Review of Proposed
"Cost of Production Insurance Plan for Cotton"

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Submitted by:

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Executive Summary

A variety of different insurance designs are commonly called "cost of production" insurance. The design contained in this submission is essentially revenue insurance with a guarantee set at a percentage of the farmer's estimated cost of production. The submitters have anticipated many of the potential problems with this design and put preventative measures in place. For example, they cap approved expenses so that they will not exceed expected gross revenue.

While this product is essentially a revenue insurance product, it has many features that are unique relative to existing revenue insurance products. The loan deficiency payment is included as actual revenue to count. The liability used to determine an indemnity is the minimum of covered expenses and actual expenses. This feature reduces indemnities if the crop is lost before all anticipated expenses are actually incurred. Actual revenue to count is based on farmer-received prices rather than futures market prices. Policyholders can purchase an "increased covered expenses endorsement" that allows liability to increase due to unforeseen pesticide purchase and application costs. Finally, the rating method used for this product is completely different than those used for existing revenue insurance products. We find evidence that the resulting coverage level rate relativities for this product are also quite different than those for existing revenue insurance products.

When we first reviewed this product, approximately one year ago, the submission contained only limited information about ratemaking. Thus, this is our first opportunity to review the proposed actuarial procedures. We have identified a number of actuarial concerns. In addition, this review addresses concerns regarding underwriting, the complexity of the product, and future maintenance requirements.

Since the loan deficiency payment is included as revenue to count, premium rates for this product must be conditioned on expected market prices. However, sales closing occurs almost 6 months after the premium rates would need to be established. Potential purchasers may switch between this product and other revenue insurance products based on changes in expected market prices over the 6-month period. This switching behavior would have adverse effects on the actuarial soundness of this product. It is important to note that while MPCI price elections are also set approximately 6-months ahead of sales closing, those price elections only affect the level of liability. They do not affect premium rates.

To develop premium rates for this product, one would ideally like to have long time-series of yield data for many farms in each county. Since those data are not widely available, the submitters have used county-level NASS yield data, RMA farm-level yield histories, and Census of Agriculture data to generate several hypothetical time-series of farm-yield data. The process used to generate these hypothetical data is quite complex. Unfortunately the process is not fully documented in the submission. The accompanying spreadsheets were helpful but we had to invest a significant amount of time and effort in trying to understand this process. More importantly, the submission provides no "out-of-sample" testing of the data generation process. Thus, it is not possible to evaluate what biases, if any, this data generation process imposes on premium rates. Since the hypothetical farm-yield data generated by this process are a major determinant of premium rates, this is a matter that we think deserves further attention.

We also have concerns about the procedures used to individualize the county base rate to the farm-level. With only four to 10 years of data, comparisons of farm mean yield to county mean yield are questionable due to sampling error. With such limited data, comparisons of coefficients of variation are at best ineffective and at worst counter-productive. We are also concerned that the quality and cost specification premium rate adjustments may not adequately reflect important regional differences.

Our primary underwriting concern focuses on the use of farmer-received prices to calculate actual revenue to count. Because of regional differences in cotton quality, we believe that this will alter the effective level of deductibles across regions. We also believe that using farmer-received prices may create potential for fraud, although this will likely be a bigger problem for commodities that do not receive government grades.

If the crop is not carried to harvest, the liability used to calculate indemnity is based on actual expenses. We see this as another point where this product may be susceptible to fraud.

This is an extremely complex product. Purchasers will be required to provide estimates of variable expenses, fixed expenses, and land expenses in addition to the acreage and historical yield information required for existing cotton insurance products. As with existing products, policyholders who file claims will be required to provide documentation of actual yields. Unlike existing products they will also be required to provide documentation of actual prices received and actual variable expenses incurred. Many farmers will likely find it difficult to provide this information at the county- and enterprise-specific level that is required. At the very least, these requirements will impose large transactions costs on policyholders, sales agents, adjusters, reinsured companies, and the RMA.

Offering this product in limited pilot areas greatly reduces the product's chances of success. There are certain fixed costs associated with marketing a new product. If sales agents and reinsured companies cannot spread those fixed costs over a large number of policies, the average fixed cost per dollar of premium sold becomes prohibitive and the product will not be marketed aggressively.

Our understanding of the ratemaking process for this product implies that the entire process, from beginning to end, will have to be repeated each year. Thus, annual maintenance of this product may be difficult compared to existing products.

Our conclusion is that while this design is certainly preferable to many alternative insurance designs that have used the label "cost of production insurance," our concerns are of sufficient importance that we cannot recommend acceptance at this time.

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1 Indemnity and Premium Calculations

The equations below represent our understanding of the basic indemnity and premium calculations on which the cost of production (COP) insurance product is based. These equations ignore any premium adjustment factors. For simplicity, we further assume that the policyholder has a 100% share in all insured acreage. *Our comments in this review are conditioned on this understanding of the basic indemnity and premium calculations*.

1.1 Indemnity Calculation

The formula for calculating an indemnity under the COP policy is

$$(1)\ Indemnity = \max\begin{bmatrix} \min[covered\ expenses\ per\ ac, actual\ expenses\ per\ ac.] \\ -\, actual\ revenue\ per\ ac., 0 \end{bmatrix} \times acres$$

where:

$$(2)\ covered\ expenses\ per\ ac. = approved\ expenses\ per\ ac. \times coverage$$

and 70% ≤ *coverage* ≤ 90% in 5% increments. For purposes of determining an indemnity

$$(3)\ liability = \min[covered\ expenses\ per\ ac., actual\ expenses\ per\ ac.] \times acres\ .$$

Actual revenue per acre is defined as

$$(4)\ actual\ revenue\ per\ ac. = (actual\ yield \times price\ received) + other\ income\ per\ ac.$$

where other income per ac. includes loan deficiency payments, the value of cottonseed, and any private crop insurance indemnities such as hail insurance. Approved expenses per acre are defined as

$$(5)\ \begin{aligned} approved\ expenses\ per\ ac. = {} & approved\ fixed\ and\ land\ expenses\ per\ ac. \\ & + approved\ variable\ expenses\ per\ ac. \end{aligned}$$

subject to,

$$(6)\ approved\ expenses\ per\ ac. \le expected\ gross\ revenue\ per\ ac.$$

$$(7)\ \begin{aligned} & expected\ gross\ revenue\ per\ ac. = \\ & \qquad \begin{bmatrix} contract\ price\ or \\ \max[FCIC\ price\ election, loan\ rate] \end{bmatrix} \times APH\ yield \end{aligned}$$

$$(8)\ \begin{aligned} & approved\ fixed\ and\ land\ expenses\ per\ ac. \le \\ & \qquad expected\ gross\ revenue\ per\ ac. \times 50\% \end{aligned}$$

(9) $\textit{approved variable expenses per ac.} \leq \textit{amount indicated in special provisions}$.

1.2 Premium Calculation

The formula for calculating premium is

(10) $\textit{Premium} = \textit{Liability} \times \textit{Premium Rate}$.

For purposes of determining premium,

(11) $\textit{Liability} = \textit{covered expenses per ac.} \times \textit{acres}$.

2 Cost of Production Insurance

At least two different insurance designs are commonly called "cost of production insurance." For clarity, it is useful to distinguish between these different insurance designs.

2.1 True Cost of Production Insurance

A true cost of production insurance policy would have the following indemnity function:

(12) $\textit{Indemnity} = \max[(\textit{actual expenses per ac.} - \textit{covered expenses per ac.}), 0] \times \textit{acres}$.

An indemnity would be paid whenever actual expenses per acre exceeded some threshold of covered expenses per acre. There are a number of problems with such a policy. First, how would covered expenses per acre be established? Expected production costs vary widely across different producers and different regions. Second, how can the insurer verify the actual expenses per acre? For example, on a large diversified farm, how can the insurer verify that the fertilizer claimed as an expense was actually applied to the insured crop? Third, how does one account for various overhead costs? There is no standard procedure for allocating land and machinery costs over various farm enterprises. Some farmers own their land while others are tenants. Even those who own their land incur an "opportunity cost" for farming the land rather than renting it to someone else. How would this opportunity cost be incorporated into covered and actual expenses? How would building and machinery expenses be estimated? How could the insurer verify important assumptions, such as the true useful life of a machine?

2.2 Revenue Insurance With a Cost of Production Guarantee

The above implies that any true cost of production insurance policy will be extremely susceptible to fraud associated with the estimates of covered and actual expenses. For this reason, when many people talk about "cost of production" insurance what they really mean is revenue insurance with a guarantee set at the farmer's estimated cost of production. That is,

(13) $\textit{Indemnity} = \max[(\textit{covered expenses per ac.} - \textit{actual revenue per ac.}), 0] \times \textit{acres}$.

But problems also exist with this type of "cost of production" insurance. For example, how does one establish the covered expenses per acre?

One of the primary rules of underwriting an individual insurance program is that the value of the insurance should never exceed the value of the insured asset; that is, the asset should never be over-insured. In the case of crop insurance, if the crop is over-insured the insured has strong incentives "to lose the crop." Why would producers want to market the crop if they can make more money on the insurance policy? Over-insurance can cause moral hazard problems that range from simply changing some management practices to out-right fraud. For example, suppose as harvest approaches an insured farmer realizes that the crop is close to triggering an indemnity. The farmer also realizes that every unit of production lost will earn more in indemnity payments than the units that are harvested and taken to market. The farmer may simply increase the speed at which he runs the harvesting machine (faster speeds cause more crop losses).

Nora Brookes of the Economic Research Service of USDA reports cost of production for cotton in the publication "Characteristics and Production Costs of US Cotton Farms." The 1997 average production costs were $0.73 per pound ($0.38 per pound operating costs and $0.35 per pound overhead costs). It has been several years since upland cotton prices have been anywhere near $0.73 per pound. This suggests that in recent years revenue insurance policies with a cost of production guarantee would have over-insured a large number of farmers.

Further, a cost of production average masks a lot of variability. In the study cited above, 75% of cotton farms had total costs of $0.64 per pound or greater; 55% had costs of $0.73 per pound or greater; and 25% had costs of $0.92 per pound or greater. Suppose a cotton revenue insurance policy were offered with a guarantee based on the $0.73 average cost of production estimate. Many producers would find this guarantee quite attractive. Those individuals would seek to purchase or rent additional acreage, driving up land prices and rental rates. This would, in turn, increase the average cost of production. If the following year's guarantee is based on this higher average cost of production, the insurance program will have created a self-perpetuating cycle of higher production costs and higher insurance guarantees. Landowners would benefit but farmers would find their production costs increasing year after year.

2.3 The Cost of Production (COP) Insurance Product Under Review

The developers of the cost of production (COP) insurance product under review have attempted to avoid the problems associated with other cost of production insurance designs.[1] Specifically, equation 6 describes how covered expenses are capped so as not to exceed a percentage of expected gross revenue. This feature reduces the potential for over-insurance problems or insurance-induced increases in production costs. However, as we describe in the following section, this feature also ensures that, in many instances, the proposed COP insurance would effectively become a type of revenue insurance.

[1] We will use the acronym COP to refer only to the cost of production insurance design under review.

3 Cost of Production Insurance as a Type of Revenue Insurance

In this section we demonstrate that if two assumptions hold, a COP insurance policy becomes a type of revenue insurance. We begin by demonstrating mathematically how these two assumptions transform COP insurance into a revenue insurance policy. Next we consider whether or not the two assumptions are realistic.

3.1 Mathematical Demonstration

Equation 6 indicates that for a COP insurance policy, approved expenses must be less than or equal to expected gross revenue.

Assumption 1: Policyholders will be able to document sufficient approved expenses such that *approved expenses = expected gross revenue*.

Given assumption 1, equation 2 can be rewritten as

$$(14)\ \ \textit{covered expenses per ac.} = \textit{expected gross revenue per ac.} \times \textit{coverage}$$

and equation 1 can be rewritten as

$$(15)\ \ \textit{Indemnity} = \max\left[\begin{array}{l} \min\left[\begin{array}{l}(\textit{expected gross revenue per ac.} \times \textit{coverage}),\\ \textit{actual expenses per ac.}\end{array}\right] \\ \qquad\qquad\qquad - \textit{actual revenue per ac.}, 0\end{array}\right] \times \textit{acres}$$

Assumption 2: The crop is carried to harvest so *actual expenses per ac.* ≥ *approved expenses per ac*.

Equation 3 can then be rewritten as

$$(16)\ \ \textit{liability} = (\textit{expected gross revenue per ac.} \times \textit{coverage}) \times \textit{acres}$$

and equation 15 collapses to

$$(17)\ \ \textit{Indemnity} = \max\left[\begin{array}{l}(\textit{expected gross revenue per ac.} \times \textit{coverage}) \\ \qquad\qquad - \textit{actual revenue per ac.}, 0\end{array}\right] \times \textit{acres}\ .$$

Equations 16 and 17 are revenue insurance liability and indemnity equations, respectively. Further, given that liability is defined as in equation 16, equation 10 becomes a revenue insurance premium equation. Thus, we have shown that two assumptions transform the COP policy into a type of revenue insurance policy. It is important to note, however, that equations 16 and 17 are not identical to the liability and indemnity equations for existing revenue insurance products. *The difference is in how expected gross revenue per acre and actual revenue per acre are defined*.

For COP, the loan rate is included in the calculation of expected gross revenue (see equation 7). Further, any loan deficiency payment (LDP) is included in the calculation of actual revenue to count (see equation 4). Existing revenue insurance products do not consider the loan rate when establishing expected gross revenue. Nor do they include the LDP in the calculation of actual revenue. Thus, COP is a type of revenue insurance unlike any existing revenue insurance products.

3.2 Are These Assumptions Realistic?

We have shown that two assumptions are sufficient to transform COP insurance into a type of revenue insurance. But how realistic are these assumptions? Consider the Franklin Parish, Louisiana example included in many of the submission materials. According to 2003 RMA county actuarial tables, the reference yield for non-irrigated cotton in Franklin Parish is 548 pounds per acre. We will assume that this is the APH yield for a representative non-irrigated cotton farm in Franklin Parish. The 2003 RMA cotton price election was $0.52 per pound. The 2003 loan rate for Franklin Parish was $0.524 per pound.[2] Thus, according to equation 7, the COP expected gross revenue per acre equals $287 per acre (548 pounds per acre × $0.524 per pound).

For assumption 1 to hold, approved expenses must be at least $287 per acre. According to the COP Special Provisions of Insurance for Franklin Parish, variable expenses are allowed up to $400 per acre. Enterprise budgets obtained from Louisiana State University (LSU) indicate that for the northeast region of Louisiana (where Franklin Parish is located) estimated variable expenses per acre for cotton production range between $404 and $436 per acre depending on production practices and seed genetics. Thus, without even considering fixed or land expenses, it appears that a representative producer in Franklin Parish would easily have approved expenses in excess of expected gross revenue (so assumption 1 would hold). Considering both variable and fixed expenses (but no land charge), LSU budgets show estimated expenses between $452 and $504 per acre. Since these data still do not include a land charge, we will assume that the $504 per acre is a conservative estimate of COP approved expenses for a representative farm. This implies that assumption 1 would hold for all producers with APH yields less than 962 pounds per acre. Said differently, assumption 1 would not hold only for producers with APH yields at least 75% higher than the county reference yield. Thus, at least for this Franklin Parish example, it seems quite likely that assumption 1 would hold for most policyholders.

What about assumption 2? NASS data indicate that between 1992-2001, approximately 99% of cotton acreage planted in Franklin Parish was harvested. Therefore, it seems very likely that for most Franklin Parish COP policies the cotton crop would be carried to harvest and assumption 2 would hold.

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[2] The 2002 farm bill maintained the national average loan rate for cotton at $0.52 per pound. Thus, the Franklin Parish loan rate should not change through at least 2007.

Thus, for our Franklin Parish, Louisiana example it seems likely that both assumption 1 and assumption 2 would hold for most COP policies. These policies would then effectively be revenue insurance policies.

There are differences in the extent to which these assumptions hold for different regions. For example, section 6.5 of this review describes regional differences in the percentage of planted acreage that is actually harvested. When the crop is abandoned prior to harvest due to an insured cause of loss, the liability used to determine indemnity on a COP policy will be less than liability for existing revenue insurance products.

4 Comparing COP to Existing Revenue Insurance Products

In this section we discuss differences between COP and existing revenue insurance products. We present these differences using three general categories. The first is a description of differences in product features between COP and existing revenue insurance products. The second is a comparison of indemnities paid given specific scenarios. The third is a comparison of coverage level premium rate relativities.

4.1 Comparing Features

COP has a number of product design features that are unique relative to existing revenue insurance products. Among these are: 1) how the LDP is handled; 2) the calculation of liability used to determine indemnity; 3) the rating method; 4) the use of actual farmer-received prices to calculate actual revenue to count; 5) the increased covered expenses endorsement; and, 6) the unit structure.

4.1.1 Loan Deficiency Payment

For COP, approved expenses per acre are capped by expected gross revenue per acre. Since most cotton is not produced under direct marketing contracts, expected gross revenue per acre is the product of the APH yield and the maximum of the RMA price election and the loan rate (see equation 7). If the RMA price election is less than or equal to the loan rate, the expected gross revenue per acre is a function of the loan rate. If the expected gross revenue per acre is a binding constraint on approved (and covered) expenses per acre, liability and the revenue guarantee will also be determined, in part, by the loan rate. Since the COP revenue guarantee is partially conditioned on the loan rate, LDPs are included in actual revenue to count.

Existing revenue insurance products are independent of the marketing loan program. Loan rates do not impact liability or the revenue guarantee. LDPs are not included in actual revenue to count.

From a public policy perspective the COP treatment of LDPs is quite interesting. It implies that COP does not provide federally subsidized price protection for price outcomes below the loan rate. The submitters have recognized that the marketing loan program already provides producers with what is, in essence, free price insurance with a price guarantee at the loan rate. So why should this price risk be included in the protection offered by federally subsidized revenue insurance products?

4.1.2 Liability Used to Determine Indemnity

The COP liability used to determine indemnity is the minimum of covered expenses and actual expenses. If the crop is harvested, covered expenses (approved expenses × coverage) will likely be less than actual expenses. However, if the crop is abandoned at some point prior to harvest, actual expenses may be less than covered expenses and liability will be based on actual expenses.

Cotton requires input applications (particularly insecticide applications) throughout the growing season. Thus, the COP liability used to determine indemnity will increase (up to a maximum) as the grower incurs expenses during the growing season. This feature is an effort to make sure that the grower is only indemnified for the expenses actually incurred up to the time the crop is abandoned. It accomplishes much the same thing as “stages” in some existing RMA insurance products.

To the best of our knowledge, existing cotton revenue insurance products do not have a feature that will reduce liability (and thus indemnity) if the crop is abandoned prior to harvest. On the contrary, if the price of the commodity increases during the growing season, the harvest price option that is included in Crop Revenue Coverage (CRC) and is optional in Revenue Assurance (RA) will actually increase liability.

4.1.3 Rating

The price risk dimension of existing revenue insurance products is rated based on futures market data. The price risk dimension of COP is rated based on price forecasts (associated with various potential national yield outcomes) generated by a proprietary econometric model. Given the COP rating procedures, we do not see any easy way to use futures market data in place of the price forecasts generated by the proprietary model.

We raise this issue for the following reasons.

1) Review and validation of the proprietary model used in COP rating is beyond the scope of this review. Further, conducting such an investigation would likely require that model details be revealed to such an extent that the proprietary nature of the model would be compromised.
2) The future availability of COP insurance would seem to be completely dependent upon continued access to the proprietary model. We make no recommendation regarding whether or not the Board should adopt an insurance product that requires continued access to a proprietary model. While that is an important question, it is a matter of Board policy and is beyond the scope of this review.

4.1.4 Prices Used to Calculate Actual Revenue to Count

Existing revenue insurance products base actual revenue to count on futures market prices. COP bases actual revenue to count on actual prices received by the insured farmer. The use of farmer-received prices eliminates both basis and basis risk. In cotton, quality differences are a major component of basis. Thus, the use of farmer-received prices creates an alternative mechanism for conducting quality adjustment. As we discuss in Section 5 of this review, it also creates some underwriting concerns.

4.1.5 Increased Covered Expenses Endorsement

As indicated earlier, cotton producers apply inputs throughout the growing season. Insecticides are a large component of variable expenses. Further, insecticide expenses can vary a great deal from year to year depending on the extent of insect pressure.

COP contains an increased covered expenses endorsement that, in exchange for additional premium, gives purchasers the option to increase their covered expenses (and thus, liability) as a result of incurring excessive pesticide purchase and application costs due to unforeseen circumstances. The increase in covered expenses may not exceed 25% of the total variable expenses shown on the approved covered expense worksheet. Total covered expenses may not exceed expected gross revenue. This feature is unique to COP. It is not available with existing revenue insurance products.

4.1.6 Units

Among existing insurance products, APH yield insurance and CRC revenue insurance are offered for optional, basic, and enterprise units. Income Protection (IP) revenue insurance is offered only for enterprise units. RA revenue insurance makes unit-like premium rate adjustments based on the number of sections insured by the policy. COP is available only for enterprise units.

4.2 Comparing Indemnities across Different Scenarios

Suppose that in 2002 a representative Franklin Parish, Louisiana farm could have purchased a COP policy, an RA policy (without the harvest price option), or a CRC policy. The farm's APH yield is 548 pounds per acre. Regardless of which policy is purchased, we will assume that the actual yield in 2002 was 411 pounds per acre, a 25% yield shortfall relative to the APH yield.

We compare revenue insurance indemnities across six different scenarios. The scenarios differ in the relationships between harvest price (HP), Spring price (SP), and the loan rate (LR). For simplicity we assume that the farmer sells all of the production at harvest so the LDP payment is based on the relationship between the loan rate and the harvest price. We also assume that RA and CRC have identical spring price and harvest price calculations. Finally, we ignore basis by assuming that the market price the farmer receives is equal to the harvest price used to settle the RA and CRC contracts. These simplifying assumptions imply that market revenue (actual yield × HP) and the LDP payment are independent of the choice of insurance product. Thus, total receipts on the representative farm differ only because of differences in the insurance indemnity.

4.2.1 Loan Rate > Spring Price

The three scenarios, presented in tables 4.2.1, 4.2.2, and 4.2.3, have a Spring market price of $0.43 per pound, so LR > SP. The scenarios differ in the realized harvest price. In table 4.2.1 price decreases during the growing season so that LR > SP > HP. For this scenario the COP indemnity per acre is less than the indemnity per acre for RA and CRC. It is insightful to compare total receipts (market revenue + LDP payments + insurance indemnity) per acre to the expected revenue per acre, where expected revenue is calculated as in equation 7. Note that with COP, if an indemnity is paid, total receipts are equal to the product of the expected revenue and the coverage level. RA and CRC total receipts are slightly higher than the product of the expected revenue and the coverage level.

In table 4.2.2 price increases during the growing season but the harvest price is still less than the loan rate (i.e., LR > HP > SP). In comparison to table 4.2.1, the higher harvest price has increased market revenue and decreased LDPs. The COP indemnity is unchanged from the first outcome. Note also that COP total receipts remain equal to the product of the expected revenue and the coverage level. Because the harvest price is higher than the spring price, the CRC liability is now based on the harvest price. The increased harvest price increases both CRC liability and insurance revenue to count, but the latter more than former. Thus, the CRC indemnity is less than in table 4.2.1. CRC total receipts are slightly less than the product of the expected revenue and the coverage level. RA total receipts are actually lower than in table 4.2.1, *despite the fact that harvest price is $0.07 per pound higher than in table 4.2.1*. This occurs because the higher market price is more than offset by the lower LDP and lower RA indemnity. The combination of the LDP and the RA policy acts as a sort of “double-hedge” against price movements, so the insured gains on both the LDP and RA policy if prices decrease but loses on both if prices increase.

In table 4.2.3 price increases during the growing season to the extent that the harvest price exceeds the loan rate (i.e., HP > LR > SP). In this outcome no LDPs are paid because the harvest price is higher than the loan rate. The COP indemnity is reduced because the harvest price is higher than the loan rate. Both CRC liability and insurance revenue to count increase relative to their values in table 4.2.2 but in this case liability increases more than insurance revenue to count so the CRC indemnity increases. Since insurance revenue to count is higher than liability, RA does not pay an indemnity. COP total receipts are still equal to the product of the expected revenue and the coverage level while RA total receipts are less and CRC total receipts are more.

Table 4.2.1 Revenue Insurance Outcomes (Loan Rate > Spring Price > Harvest Price)

	COP	RA (no HPO)	CRC
APH Yield	548	548	548
RMA Est. Price	$0.52		
Spring Market Price	$0.43	$0.43	$0.43
Loan Rate	$0.524	$0.524	$0.524
Coverage	85%	85%	85%
Actual Yield	411	411	411
Harvest Market Price	$0.40	$0.40	$0.40
Market Revenue	$164.40	$164.40	$164.40
LDP payment	$50.96	$50.96	$50.96
Liability	$244.08	$200.29	$200.29
Insurance Revenue to Count	$215.36	$164.40	$164.40
Indemnity	$28.72	$35.89	$35.89
Total Receipts	$244.08	$251.26	$251.26
Expected Revenue	$287.15	$287.15	$287.15
Expected Revenue x Coverage	$244.08	$244.08	$244.08

Table 4.2.2 Revenue Insurance Outcomes (Loan Rate > Harvest Price > Spring Price)

	COP	RA (no HPO)	CRC
APH Yield	548	548	548
RMA Est. Price	$0.52		
Spring Market Price	$0.43	$0.43	$0.43
Loan Rate	$0.524	$0.524	$0.524
Coverage	85%	85%	85%
Actual Yield	411	411	411
Harvest Market Price	$0.47	$0.47	$0.47
Market Revenue	$193.17	$193.17	$193.17
LDP payment	$22.19	$22.19	$22.19
Liability	$244.08	$200.29	$218.93
Insurance Revenue to Count	$215.36	$193.17	$193.17
Indemnity	$28.72	$7.12	$25.76
Total Receipts	$244.08	$222.49	$241.12
Expected Revenue	$287.15	$287.15	$287.15
Expected Revenue x Coverage	$244.08	$244.08	$244.08

Table 4.2.3 Revenue Insurance Outcomes (Harvest Price > Loan Rate > Spring Price)

	COP	RA (no HPO)	CRC
APH Yield	548	548	548
RMA Est. Price	$0.52		
Spring Market Price	$0.43	$0.43	$0.43
Loan Rate	$0.524	$0.524	$0.524
Coverage	85%	85%	85%
Actual Yield	411	411	411
Harvest Market Price	$0.56	$0.56	$0.56
Market Revenue	$230.16	$230.16	$230.16
LDP payment	$0.00	$0.00	$0.00
Liability	$244.08	$200.29	$260.85
Insurance Revenue to Count	$230.16	$230.16	$230.16
Indemnity	$13.92	$0.00	$30.69
Total Receipts	$244.08	$230.16	$260.85
Expected Revenue	$287.15	$287.15	$287.15
Expected Revenue x Coverage	$244.08	$244.08	$244.08

Table 4.2.4 Revenue Insurance Outcomes (Spring Price > Loan Rate > Harvest Price)

	COP	RA (no HPO)	CRC
APH Yield	548	548	548
RMA Est. Price	$0.56		
Spring Market Price	$0.56	$0.56	$0.56
Loan Rate	$0.524	$0.524	$0.524
Coverage	85%	85%	85%
Actual Yield	411	411	411
Harvest Market Price	$0.43	$0.43	$0.43
Market Revenue	$176.73	$176.73	$176.73
LDP payment	$38.63	$38.63	$38.63
Liability	$260.85	$260.85	$260.85
Insurance Revenue to Count	$215.36	$176.73	$176.73
Indemnity	$45.48	$84.12	$84.12
Total Receipts	$260.85	$299.48	$299.48
Expected Revenue	$306.88	$306.88	$306.88
Expected Revenue x Coverage	$260.85	$260.85	$260.85

Table 4.2.5 Revenue Insurance Outcomes (Spring Price > Harvest Price > Loan Rate)

	COP	RA (no HPO)	CRC
APH Yield	548	548	548
RMA Est. Price	$0.56		
Spring Market Price	$0.56	$0.56	$0.56
Loan Rate	$0.524	$0.524	$0.524
Coverage	85%	85%	85%
Actual Yield	411	411	411
Harvest Market Price	$0.54	$0.54	$0.54
Market Revenue	$221.94	$221.94	$221.94
LDP payment	$0.00	$0.00	$0.00
Liability	$260.85	$260.85	$260.85
Insurance Revenue to Count	$221.94	$221.94	$221.94
Indemnity	$38.91	$38.91	$38.91
Total Receipts	$260.85	$260.85	$260.85
Expected Revenue	$306.88	$306.88	$306.88
Expected Revenue x Coverage	$260.85	$260.85	$260.85

Table 4.2.6 Revenue Insurance Outcomes (Harvest Price > Spring Price > Loan Rate)

	COP	RA (no HPO)	CRC
APH Yield	548	548	548
RMA Est. Price	$0.56		
Spring Market Price	$0.56	$0.56	$0.56
Loan Rate	$0.524	$0.524	$0.524
Coverage	85%	85%	85%
Actual Yield	411	411	411
Harvest Market Price	$0.58	$0.58	$0.58
Market Revenue	$238.38	$238.38	$238.38
LDP payment	$0.00	$0.00	$0.00
Liability	$260.85	$260.85	$270.16
Insurance Revenue to Count	$238.38	$238.38	$238.38
Indemnity	$22.47	$22.47	$31.78
Total Receipts	$260.85	$260.85	$270.16
Expected Revenue	$306.88	$306.88	$306.88
Expected Revenue x Coverage	$260.85	$260.85	$260.85

4.2.2 Spring Price > Loan Rate

The three scenarios, presented in tables 4.2.4, 4.2.5, and 4.2.6, have a Spring market price of $0.56 per pound, so SP > LR. Again, the scenarios differ in the realized harvest price. We have further assumed that the RMA established price is equal to the Spring market price so that COP expected revenue and liability are now based on the RMA established price rather than the loan rate. In table 4.2.4 price decreases such that the harvest price is less than the loan rate (i.e., SP > LR > HP). Total receipts for RA and CRC are identical and exceed the product of expected revenue and coverage. In table 4.2.5 price decreases but the harvest price is above the loan rate (i.e., SP > HP > LR). Total receipts are identical for all three products and are equal to the product of expected revenue and coverage. In table 4.2.6 price increases such that the harvest price is higher than the Spring price (i.e., HP > SP > LR). Total receipts are identical for COP and RA and are equal to the product of expected revenue and coverage. CRC total receipts are higher than the product of expected revenue and coverage.

4.2.3 Comparing COP and CRC Indemnities

What can we conclude from our comparison of COP, RA, and CRC for a representative Franklin Parish, Louisiana cotton farm? In every scenario COP total receipts equaled the product of the expected revenue and coverage level. This illustrates an important aspect of the COP policy. Given the simplifying assumptions mentioned earlier, *when the COP policy pays an indemnity*, the farmer's total receipts will be equal to the product of the expected revenue and the coverage level. In contrast, with an RA or CRC policy the farmer's total receipts may be less than or greater than the product of the expected revenue and coverage level.

It is important to reiterate that these comparisons are conditioned on assumptions 1 and 2. However, we believe (and have provided some evidence to this effect) that these assumptions will hold for many COP policies. Thus, these COP policies will effectively become a type of revenue insurance. Our comparison is also conditional on the simplifying assumptions mentioned earlier.

4.3 Coverage Level Premium Rate Relativities

While it is true that COP will often revert to a type of revenue insurance, it is very difficult to make meaningful comparisons between premium rates for COP and existing revenue insurance products. There are at least three reasons for this. First, as we discuss in section 4.1, COP has features that are unique relative to existing revenue insurance products. Second, with existing revenue insurance products, one needs only the county actuarial document (FCI-35) and the producer's APH yield to transform county base premium rates into farm-level premium rates. With COP, transforming county base premium rates into farm-level premium rates involves farm to county comparisons of mean yield, coefficient of variation of yield, and profit margin. Third, the "continuous yield span" exponential function used in existing revenue insurance products to transform county base premium rates into farm-level premium rates is likely more symmetric than the process used for COP. That is, for existing revenue insurance products some farm-level premium rates will be higher than the county base rate while others will be lower. With the COP process, most farm-level premium rates will be higher than the county base rate. This is because the historical farm yield coefficient of variation will almost always be higher than the county yield coefficient of variation. We discuss this further in section 6.4.2 of this review.

Figures 4.3.1 – 4.3.6 show, for various coverage levels, COP county base premium rates divided by 2003 CRC premium rates calculated at the county reference yield (and the middle enterprise unit factor). In most cases, this ratio is less than one, indicating that the COP county base premium rate for that coverage level is lower than the 2003 CRC premium rate. As indicated above, it is hard to make meaningful comparisons of absolute premium rates across the two products. However, the figures reveal something interesting about differences in the coverage level rate relativities between the two products. If both products were based on the same coverage level rate relativities, the ratio of the COP premium rate divided by the CRC premium rate should be constant across different coverage levels. Instead, the figures clearly indicate that the difference in the two premium rates is greater at higher coverage levels and less at lower coverage levels. In short, the figures suggest that there are large differences between the established coverage level rate relativities for CRC and the implied coverage level rate relativities for COP. Further, these differences vary across regions.

Figure 4.3.1 COP County Base Premium Rate Divided by 2003 Non-Irrigated CRC Premium Rate Calculated at the County Reference Yield for the Three Eastern Uplands Region (Alabama) COP Cotton Pilot Counties

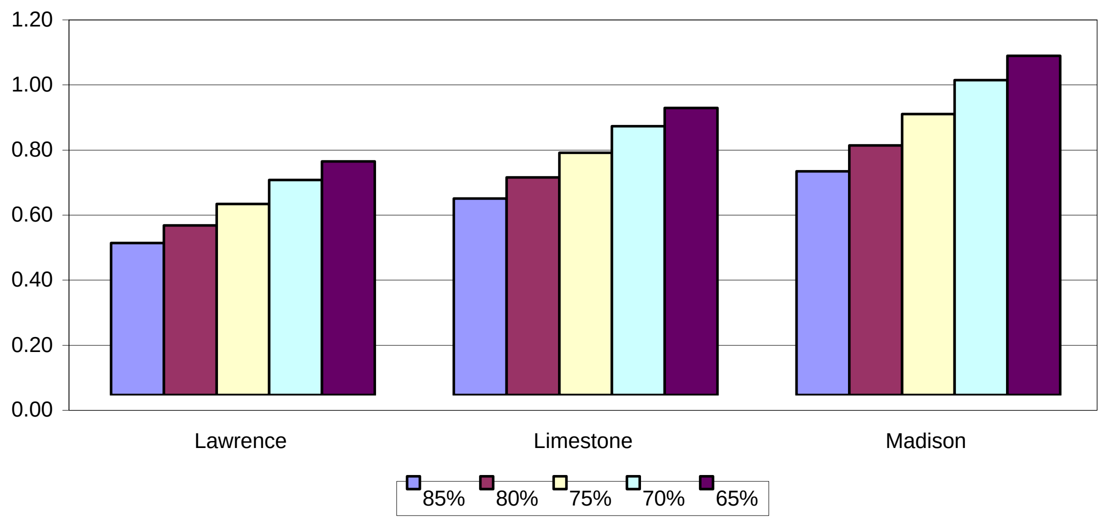


Figure 4.3.2 COP County Base Premium Rate Divided by 2003 Irrigated CRC Premium Rate Calculated at the County Reference Yield for the Eight Arizona and California COP Cotton Pilot Counties

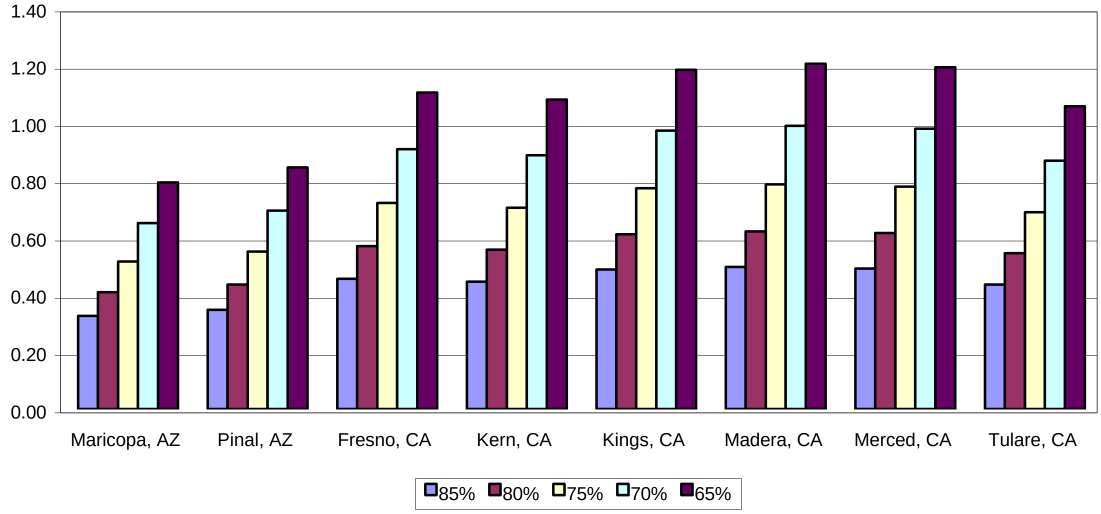


Figure 4.3.3 COP County Base Premium Rate Divided by 2003 Non-Irrigated CRC Premium Rate Calculated at the County Reference Yield for the Seven Mississippi Portal Region (Louisiana and Mississippi) COP Cotton Pilot Counties

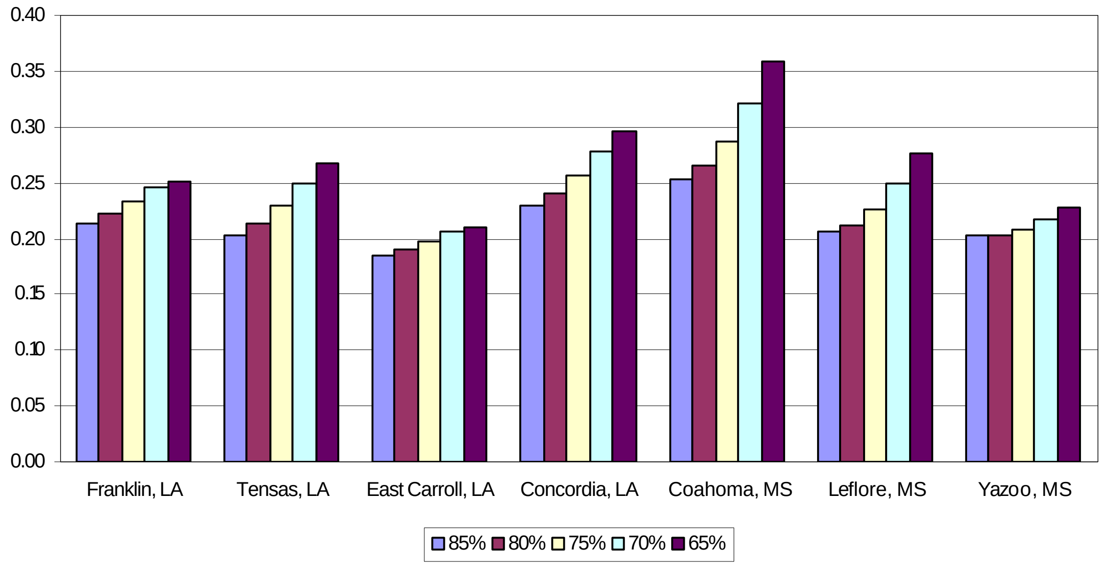


Figure 4.3.4 COP County Base Premium Rate Divided by 2003 Non-Irrigated CRC Premium Rate Calculated at the County Reference Yield for the Five Texas Fruitful Rim Region COP Cotton Pilot Counties

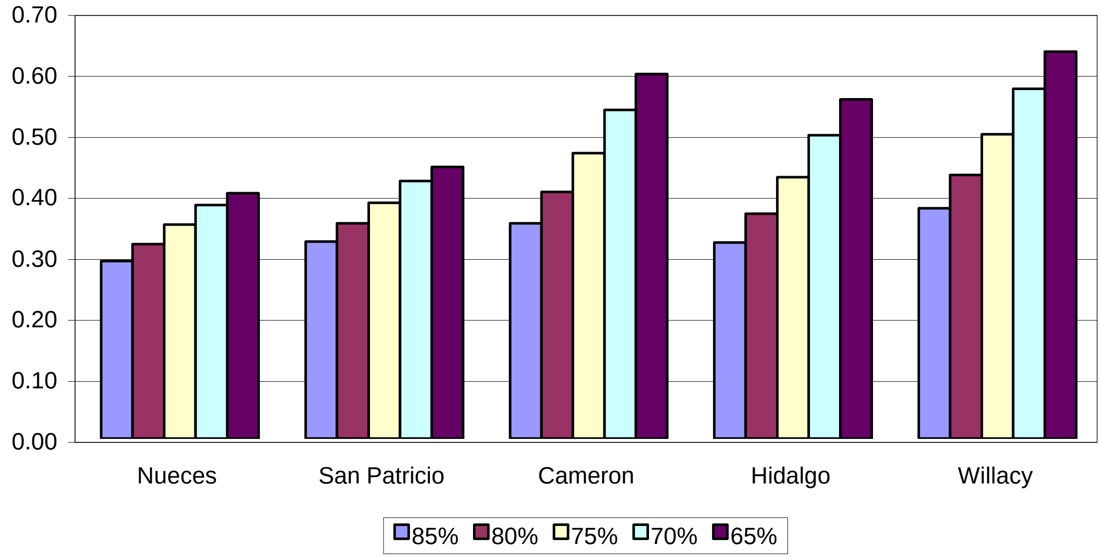


Figure 4.3.5 COP County Base Premium Rate Divided by 2003 Non-Irrigated CRC Premium Rate Calculated at the County Reference Yield for the Eighteen Texas Prairie Gateway Region COP Cotton Pilot Counties

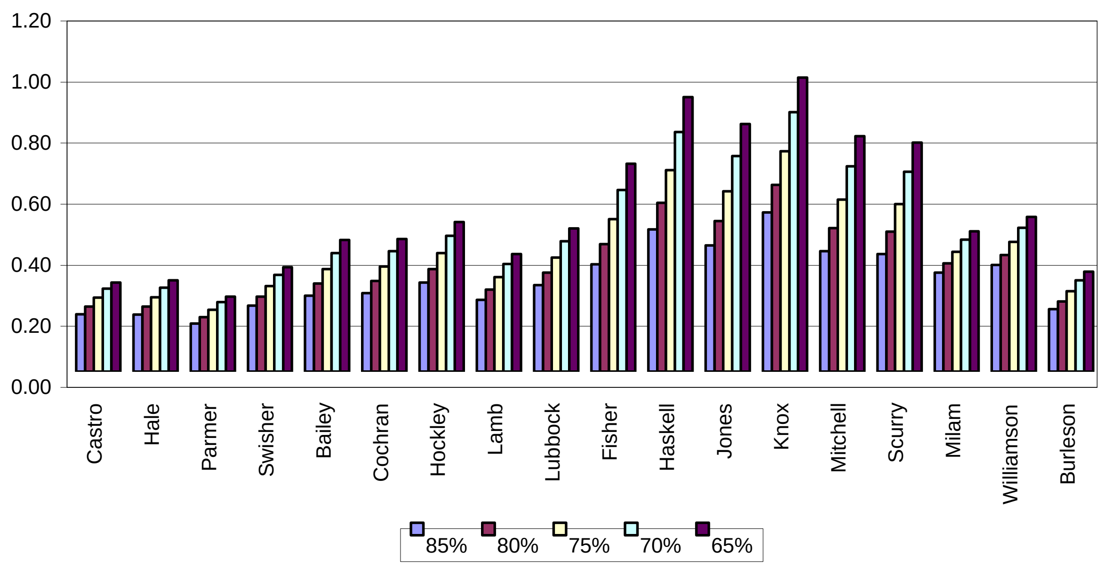
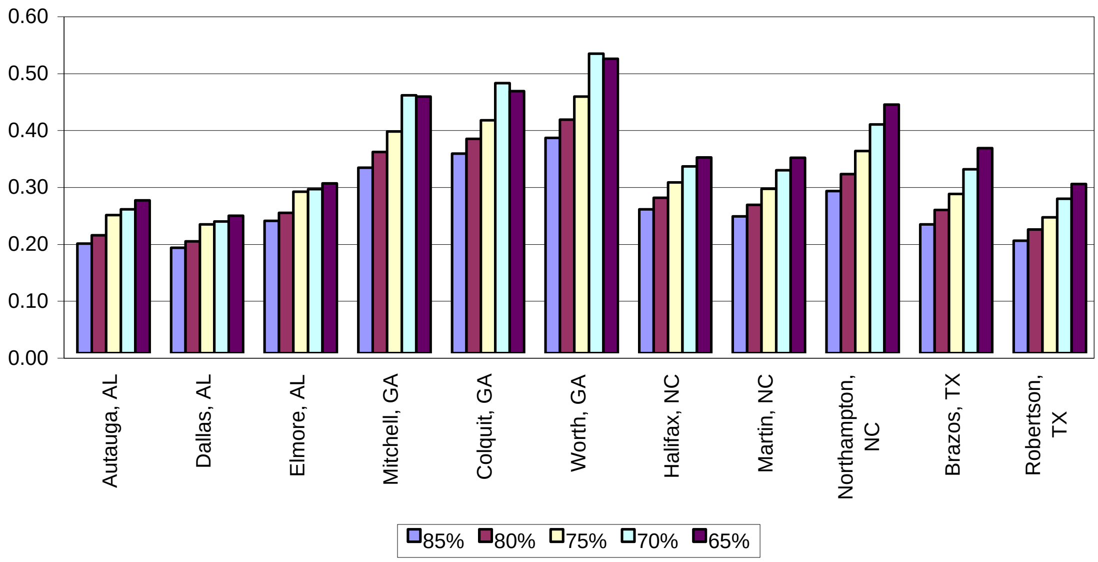


Figure 4.3.6 COP County Base Premium Rate Divided by 2003 Non-Irrigated CRC Premium Rate Calculated at the County Reference Yield for the Eleven Southern Seaboard Region (Alabama, Georgia, North Carolina, & Texas) COP Cotton Pilot Counties



5 Underwriting Issues

The COP product contains a number of important features that attempt to control fraud and moral hazard. We commend the submitters for reducing the maximum coverage level to 85%. We like that fact that the product is restricted to enterprise units and that the expected gross revenue constraint generally keeps the potential liability below levels that might exceed the value of the crop. Still we have a number of underwriting concerns related to the calculation of both actual revenue to count and actual expenses.

5.1 Actual Revenue to Count Based on Farmer-Received Price

No other federal crop insurance product settles based on farmer-received prices. The stated purpose for using farmer-received prices with this product is to allow for indemnities that will reflect quality losses. Farmers will receive significantly lower prices if there are serious quality problems.

There are important reasons why this has not been done with existing crop insurance products. It opens the door for potential moral hazard and fraud. It will also alter effective deductibles.

5.1.1 Opportunities for Fraud

An insured producer who had losses in excess of the deductible could increase indemnities by underreporting actual price received. We can imagine scenarios where buyers would agree to provide sellers with sales receipts that underreport the true sales price. We are not suggesting that most insured farmers would engage in this kind of fraudulent behavior but the history of the crop insurance program indicates that some farmers are willing to engage in such behaviors. This is why, for existing revenue insurance products, price received is based on a 3rd party source such as futures markets. Since cotton receives a government quality classification, this may not be a major problem for cotton. But if applied to other commodities, this feature of the COP design could create significant opportunities for fraud.

5.1.2 Use of Farmer-Received Price Alters Effective Deductibles

If the RMA established price is above the loan rate, the COP expected gross revenue is based on the RMA established price. The actual revenue is based on the price received by the farmer. The RMA established price does not account for basis. Many regions have a strong negative basis because of poor quality characteristics. In those regions, the expected local price will be significantly lower than the RMA established price used to calculate COP expected gross revenue. This would create a situation where the effective coverage level may be well above the stated coverage level (effective deductible < stated deductible).

5.2 Purchase Contracts

Section 13 of the basic policy provisions states that the following are not covered causes of loss: "refusal of any person to accept your insured crop" and "failure of any buyer to pay you for insured crops you produced." What if the buyer in a purchase contract refuses to purchase the commodity because it does not meet the quality standard specified in the contract and the quality problem is a direct result of an insurable cause of loss?

We are also concerned about how actual price received will be handled for contracted production. Again this is likely a much more important issue for commodities other than cotton (which has little contracted production). We can imagine scenarios where a producer contracts to produce a commodity with certain quality characteristics. Then if the production does not meet the exact quality specifications in the contract, the buyer refuses to accept the commodity or agrees to accept it only at a greatly reduced price. As we understand the policy provisions, this may be an insurable loss. We are not aware of any other federal crop insurance product that protects growers against the risk of not meeting the exact quality specifications for contracted production.

5.3 Actual Expenses

If the crop is not carried to harvest (our assumption 2 does not hold) the farmer can commit fraud by carrying variable inputs from one season to the next and claiming that they were applied to the current insured crop. This potential problem is compounded since farmers can change from COP to other insurance products from one year to the next.

6 Actuarial Issues

This submission had more detail than the earlier submission about the COP rating process. Having said that, we still found it extremely difficult to understand the sequence of procedures used to generate premium rates. The COP Insurance Rating Methodology White Paper (including Appendix M) is not sufficiently detailed for a reviewer to be able to understand the process used to generate hypothetical farm-level yield data. These data are likely the most important factor in determining COP premium rates. The spreadsheets helped to "fill in the gaps" where the white paper lacked sufficient detail. Also, the submitter was very responsive to inquiries from this team of reviewers. Nevertheless, we had to invest far too much of the dollars (time) allocated for this review in simply trying to understand the process used to generate the hypothetical farm-level yield data. We now believe that we understand the process used to generate these data but as we will discuss in section 6.2, we can make no assessment regarding the adequacy of the resulting premium rates.

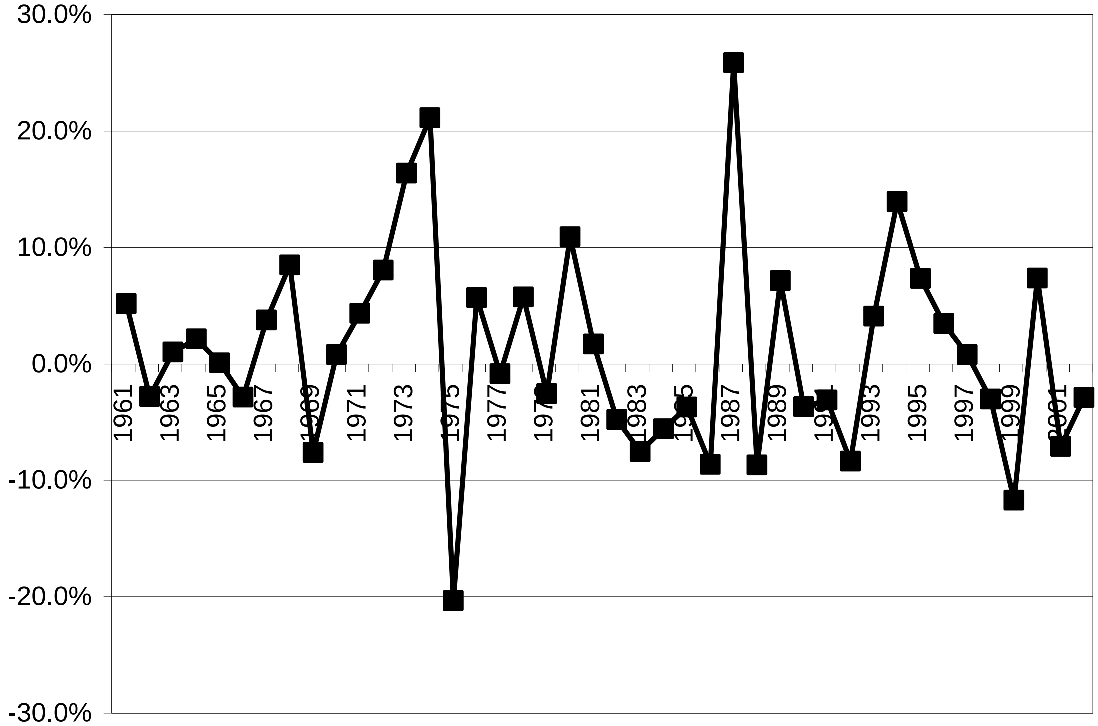
6.1 Rating Based on 6-Month Ahead Forecast of Expected Price

Because the LDP is included in actual revenue to count, COP premium rates are conditioned on price expectations relative to the loan rate. As market conditions change from year to year, COP premium rates can change dramatically.

To allow time for preparation of the necessary actuarial documents, COP ratemaking for year, t, would need to be completed by approximately early September of year t-1. Potential purchasers may switch between this product and other revenue insurance products based on changes in expected market prices over the 6-month period. This switching behavior would have adverse effects on the actuarial soundness of this product. It is important to note that while MPCI price elections are also set approximately 6-months ahead of sales closing, those price elections only affect the level of liability. They do not affect premium rates.

To assess the magnitude of historical price movements we calculated two price series for the period 1961-2002. The first series is the January 15 – February 14 average of closing prices for the December cotton futures contract. The second price series is the prior year's September 1-15 average of closing prices on the same December cotton futures contract. By comparing the two series we can assess the magnitude of historical cotton price movements between September 1-15 (when price forecasts would be required to conduct COP rating) and the period prior to February 28 when farmers would be making insurance purchase decisions. The annual percentage differences between these two price series are presented in figure 6.1.1.

Figure 6.1.1 Historical Percentage Changes in Cotton Prices Between September 1-15 and January 15-February 14



The annual percentage differences between these two price series are presented in figure 6.1.1. This figure clearly demonstrates the potential for large price movements between early September and sales closing. For this reason, we believe COP may create adverse selection problems. Adverse selection problems would both undermine the actuarial soundness of COP and affect demand for other products in the RMA portfolio.

6.2 Need Tests of Rating Procedures

Even after understanding the steps used to generate the hypothetical farm-level yield data, one is left wondering about the statistical properties of the data generation process. We recommend two procedures that will provide insight into the statistical properties of the data generation process.

6.2.1 Using COP Procedures to Generate APH or IP Premium Rates

In the COP ratemaking process, the generated hypothetical farm-level yields and associated prices are used to calculate loss costs for the proposed COP product. The hypothetical farm-level yields and prices could just as easily be used to calculate loss costs for APH yield insurance or IP revenue insurance. Doing so would provide an interesting benchmark comparison of COP ratemaking procedures to those used for existing products. We strongly suggest that this be done.

6.2.2 Out-of-Sample Testing

We understand why the submitters need to use a series of *ad hoc* statistical procedures to generate hypothetical farm-level yield data. But when *ad hoc* procedures must be employed, Monte Carlo simulations are typically conducted under a wide range of possible assumptions to show that the methods do, in fact, what they are purported to do. These simulations would reveal what biases, if any, may be associated with the *ad hoc* procedures.

Quite specifically we are arguing for an analysis based on a set of known farm-level yield distributions within an assumed county. By sampling from these distributions, one would generate the Census, RMA, and NASS data that are used to initialize the COP process for generating hypothetical farm-level yields. After these data are run through the COP process, loss costs would be calculated based on the hypothetical farm-level yields. These loss costs would then be compared to loss costs generated by simulating out of the known farm-level yield distributions. This comparison would allow one to test, out of sample, for any statistical biases that may exist in the COP process for generating hypothetical farm-level yields. By changing various assumptions (the nature of the farm-level yield distributions, the correlation between farm yields, etc.) one could also test how robust the COP procedures are across different possible scenarios. Without such a test we do not believe it possible to assess the adequacy of COP premium rates.

6.3 Quality Adjustment Load

If the RMA established price is above the loan rate, the COP expected gross revenue is based on the RMA established price. The RMA established price does not account for basis. In cotton, quality is the primary determinant of basis. Further, quality varies widely by region. Evidence of this is found in figure 7 (p. 41) of the COP Insurance Rating Methodology White Paper. In this figure the percentage of value lost due to quality ranges from 0.6% for the Visalia classing office to 5.0% for the Lubbock classing office. Some regions have a strong negative basis because of poor quality characteristics.

Since revenue to count is based on the farmer-received price, it is extremely important that premium rates adequately reflect regional differences in quality. Otherwise, this product will be highly susceptible to adverse selection problems.

Page 124 of the COP Insurance Rating Methodology White Paper shows a table of "NATMOD State Specific Upland Cotton Price Projections." Though this is not specifically said in the text, we interpret this table to mean that state-specific NATMOD price projections are used to calculate the loss-cost ratios that are the basis of county base rates. The differences in price projections across states are likely due to historical quality differences. If state-specific price projections are in fact used in the rating process this would at least partially alleviate our concern about whether rates adequately reflect regional quality differences. However, we remain concerned that the COP quality adjustment load is calculated at a national level and applied uniformly across all COP policyholders. If the COP rating process does not adequately account for regional differences in quality, premium rates will be too low (in a relative sense) in regions that produce low quality cotton and too high (in a relative sense) in regions that produce high quality cotton.

6.4 Individualizing the County Base Rate to a Producer Level

COP uses three variables to adjust the county base rate to a producer level. Specifically the variables are farm mean yield relative to the county mean yield, farm yield coefficient of variation (CV) relative to county yield CV, and farm expected profit margin relative to county expected profit margin. The comparisons of mean yield and CV of yield are based on the data in APH yield histories. The profit margin comparison is based on the farm's APH yield and approved expenses for COP.

6.4.1 Background

To put the proposed adjustment factors in context, we first provide some background on adjustment schemes that have been used in the past. At the time of the 1980 Act, individual farm expected yields and yield insurance premium rates were based on the region where the farm was located. Regions were defined to have soils of similar productivity. There were at least three difficulties with this approach. First, given the technology of the time, developing and maintaining the regional maps was extremely costly. Second, developing accurate estimates of the expected yield for each region was a challenging task. Third, differences in producer management skill were ignored. The result was that the pool of insured farmers tended to be made up of those who were misclassified to their benefit. That is, those whose expected yields were below the expected yield assigned by FCIC.

This led in 1983 to the voluntary individualized yield program (IYC) that, in the mid-1980s, became the compulsory APH Plan. The idea was that a producer's historical average yield was the best estimate of that producer's production potential and would capture both soil productivity and managerial characteristics.

Around this time FCIC also began wondering if producers' historical average yields, relative to those of their peers, were effective indicators of relative risk. That is, should producers with higher (lower) average yields relative to their peers be charged lower (higher) premium rates. Milliman & Robertson was commissioned to examine the relationship between required actuarially fair premium rates and historical average yield. About the same time, a group of university researchers in five states used university farm management record association data to investigate this relationship (Black et. al., Skees and Reed). These studies confirmed a relationship between required actuarially fair premium rates and the historical average yields of producers relative to those of their peers. In general, producers with higher average yields were found to be less risky and thus deserving of a lower premium rate. However the studies also recognized that a farm's historical average yield was far from a perfect predictor of relative risk. The accuracy of the prediction increased as more years were used to calculate the historical average yield. Also, the higher the inherent yield variability in a region the less accurate a farm's historical average yield was as a predictor of relative risk.

At this time, there was also some exploration into whether a farm's yield CV relative to that of peers could be used to predict relative risk (Black et. al.). While the concept is appropriate for individualizing rates, it became clear that more years of yield data were required before CV comparisons would have significant predictive accuracy. In fact, the researchers determined that more than twice as many years of yield data would be required for relative yield CVs to generate the same level of predictive accuracy as relative yield means. Similar analysis was conducted by Goodwin with Kansas wheat data in the mid 1990's.

Black and Hu and Knight extended previous work by focusing on out-of-sample performance of the FCIC individualization of rates based upon historical relative yields. Black and Hu used complete record sets from sugar beet producers in the Red River Valley of Minnesota and North Dakota and in Southern Minnesota as well as APH Plan records for corn insureds with at least eight years of yield data. The Red River Valley and Southern Minnesota sugar beet records were organized into an approximation of basic units and enterprise units. The topography of the two sugar beet producing areas is quite different with the result that farm yields in the Southern Minnesota area are highly correlated with county yields while farm yields in the Red River Valley are not highly correlated with county yields. Black and Hu found that an average farm yield based on only four years of data contained very little information about relative risk, particularly for basic units and in areas where farm yields had a low correlation with county yields. In areas where farm yields were highly correlated with county yields, comparisons of average farm yields relative to the average yields of peers did help predict relative risk, especially as the years of yield data increased. Interestingly, the study showed that with limited years of data and a poor correlation between farm yields and county yields, the use of relative mean yields as a predictor of relative risk could result in severe misclassification. That is, high (low) risk individuals could be charged relatively lower (higher) premium rates. Knight used RMA data to investigate the extent to which the relationship between farm APH yields and county average yields could be used to predict loss cost. Because of the short times series used to generate APH yields, they found that the relationship between APH yields and county average yields had only limited ability to predict loss costs in subsequent years.

Statisticians in the 1970s and 1980s conducted extended studies of the properties of estimators of means and variances when small samples are used and particularly when small samples are drawn from non-Gaussian (non-normal) probability distributions (e.g., Hoaglin, et al., Huber; and Hampel et. al.). The studies were called "robustness" investigations because they were trying to determine how robust alternative estimators were to misspecification of the underlying assumptions and to small sample sizes. These studies, like the studies mentioned above, have a significant bearing on the approaches used in COP.

6.4.2 COP Specifics

COP uses three variables to adjust the county base rate to a producer level. Specifically the variables are farm mean yield relative to the county mean yield, farm yield CV relative to county yield CV, and farm expected profit margin relative to county expected profit margin. We contend that for COP the farm's profit margin is effectively a mechanism to scale the deductible.

For COP, the deductible is the amount by which covered expenses are less than approved expenses (see equation 2). Approved expenses are capped at the expected gross revenue. If the farm shows a positive profit margin it is because the farm has chosen to claim approved expenses less than the maximum allowed (which is the expected gross revenue). So a positive profit margin simply implies that the farm's effective deductible (relative to expected gross revenue) is higher than the stated deductible. It may be that profit margin also contains information on classifying policyholders into proper relative risk pools but no evidence is offered supporting this idea. Thus, ideally, we would like to see profit margin treated simply as a deductible and included within the deductible aspects of the rating methods.

What about the other two variables used to make producer-level adjustments to COP county base rates? We conducted Monte Carlo simulations to test how well means and CVs based on small samples of data could predict differences in relative risk. We worked with hypothetical farm-level yield probability distributions that were relatively benign compared to those that likely exist on real farms. We calculated means and CVs based first on 10 years of data and then on 4 years of data. We also assumed different correlations between farm yields. Our simulations were conducted under circumstances that should be most favorable to using means and CVs as predictors of relative risk. Actual misclassification would be greater than is indicated by our results for yields drawn from more variable probability distributions and/or distributions with more skewness and/or thicker tails.

The Monte-Carlo simulations were based on a hypothetical county that consists of 10 farms. We have run variants of the model with as many as 50 farms in each county. Adding more farms does not materially change the points we are making here. Each farm is of equal size. On each farm, yields are normally distributed with the same mean and the same coefficient of variation (equal to 35%). Thus, we are testing whether the procedures proposed for COP will correctly identify farms as having the same relative yield risk when they in fact do have the same relative yield risk. For each farm *i* we report simulation results for farm yield CV relative to county yield CV (CV_i / CV_C) and, as a point of reference, farm mean yield relative to county mean yield ($Mean_i$ / $Mean_C$).

On each farm in each year, the yield is simulated as a random draw from the assumed normal distribution (and maintaining the assumed correlation between farm yields). For each year, the county average yield is the simple average of the yields on the 10 farms. Note that unlike NASS county yields, there is no sampling error in constructing the average yield for our hypothetical county. The farm-level random yield draws are repeated for however many years are used to generate the relative yield CVs and means.

Table 6.4.1 shows results for CV_i / CV_C from one 10-year simulation with farm yields correlated at 0.20. There are two important results to note. First, for every farm, CV_i / CV_C is greater than one (that is, the farm yield is riskier than the county yield). Though it is possible for CV_i / CV_C to be less than one, in most cases it will be greater than one so this component of the COP producer-level adjustment process will almost always adjust premium rates higher. Second, though the farms are identical, CV_i / CV_C, calculated over a 10-year period, varies from 1.06 for farm 5 to 3.15 for farm 2. The difference reflects the sampling error associated with calculating CV_i / CV_C using only 10 years of data. With sufficient years of data CV_i / CV_C would be identical for all farms. Though farms 2 and 5 have identical relative risk, the relative CV component of the COP producer-level adjustment process would increase the premium for farm 2 much more than for farm 5.

Table 6.4.1 Farm Yield CV Divided by County Yield CV: One 10-Year Simulation with Farm Yields Not Highly Correlated

Farm (*i*)	CV_i / CV_C
1	1.57
2	3.15
3	1.75
4	1.53
5	1.06
6	2.74
7	2.59
8	1.84
9	2.35
10	2.41

While table 6.4.1 shows results from just one 10-year period, table 6.4.2 shows results for the same situation simulated over 100 10-year periods. The average of $Mean_i$ / $Mean_C$ calculated over the 100 simulations is equal to one for all 10 farms. However, for any given 10 year period, $Mean_i$ / $Mean_C$ ranged from 0.72 to 1.28 *despite the fact that the farms are identical*. Thus, even if the farm's APH yield is calculated with the full 10 years of yield data, the variable $Mean_i$ / $Mean_C$ will still misclassify many farms. The situation is worse if we try to classify relative risk based on CV_i / CV_C. For any given 10 year period, CV_i / CV_C ranged from 0.60 to 6.10, *despite the fact that the farms are identical*.

Table 6.4.3 is the same as table 6.4.2 except that we now assume that the comparisons of farm mean yield to county mean yield and farm yield CV to county yield CV are based on only 4 years of data. Not surprisingly, the potential for misclassification is much worse if the APH yield is based on only 4 years of data. For any given 4 year period, $Mean_i$ / $Mean_C$ ranged from 0.48 to 1.48. For any given 4 year period, CV_i / CV_C ranged from 0.13 to 22.06, *despite the fact that the farms are identical*.

Table 6.4.2 Farm Yield Mean Divided by County Yield Mean and Farm Yield CV Divided by County Yield CV: 100 10-Year Simulations with Farm Yields Not Highly Correlated

Farm	Average of $Mean_i$ / $Mean_C$	Standard Deviation of $Mean_i$ / $Mean_C$	Min. of $Mean_i$ / $Mean_C$	Max. of $Mean_i$ / $Mean_C$	Average of CV_i / CV_C	Standard Deviation of CV_i / CV_C	Min. of CV_i / CV_C	Max. of CV_i / CV_C
1	1.00	0.10	0.76	1.23	2.04	0.76	0.75	6.10
2	1.00	0.11	0.73	1.24	1.99	0.64	0.99	4.55
3	1.00	0.11	0.73	1.31	2.02	0.76	0.60	3.89
4	1.00	0.09	0.81	1.22	2.03	0.70	0.81	5.70
5	1.00	0.09	0.74	1.28	2.06	0.73	0.84	4.40
6	1.00	0.09	0.72	1.22	2.03	0.68	0.84	4.63
7	1.00	0.09	0.79	1.22	2.05	0.64	0.70	4.05
8	1.00	0.09	0.76	1.20	2.08	0.72	0.95	4.49
9	1.00	0.10	0.72	1.21	2.03	0.72	0.95	5.71
10	1.00	0.09	0.76	1.26	2.03	0.67	0.87	4.06

Table 6.4.3 Farm Yield Mean Divided by County Yield Mean and Farm Yield CV Divided by County Yield CV: 100 4-Year Simulations with Farm Yields Not Highly Correlated

Farm	Average of $Mean_i$ / $Mean_C$	Standard Deviation of $Mean_i$ / $Mean_C$	Min. of $Mean_i$ / $Mean_C$	Max. of $Mean_i$ / $Mean_C$	Average of CV_i / CV_C	Standard Deviation of CV_i / CV_C	Min. of CV_i / CV_C	Max. of CV_i / CV_C
1	1.00	0.16	0.48	1.43	2.40	1.91	0.59	13.33
2	1.00	0.15	0.59	1.36	2.38	2.12	0.41	17.55
3	1.00	0.14	0.65	1.33	2.47	2.52	0.33	22.06
4	1.00	0.15	0.62	1.40	2.43	2.03	0.37	12.42
5	1.00	0.15	0.61	1.35	2.52	1.93	0.31	11.05
6	1.00	0.16	0.58	1.48	2.27	1.78	0.42	14.20
7	1.00	0.15	0.57	1.31	2.36	2.00	0.44	16.98
8	1.00	0.15	0.65	1.34	2.53	2.23	0.38	15.89
9	1.00	0.14	0.62	1.28	2.40	1.56	0.13	9.43
10	1.00	0.14	0.48	1.26	2.39	1.97	0.42	15.90

Table 6.4.4 Farm Yield Mean Divided by County Yield Mean and Farm Yield CV Divided by County Yield CV: 100 4-Year Simulations with Farm Yields Highly Correlated

Farm	Average of $Mean_i$ / $Mean_C$	Standard Deviation of $Mean_i$ / $Mean_C$	Min. of $Mean_i$ / $Mean_C$	Max. of $Mean_i$ / $Mean_C$	Average of CV_i / CV_C	Standard Deviation of CV_i / CV_C	Min. of CV_i / CV_C	Max. of CV_i / CV_C
1	1.00	0.07	0.76	1.18	1.16	0.46	0.41	2.96
2	1.00	0.08	0.73	1.24	1.21	0.55	0.40	3.33
3	1.00	0.08	0.75	1.16	1.08	0.37	0.20	2.38
4	1.00	0.08	0.84	1.19	1.16	0.47	0.21	3.09
5	1.00	0.08	0.82	1.26	1.21	0.52	0.36	4.26
6	1.00	0.08	0.72	1.25	1.17	0.45	0.28	3.47
7	1.00	0.08	0.70	1.19	1.21	0.48	0.44	3.37
8	1.00	0.08	0.82	1.17	1.19	0.45	0.48	2.87
9	1.00	0.08	0.80	1.28	1.20	0.41	0.40	3.13
10	1.00	0.08	0.72	1.23	1.17	0.41	0.47	2.72

Finally, table 6.4.4 shows the same situation as table 6.4.3 (means and CVs based on only 4 years of data) but with an assumption that the farm yields are correlated at 0.8 rather than 0.2. If the farm yields are more highly correlated the standard deviations of $Mean_i$ / $Mean_C$ and CV_i / CV_C decrease tremendously, indicating that the potential of misclassification is reduced. But even with the higher yield correlation, for any given 4-year period, $Mean_i$ / $Mean_C$ ranges from 0.70 to 1.28. and CV_i / CV_C ranges from 0.20 to 4.26, *despite the fact that the farms are identical*.

These results are particularly dramatic when one remembers that the Monte-Carlo simulation was structured to be unrealistically favorable to the use of relative means and CVs for risk classification. The results strongly suggest that, with small samples, classifying relative risk based on $Mean_i$ / $Mean_C$ is problematic. Classifying relative risk based on CV_i / CV_C is likely futile and counter-productive.

The developers of COP recognize that the number of years of data are important and take that into account in their development of producer specific credibility. Our contention, however, is that they substantially overestimate the information content of farm yield CVs relative to the county yield CV in part because they assessed the accuracy of CV as a predictor of loss cost using in-sample information. Also, as our simulations show, information on the yield correlations between farms would provide substantial insights regarding the potential merits of relative CVs as a risk classification variable.

Additional components of credibility weighting require further introspection on the part of the developers. First, the square root of N rule applies to the standard error of an average. Does it apply to the standard error of relative coefficients of variation? Second, if the correlation between farm yields is high (the situation where relative CVs are most likely to add information regarding relative risk), does acreage add substantial credibility since yields on all farms – large and small – are moving together? Third, would a more robust estimator of acreage such as the median be more meaningful since a farm could have several years with small to modest acreage and one or two years with large acreage?

In summary, it is not clear to us that using relative CVs in the proposed producer specific rate adjustment procedures adds any value when compared to the continuous yield span adjustments currently used for existing insurance products. Indeed, we are concerned that the purported gains may be illusionary – the result of in-sample testing. We view the "profit" adjustment as an adjustment in the deductible and would suggest treating it in a more straightforward manner.

6.5 Cost Specification Adjustment

The base rate adjustment for cost specification is based on a national analysis that shows 8% average abandonment (planted acres that are not harvested) over the past 30 years. The adjustment factors for different cost specifications are based on this 8% average abandonment for the U.S. over the past 30 years.

This very simplistic procedure ignores any regional differences in abandonment. For the proposed COP pilot counties, figures 6.5.1–6.5.5 show the historical percentage of cotton planted acres that were actually harvested. Figure 6.5.1 shows almost no abandonment in the COP pilot counties in Arizona and California. This is not surprising since production in these counties would be almost exclusively irrigated. Historically, there is also very little abandonment in the Mississippi and Louisiana COP pilot counties (figure 6.5.2). With the exception of two years, there has been very little abandonment in the North Carolina, Georgia, and Alabama COP pilot counties (figure 6.5.3). The Texas COP pilot counties are divided by USDA Farm Resource Region with figure 6.5.4 showing counties in the Fruitful Rim region and figure 6.5.5 showing counties in the Southern Seaboard and Prairie Gateway regions. Figure 6.5.4 shows that in four of the past eight years, harvested acres have been less than 80% of planted acres. Since 1968, the counties in these regions have averaged harvesting about 92% of planted cotton acres (8% abandonment). Since 1968, the Southern Seaboard and Prairie Gateway counties shown in figure 6.5.5 have averaged harvesting about 85% of planted cotton acreage (15% abandonment). For counties in both figures 6.5.4 and 6.5.5, the historical average may understate the current expected abandonment since there appears to be a trend toward more abandonment in recent years.

While, for reasons described earlier, we can make no judgments about the adequacy of the absolute level of premium rates being proposed for COP, we can make some assessments about relative premium rates. By ignoring regional differences in abandonment, the proposed procedure will generate premium rates that are too low (in a relative sense) for regions with high abandonment and premium rates that are too high (in a relative sense) for regions with low abandonment. In addition, the submitters have used a simple historical average to estimate expected abandonment. This procedure ignores what appear to be obvious trends toward increased abandonment in some regions thus further compounding errors in relative premium rates across regions.

Figure 6.5.1 Percent of Cotton Planted Acres that Were Harvested in COP Fruitful Plains Pilot Counties in Arizona and California

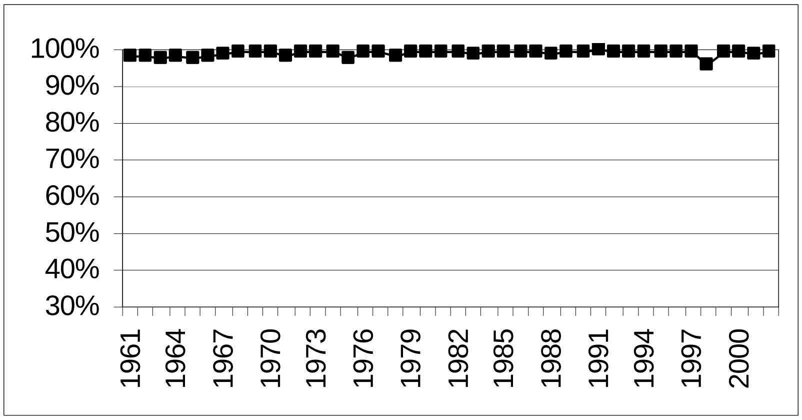


Figure 6.5.2 Percent of Cotton Planted Acres that Were Harvested in COP Mississippi Portal Pilot Counties in Mississippi and Louisiana

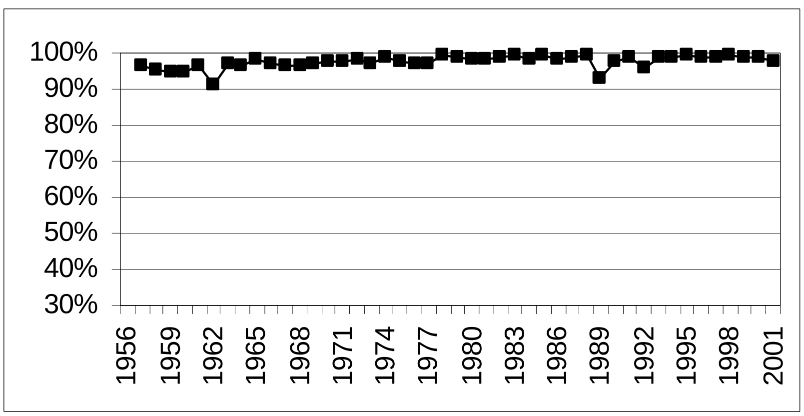


Figure 6.5.3 Percent of Cotton Planted Acres that Were Harvested in COP Southern Seaboard and Eastern Uplands Pilot Counties in North Carolina, Georgia, and Alabama

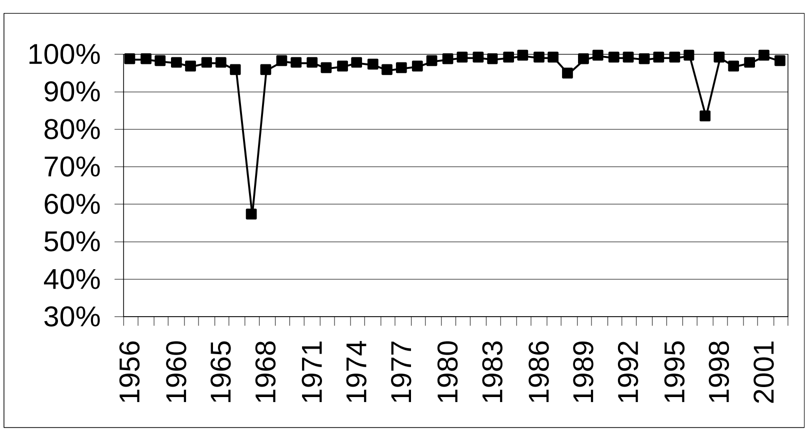


Figure 6.5.4 Percent of Cotton Planted Acres that Were Harvested in COP Fruitful Rim Counties in Texas

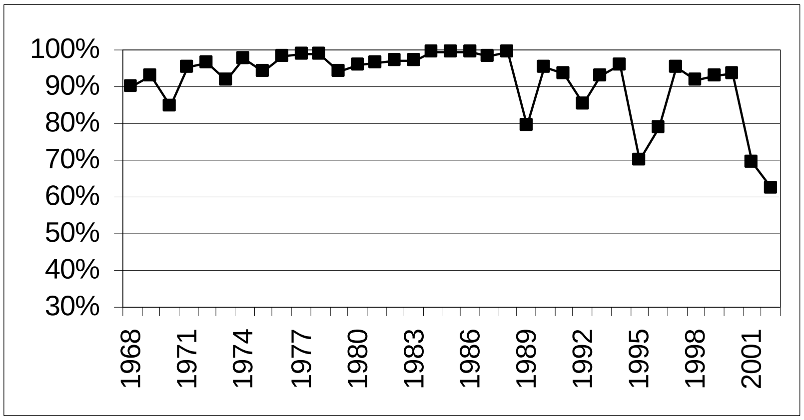
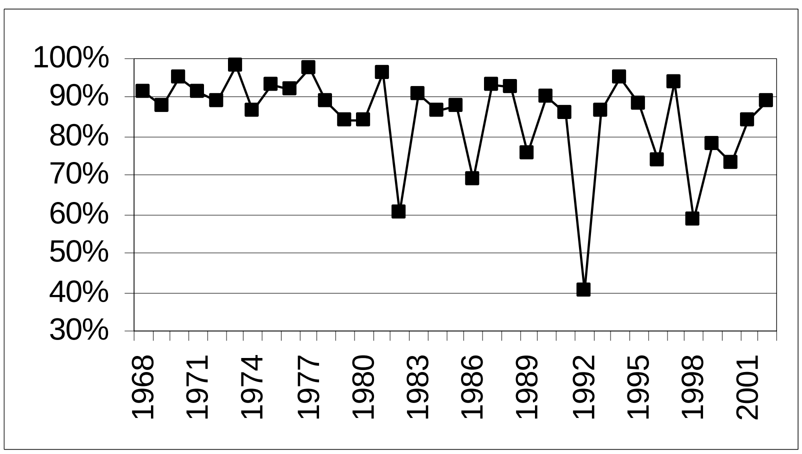


Figure 6.5.5 Percent of Cotton Planted Acres that Were Harvested in COP Southern Seaboard and Prairie Gateway Counties in Texas



6.6 Data for Other Proposed Crops

Earlier we described some of the unique features and unique rating methods associated with COP. In the materials presented for review and in a meeting with reviewers in Kansas City, the submitters indicated that some of unique characteristics were introduced because of their merits for other crops for which COP is proposed. That is, they would not necessarily have been implemented if cotton had been the only crop under consideration.

In our judgment, major field crops, like cotton, represent a best-case scenario. For some of the other commodities being considered for COP, some of the data used to initialize the process for generating hypothetical farm-level yields will likely either not exist or will be of significantly lower quality than that available for cotton. The other exchange traded crops that have revenue contracts have similar characteristics to cotton. NASS time series data are available on a county basis. In most of these crops, significant amount of APH Plan data exists in core areas; less exists as one moves to the periphery or into areas where either classification or moral hazard have been a significant problem. For many of the specialty crops, county NASS time series data is only available in limited areas (e.g. California and Oregon). APH Plan data is sometimes limited and may not be representative of the industry. Since the cost of developing and maintaining COP under the proposed methods will be substantial, the practicality of these methods for proposed extensions needs to be taken into account now.

Some crops, such as cranberries, may also offer a quite different approach to the underlying data since the marketing is done by a small group of cooperatives. Producer yield data for most of the members may be available. The potential for conflicts of interest between the grower cooperatives, which set prices, and the "insurance pool" also exists for contracts that trigger on revenue shortfalls. Explicit use of "shrinkage" estimation procedures that have been widely used in statistical applications, and are now starting to appear in actuarial applications, might be feasible and relevant for some of these crops.

Cotton is perhaps unique in terms of third party auditing of quality. The issue of quality standards will be a challenge as on moves to other crops. One of the reasons producers are attracted to designs that utilize actual farmer-received prices, as contrasted to a futures market prices, is that these designs more accurately take into account product quality differentials. They also provide more opportunities for fraud.

The estimation of location specific expected prices and price volatilities will be a challenge for many of the specialty crops, particularly where market windows are very site specific. This will be a particular problem if price forecasts have to be made in early September and the previous years crop has not yet been harvested.

RA, when it was first introduced, used county specific adjustments to the futures price based upon the recommendation of the producer advisory committee. Ultimately, these adjustments were dropped – presumably because the extra cost of maintenance was not worth the gain.

6.7 Questions

We still have a few questions about the ratemaking process. The questions are listed below. All page references refer to the COP Insurance Rating Methodology White Paper.

1. **How are the loss elimination and efficiency ratios used to determine catastrophic caps?** On page 18 the authors say only that they are looking for "natural break points." Further description would be helpful. For example, it is not clear why 85% is considered a natural break point in figure 3.

2. **How were direct and proportional catastrophic loading percentages determined?** Page 45 states only that they are the result of an "empirical study." Another empirical study is cited which finds that a county's average loss cost is inversely related to the catastrophic losses it contributes to the loading factor? Further details on the empirical studies would be helpful. Can you provide a conceptual explanation for the latter finding? It is not intuitively obvious.
3. **What if the producer has grown cotton in different regions of the same county?** When individualizing the county base rate to a producer level, is there any requirement that the yield and profit margin history be based on the same parcels of land that the farmer is now insuring? Some counties have soil qualities that are quite heterogeneous. For example, some Mississippi counties are split between "the delta" and "the hills." Cotton yields of over 1,000 pounds per acre are common on fields in the delta. Yields over 600 pounds per acre would be unusual for fields in the hills. It seems like a tenant farmer could establish a yield and profit history on high quality delta soils and transfer that history to low quality soils in the hills. Even with existing products, this problem occurs when establishing APH yields. It seems like it could be magnified by the process described here for individualizing the county base rate to a producer level.
4. **How was the midseason added expense option load calculated?** Page 72 states that the load is a 5% increase in premium. How was this calculated?

7 Complexity and Transactions Costs

This is an extremely complex product. Purchasers will be required to provide estimates of variable expenses per acre, fixed expenses per acre, and land expenses per acre in addition to the acreage and historical yield information required for existing cotton insurance products. As with existing cotton insurance products, policyholders who file claims will be required to provide documentation of actual yields. Unlike existing products they will also be required to provide documentation of actual prices received and actual variable expenses.

We argue in section 5 of this review that these added complexities create opportunities for fraud. But even the vast majority of farmers who would never consider committing fraud may find it difficult to provide the information required for this product. Farmers who produce several different crops and/or produce in several different counties will find it difficult to generate crop- and county- specific expense estimates. For example, fertilizer is commonly used for many crops and can be used for pasture as well. Thus, simply showing purchase receipts for fertilizer does not confirm that all of that fertilizer was used for a particular enterprise.

For tax purposes, farmers maintain whole-farm records of fixed expenses. Very few farmers, however, will have records that attempt to allocate fixed expenses across different enterprises. Tax policies also create incentives for farmers to purchase variable inputs at the end of the calendar year. Thus, it is cumbersome to track inventories of variable inputs and identify in what crop year the inputs are actually applied. All of these factors will increase the time and effort required of insurance purchasers relative to existing products.

Given that alternative cotton insurance products are available, we believe that sales agents and farmers will find the transactions costs associated with COP to be overly burdensome. To reduce the transactions costs for potential buyers, sales agents will likely make use of “pre-prepared” expense estimates for growers in their region. However, if sales agents use this shortcut, policyholders who file claims may receive less indemnity than expected if actual expenses are significantly below covered expenses.

It is important to remember that sales agent commissions are typically calculated as a percentage of premium dollars. Indications are that COP will generate lower premiums than existing cotton revenue insurance products. Yet the transactions costs associated with selling a COP policy will be significantly higher than for existing products. Given this, we don’t see any incentive for sales agents to promote COP to their existing clients.

Finally, we would note that beginning this program as a limited pilot in a small subset of counties greatly reduces the product’s chances of success. There are certain fixed costs that must be covered before a company can target sales of a new product. Sales agents, adjusters, and company personnel must be trained. Record-keeping and information technology (IT) systems must be altered to fit the new product. Promotional materials must be produced. Similarly, independent sales agents must incur the fixed costs of learning about a new product. Those costs will be particularly high for COP because of its complexity.

If companies and sales agents are only allowed to sell COP in restricted areas (3 counties in North Carolina, 3 counties in Georgia, 3 counties in northern Alabama, 3 counties in south-central Alabama, 3 counties in Mississippi, and 4 parishes in Louisiana) they cannot spread these fixed costs over a large number of policies. Thus, the average fixed costs incurred per dollar of premium sold is prohibitive. In these restricted markets, both reinsured companies and sales agents will likely make a rational business decision to downplay COP in favor of existing cotton insurance products. This will greatly reduce the learning that can occur through the pilot process.

8 Maintenance

The submission did not specifically address how premium rates would be maintained in subsequent years. The ratemaking process utilizes three sources of data; NASS county-yields, RMA actual yield histories, and the Census of Agriculture. NASS and RMA data are updates each year. The Census of Agriculture is updated every 5 years. Will these updated data be incorporated into the ratemaking process as they become available?

Because of the way that LDP payments are handled in the COP policy, premium rates must be conditioned on current market prices. Therefore the NATMOD price projections used in the ratemaking process must be recalculated each year. This combined with efforts to incorporate updated yield data will require that the entire ratemaking process, from beginning to end, be repeated each year. Thus, annual maintenance of this product may be difficult compared to existing products.

At various points the COP Insurance Rating Methodology White Paper seems to imply that COP will eventually be transformed from simulation based rating to loss-cost based rating. We wish this had been more fully explained. Given that COP premium rates must be conditioned on current market prices, it is not clear to us how COP could ever move to loss-cost rating.

We trust that ratemaking procedures have been streamlined beyond the set of spreadsheets that we were provided. While useful for demonstration purposes, spreadsheets would be an extremely labor-intensive and cumbersome way to develop and maintain premium rates.

Finally, we would again note that COP premium rating requires the use of the NATMOD proprietary econometric model. Future availability of COP is dependent upon continued access to this (or a similar) econometric model.

9 Supplemental Review Questions from Board Members

1) *"Changes in itemized variable expenses more than 20% must be reported . . . One wonders whether agents and companies are going to be able to keep track of all this extra paperwork and whether or not problems will arise during claim times."*

   This is one example of the complexity and high transactions costs associated with this product. A general discussion of these matters is found in section 7 of this review.

2) *"Pay close attention to the APH x price ceiling cap. All farmers who have had a disaster year (or years) are heavily penalized with amount of coverage + higher premium rates. Will this cause economic micro shifts in production due to availability for operating loans when loans may be evaluated on coverage amounts? Remember that one bank controls the majority of operating loan funds."*

   Even with existing products one or more disaster years will cause APH yields to decrease and premium rates to increase. Our understanding is that APH yields for this product will be subject to the same cups as existing products.

3) *"Does this insurance offer any more coverage than other plans already available? Previous studies show rare instances for this model to do as much. Usually recovery is less. Less insurance cost does not mean better coverage."*

   This insurance product will offer less protection than existing revenue insurance products. There are at least four reasons for this. First, the loan deficiency payment is included as actual revenue to count. Second, the liability used to determine indemnity is based on the minimum of covered expenses and actual expenses. Third, the harvest price option that is mandatory in CRC and optional in RA is not available with COP. Fourth, COP is available only at the enterprise unit level. The trade-off for receiving less protection is that COP purchasers will likely pay premium rates that are lower than those for existing revenue insurance products.

4) *"Due to data needed for policy to determine standard expense ceiling, the policy may be severely limited to few areas that will have adequate 3rd party (excluding banks with conflict of interest) information."*

   This is a good point. For cotton COP the submitters have relied heavily on the estimated cost of production budgets generated by university extension services. Due to reduced state and federal appropriations, the extension services at some universities are reducing the number of commodities for which they generate cost of production budgets. To maintain COP policies in the future, RMA may need to contract with universities or with NASS to compile these cost of production data.

5) *"The past 15 year history has shown sale price decline and inputs quickly increasing with overall production steady or rising ever so little. In the future will this insurance become less attractive than currently?"*

   We don't believe that the impact of these trends would be any different for COP than for existing revenue insurance products.

6) *"This cotton policy has failed earlier due to inadequate coverage. This version only begins to fulfill by inserting subsidies into price. As a model for future crops what happens with crops with no supports? Are we putting ourselves into favoritism or worse? Why not build a data bank on cost by region for crops and build the insurance around it? As it stands now are we defeating the purpose why the term Cost of Production is even stated because revenue is the governing factor."*

   In section 2 of this review we describe the problems associated with true cost of production insurance.

7) *"Is the cost worksheet misleading when it lists harvest costs which can be made up primarily of fixed equipment costs. Is this term meant to reference only custom harvest charges?"*

   We defer to the submitters regarding what the term "harvest costs" was meant to include. However, we would note that approved expenses are capped by expected revenue. Thus, the composition of the approved expenses is relevant only if the two assumptions we describe in section 3.1 do not hold.

8) *“Variable costs are supposed to be capped at 125% of county average. This is not explicitly included in the policy provisions, but rather is calculated and placed in the actuarial documents? Does it appear that producers will understand this ‘implicit’ cap?*

We don’t see any reason why it could not be included in the policy provisions but would defer to the expertise of RMA professionals on this question.

10 Supplemental Review Questions from RMA

1) *“Could the proposed COP incorporate stages that were not based on production-expense data?”*

COP liability used to determine indemnities increases through the growing season (up to a cap) as actual production expenses are incurred. “Stages” have been used with existing RMA products to accomplish much the same thing. Pre-determined stages will not perfectly match the flow of actual expenses incurred. In addition, actual cotton production expenses (particularly insecticide purchase and application) can vary significantly from year to year.

2) *“How would this (stages) affect the insurance plan in terms of ease of administration?”*

With stages there is no need for insured farmers to provide cost of production estimates or documentation of actual expenses incurred. Relative to the current COP design, this would greatly reduce transactions costs and data management requirements for insured farmers, agents, reinsured companies, and RMA. See our discussion of these issues in section 7 of this review.

3) *“Are producers likely to react positively or negatively to the presence of stages in the proposed COP plan?”*

Since the proposed COP product does not include predetermined stages, we assume that the question is referring to the liability structure (described earlier in our equation 3) of the proposed COP product. In part because of this liability structure, the COP product would offer less protection than existing revenue insurance products. It would likely also cost less. Individual producers will likely have different reactions to a product that offers less protection at less cost.

4) *“Would the premium rates produced by the individualized rating system for COP versus the APH-based rating system for other plans have any negative effect on the actuarial performance of the other plans or FCIC in general?”*

See comments in section 6.4 of this review.

5) *“Are the individualized rates produced by the proposed COP rating model credible?”*

   We believe that the process used to individualize rates is prone to errors associated with small sample sizes. See our discussion in section 6.4 of this review.

6) *“Production-expense data is used in the proposed COP plan for the following purposes:*
   a. *Insurance Guarantee – Limit the maximum amount of insurance available when reported production expenses are less than the expected gross income (EGI).*
   b. *Insurance Indemnity – Reduce loss payments when actual production expenses are less than the Approved Expenses.*

   Does the incorporation of production-expense data serve any other function or provide any other benefit in the proposed COP plan?”

   As best we can tell, no.

7) *“When its pilot programs contain unusual or controversial features, FCIC sometimes requires that applicants sign a ‘disclaimer’ at the time of purchase. These disclaimers contain a statement whereby the producer acknowledges that the unusual/controversial features exist and that she/he understands and accepts them. Such forms are used to promote a thorough discussion between the agent and the producer before the sale is completed, thereby reducing the probability of angry feelings at loss time. A draft disclaimer for COP, which highlights four features, is included at the end of this Appendix. Should FCIC require COP applicants to sign this or a similar disclaimer? If so, are there other components that should be included in the Disclaimer?”*

   We cannot think of any “downside” to having applicants sign such a disclaimer.

8) *“Can the assumption of normality within a quintile in the NASS yield data be safely made?”*

   The assumption is not accurate. When you ask if the assumption can be “safely made” we assume you are asking if the adequacy of the approximation is “good enough.” We don’t know the answer to that question. Further, we believe that the only way to answer that (and other questions related to the rating procedures) is to conduct tests based on simulations from known distributions as we propose in section 6.2 of this review.

9) *“Is there a more appropriate assumption that could be made to generate the set of producer data?”*

We don't know. Again, to address this question we would suggest conducting tests based on simulating from known distributions.

10) *"After the data set for 1997 is generated from the quintiles, the yields are plotted relative to the county average. These 1997 yields are then plotted across time keeping the same relationship with the county average as was demonstrated in 1997. A random adjustment is then made to represent variability across years. Is this adjustment reasonable?"*

We don't know. Again, to address this question we would suggest conducting tests based on simulating from known distributions.

11) *"Is this adjustment constrained by the spatial variability that existed in 1997?"*

The random adjustment procedure is an attempt to simulate farm-level yield variability by amplifying the time-series variability in the NASS county yield data. Within a given quintile, it is constrained by the time-series variability in the RMA actual yield history data for that quintile.

12) *"This data set is the basis for all rate calculations. Do these data simulation and adjustment procedures generate a set of good data for the purpose of rating?"*

We don't know. To address this question we would suggest conducting tests based on simulating from known distributions.

13) *"Is there a better data set that could be used for the rating of this product?"*

COP rating procedures take a limited set of actual farm and county yield data and use it to create a much larger set of hypothetical farm yield data. We are not aware of any better data sets that could be used to initialize this process. The adequacy of the procedures used to create the hypothetical farm yield data should be tested as we propose in section 6.2 of this review.

14) *"Is it appropriate to calculate the premium as the weighted average of three independent functions of profit margin, average yield, and coefficient of variance of yield? In other words, are these functions actually independent?"*

Clearly, the variables are not independent. In the process used to individualize rates the effect of any interdependency between these variables is likely swamped by sampling errors associated with using such short time-series. As indicated in section 6.4 the profit margin is simply an adjustment to the effective deductible.

11 General Questions in the Description of Work

11.1. Protection of producers' interests

11.1.1. Does the policy provide meaningful coverage that is of use to producers, and provide it in a cost-efficient manner?

The policy does provide coverage that would be useful to producers. Without more data on actual farm-level premium rates we cannot comment on whether the coverage would be cost-efficient from the producer's standpoint.

11.1.2. Is the policy clearly written such that producers will be able to understand the coverage that they are being offered? Does the policy language permit actuaries to form a clear understanding of the payment contingencies for which they will set rates? Is it likely that an excessive number of disputes or legal actions will arise from misunderstandings over policy language?

See comments in section 7 of this review.

11.1.3. Is the mechanism for determining liability (i.e., the amount of coverage) clearly stated and supported by an example?

Yes.

11.1.4. Is the mechanism for determining the amount of premium clearly stated and supported by an example?

Assuming a given premium rate the mechanism for determining the amount of premium is clearly stated.

11.1.5. Are the mechanisms for calculating indemnities clearly stated and supported by an example?

Yes.

11.1.6. In the case of price or revenue policies, are the mechanisms for establishing price clearly stated?

Yes. The maximum of the RMA price election or the loan rate are used in establishing the revenue guarantee. The price received by the farmer is used in calculating actual revenue to count.

11.1.7. Is adequate, credible, and reliable data available for establishing expected market prices for insured commodities? Is it likely that the data will continue to be available? Is the data vulnerable to tampering if the proposed policy is approved? Is the data likely to be available when needed? If the proposed system for publishing prices feasible?

Adequate, credible, and reliable data are available for establishing expected cotton market prices. The RMA price election used for other cotton insurance products would be used for COP. Futures market prices are used to generate the RMA price election. Futures market price data are adequate, credible, and reliable. They will continue to be available and are not vulnerable to tampering.

11.1.8. Does the policy avoid providing coverage in excess of the expected value of the insured crop?

In general, the expected revenue cap on approved expenses should prevent coverage in excess of the expected value of the crop. However, note our concerns in section 5 of this review.

11.1.9. Does the policy contain indemnity or other provisions that cannot be objectively verified by loss adjusters, underwriters, or auditors?

Perhaps. Note our concerns in section 5 of this review.

11.1.10. Is the policy likely to treat all similarly-situated producers the same?

This is the basis for our concerns expressed in sections 5.1.2, 6.3, 6.4, and 6.5 of this review.

11.1.11. Will insureds be able to comply with all requirements of the policy?

Perhaps, but the transactions costs will be quite high (see section 7 of this review).

11.1.12. Does the policy create vulnerabilities to waste, fraud, or abuse?

See the discussion in section 5 of this review.

11.1.13. Is the product likely to adversely affect the agricultural economy of the crop that is proposed for coverage, or of other crops or areas?

Previous experience suggests that if underwriting problems create insurance offers that are too generous, planted acreage and production can increase dramatically with adverse effects on producers of the insured crop and other crops (e.g., previous experiences with watermelons and durum wheat). Our primary concern in this regard is the 6-month ahead price forecasts described in section 6.1 of this review.

11.2. Actuarial soundness

11.2.1. *Is adequate, credible, and reliable ratemaking data available? Is it likely that the data will continue to be available? Is the data vulnerable to tampering if the proposed policy is approved?*

Adequate farm-level yield data are not available. This is why the proposed ratemaking procedures involve a process that generates hypothetical farm-level yield data from a limited set of farm- and county-level yield data. These limited data will continue to be available and are likely not vulnerable to tampering. Output from a proprietary econometric model is also required for rating COP. We can make no assessment regarding the continued availability of that model.

11.2.2. Are the explicit and implicit assumptions used in the rating process reasonable?

Our concerns regarding the rating process are discussed in section 6 of this review.

11.2.3. Are the technical analyses (e.g., stochastic and other simulations) technically correct? Do they provide credible, relevant results?

To answer this question we would need results from tests based on simulations from known farm-level yield distributions.

11.2.4. Is the data used for the analyses appropriate, reliable, and the best available?

The limited farm- and county-level data sets used to initialize the ratemaking process are likely the best available. To determine whether or not the hypothetical farm-yield data generated in the ratemaking process are appropriate and reliable, we would need results from tests based on simulations from known farm-level yield distributions.

11.2.5. Does the certification from an actuary or similar person provide adequate support for the submission?

Yes.

11.2.6. Does experience from prior years and relevant crops and areas support the validity of the proposed rates?

No previous experience exists for COP. In section 6.2.1 of this review we suggest that COP procedures be used to generate hypothetical premium rates for APH yield insurance and IP revenue insurance. Comparing these hypothetical premium rates to the actual APH and IP premium rates would provide some insight into the internal consistency between COP rating procedures and those used for other crop insurance products.

11.2.7. Is the product likely to be sold in a sufficient number such that actuarial projections would be credible?

We don't know.

11.2.8. Does the submission increase or shift risk to another FCIC-reinsured policy?

To the best of our knowledge, no.

11.2.9. Are the proposed premium rates likely to cover anticipated losses and a reasonable reserve?

We don't know. Our actuarial concerns are addressed in section 6 of this review.

11.3. Other review areas

11.3.1. Does this policy provide coverage that, in whole or part, is generally available from the private sector?

No.

11.3.2. Does the policy propose to insure a peril that is not authorized by the Act?

To the best of our knowledge, no.

11.3.3. Does the policy place an unreasonable administrative burden on the insured, the AIPs, or the Federal crop insurance program?

See our comments in sections 7 and 8 of this review.

11.3.4. To the extent of the reviewer's knowledge, does the policy comply with all requirements of the Act and the public policy goals of the Corporation?

Cost of production insurance was mandated by the Agricultural Risk Protection Act of 2000.

12 Recommendation

We feel strongly that this product is preferable to many of the alternative "cost of production" insurance designs that have been widely discussed in the past. Though it has many unique features relative to existing products, COP is, in essence, a revenue insurance product. It is a revenue insurance product, however, with rating methods unlike those used for any of the existing revenue insurance products. In this review, we have identified a number of important concerns related to COP ratemaking. We have also expressed concerns about some underwriting issues, the complexity of the COP product, and the maintenance required for continued availability. Until those concerns are adequately addressed, we cannot recommend that the Board of Directors accept COP into the portfolio of FCIC products.

13 Reviewers' Backgrounds

Dr. Jerry R. Skees is H.B. Price professor of agricultural economics at the University of Kentucky and President of GlobalAgRisk, Inc. Dr. Barry J. Barnett is associate professor of agricultural and applied economics at the University of Georgia. Dr. J. Roy Black is professor of agricultural economics at Michigan State University. James D. Long is Vice-President of GlobalAgRisk, Inc. Barnett and Skees participated in this review as contracted consultants to GlobalAgRisk, Inc.

This team of reviewers has a combined 60 years of experience working on crop insurance and risk management issues. We have worked on many RMA-funded research projects. We have also worked on risk management projects sponsored by the World Bank and USAID. While our past experience qualifies us to perform underwriting reviews, we are not professional underwriters and do not have any underwriting certifications from insurance trade groups. We provide this information in part as a disclaimer. Nonetheless, we believe our insights will prove useful as you consider this product. Our review is developed in that spirit.

Our review is based on the information provided to GlobalAgRisk, Inc. No attempt was made to verify this information. Neither GlobalAgRisk, Inc. nor the contract consultants named above provide any warranties or guarantees that this review has identified all of the potential shortcomings of the submission under review. Further, neither GlobalAgRisk, Inc. nor the contract consultants named above assume any responsibility for loss or damage that might arise from the use of, or reliance upon, this review.

14 References

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