>0.80</td>
<td>14.1</td>
</tr>
</tbody>
</table>

Source: Based on information from the Department of Agricultural Statistics, Purdue University.

* Prices are converted to 1985 dollars using the GNP Implicit Price Deflator.
for government payments, such as deficiency, diversion or set-aside payments, received by farmers. These payments have been generally more important for wheat than other crops and were also more important in the 1960s than in the 1970s. However, given recent changes in government commodity programs, it appears that future deficiency payments may be substantial.

The range of prices within a year, illustrated by the high and low average monthly prices in 1985 dollars, is indicated by the ends of the vertical lines for each year. Use of average monthly prices underestimates the full range of variability for a period because the highs and lows within a month are not reflected by the average. Individual farmers could have received prices over wider ranges than indicated in the figures.

Corn prices (Figure 1) show a very sharp run up in the 1973-74 period (an average monthly high of almost $7 in 1974 when expressed in terms of 1985 dollars). This rapid price increase was the result of reductions in U.S. grain stocks, devaluation of the U.S. dollars, crop shortfalls in other countries and other factors. Prices in the 1980-84 period have been low relative to the early 1970s, but not especially low relative to the 1960-70 period when expressed as 1985 dollars. However, the 1985 average price was the lowest in real terms over the 26-year period.

The very high real prices of the mid-1970s appear as the exception rather than the general trend for corn. Prices in the 1980s, although low relative to the long-term average, are not substantially below the 1960s and early 1970s.

Soybean prices (Figure 2) have the same general pattern as corn prices. The peak in 1973 (almost $23 per bushel in terms of 1985 dollars) was about three times the average of the 1960s, as compared with about two times for corn. During the 1960s, soybeans exhibited a relatively narrow and constant range of monthly average highs and lows. For the 1970s and later, the range of prices within a year tended to be much greater. In the 1980s, real soybean prices have also been at levels which are low relative to average of the 1960s, and 1985 was the lowest year in the 26-year period.

Wheat prices (Figure 3) showed a rather steady and substantial decline in real terms from 1960 into the early 1970s (no government payments are included). Prices increased sharply in the 1973-75 period because of sales to Russia and the factors discussed previously. There was another peak in 1979, but prices since 1981 have been near the lows of the late 1960s and early 1970s. The range of prices within the year, as indicated by the monthly average highs and lows, has also narrowed considerably in the 1980s.

Oats (Figure 4) and hay (Figure 5) have similar patterns of real prices. Both fluctuated over a relatively narrow band during the 1960s and early 1970s, with some tendency for real prices to decline. Although prices increased in

Figure 1. Corn Prices 1960-1985. Annual Average Prices Received by Indiana Farmers in Nominal and 1985 Dollars and Range of Average Monthly Highs and Lows in 1985 Dollars.

Figure 2. Soybean Prices 1960-1985. Annual Average Prices Received by Indiana Farmers in Nominal and 1985 Dollars and Range of Average Monthly Highs and Lows in 1985 Dollars.
the 1973-75 period, the increases were not as
great as for corn, soybeans and wheat. Prices
in the 1980s have trended toward levels of the
1960s. Prices for both oats and hay were
sharply lower in 1985. The range of prices
within a year has been considerably wider
than in the 1960s, especially for hay in the
1980s.

Figure 3. Wheat Prices 1960-1985. Annual Average
Prices Received by Indiana Farmers in Nominal
and 1985 Dollars and Range of Average Monthly
Monthly Highs and Lows in 1985 Dollars.

Figure 4. Oat Prices 1960-1985. Annual Average
Prices Received by Indiana Farmers in Nominal
and 1985 Dollars and Range of Average Monthly
Monthly Highs and Lows in 1985 Dollars.

Hog prices (Figure 6) show a pattern which
is quite different from that of the crops.
Although hogs also reached historic highs in
real terms during the mid-1970s, there have
been price cycles. Use of quarterly or monthly
hog prices would indicate the cycles of hog
prices more clearly than the annual data does.
Since the mid-1970s the price cycles are less
pronounced in this annual data. Prices have
tended to decline in real terms as nominal
prices have varied over a narrow range. Also
in contrast to crop prices, the range in average
monthly highs and lows within a year has
been much the same over the period.

Beef cattle prices (Figure 7) also have a
cyclical pattern, and the last two cycles show
very clearly in real prices. Annual average
prices have declined substantially since the
peak in 1979. This long decline in real prices,
together with the relatively low real prices of
the mid-1970s, resulted in beef cattle prices
averaging less in the 1973-85 period than they
did from 1960 to 1972 (Table 1). Real beef cat-
tle prices in 1985, like corn and soybeans, were
at the lowest point of the 26-year period since
1960.

Milk prices (Figure 8) have shown greater
stability than other commodity prices in the
1960-85 period. This largely reflects adminis-
trative determination of price through milk
marketing orders and government policy. The
within-year range in prices generally reflects
the seasonal pattern of milk production, and
this has tended to narrow in recent years.
After tending to work higher in real terms over time, milk prices have trended downward since 1979, reaching the levels of the early 1960s. Nominal prices have also declined slightly since 1981.

Egg and turkey prices (Figures 9 and 10) have shown a downward trend in real prices and a narrowing of the within-year variability. This largely reflects the changes in both production and marketing technology which have occurred since 1960. With integrated production and marketing, as well as the shorter biological cycle, adjustments to changes in profitability of production can occur more quickly than with beef cattle or hogs. Turkey prices were considerably higher in 1984 than in other

Figure 6. Hog Prices 1960-1985. Annual Average Prices Received by Indiana Farmers in Nominal and 1985 Dollars and Range of Average Monthly Highs and Lows in 1985 Dollars.

Figure 7. Beef Cattle Prices 1960-1985. Annual Average Prices Received by Indiana Farmers in Nominal and 1985 Dollars and Range of Average Monthly Highs and Lows in 1985 Dollars.

Figure 8. Milk Prices 1960-1985. Annual Average Prices Received by Indiana Farmers in Nominal and 1985 Dollars and Range in Average Monthly Highs and Lows in 1985 Dollars.

Figure 9. Egg Prices 1960-1985. Annual Average Prices Received by Indiana Farmers in Nominal and 1985 Dollars and Range of Average Monthly Highs and Lows in 1985 Dollars.
recent years. Monthly prices have not been collected for turkeys since 1981, thus no range in prices is indicated for recent years.

Yield Variability

Table 2 summarizes the average crop yields and coefficients of variation for average yields in Indiana and in Tippecanoe County. Unlike commodity prices, differences in variability among crops, as indicated by the similar coefficients of variation, are small. The coefficients of variation are larger for most crops for the 1973-85 period than for 1960-72, indicating increased yield variability, but the change between periods is much less than for prices.

Note that the coefficients of variation for crops yields are all larger in Tippecanoe County than for Indiana. Yields tend to be more variable as smaller geographic areas are considered. Yield variability on individual farms would generally be even greater. State and county data generally underestimate the variability faced by individual farmers. Furthermore, because of their unique circumstances and management practices, some farmers may have yields which are less variable than other farmers on their individual farms.

Figures 11, 12, and 13 indicate average yields for Indiana and Tippecanoe County for corn, soybeans and wheat. The bad yields of 1974 and 1983 for corn and the good years of 1972, 1973, 1976, 1979, 1984 and 1985 show up clearly. Soybean yields were bad in 1967, 1974, 1981 and 1983 in Indiana. However, 1983 was nowhere near as bad for soybeans as for corn, especially in Tippecanoe County. In contrast to corn, the only outstanding year for soybean yields was 1982. Wheat yields have varied substantially over the 1960-85 period. It is interesting to note that although 1983 is
Corn has the most variable yields in both Indiana and Tippecanoe County. Soybeans have the most stable yields in Tippecanoe County after the effect of the linear trend is removed. However, the differences in variability among these crops are not great.

Figures 14, 15 and 16 indicate variations in yields expressed as deviations from the trend-adjusted yields for corn, soybeans and wheat in Tippecanoe County. For corn, the disaster years of 1974 and 1983 (when yields were 65.1 and 64.0 percent respectively of the trend-adjusted yield) continue to stand out as substantial deviations from the historical band of deviations of plus or minus 15 percent. In contrast, the record high yield of 1982 was only 18.9 percent above the trend and only slightly above the historical variation. The low yields in 1967 (81.5 percent) and 1974 (67.9 percent) for soybeans stand out much more than the high yields of 1960 (111.7 percent) and 1982 (111.2 percent) from the trend-adjusted yield. In wheat, the extremes of highs and lows are within the same general range of plus or minus less than 20 percent from trend-adjusted yield.

Implications

Based on these figures, three conclusions can be drawn. First, there does not appear to be any predictable pattern in crop yields after the effects of trends are removed. A series of above average or below average years may occur together. A good year does not necessarily follow a bad year or vice versa.

Second, yields of corn and soybeans tend to move together: if one is above average, the other is likely to be above average too. Variations in wheat yields are not as closely associated with variations in corn and soybeans. At times, such as 1964 and 1974, all three crops

Table 2. Average Indiana and Tippecanoe County Yields (Ave.) and Coefficients of Variation (C.V.) for Selected Crops from 1960 to 1985.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indiana</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>85.5</td>
<td>13.6</td>
<td>104.0</td>
<td>16.4</td>
<td>94.8</td>
<td>18.1</td>
<td>1.55</td>
</tr>
<tr>
<td>Soybeans</td>
<td>28.5</td>
<td>9.8</td>
<td>34.4</td>
<td>14.4</td>
<td>31.5</td>
<td>15.7</td>
<td>.47</td>
</tr>
<tr>
<td>Wheat</td>
<td>38.1</td>
<td>13.6</td>
<td>43.5</td>
<td>13.6</td>
<td>40.8</td>
<td>14.9</td>
<td>.58</td>
</tr>
<tr>
<td>Oats</td>
<td>55.0</td>
<td>12.6</td>
<td>57.5</td>
<td>9.7</td>
<td>56.2</td>
<td>11.3</td>
<td>.36</td>
</tr>
<tr>
<td><strong>Tippecanoe County</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>91.9</td>
<td>14.1</td>
<td>110.1</td>
<td>21.4</td>
<td>101.0</td>
<td>20.6</td>
<td>1.49</td>
</tr>
<tr>
<td>Soybeans</td>
<td>29.5</td>
<td>12.3</td>
<td>36.8</td>
<td>14.6</td>
<td>33.1</td>
<td>17.6</td>
<td>.55</td>
</tr>
<tr>
<td>Wheat</td>
<td>41.1</td>
<td>13.9</td>
<td>48.2</td>
<td>17.1</td>
<td>44.6</td>
<td>17.5</td>
<td>.70</td>
</tr>
</tbody>
</table>

Source: Based on information from the Department of Agricultural Statistics, Purdue University.
Table 3. Average Indiana and Tippecanoe County Yields, Standard Deviation and Coefficients of Variation for Selected Crops from 1960 to 1985 Using 1985 Technology.*

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average Yield (bu.)</th>
<th>Standard Deviation (bu.)</th>
<th>Coefficient of Variation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indiana</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>115.8</td>
<td>12.4</td>
<td>10.6</td>
</tr>
<tr>
<td>Soybeans</td>
<td>37.9</td>
<td>3.3</td>
<td>8.8</td>
</tr>
<tr>
<td>Wheat</td>
<td>48.6</td>
<td>4.2</td>
<td>8.7</td>
</tr>
<tr>
<td><strong>Tippecanoe County</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>121.1</td>
<td>17.4</td>
<td>14.4</td>
</tr>
<tr>
<td>Soybeans</td>
<td>40.5</td>
<td>4.0</td>
<td>9.9</td>
</tr>
<tr>
<td>Wheat</td>
<td>54.0</td>
<td>5.7</td>
<td>10.6</td>
</tr>
</tbody>
</table>

Source: Based on information from the Department of Agricultural Statistics, Purdue University.

* Yields using current technology are estimated using the 1960-85 trend. For example, corn yields had increased an estimated 1.55 bushels per year from 1960 to 1985, making the 1960 yield with 1985 technology about 40.30 bushels (28 years x 1.55 bu) higher than the actual 1960 yield.

Figure 14. Variability of Corn Yields in Tippecanoe County from 1960 to 1985 as Percent of Mean Yield (trend removed).

Figure 15. Variability of Soybean Yields in Tippecanoe County from 1960 to 1985 as Percent of Mean Yield (trend removed).

Figure 16. Variability of Wheat Yields in Tippecanoe County from 1960 to 1985 as Percent of Mean Yield (trend removed).

may be below average or, as in 1960, 1962, 1963, 1971 and 1975, all three may be above average. However, it is common for the wheat yield to be above average when the corn and soybean yield are below or vice versa.

Third, above average yields occurred more frequently than below average yields for all three crops in Tippecanoe County from 1960 to 1985. Better than average years outnumber below average years in a ratio of 8 to 5 for both corn and soybeans. However, the negative deviations tend to be considerably larger than the positive ones. A really BAD year is more likely than a really super one, especially for corn and soybeans.

Management Considerations

Knowledge of historical levels and variability of prices and yields can be helpful in formulating expectations. Current prices can be
considered in terms of the historical perspective. For example, annual average real corn prices of less than $3.00 per bushel in 1985 dollars have occurred only four times since 1960, the same frequency that average real prices above $4.00 per bushel have occurred. However, the 1986 target price for corn of $3.03 is equivalent to slightly less than $3.00 per bushel in 1985 dollars. An historical perspective is also useful in assessing the range and probabilities of possible outcomes. Nevertheless, relying on the past to predict the future may be just as dangerous as ignoring the past.

There are some contrasts between prices and yields with respect to variability. Although within-year and year-to-year changes in prices are substantial, there are periods of generally rising or falling prices which persist for periods of time which are longer than a year. Furthermore, beef cattle and hog prices do have cycles. However, it is difficult to call the turning points (especially with enough lead time to take advantage of it). Weather in one year, on the other hand, is essentially independent of the preceding year. Thus, yields in one year are not greatly affected by yields in the previous year. However, the average yields are expected to increase over time because of the influence of technology.

Prices often have limited downside-risk, relative to yields, especially for the grains. Government price and income policy has tended to place a floor under prices. Participation in government programs commonly requires diversion or set-aside of some crop land, but this cost may be offset by eligibility for deficiency payments and/or loan programs. Agricultural policy legislation may change, but participation in government programs will generally provide some price or income protection.

Input prices, availability and cost of credit, as well as many other factors, can also affect farm income and planning. Technological risk is generally greater for buildings, improvements and storage facilities for which disposal is difficult than for more mobile investments like machinery. Legal and social risks appear to be increasing, but could have quite different effects depending on an individual's circumstances. The human sources of risk are often very difficult to assess because other individuals may be involved. Objectivity may also be difficult because of emotional considerations.

Decisions involve expectations with respect to the future. Historical information is generally not readily available to help individuals assess technological, legal and social, and human sources of risks. However, the perspective provided by price and yield information can be helpful in formulating expectations. Farmers will want to use their own experience and other information in making judgements about the future.

Appreciation is expressed to Dave Bache, Freddie Barnard, Don Pershing and John Sanders for comments helping to clarify an earlier version and to Allen Featherstone for developing the computer routines used in price and yield graphing.