

Area or Index-Based Insurance Plans Review and a Look Ahead¹

By Dr. Harun Bulut, NCIS

Introduction

Over the last decade, there have been considerable developments in the space of area-based or parametric (index-based) Federal crop insurance products. As a result, the respective market shares of area-based and index-based products approached five percent and 10 percent of the standard book of

business (multi-peril crop insurance, MPCI) premium in 2021. This article provides a brief review of these products in association with the overall book of business—which has been predominantly individual coverage. The objective of the article is to clarify the roles of area or index-based plans within the Federal crop insurance portfolio.

The State of the Area or Index Based Insurance Plans

The full list of specific products that fall under either the area or index-based plan categories, along with their premiums in 2021, are presented in Table 1. Area-based plans are viewed as conceptually distinct from index-based products: the former measure production (a direct measure) while the latter measure some exogenous factors that influence production (an indirect measure). This approach somewhat differs from the literature in that both categories are treated as index products: one based on the yield and the other on the weather (Barnett 2004).

The traditional suite of area plans (commonly known as Area Risk Protection Insurance, ARPI, plans) triggers at the county level, protecting against shortfalls in the expected yield or revenue. Farmers have the option of scaling the county-level liability up or down to align with their risk management needs. These products are designed to work separately from individual plans, and farmers must choose between the two types of plans. The premium volume associated with ARPI plans stood at \$58.7 million in 2021.

The 2014 Farm Bill introduced additional area-based supplemental revenue products: Supplemental Coverage Option (SCO) and Stacked Income Protection (STAX). In contrast to ARPI, SCO supplements underlying individual crop insurance policies and its coverage depends on the underlying crop insurance plan and coverage. SCO has a high subsidy rate of 65 percent, which exceeds the subsidy rates on the highest individual plan coverage levels. SCO saw a modest uptake, claiming \$234.2 million in premium in 2021.² Similarly, Stacked Income Protection (STAX) was introduced for cotton producers

Table 1
Premium Volume by Area or Index Based Products in 2021

AREA-BASED PLANS OF INSURANCE		PREMIUM (million \$s)
ARPI	Area Risk Protection Insurance	58.7
SCO	Supplemental Coverage Option	234.2
ECO	Enhanced Coverage Option	221.4
STAX	Stacked Income Protection	85.9
MP	Margin Protection	68.5
Total for the Area-Based Products		668.70
As a Share of the Standard Book of Business		4.88%
INDEX-BASED PLANS OF INSURANCE		PREMIUM (million \$s)
HIP-WI	Hurricane Insurance Protection: Wind Index	191.0
PRF-RI	Pasture, Rangeland, Forage: Rainfall Index	1,084.0
Total for the Index-Based Products		1,275.0
As a Share of the Standard Book of Business		9.30%
AREA-BASED LIVESTOCK PLAN OF INSURANCE		PREMIUM (million \$s)
DRP	Dairy Revenue Protection	398.6
As a Share of the Livestock Book of Business		69.6%

Note. The standard book of business premium stood at \$13,714.9 million, while the livestock book of business premium was \$572.7 million in 2021. Data is current as of February 22, 2022.

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² The 2014 Farm Bill's requirement that producers who elected Agriculture Risk Coverage (ARC) program, which is a free farm program at the county level, are ineligible for SCO might have influenced farmers' initial uptake of SCO. SCO is available if the other farm program Price Loss Coverage (PLC), which also comes as free, is elected. Under the 2018 Farm Bill, starting with the 2021 program year, farmers can switch between ARC and PLC rather than committing to either program over the life of the farm bill as required in the 2014 Farm Bill. With this additional flexibility, farmers may consider SCO whenever PLC arises as a better fit for their situations.

with an 80 percent subsidy rate. STAX also saw a limited uptake: the premium volume was less than \$100 million in 2021.

Most recently, Enhanced Coverage Option (ECO) was introduced as an additional area-based supplemental product, protecting a portion from 90 percent or 95 percent down to 86 percent of the deductible with the underlying base plan of insurance. ECO adds another layer of coverage on top of SCO. ECO products were developed privately. In its first year of introduction, the premium volume for ECO products approached that of SCO products, with both exceeding \$200 million in 2021.

Finally, Margin Protection (MP) products protect against profit margin losses, beginning in 2017 for corn and 2018 for soybeans. MP products were also privately developed and can be either purchased as stand-alone policies or in conjunction with the underlying individual coverage. The premium volume for MP products stood at \$68.5 million in 2021.³

On the livestock side of the business, Dairy Revenue Protection (DRP), which is based on state-level milk yields, led the high growth in that space since its introduction in 2019. The premium for DRP was near \$400 million in 2021, which represented 69.6 percent of the entire livestock premium volume. The strength of DRP lies in tailoring to the price protection needs of producers. Currently, this product is not available at the county or individual level.

As for parametric insurance schemes, the Hurricane Insurance Protection–Wind Index (HIP-WI) Endorsement was introduced in 2020. This is an event-based insurance in which hurricane occurrence is determined based on hurricane wind speed within a county or adjoining counties. The premium for this product remained less than \$200 million in 2021—still up 77.8 percent from the level in 2020.

The other index product, Pasture, Rangeland, Forage Rainfall Index (PRF-RI), originated in 2007 and has expanded in recent years. The premium volume had an increasing trend after the 2014 Farm Bill and exceeded \$1 billion in 2021.

The Factors Influencing Farmers' Choices on Area or Index Products

Farmers assume basis risk in using either type of products as the farm losses can be positively yet imperfectly correlated with area losses or implied losses via changes in the index value, and these products may have false negatives. For instance, providing evidence out of California, a recent article (Keller and Saitone 2022) approximates forage production via the NDVI (Normalized Difference Vegetation Index) values and estimates the probability of a farmer experiencing a loss and yet PRF-RI not making any payment as 31 percent to 46 percent in the case of single interval selection. These estimated values are higher than what is reported (26 percent) in a previous article (Yu et al. 2019) for three locations in Kansas and Nebraska. The latter authors also find that basis risk is derived from non-precipitation-related factors that affect forage production and thus having site-specific precipitation measurements would be of limited value in reducing basis risk. The Keller and Saitone article shares a similar observation in that rainfall does not coincide with abiotic factors influencing forage production in California. Finally, another article (McLaurin and Turvey 2011) finds that the relationship between NDVI values, yield, and weather variables, such as precipitation or extreme heat, is highly variable and is dependent on location-specific characteristics.

Certain features of index products can influence their growth potential. In the case of HIP-WI or PRF-RI, the product is based on an exogenous factor: HIP-WI triggers if sustained hurricane wind speed exceeds a certain threshold, while PRF-RI triggers if rainfall index falls below the historical average.⁴ Payments can be made very quickly after the determination. On the other hand, area plan indemnities cannot

be determined until the summer following the crop year. Index products can also be viewed as a form of named-peril and can be less expensive and more specific than multi-peril products. In the case of HIP-WI, hurricane damages are at the forefront of perils that farmers face in those regions where it is offered. In the case of PRF-RI, the index may be suitable for vast swaths of land in which traditional loss adjusting can be more costly and time-consuming. This is in addition to the yield measurement problems inherent in rangeland and pasture vegetation (Rowley, Price, and Kastens 2007; McLaurin and Turvey 2011). There is also the expectation in the literature that the expanded remote sensing technology capabilities, such as drones, hyperspectral sensors, satellite-based imagery with higher frequency and resolution, or synthetic aperture radar (SAR)⁵, combined with field level validation can be used to offer index insurance products that better track the changes in the phenology of a forage crop (Keller and Saitone 2022; Rowley, Price, and Kastens 2007).

One also needs to recall the fact that the PRF-VI (Vegetation Index) product was discontinued in 2014 because of a lack of interest. Potential explanations include that farmers may have not trusted the product in the absence of ground validation, or the effects through the PRF-VI were too convoluted for them to discern. In contrast, PRF-RI (Rainfall Index) represented more than \$1 billion in premium in 2021. Some behavioral factors may account for the differential uptake between the two.

When it comes to area plans, there are already enterprise units that can be spread over an area, and therefore, can mimic an area plan, while still being based on a farmers' own actual production history (APH). Anecdotal evidence suggests that producers may prefer responsibility for the outcomes on their farm (as in individual insurance) rather than relying on county outcomes. A policy change in the 2008 Farm Bill reduced the subsidy rates for the predecessors of the ARPI plan of insurance, while markedly increasing the subsidy rates for enterprise units. Since then, the use of enterprise units experienced an initial jump and followed by continuous growth (Bulut 2020), while the market share for ARPI plans has steadily declined since 2006.

Farmers, as decision-makers, may also be prone to loss aversion. In that case, the losses would hurt more than any pleasure from gains of an equal size, which would amplify the concerns over basis risk. There is an indication of such bias

³ While the premium volume in 2022 was not known at the time of writing, the number of policies sold was up 70 percent from a year earlier, perhaps reflecting the elevated demand for such products in response to high input prices.

⁴ The comparison between such index products and area or individual plans is primarily intended for the HIP-WI as there are crop-county cases where producers are offered all three options. While PRF-RI is limited to forage crops, a similar comparison can conceptually extend to other crops as well.

⁵ More information about these technologies can be found at <https://gisgeography.com/category/remote-sensing/>.



Targeting Specific Perils

in a recent study (Stigler and Lobell 2020). It is not known whether area plans or index plans are more prone to this bias. Perception issues may arise because of other producers impacting area plan results versus the purely weather-related factors in index plans. Area plans may be better at tracking a producer's production in counties where both types of plans are available.

The participants in area plan programs have been required to report their acreage and production data since 2011. The 2018 Farm Bill encouraged the use of Risk Management Agency (RMA) data instead of National Agricultural Statistics Service (NASS) data for the ARC program. As such, transaction costs with area plans increased relative to individual plans. From a farmer's point of view, there is no operational advantage of selecting an ARPI policy as far as production or acreage reporting is concerned. For PRF-RI, farmers only need to report acreage data as production is difficult to measure. In the case of HIP-WI, the production and acreage data are already reported with the underlying individual policy. This approach provides a small advantage in that if a county loss triggers but the underlying individual coverage does not, farmers don't need to file a notice of loss and no loss adjustment is needed.

What is a Proper Role for Area or Index Based Plans?

Some theoretical perspectives can be helpful in evaluating the policy implications of some of the new product introductions. A theoretical study of farmers' optimal coverage choices (Bulut, Collins, and Zacharias 2012) shows that once area plans are underpriced (i.e., subsidized more) relative to individual plans, producers would start to substitute a portion of individual coverage with area coverage, but that would amount to distorting the optimal choice as to risk minimization (via risk transfer). A version of this can be seen at play with the introduction of SCO or STAX. The policy intent appeared to induce higher participation in regions where producers typically purchase lower coverage levels. A simulation-based study of farmers' optimal coverage choices (Bulut and Collins 2014) finds that SCO or STAX typically reduces demand for crop insurance coverage at higher coverage levels. When the area coverage for supplemental products overlaps with those for individual coverage, farmers are left with trading higher subsidy rates

for SCO or STAX (at high coverage levels) against better risk reduction that comes with individual plans. The concern is whether supplemental area plans set farmers up for "buyer's remorse." In catastrophic years, producers may find themselves surprised with larger revenue losses than expected, and that could also lead farmers to criticize crop insurance, ironically not for a program failure, but as a result of their own choice.

Similarly, in the case of HIP-WI, by offering a single peril insurance product, RMA's intent appears to be to cover a major peril that farmers care about the most at a price that is relatively cheaper than individual MPCCI coverage options. This solution was intended for the Southeastern region where lower coverage levels for individual plans had been the predominant choice. HIP-WI may be utilized even when it overlaps with available individual coverage, but the producer paid premium per dollar of incremental liability for HIP-WI is cheaper, although some behavioral factors might favor the HIP-WI option.

It is possible for some area or index-based plans to cover deductibles beyond the maximum coverage levels that individual plans can cover.⁶ As ECO and HIP-WI are available for 31 and 70 crops, respectively, they have some potential for such coverage.⁷ A producer can protect up to 95 percent of the expected crop value, after combining the 85 percent individual coverage with ECO (while the gap in coverage between 85 percent and 86 percent can be filled by SCO) or HIP-WI. One thing to note is that ECO coverage com-

⁶ The state-regulated private Crop-Hail products (such as standard hail policy, companion plan, and production plan) are also used towards protecting the deductible with the underlying MPCCI coverage (Bulut 2020). These products protect against damages primarily due to hail and various other named perils such as wind.

⁷ A caveat here is that ECO and HIP-WI cannot be purchased on the same crop in the same crop year.

bined with Revenue Protection has an advantage over HIP-WI when both options are available to a crop in a county because HIP-WI does not offer harvest price protection.

For certain policies, such as PRF, index coverage is the only option but there is room for improvement in this product as recently reviewed (Coble et al. 2020). RMA has shared the contractor's report on PRF with the public and received about a thousand comments. Further, since participation stands at about 27 percent (covering 205.3 million acres), there is also room for growth.

Index products may also be utilized by specialty crop producers, targeting specific perils such as freeze (Barnett 2004). Quality loss issues associated with specialty crops may be one reason that explains the lower uptake of crop insurance. While major row crops have quality loss coverage in place, there does not appear to be a quality loss adjustment to the APH for specialty crops (except apples). To offer some solution for this lack of coverage, strawberry producers (who previously had a nearly zero percent participation rate with available products) recently became el-

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igible to use the HIP-WI product. In addition, for strawberries grown in California and Florida, there are also pilot revenue products being offered: "Production Revenue History-Plus" and "Production Revenue History-Revenue". RMA intends to extend the preceding products to other specialty crops. Finally, under a contract extended by RMA, research efforts are underway in developing a specialty crop weather index product. RMA is currently evaluating this research but has not made any determination as to the usefulness of such an index product (Ponds 2021).

Conclusion

In the future, area-based or index-based products will continue to coexist with individual plans. Technological advances, some inherent advantages and behavioral factors appear to give an edge to index-based products over

area-based ones. Area-based plans, on the other hand, naturally better track production than index-based plans and account for crop recovery, which in turn helps to reduce the losses in case of a major weather event. The remote sensing technologies mentioned earlier are not necessarily limited to index-based products per se, as they can also aid loss adjustment for individual plans. With the risk minimization objective being at the forefront of policymaking, area-based or index-based products should be designed such that they do not distort farmers' choices on individual coverage but rather are complementary to individual plans and fill the remaining gaps in insurance coverage.

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