

off-farm employment and farm income variability. In one study, a times series analysis of aggregate data indicated that the fraction of total farm family income earned from off-farm sources was higher in the 1980's than in the early 1970's, and suggested that the riskiness of farm income is positively related to working off the farm (Kyle). A study focusing on producer responses to a survey in Dodge County, Georgia, in the 1980's indicated that risk and low incomes were major disadvantages associated with full-time farming (Bartlett). In another study, farm household total income was found to be significantly less variable if producers and their spouses worked off the farm (Sander).

More recent research has more explicitly linked the decision to work off the farm with farm income variability and other factors (Mishra and Goodwin, 1997). Mishra and Goodwin's analysis, using a simultaneous-equation Tobit model, confirmed that the off-farm labor supply of farmers is positively correlated with the riskiness of farm income among Kansas farmers. Their results also indicated that off-farm work (for both the farmer and spouse) is positively correlated with off-farm experience and with the degree of leverage associated with the farm. Further, operators of larger farms and those receiving government supports were less likely to work off the farm. In a followup study, Mishra and Goodwin (1998) also found a positive and significant correlation between farm income variability and the decision by farm operators in North Carolina to work off the farm.

Although the focus of this section has been on off-farm employment, off-farm income may be derived from other sources as well (such as interest and dividends). Indeed, several studies have concluded that the low correlation between

financial assets (stocks, bonds, certificates of deposit) and farm assets suggests that diversifying into financial assets may yield important gains in risk efficiency for farm households. A quadratic programming analysis of a representative Illinois grain farm, for example, indicated that various levels of diversification could reduce the relative variability of the farm's rates of return on assets by 15-25 percent compared with holding farm assets alone (Young and Barry). Conversely, other research has focused on nonfarm equity investment in agriculture, generally concluding that investors can gain from inclusion of farm assets in their investment portfolios (Crisostomo and Featherstone; Moss, Featherstone, and Baker).

Other Ways of Managing Risk

The strategies and tools just discussed in detail are by no means all inclusive. Many other diverse strategies for farm risk management are commonly used by producers on their operations. Some of these additional strategies include the following:

- *Adjusting inputs and outputs*—Producers can respond to risk by altering output levels, input use, or some combination of the two. Research indicates that greater output price risk results in lower levels of both input use and final output. Given that preferences toward risk and circumstances can vary greatly across producers, the final input and output levels chosen by producers can, accordingly, vary considerably for individuals in similar situations. (See Sandmo; Hawawini; Ishii; Robison and Barry; and Just and Pope for more detail.)
- *Cultural practices*—Cultural practices can be used to reduce yield and, hence, income risk. One such practice involves planting short-season varieties

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that mature earlier in the season, protecting against the risk of early frost and yield loss. Supplemental irrigation due to abnormal weather is another means to protect against yield loss.

- *Excess machine capacity*—A farmer may have enough machine capacity so that planting and harvesting crops can occur more rapidly than needed under normal weather conditions. By having such resources, the farmer can avoid delays at either planting or harvest that may reduce yield losses.

Other methods of risk management in farming are also important, and focus on other types of

issues than those specific to production, marketing, and finance. Legal risks and issues associated with farm liability, for example, have become increasingly important. In addition, tax concerns are a key issue in managing the income risks associated with year-to-year income flows, as well as estate transfers from generation to generation (Keller; Keller and Rigby-Adcock; Baquet, Hambleton, and Jose). Government payments—such as contract payments under the 1996 Farm Act—can also be used to provide liquidity, for example, or to pay the premium for an options contract or a “buy up” crop insurance policy.