Revenue Insurance

A New Dimension in Risk Management

by Barry K. Goodwin and Alan P. Ker

Federal crop insurance programs have been an important part of the U.S. agricultural policy landscape since the 1930s. For the most part, these programs provided producers with a means of protection against yield shortfalls occurring for any reason, including weather shocks, pest damages, and other factors affecting yields. Over most of their existence, these all-risk (multiple-peril) programs have been characterized by low participation and somewhat spotty actuarial performance. Between 1990 and 1997, U.S. federal budget outlays for crop insurance programs totaled about $8.9 billion (U.S. GAO).

The U.S. agricultural policy landscape has undergone significant structural adjustments in the last few years. The most radical of these changes came under the 1996 Federal Agricultural Improvement and Reform (FAIR) Act. Prior to this act, a range of deficiency payment and price support programs protected farmers from price and income shortfalls. The act signaled a new policy environment under which farmers would be subject to market forces. Specifically, it stipulated the removal of deficiency payments. Over a seven-year transition period, farmers will receive annual income support payments (known as *production flexibility contract payments*) not tied to crops or production levels. Eligibility for these payments is based upon participation in farm commodity programs over the preceding five-year period. The 1996 FAIR Act exposes farmers, to a much greater extent, to market-determined prices.

Many observers believe the ad hoc provision of disaster relief payments in years of widespread crop losses limit participation and the actuarial performance of the federal crop insurance program. Between 1980 and 1993, the U.S. Department of Agriculture spent more than $22 billion on disaster relief measures. Crop disaster relief, a form of free crop insurance, created significant distortions in crop insurance markets. Disaster payments occurred frequently enough to make them a virtual certainty in years of widespread crop losses. The Federal Crop Insurance Reform and Department of Agricultural Reorganization Act of 1994 formally eliminated disaster relief programs and instead introduced a low level of catastrophic protection that was provided to producers for a small administrative fee. The act initially mandated participation in the catastrophic insurance program as a condition for receiving any other farm program benefits. Not surprisingly, crop insurance participation rose to over 70 percent of eligible acres. However, with mandated participation now removed, the number of insured acres has dropped. It is likely that participation will continue to decline given the 1998 disaster aid.

The 1994 act also mandated that the Federal Crop Insurance Corporation develop a pilot program that provided producers a cost-of-production form of coverage. The substantial difficulties associated with defining and measuring costs of production resulted in a program guaranteeing a minimum level of crop revenues. Concurrently, private insurance companies developed and introduced two alternative revenue insurance programs.

The extent to which the 1994 and 1996 acts actually constitute a real and tangible movement toward free markets remains to be seen. In July 1998, the federal government purchased $250 million of wheat to boost prices. In September 1998, President Clinton requested $2.3 billion in disaster aid for U.S. farmers. On 7 October 1998, President

Clinton vetoed the Agricultural Appropriations Act of 1999 (H.R. 4101) because it did not contain enough emergency disaster aid for U.S. farmers. By mid October 1998, U.S. legislators scrambled to try to add $3 billion in disaster aid to accommodate the president's demands. The extent of future aid for farmers remains unclear. It is, however, clear that the rhetoric underlying policy liberalization is unlikely to produce binding constraints on disaster relief and income support programs.

Revenue insurance has taken on new prominence under the new policy regime. It is, in some respects, one of the only government-subsidized, income-stabilizing mechanisms available to agricultural producers. As such, its market has expanded significantly since the introduction of the pilot programs.

The three revenue insurance products

Three alternative crop revenue insurance products were available in 1998: crop revenue coverage (CRC), income protection (IP), and revenue assurance (RA). These programs all aim to guarantee farmers a minimum level of crop revenues. If any combination of low yields and/or prices generates a shortfall in insurable crop revenues, indemnity payments are made. However, the three plans differ significantly in their operation and scope.

Unlike revenue insurance products, the standard yield insurance contract, termed multiple peril crop insurance (MPCI) or actual production history (APH), pays indemnities at a predetermined price (prior to planting) only when realized yields fall below guaranteed yields. The predetermined price typically reflects prevailing futures prices for postharvest contracts. Note, however, that if yields fall, farmers under APH contracts receiving indemnities for lost yields may actually be reimbursed somewhat less (in bushels) than their guarantee since their indemnities would tend to reflect a price that is lower than the actual harvest price. For example, if indemnities are paid at a price of $2.50 a bushel when prevailing market prices are $3.00 a bushel, a farmer who realizes a yield shortfall of 60 bushels per acre is only reimbursed 50 bushels at actual harvest price ($2.50 x 60/$3.00 = 50 bushels). Crop revenue coverage (CRC) had its beginnings with an optional rider on the APH contract that attempted to overcome the above situation by paying indemnities at harvest-time market prices. In conjunction with a put option contract, this allowed producers to guarantee a minimum level of crop revenues. CRC, developed by Redland Insurance Company, was introduced to corn and soybean producers in Nebraska and Iowa in 1996. By 1998, CRC had become available in major growing regions for corn, soybeans, wheat, cotton, and grain sorghum.

Income protection (IP) was developed under a directive of the Federal Crop Insurance Act to create a pilot cost-of-production plan. IP guarantees a minimum level of crop revenues, based upon forecast prices and individual farm yields. Estimates of individual farm yields and the underlying risks of these yields are made using data at the individual farm, county, and crop reporting levels. If realized revenues fall beneath the revenue guarantee, producers receive an indemnity payment for the amount of the shortfall. The government initially made IP available in a limited market. In 1998, the government-offered IP was available to corn growers in fourteen counties, to cotton growers in eight counties, to wheat growers in thirty-seven counties, to grain sorghum growers in twenty-five counties, and to soybean growers in fifty-six counties.

Agronomist Larry Heatherly examines an early maturing variety of soybean plants growing in a "flood"-irrigated field in Mississippi.

Keith Weller, Agricultural Research Service, USDA

Revenue Assurance (RA) was developed by the Iowa Farm Bureau as a pilot program for corn and soybeans in Iowa. RA provides the option for "whole-farm" insurance in that producers insuring both corn and soybeans receive significant premium discounts. RA provides a guaranteed minimum level of revenue, the amount determined by individual farm yields and futures prices (adjusted for the local historical basis). If realized revenues fall beneath the guarantee because of low prices, low yields, or both, farmers receive an indemnity payment for the amount of the shortfall. The RA program, in contrast to other programs, utilizes market-based measures of price risks available in options markets. In contrast, CRC and IP programs utilize historical futures prices to develop measures of price risks.

Although marketed and serviced by private companies, the federal government subsidizes crop insurance premiums and backs contracts under the standard reinsurance agreement (SRA). According to a recent GAO report, the government pays an average of 40¢ of each dollar of producers' premiums and agrees to absorb a significant share of any losses incurred by insurance companies. The SRA also stipulates that private companies receive 24.5¢ for each dollar of premiums generated by insurance sales in order to cover administrative costs. The three revenue insurance products are all subject to the benefits (and requirements) applicable under the SRA. The SRA requires that the insurance plans be available for sale by any private insurance company. Thus, in order to be eligible for SRA benefits, the private developers of CRC and RA must face competition from other insurance companies.

Severe soil erosion in a wheat field near Washington State University.

Jack Dykinga, Agricultural Research Service, USDA

Although all three plans guarantee a minimum level of revenue, the plans do differ substantially in terms of the specific provisions of their protection. Both IP and RA pay only when revenues fall beneath the revenue guarantee. CRC has an additional price up-side risk that stems from its market-value protection property. Thus, the revenue guarantee may actually increase over the growing season with CRC.

A number of complex actuarial issues have arisen as revenue insurance contracts have been developed. Underlying these issues is the fact that revenue risk is comprised of both price and yield uncertainty. These two sources of risk are generally not independent but rather negatively correlated; lower yields typically result in higher prices. RA and IP recognize the negative correlation between yields and prices in determining premium rates while CRC does not explicitly recognize this. Accordingly, premium rates for RA and IP are usually lower than those for CRC. Additionally, these rates are usually lower because CRC must consider an additional up-side price-risk component. Although CRC rates are necessarily higher than APH rates, IP and RA rates may be higher or lower.

Given the infancy of these programs, their actuarial soundness remains uncertain. CRC rate determination is fairly ad hoc. RA rate determination uses the beta distribution for yields and calculates rates from an estimate which is not consistent with the revenue distribution for the insurance contract. IP uses past price movements which may or may not adequately reflect current price risks. Clearly, a thorough and detailed analysis of all three programs is warranted before a judgment about their actuarial soundness can be made.

Example

For explanatory purposes, we provide a simple example that contrasts coverage levels under the three revenue plans. The example (U.S. GAO) simulates experiences for a corn farmer in Adair County, Iowa, with an actual production history yield of 120 bushels per acre who purchases coverage at the 75 percent level of coverage. Table 1 illustrates per acre premiums and indemnity payments under APH insurance and the three alternative revenue plans. For

Table 1. Comparison of alternative revenue insurance plans simulating an Iowa corn family

Yield/Price Realization	Actual Production History	Crop Revenue Coverage	Income Protection	Revenue Assurance
		$/Acre		
Premium	11.20	16.50	5.90	8.40
Indemnity payment				
Normal yield and 30 percent price decrease	0	15.90	16.50	13.80
Yield shortfall of 30 percent with 30 percent price decrease	14.70	81.06	85.26	73.92
Yield shortfall of 30 percent with 30 percent price increase	14.70	20.22	0	0

Source: U.S. GAO Report GAO/RCED-98-111 (p. 27, 1998).
Note: This example assumes an average of 120 bushels per acre and insurance at the 75 percent coverage level.

this county, APH premium rates are higher than those for IP and RA but significantly lower than those for CRC. IP has the lowest rate of all revenue insurance plans. In the case of a normal yield with a 30 percent decline in price, the APH contract pays nothing while the other contracts pay similar indemnities ($13.80 to $16.50 per acre) to account for lost revenue resulting from low prices. In the case of a yield shortfall of 30 percent accompanied by a price decline of 30 percent, payouts for the three new revenue insurance programs are again quite similar, ranging from $73.92 for RA to $85.26 for IP. Finally, consider a case of a 30 percent yield shortfall accompanied by a 30 percent price increase. This case is the one that really distinguishes the level of coverage offered by alternative plans. In the case of RA and IP, an insurable revenue shortfall is not realized because the increased price offsets the revenue loss caused by lower yields. The CRC, however, pays indemnities on the lost production at the higher market price level, leading to $20.22 in indemnity payments. Note that this is roughly 30 percent higher than payouts under APH because indemnities are paid at the higher market price.

Participation in the revenue insurance programs has been significant despite limited availability. In 1997, the three revenue insurance products accounted for 14.19 percent of U.S. insured acres and 17.96 percent of total premiums. If we restrict our attention to Iowa, a state which offers all three types of coverage, these products account for 37.79 percent of insured acres and 53.40 percent of total premiums. These numbers clearly suggest that Iowa producers have embraced the new revenue insurance products.

Many uncertainties remain

The high level of participation in the revenue insurance programs undoubtedly surprised policy makers. It is clear that, with diminished price supports and more limited involvement of the government in production agriculture, crop revenue insurance has taken on new relevance and importance. It is likely that this importance will continue to grow and expand. The billions of dollars in liability heighten the need for a thorough understanding of actuarial issues and government insurance subsidies. Several important questions remain. To what extent will producer participation fall given the 1998 disaster relief? What impact will reduced participation have on the viability of these new revenue insurance programs? Should and will subsidies to either or both producers and private insurance companies continue or decline? Certainly, the next step in farm legislation will be of great importance to the future of crop insurance programs.

Whether recent moves to generate support for farmers through disaster relief and actions undertaken to support prices signal a return to a regime of strong government support of agriculture (if indeed we ever left such) or simply reflect election-year politics also remains unclear. It does seem certain that a variety of new insurance products will become an important part of the farm policy landscape. Other new insurance products are under development. For example, a new pilot program which will guarantee revenues on the basis of Schedule F tax return information over the preceding five years will be implemented in 1999 for Florida, Maine, Massachusetts, Michigan, and New Hampshire. Such programs will face their own actuarial hurdles. ◘

■ For more information

U.S. General Accounting Office (U.S. GAO). *Crop Revenue Insurance: Problems With New Plan Need to Be Addressed.* GAO/RCED-98-111, Washington DC, April 1998.

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