

Crop Yield and Revenue Insurance Contracts

In this study, we examine several crop yield and revenue insurance plans—Actual Production History (APH) insurance, Group Risk Plan (GRP), Crop Revenue Coverage (CRC), Income Protection (IP), and Revenue Assurance (RA)—and their discrete coverage levels of 50 percent through 75 percent. The exception to this coverage range is GRP, which is offered at up to the 90-percent coverage level. Three revenue insurance products, CRC, RA, and IP, were offered on a large scale in 1997, in addition to the traditional yield insurance products, APH and the GRP. In terms of geographic coverage, the revenue insurance products represented nearly a third of insured corn and soybean acres in Iowa in 1997 (Makki and Somwaru, 1999b).

The APH contract is an individual yield insurance plan that protects farmers against yield shortfalls if the actual yield falls below the guaranteed level. APH insurance includes catastrophic coverage (CAT) and optional (buy-up) levels of coverage above CAT. For a flat fee of \$60 per crop per farm, CAT provides a 50-percent yield guarantee and pays an indemnity based on 55 percent of the projected price. In this analysis, we separate CAT and APH buy-up coverage and will hereafter refer to APH buy-up simply as APH insurance. APH insurance provides yield protection of up to 75 percent of the farmer's average historical yield, with a premium based on the chosen coverage level. The APH contract pays an indemnity if the farmer's yield falls below the guaranteed level but offers no price protection. The indemnity payment from a typical APH insurance is given by:

$$(13) I = \max \{0, (y^g - y^a) P^g \}$$

where y^g is the guaranteed yield, y^a is the actual yield, and P^g is the guaranteed price (or elected price). The guaranteed price, P^g , is a certain fixed proportion of the expected price, which is usually USDA's projected farm-level price for the crop year. The guaranteed yield, y^g , is a certain fixed proportion of the expected yield (y^e), usually based on the average historical yield (y^{AHY}) of each given farm, and the chosen coverage level:

$$(14) y^g = \theta y^e = \theta y^{AHY}, \quad 0.50 \leq \theta \leq 0.75$$

where θ is the chosen coverage level. CAT and APH contracts allow for basic units, which combine each of

the fields of a crop under a single type of ownership arrangement, and optional units, which allow insurance by section line and practice (dry land versus irrigated crops).

GRP is a yield insurance product, but is tied to the county average yield rather than the individual farm yield. GRP contracts provide indemnity payments when the county average yield (y^c) drops below a critical or guaranteed level, regardless of the yield of the individual farmer:

$$(15) I = \max \{0, (y^g - y^c) P^g \}$$

This indemnity function is similar to equation (13), except that the individual farm yield is replaced by the county yield and the critical yield is estimated based on past county yield histories. GRP buyers can insure up to 90 percent of the expected county yield at up to 150 percent of the expected price (Skees et al., 1997).

CRC, RA, and IP are revenue insurance plans that protect the farmer from lost revenue caused by low yields, low prices, or a combination of both. They are all based on the farmer's historical average yield and futures prices, but differ somewhat in their specific design and operation. CRC provides replacement-cost protection to producers in addition to a revenue guarantee. Indemnities are paid if the producer's calculated revenue (based on his or her actual yield in that year, multiplied by the harvest-time quote on the harvest-time futures contract) falls below the predetermined guarantee level (based on the coverage level chosen by the producer, the farmer's average historical yield, and the higher of the planting-time quote or the harvest-time quote on the harvest-time futures contract). In other words, under a typical CRC contract, the indemnity payment is defined by:

$$(16) I = \text{MAX} \{0, (y^g \max(P^g, P^m) - y^a P^m) \}$$

where P^m is the harvest futures market quote on the harvest-time futures contract, P^g is the planting-time quote on the harvest-time futures contract, y^g is the guaranteed yield, and y^a is the actual yield.⁵ Since CRC uses the higher of the planting-time price for the harvest-futures contract or the actual-futures contract quote at harvest in setting the guarantee, the producer's revenue guarantee may actually increase over the season. This is because CRC allows producers to purchase "replacement bushels" if yields are low and prices increase during the season (Harwood et al., 1999). CRC, which allows for enterprise units,

basic unit, and optional unit coverage, has rapidly expanded to all major crops in major growing areas (GAO, 1998).

RA and IP also protect farmers against reductions in gross income when either prices or yields decrease during the crop year from early-season expectations. Indemnity amounts are determined by individual farm yields and harvest-time futures prices:

$$(17) \quad I = \text{MAX} \{ 0, (y^g P^g - y^a P^m) \}$$

where P^m is the harvest futures market quote on the harvest-time futures contract, P^g is the planting-time quote on the harvest-time futures contract, y^g is the guaranteed yield, and y^a is the actual yield.

There are, however, key differences between RA and IP contracts. RA provides the option of enterprise-level farm insurance (where the guarantee is based on expected revenue from all the farmer's acreage in a given crop in the county) as well as whole farm insurance (where the guarantee is based on the expected revenue from multiple crops grown by the farmer in a given county). RA also allows both basic unit coverage (where the insurance contract is based on ownership and county) and optional unit coverage (where the

insurance contract is based on ownership, farming practice, county, and section line). Beginning in 1999, RA also offers a harvest price option (RA-HP). If a farmer purchases the RA-HP contract, then his or her coverage is similar to CRC but with no price liability limit in a rising-price market (Risk Management Agency, 1999).

IP is offered only on the basis of enterprise units, meaning that all fields of a crop which a farmer owns or has a share of the commodity in the county are combined into one unit. IP and RA (without the HP option) offer exactly the same coverage if the farmer chooses enterprise units. IP and RA also differ in the way price guarantees are set. The IP revenue guarantee is based on the futures price with no basis adjustment (using an average of Chicago Board of Trade (CBOT) February price quotes for the December contract), while the RA guarantee is based on an approximate local price (the December price adjusted for a county factor). In both cases, indemnities are paid if the producer's gross income falls below the predetermined guarantee (Harwood et al., 1999). Even though both IP and RA were introduced in 1996, they are available only in selected counties and for selected crops (Risk Management Agency, 1999).