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ALTERNATIVES FOR PRODUCER RISK MANAGEMENT

by

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Market and price volatility have long been a hallmark of the agricultural sector. When aggregate output or demand changes sharply, farm-level prices can fluctuate wildly. U.S. agricultural policies for major field crops have attempted to mitigate the risks farmers face from variations in crop yields and prices, and to help farmers manage these risks.

The form those policies have taken has, however, changed dramatically over time. The 1996 Farm Act has altered the government's role in providing support to producers, and has renewed interest in the agricultural risk environment and alternative ways to mitigate risk. Meanwhile, relatively new risk management tools--federally subsidized revenue insurance, yield futures and options, and hybrid cash contracts--add to the alternatives available to producers.

These developments raise several questions: How has the risk environment faced by producers changed over time, particularly with passage of the 1996 Farm Act? What are some of the new risk management tools available to producers? How effective are they in reducing farm-level income risk? This paper examines these questions, focusing on the risk environment faced by producers of major grain crops.

What Does the New Environment Mean for Income Risk?

The 1996 Farm Act dismantled the complex system of deficiency payments and annual supply management programs that were in place since 1973, affecting expected returns and the income risk confronted by grain producers. The "old" system provided program crop producers with price and income support in years of low market prices. In contrast, participating producers under the 1996 Act will receive "contract payments" that are fixed in the aggregate for each of the years 1996-2002, and that are at relatively high levels when compared to projected payments had the deficiency payment system been continued. Because contract payments do not increase when prices are low--a major feature of previous commodity programs--they do not, however, directly reduce farmers' income risks.

Under the pre-1996 program, payments were made during times of low market prices. That system not only raised farmers' incomes on average, but also provided a degree of protection against low incomes. Research conducted by USDA's Economic Research Service (ERS) and Ohio State University, based on conditions and program parameters in effect in 1992 and accounting for a wide range of weather shocks, indicates that simulated market returns for U.S. corn producers averaged about \$270 per acre. Deficiency payments would add \$50 per acre, on average, in income support.

In addition, deficiency payments tended to stabilize revenues by transferring income to producers when national average market prices were low. According to these research results, deficiency payments reduced relative revenue risk by an average of 20 percent for U.S. corn producers. Because deficiency payments were made when national average prices for program crops were low--and not necessarily when the revenue for an individual farm was low--this system was far from totally effective. In fact, year-to-year revenue risk was not dampened significantly for certain individual farms, and not at all in other cases--particularly for those farms in areas where yields and prices exhibit a strong inverse relationship, creating a "natural hedge" that works to stabilize revenues through market forces.

In contrast to the risk effects associated with deficiency payments, the new contract payments do not reduce relative revenue variability for producers. This is because they are not based on current prices or yields. In 1998, for example, a participating corn producer is projected to receive a contract payment averaging to about \$32 per acre, regardless of actual price levels in that year. As a result, the revenue variability faced by producers who receive contract payments is essentially identical to the variability they confront if they depend only on market returns.

Although contract payments do not provide direct protection against risk, it is important to note that they offer substantial income support. Contract payments over the 1996-2002 are projected to be significantly higher than payments had the deficiency payment program been continued, totaling to more than \$35 billion over the seven years.

....And For Price Risk?

It remains unclear whether and by how much price variability will change. Under the 1996 Act, output and price depend entirely on the market--USDA will no longer implement acreage reduction and other supply management programs. The net effect on price variability remains unclear, and depends on many factors.

For example, the aggregate effect of the increased planting flexibility associated with the 1996 Farm Act on the volatility of crop prices is uncertain. Before 1996, participating producers' planting decisions were limited by base acreage constraints, acreage reduction programs (ARPs), and other provisions. With the 1996 Act, however, farmers now have nearly total freedom to

plant a wide variety of crops on any of their land, and ARPs have been eliminated. As a result, planting decisions are affected by the expected prices and yields that farmers envision at planting time, relative costs, rotational concerns, management abilities, available equipment, and weather conditions at planting time.

The effect of this increased planting flexibility on the volatility of crop prices (and hence farm revenues) depends on producer behavior and aggregate supply response. If year-to-year planting adjustments are significantly greater than in the past, prices and revenues may be more volatile. On the other hand, volatility may be reduced if farmers can more readily respond to market signals, without the planting restrictions that may have constrained acreage shifts in the past.

Changes introduced with the 1996 Farm Act are part of an evolution to more market-oriented policies that began with the 1985 Farm Act, and many program changes that have occurred over time have implications for variability. During the early 1980's, government loan rates (the price per unit for commodity loans to participating farmers) were set at high levels, establishing a floor under market prices and encouraging forfeiture of crops into government stocks in lieu of loan repayment. The 1985 Act reduced loan rates, increasing the role of marketplace signals and reducing government intervention and stockholding. The 1996 Farm Act capped commodity loan rates at 1995 levels and marketing loan provisions are in place--both of which reduce the likelihood that loan rates will interfere with market prices.

Other developments have also affected the risk environment, particularly the tightening of world grain stocks. This situation is the result of rising demand outpacing production, as well as policies in the U.S. and elsewhere aimed at reducing government-held stocks. The global stocks-to-use levels for corn and wheat in 1995/96 fell to the lowest level in the USDA data base that starts in 1960. If low global stock levels persist, prices (and revenues) will likely be more volatile than if higher stocks were available to buffer year-to-year supply and demand shocks.

Some changes in the risk environment may be partially offsetting. Reduction in trade barriers, including passage of the Uruguay Round Agreement and the North American Free Trade Agreement, has enhanced world market integration and agricultural trade potential. The ability to ship more goods from areas of commodity surplus to deficit regions may work to dampen market volatility and reduce price variability in future years.

In short, substantial uncertainty remains regarding the price risks faced by producers. However, with the absence of downside price protection provided by deficiency payments--and the current system of fixed, declining contract payments--revenue variability will likely increase. And, of course, any increases or decreases in price variability--an empirical question to be measured over time--will have implications for the variability in farm-level revenues as well.

Farmers Use a Variety of Tools

Within the changing risk environment, many traditional risk management tools continue to be useful to farmers, including crop insurance and various production and marketing strategies. Certainly, income risk is nothing new to farmers, and many have used a wide variety of tools--including Government programs, diversification, and various forward sales strategies--for some time.

Federal crop insurance, for example, which underwent extensive reform in 1994, has been available to producers of program crops (and various specialty crops) since at least 1980, and for some crops and areas as early as 1938. At the catastrophic level (CAT), producers pay a \$50-per-crop fee for coverage against yield losses of greater than 50 percent of the farm's expected yield. CAT can be purchased through private insurance companies and, in some locations, through Farm Service Agency offices. Producers can increase coverage up to 75 percent of their expected yield by paying a premium. This additional coverage is available only through private companies. USDA subsidizes Federal crop insurance policies and reinsurance (shares the losses and gains) with the company writing the policy to the producer.

USDA's 1993 Farm Costs and Returns Survey (FCRS) included several questions that probed farmers' use of alternative risk strategies. Two categories were used to summarize farmers' responses: production strategies (such as Government programs, crop insurance, and diversification), and marketing strategies (such as forward contracting, hedging, and spreading sales throughout the year).

According to the results, more than half of the farmers surveyed used government programs and about 25 percent used crop insurance in 1993 (Figure 1). The survey found that the use of government programs and crop insurance was especially important for operators of cash grain farms in the Northern Plains and the western Corn Belt. Other strategies such as leasing land and using custom labor were more likely to be chosen by farmers in the Southeast and in the West. These latter strategies are risk-reducing because they allow producers to expand their operations without taking on an added mortgage or fixed equipment costs. In general, large farms appear to use diversification, leased land and equipment, and the contracting of inputs more commonly than do smaller farms.

The survey indicated that the most popular marketing strategy among U.S. farmers in 1993 was spreading sales over the year, followed by contracting the sale of farm production (Figure 2). The latter technique establishes a pre-harvest selling price and guarantees an outlet for the commodity. A less popular strategy was hedging, a process whereby the farmer uses the futures market to establish a pre-harvest price for his or her crop. To successfully implement a hedging strategy, cash or credit is required to begin and maintain the hedging process, which may limit its use.

Large farm operators are most likely to use marketing strategies to manage their risks, and farmers in the Northern Plains are much more likely to use such strategies than those in the Southeast. Farmers in the Northern Plains typically have less diversified operations than those in the Southeast, which may explain this geographic pattern. Also, farms in the Northern Plains tend to be larger, as measured by sales volume, than those in the Southeast.

New Products Help Farmers Manage Risks

In the spring of 1996, two pilot revenue insurance programs were introduced to complement the traditional risk management tools discussed above. Income Protection (IP) was developed by USDA's Risk Management Agency in response to a mandate in the Federal Crop Insurance Reform Act of 1994, while Crop Revenue Coverage (CRC) was designed by a private insurance company. These programs have expanded to new geographic areas over the past year, and a new product--Revenue Assurance (RA)--will be offered in the spring of 1997 in selected areas and for selected crops. Each product is based on the concept of combining price and yield risk protection in one program that provides downside revenue risk protection to producers.

IP offers a "revenue guarantee" based on the total acreage planted by a producer, the sign-up time futures price for harvest-time delivery, and the farmer's expected yield. The farmer receives an indemnity if the harvest-time price, multiplied by the farm's actual yield in that year, falls below the guarantee. Because the guarantee is based on the early-season price projection for harvest-time, IP protects against shortfalls in actual revenue below the expected revenue for the particular season. This policy, similar to CRC and RA, also provides a measure of inter-year stability because sign-up time futures prices for harvest-time delivery are less variable than harvest-time prices. IP premium costs are lower than for traditional crop insurance, especially in areas with high yield-price correlation.

CRC contains two components. The first, similar to IP, offers a revenue guarantee based on price expectations and farmers' expected yields. The second component offers "replacement coverage," whereby coverage can increase during the season if prices rise. If a producer has a short crop and the price is higher at harvest than the pre-harvest projection, the producer's crop yield loss is indemnified at the higher harvest-time price, allowing him or her to buy "replacement" bushels in the marketplace. The producer receives the higher of the "revenue guarantee indemnity" or the "replacement coverage" indemnity. Because of the added costs of replacement coverage, as well as other features, CRC premiums are much higher, on average, than IP premiums.

Revenue Assurance contains only one component--the revenue guarantee--making it more similar to IP than to CRC. However, RA and IP differ in important ways. RA embeds a unique system of premium discounts that depend on the unit structure associated with the farm. In contrast, IP allows producers to insure at only the enterprise unit level (all acreage in a crop in a

county is combined into one parcel), while CRC provides for both basic and optional acreage division.

As with Federal crop insurance, USDA subsidizes and reinsurance revenue insurance policies that are approved by the Federal Crop Insurance Corporation Board of Directors. Premiums vary by the coverage level selected (options range up to 75 percent yield coverage), and policies are then sold to producers by private companies. The geographic areas eligible for coverage have expanded considerably over the past year:

- *Income Protection*--IP was offered for corn, cotton, and spring wheat in 29 counties in the spring of 1996, and for winter wheat in 18 counties in the fall of 1996. For the spring of 1997, the FCIC Board approved IP expansion into soybeans (56 counties) and grain sorghum (24 counties).
- *Crop Revenue Coverage*--CRC was offered for corn and soybeans in all Iowa and Nebraska counties in the spring of 1996, as well as for winter wheat in six states (and selected counties in Montana) in the fall of 1996. Beginning in the spring of 1997, CRC is available for cotton, grain sorghum, and spring wheat in selected counties, and geographical coverage for corn and soybeans has been expanded significantly.
- *Revenue Assurance*--RA policies were approved for sale for corn and soybeans in all counties in Iowa for 1997. This is the first offering of the RA product.

Experience data show considerable variation in participation rates depending on the crop and the area. About 90,000 CRC policies were sold in Iowa and Nebraska in 1996, and about one-third of the Federally-subsidized crop insurance policies in those states were CRC policies. CRC covered about one-third of all corn and soybean planted acreage in the two states, and the liability for CRC and MPCI sales were nearly identical (Table 1).

In contrast, about 10 percent of all Federally subsidized winter wheat policies in states where CRC was available were CRC sales--a substantial drop compared to spring-crop experience (Table 2). Some argue that lower winter wheat sales were due to the relative premium rate increase on CRC winter wheat policies when compared to corn and soybeans. Some observers also indicate that corn and soybean producers may have been in a better financial position in 1996 to pay the CRC premium than were winter wheat producers. The impact of lower commodity prices in 1997 on CRC sales remains to be seen.

In addition to these revenue insurance products, new forward contracting arrangements have also developed. Farmers have long been able to lock in a price for a given quantity well ahead of harvest by forward contracting with a local elevator. New types of contracts provide farmers with greater flexibility in managing risks, but some, particularly hedge-to-arrive contracts, are

often difficult to understand, and have led in some cases to legal disputes between farmers and buyers.

In addition, the Chicago Board of Trade has introduced yield futures contracts for selected states and crops. When combined with price futures (or options), the yield contract can substantially reduce revenue risk in many areas. Farms and businesses--including grain companies and insurance companies--have expressed an interest in these contracts, but trading volume has been low. Basis risk (uncertainty about the difference between a farm's yield and the state yield on which the contract trades) is a major obstacle to direct hedging in yield futures by farmers.

How Effective Are Various Risk Management Tools?

The many options available for managing income risk lead to questions about their effectiveness and about how they can best be combined, and particularly, their relative effectiveness in different regions. To address these questions, ERS examined four risk management strategies--forward selling a portion of expected output (for example, through a futures hedge); purchasing crop insurance at the 75-percent coverage level; combining crop insurance and a forward sale; and purchasing revenue insurance at the 75-percent coverage level (based on the harvest-time futures price). Although there are many ways in which risk can be measured, the approach used here assumes a "safety first" criteria, where risk is measured as the probability of revenue falling below 70 percent of expected revenue.

In making the comparisons, we focused on risk and did not estimate the effects of the different strategies on average revenues. Forward selling generally has little effect on average revenues, but with government subsidies, crop and revenue insurance increase average revenues for most farmers. Subsidization provides an additional incentive for farmers to insure.

The effects of the four strategies were compared with the use of a "no risk-reducing strategy" for representative corn producing locations in Illinois, Iowa, North Carolina, and South Dakota. This strategy assumes that producers sell their crops at harvest for the local cash prices. As seen below, the effectiveness of the various risk-managing strategies varies by location. These differences stem largely from differences in yield variability, yield-price correlation, and basis variability between the locations.

The results indicate that a representative corn producer in Iowa or Illinois who does not sell forward or buy crop insurance would expect, on average, that his or her revenue would be less than 70 percent of preplanting expectations about 8-11 percent of the time (Figure 3). In contrast, the probability of such a low revenue is much higher in North Carolina or South Dakota--about 20-25 percent of the time. This is because yields are more variable in North Carolina and South Dakota than in the central Corn Belt. Moreover, the negative relationship between yield and price--called the "natural hedge"--is relatively weak in North Carolina.

The natural hedge is an important concept in analyzing risk. For example, in the major producing areas of the Corn Belt, the widespread occurrence of low corn yields can cause prices to increase significantly. Conversely, low prices are often associated with bumper-crop years. This "offsetting" relationship between prices and yields tends to stabilize farm revenues over time in these areas. Yield and price variations are less likely to offset each other in their effects on revenue where the natural hedge is weak. In states such as North Carolina, low corn prices and low yields (or high prices and high yields) are more likely to occur at the same time than in the Corn Belt, making corn revenues inherently more variable. This is because these areas have less impact than the Corn Belt on national output and prices.

Forward selling part of the expected crop prior to harvest reduces risk modestly compared with the "no strategy" case, although the impact varies considerably across locations. When the optimal amount is sold forward, the probability of revenue amounting to less than 70 percent of expected levels declines to 6-8 percent in the central Corn Belt and to 15-20 percent in North Carolina and South Dakota. Forward selling reduces revenue risk substantially in North Carolina, where the natural hedge is relatively weak.

Forward selling--either through hedging, buying a put option, or forward contracting with a local elevator--results in similar risk reduction. Each method has pros and cons depending on the farmer's situation and risk preferences.

Futures hedging ensures a highly competitive price, but requires access to credit if prices rise before harvest. Buying put options gives farmers the right (but not the obligation) to sell a futures contract at a specific price. Put options provide protection against price declines, without completely eliminating opportunities to gain from price increases, but there is a premium cost. Cash forward contracting with a local buyer is the simplest for many farmers and assures a physical outlet, but offers less flexibility and may not result in the highest price.

Used alone, crop insurance tends to be more effective than forward pricing in reducing revenue variability. The effect is the greatest in South Dakota, where yields are more variable than in the other three states in the ERS study. Whether crop insurance or forward selling is more effective by itself depends on the relative variability of yields, and on the fact that crop insurance has been offered with a maximum of 75 percent coverage. Coverage higher than 75 percent would be more effective in reducing risk, particularly in the Corn Belt, but also could raise Federal costs by increasing farmers' temptations to reduce inputs once yields are guaranteed.

When a producer combines a forward sale with the purchase of crop insurance, the probability of low revenue is reduced dramatically for each of the locations, compared with the no-strategy case. The two strategies complement each other strongly, particularly where the natural hedge is strong. Probabilities of revenues below 70 percent of expectations are reduced significantly in every case, and reduced to nearly zero in Illinois and Iowa.

The greatest risk reduction among the alternatives examined is provided by 75-percent-coverage revenue insurance. (The revenue insurance plan assumed here is an intra-seasonal guarantee based on individual farm yields and futures price projections, and does not include a replacement coverage component--only a basic revenue guarantee. Thus, it is more similar to IP or RA than to CRC.) Such coverage reduces the probability of revenues less than 70 percent of expectations to zero, except for risk associated with differences between local prices and futures prices at harvest-time (i.e., basis risk).

These examples show that probabilities of revenues falling below 70 percent of signup time expectations can be reduced substantially by combining forward pricing and crop insurance. Direct revenue insurance can be even more effective in reducing probabilities of such low revenues. Moreover, the consistent use of these strategies in successive years can be expected to reduce year-to-year variability in revenues because signup time yield and price expectations are less variable than the yields and prices realized at harvest. This year-to-year stabilization effect is not quantified here.

But farmers face longer term revenue risks when prices differ from historical levels for more than a year. Dealing with these longer term risks calls for other types of strategies, such as holding reserve funds, diversification among enterprises, adopting risk-lowering technologies (such as shorter season crop varieties or supplemental irrigation), and acquiring off-farm sources of income. As indicated by the FCRS data, many producers are using a combination of such tools and strategies. However, many issues remain regarding risk management, particularly over the long run.

Issues for the Future

Can farmers use existing tools more effectively? The effectiveness of different risk management strategies can vary widely across different geographic regions. Additional research is needed to determine what types of currently available tools and strategies are most useful to producers across the various regions, as well as to investigate new types of safety nets. And certainly, risk management education is increasingly important to help producers better understand how to most effectively use available strategies. Important issues for the future include:

- How do farmers spread risk over time? The FCRS data provide a "snapshot" for each year, but do not track producers over time. Tracking longer term behavior could be helpful in developing new products and making recommendations on inter-year strategies for different geographic locations and situations.
- Can (and should) government programs be designed to protect against inter-year revenue risk? Undoubtedly, the U.S. will experience, at some point, a sequence of years when farm-level revenues are low. Ideas for inter-year risk protection include a "target" revenue insurance program that stabilizes inter-year revenues,

or an income stabilization account approach that subsidizes producer savings to be drawn upon in years when revenues are low.

- What are the possibilities for private tools and institutional arrangements? Ideas for new private tools include longer term forward contracts, while public-private arrangements could include innovations to the current crop insurance program or the revenue insurance pilots. These programs are public-private arrangements in the sense that they are delivered (and designed in some cases) by private companies, with the government subsidizing the products (once approved) and sharing in the risk of loss.

As farm sizes become larger, some farmers may be in a better position to self-insure through the use of on-farm savings, along with use of risk management strategies. However, risk protection will remain an important issue well into the next century for farm households depending primarily on farm income, especially mid-sized commercial farms.

Risk management in farming calls for a variety of tools that, as a whole, reduce year-to-year revenue variability over the long run. Insights into the questions--and issues--discussed above may help producers better understand and cope with risks, and help policymakers and the private sector create improved safety nets for producers.

Table 1

A Comparison of Crop Insurance and Crop Revenue Coverage Acreage and Liability

1996 Corn and Soybeans in Iowa and Nebraska

Crop	Net Insured Acres (Million acres)		Liability (Billion dollars)	
	MPCI ¹	CRC ²	MPCI	CRC
Corn	10.3	7.4	\$1.7	\$1.8
Soybeans	6.8	3.3	\$0.9	\$0.6
Two-state, two-crop total	17.1	10.7	\$2.6	\$2.4

¹ Multi-peril crop insurance.

² Crop Revenue Coverage.

Table 2

A Comparison of Crop Insurance and Crop Revenue Coverage Policy Sales for Winter Wheat, 1997 Crop

(Data are preliminary, and reflect number of policies)

State	MPCI ¹	CRC ²	Total ³	Percent CRC
Kansas	63,526	7,982	71,550	11.2
Michigan	3,215	626	3,841	16.3
Montana ⁴	7,699	128	7,827	1.6
Nebraska	18,239	3,133	21,372	14.7
South Dakota	12,351	222	12,573	1.8
Texas	16,940	2,294	19,234	11.9
Washington	4,917	139	5,056	2.7
Total	126,887	14,524	141,453	10.3

¹ Multi-peril crop insurance.

² Crop Revenue Coverage.

³ Total includes a small number of Income Protection and Group Risk Plan sales.

⁴ Not all Montana counties were eligible for CRC coverage.

Figure 1
Producers' Production Strategies for Managing
Risk Vary by Economic Size

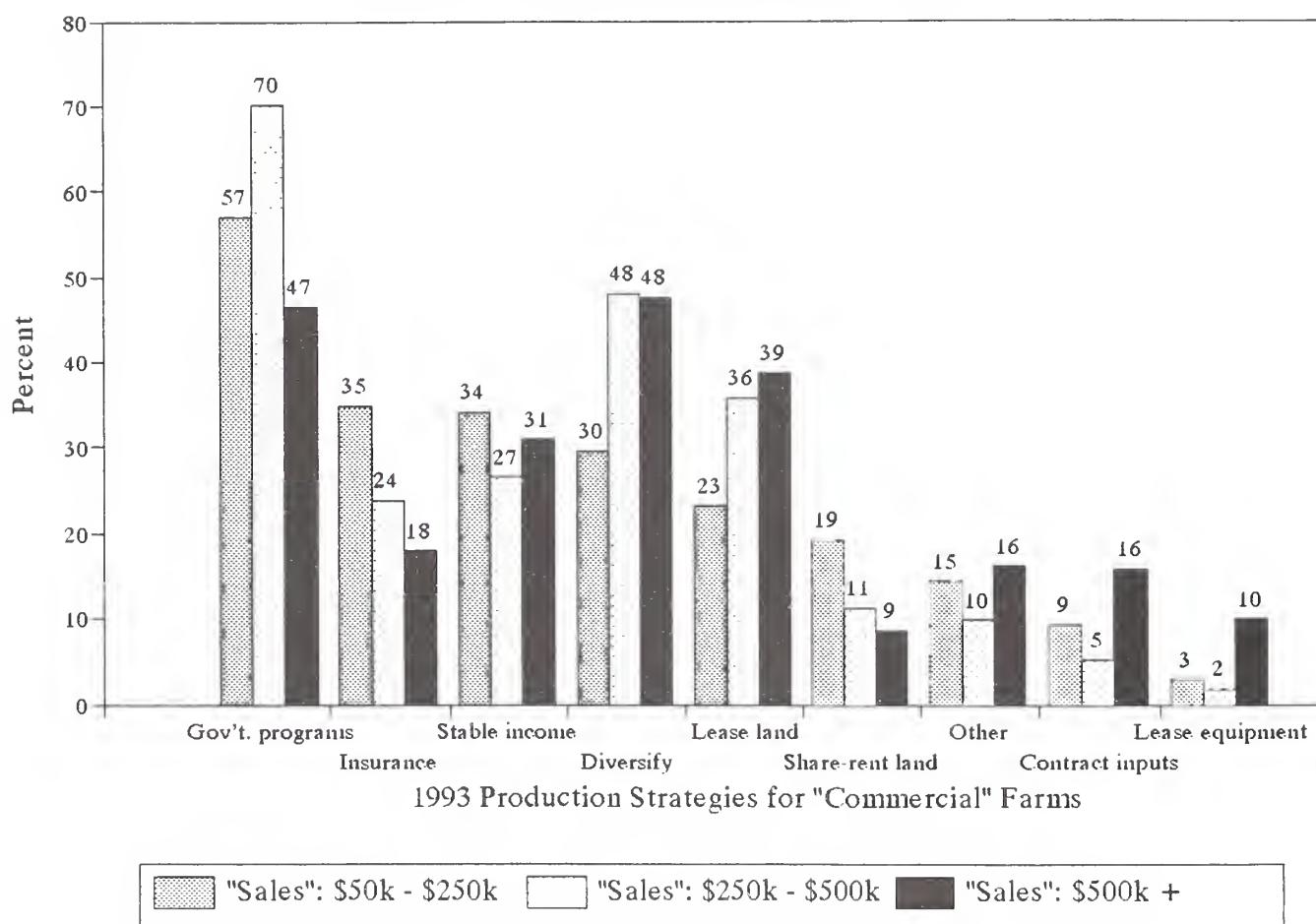


Figure 2
 Producers' Marketing Strategies for Managing
 Risk Vary by Economic Size

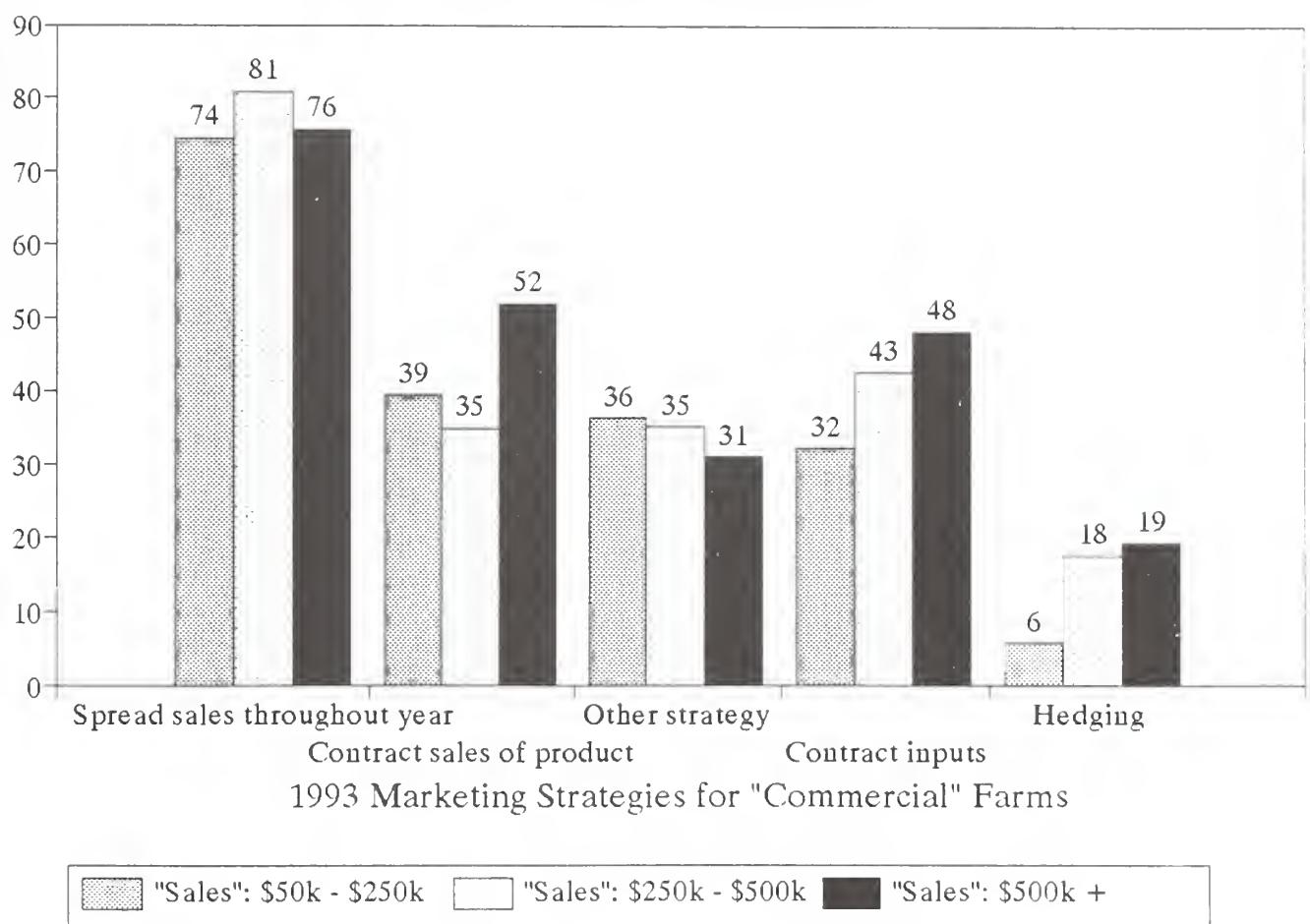


Figure 3
Risk Management Strategies Reduce the Probability of Low Revenues for Corn Producers

