



Managing Global Crop Insurance Portfolios

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Agenda

- Crop insurance programs around the world
- 2012 year-in-review
- AIR agricultural risk model components
- Model applications for crop reinsurance and insurance

Crop Insurance Markets Align with Crop Production

Major Crop Production Countries - Millions of Metric Tons*

	Corn	Soybean	Wheat	Rice	Cotton	Rapeseed	Sugarcane
U.S.	274	82	61.5	6.5	17	1	8
China	208	12.6	121	143	35	13.5	14.5
Brazil	72.5	83.5	4.5	8	6.5	-	37.5
India	21	11.5	95	101	25.5	7	25.5
Canada	13	5	27.5	-	-	13.5	-
Russia	8	2	38	1	-	1	5
France	15.5	-	38	-	-	5.5	-
Argentina	26.5	51.5	11	1	1	-	2.1
Mexico	21.5	-	3.5	-	1	-	6
Ukraine	21	2.5	16	-	-	1.2	-
Australia	0.5	-	22	1	4.5	3	4.5

* 2013 Projected



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Source: USDA Foreign Agricultural Service
<http://www.fas.usda.gov/psdonline/circulars/production.pdf>

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Crop Insurance Premium Is Significant and/or Growing in the Major Agricultural Countries

Country	Crop Insurance Premium (Millions USD)
United States	11,082 MPCl + 953 for crop-hail (2012)
China	2,700 (2011)
Canada	1,100
Spain	809
India	656 (2012)
Brazil	456 (2009)
France	366
Russia	315
Argentina	240
Mexico	222

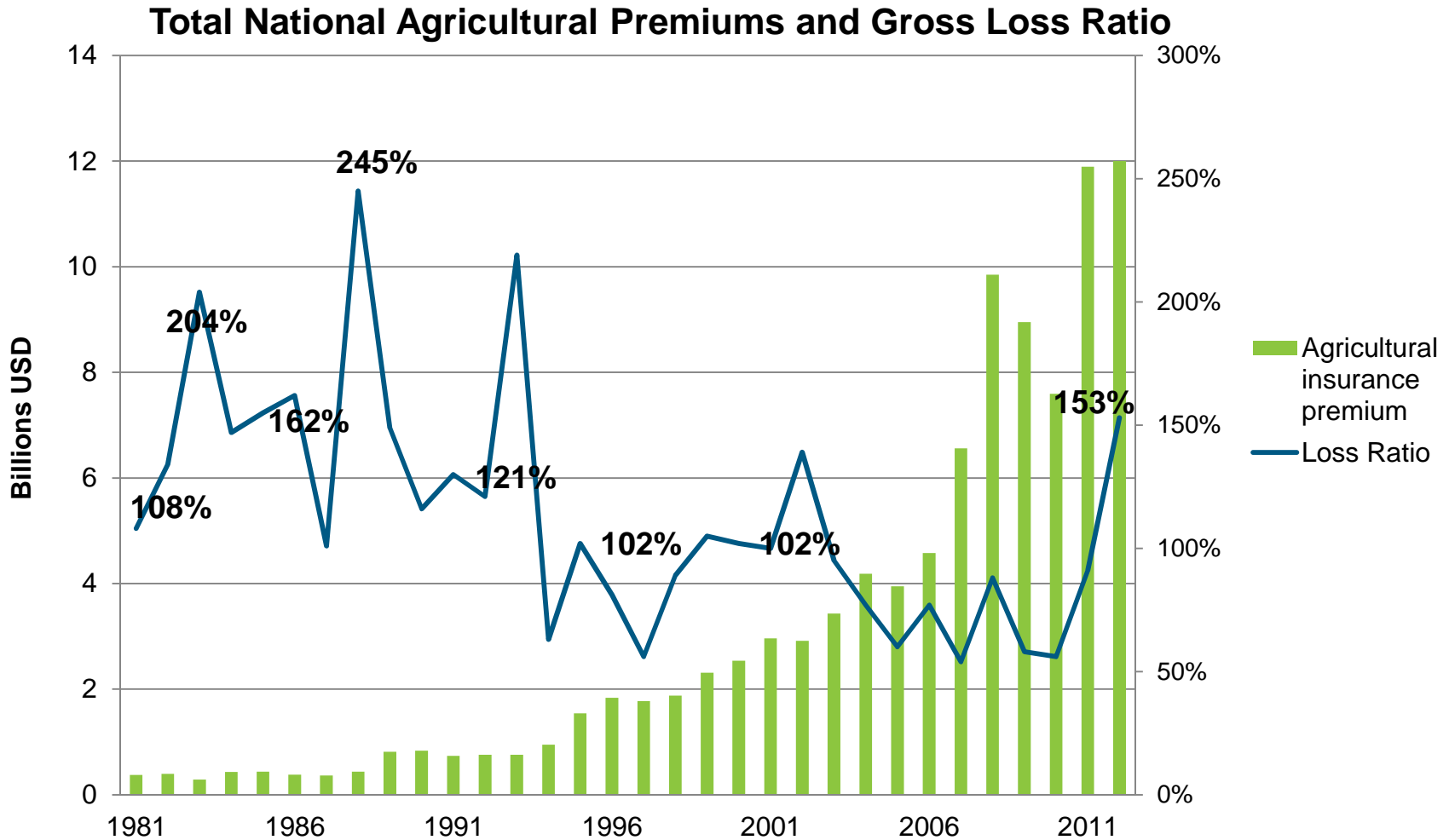
Source: World Bank Survey 2008
 * Risk Management Agency, USDA



Government Involvement Makes Crop Insurance Feasible

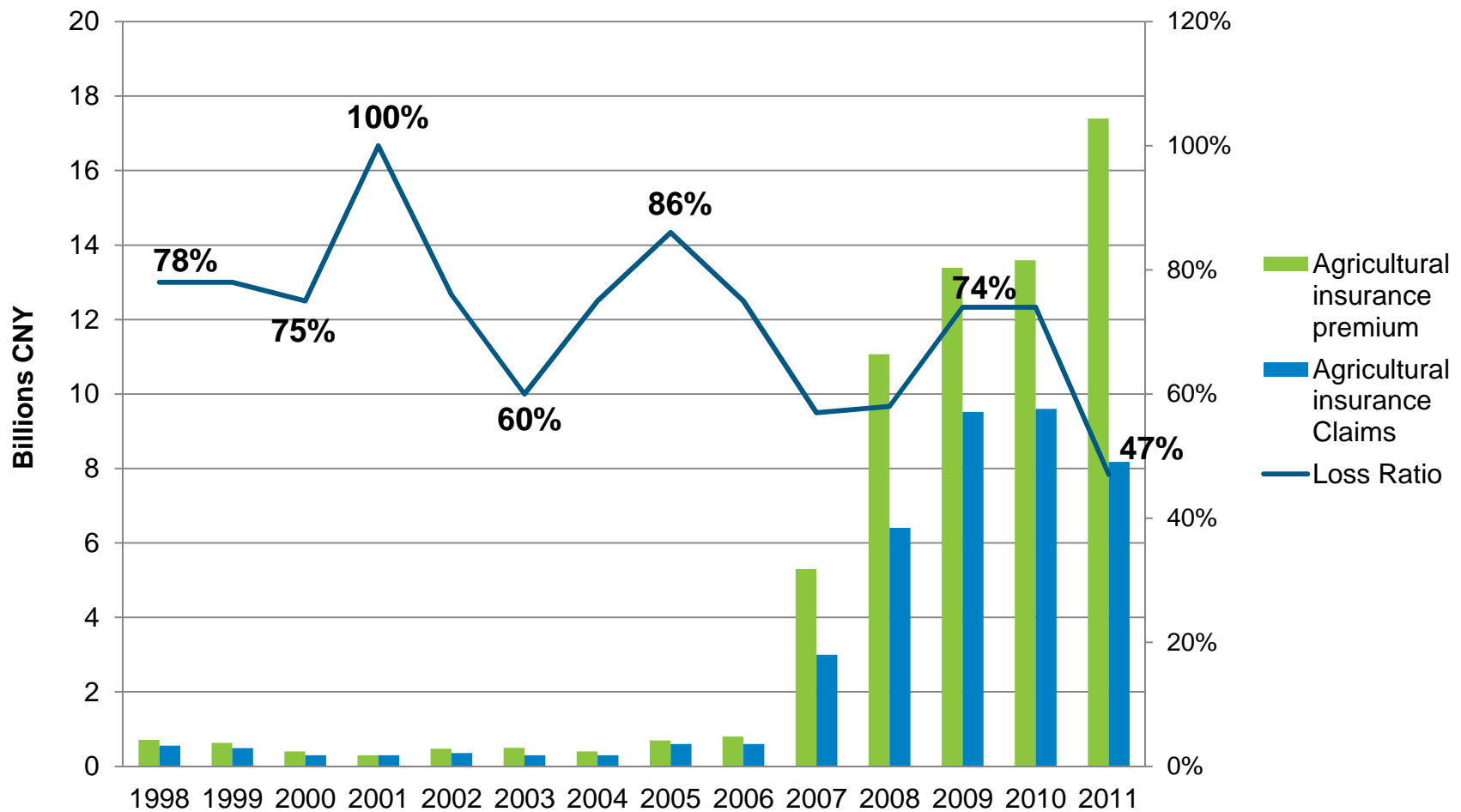
- Impacted areas are large, especially for drought
- Losses are highly correlated spatially
 - Exception is hail
- Losses are frequent and can be severe for farmers
- Premiums are subsidized
- Administrative costs for insurers may be subsidized
- Losses are limited by government
- Gains may be shared with government
- Governments typically determine
 - Premium rates
 - Program changes, e.g. perils covered, types of policies
 - Level of protection

Growth of the U.S. Crop Insurance Program and Historical Loss Experience



Agricultural Insurance Premiums and Claims in China Have Grown Significantly Since 2007

Total National Agricultural Premiums and Claims Since 1998



Source: National Bureau of Statistics of China

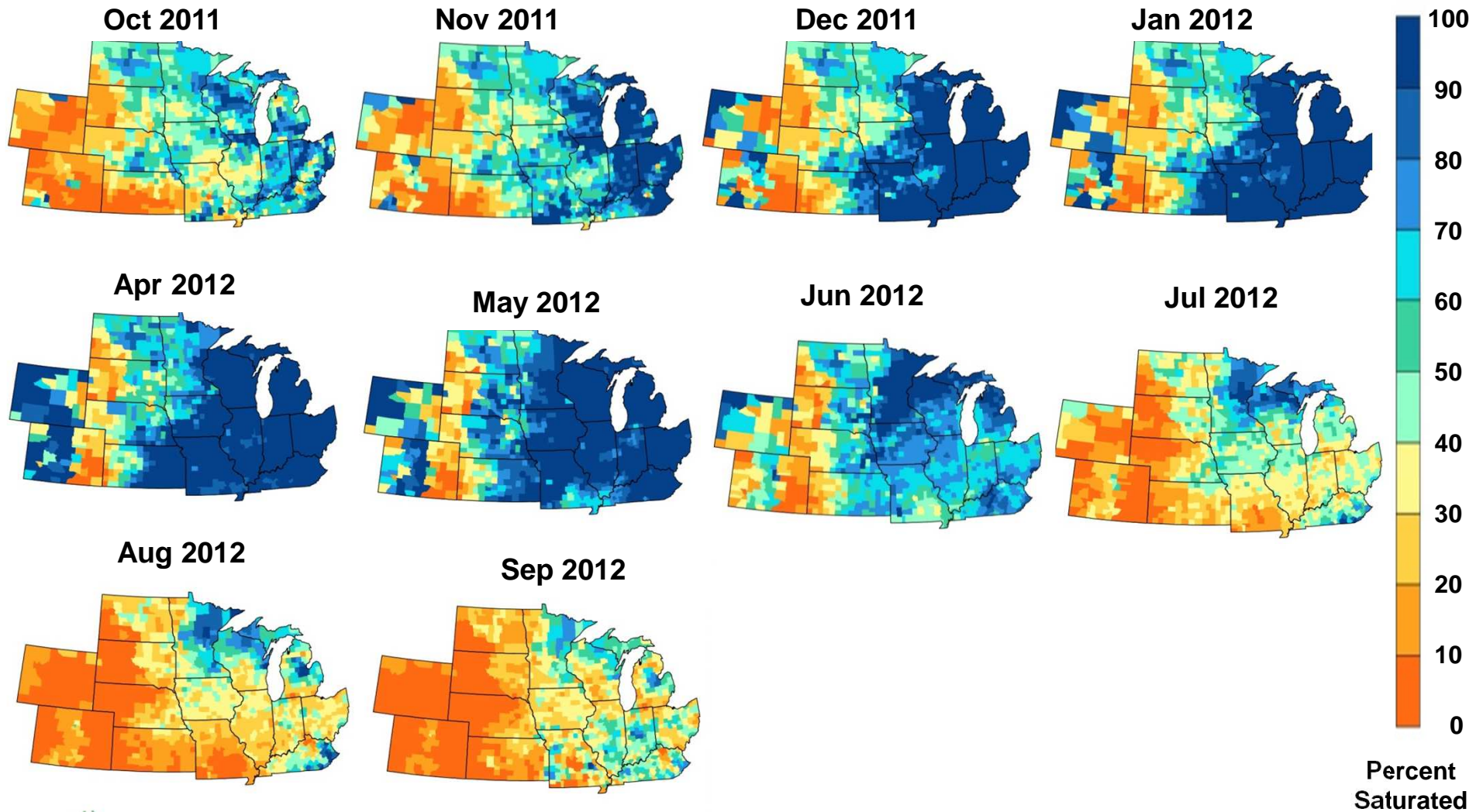


Weather Is the Key Source of Uncertainty Affecting Yields

	% Crop Loss
Drought & Heat	37%
Excess Moisture	33%
Hail	13%
Cold, Frost & Freeze	5%
Wind & Hurricane	4%
Flood	1%
Subtotal – Directly related to weather	93%
Disease	5%
Insects & Wildlife	1%
Other	1%
Subtotal – Other perils	7%
Total	100%



Development of Sub-Surface Moisture Content for 2012 Crop Season



The 2012 U.S. Drought Event



AIR's Estimated Losses for the 2012 Drought Compare Well to RMA Data

AIR 2012 crop insurance industry loss estimates as of November 2012 (Source: AIR)

Range	Gross Premium	Gross Loss	Gross Loss - Premium	Gross Loss Ratio
Upper	USD 11 Billion	USD 17.2 Billion	USD 6.2 Billion	156%
Lower	USD 11 Billion	USD 15.3 Billion	USD 4.3 Billion	139%
Range	Retained Premium	Net Loss	Net Loss - Premium	Post-SRA Loss Ratio
Upper	USD 9.3 Billion	USD 10.9 Billion	USD 1.6 Billion	117%
Lower	USD 9.3 Billion	USD 10.1 Billion	USD 786 Million	108%

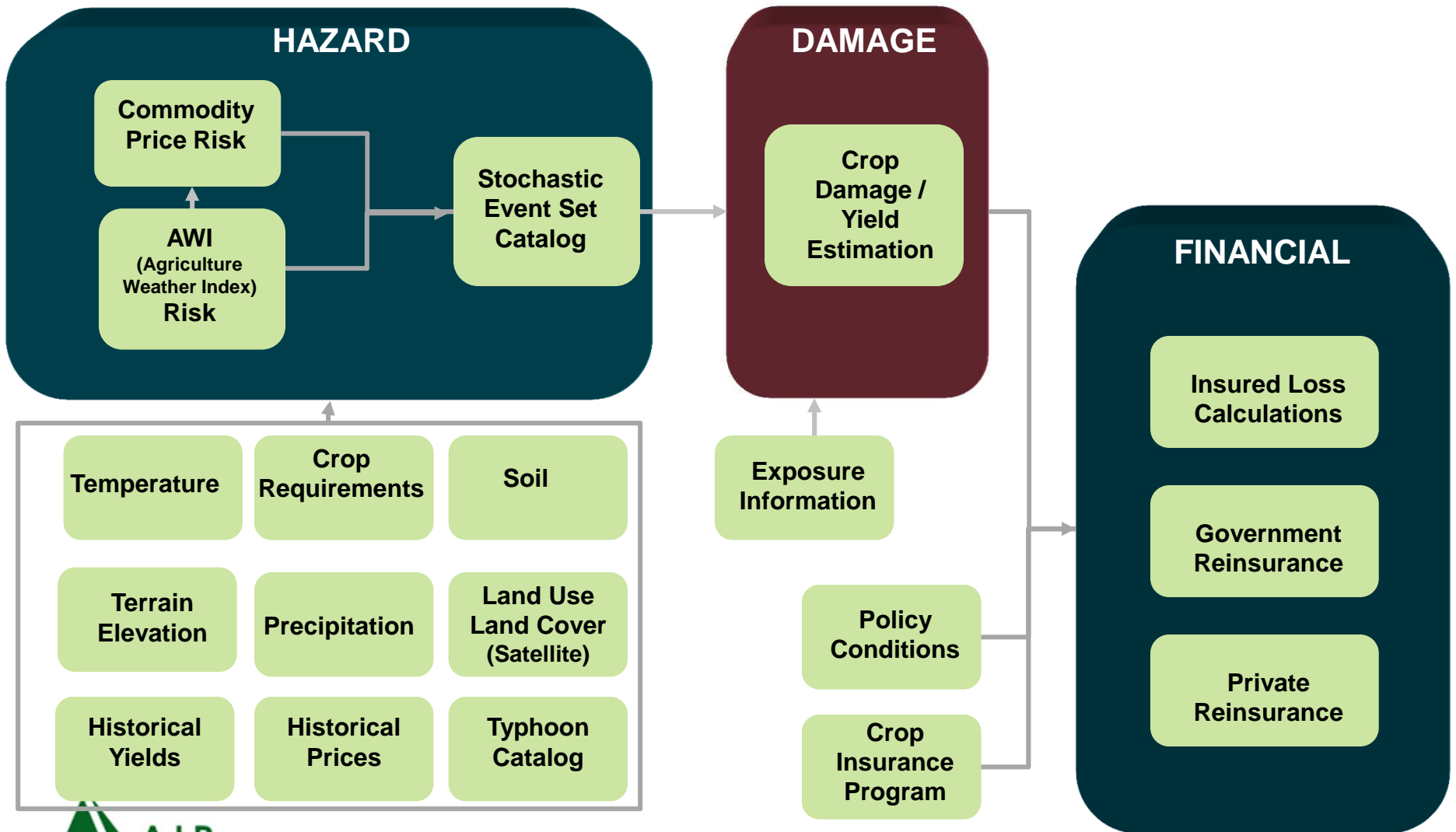
AIR's estimated gross loss ratio range (November 2012) agrees well with the RMA value (April 2013):

	Gross Loss Ratio (Observed)
2012	153%*

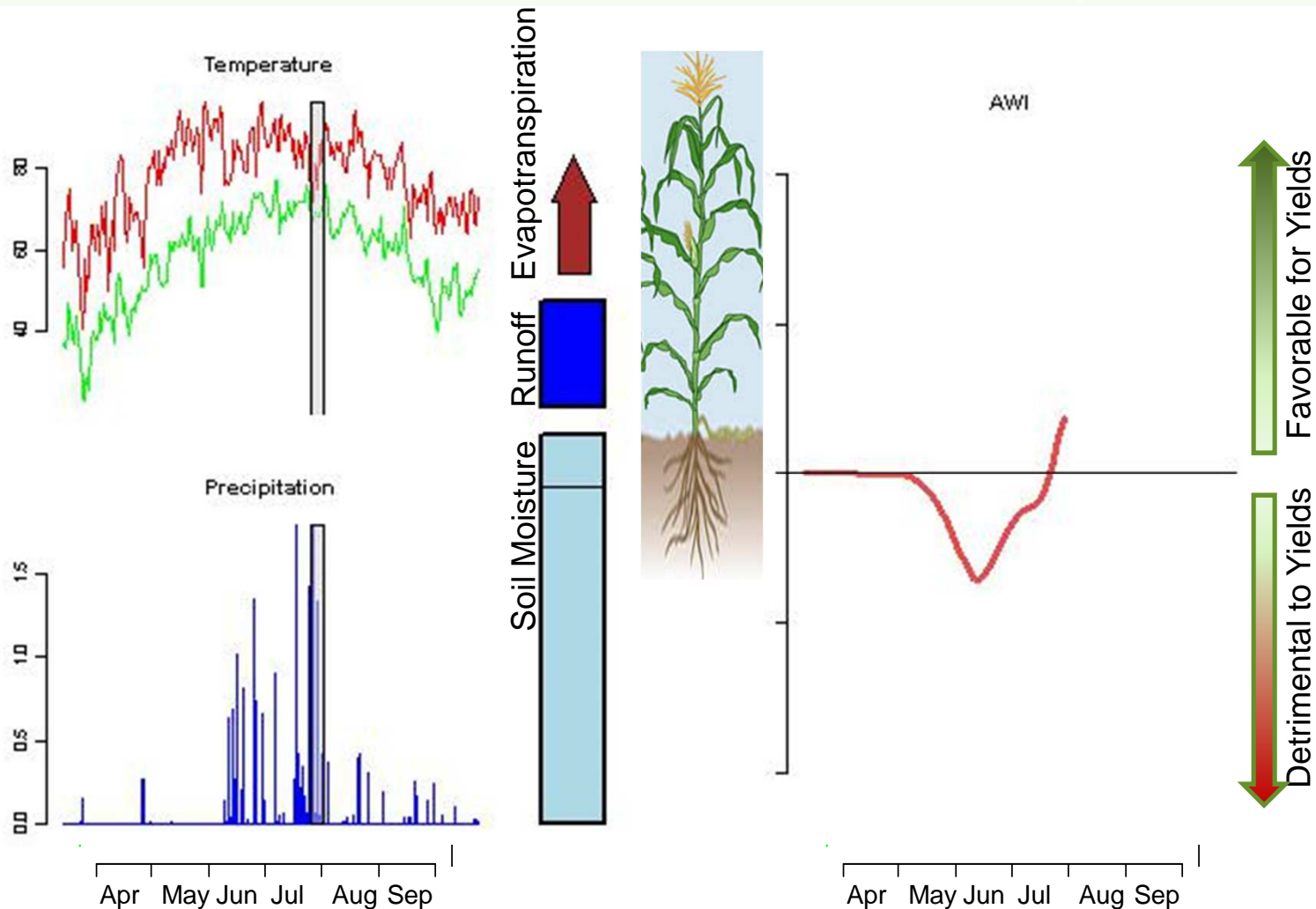
*Source: RMA



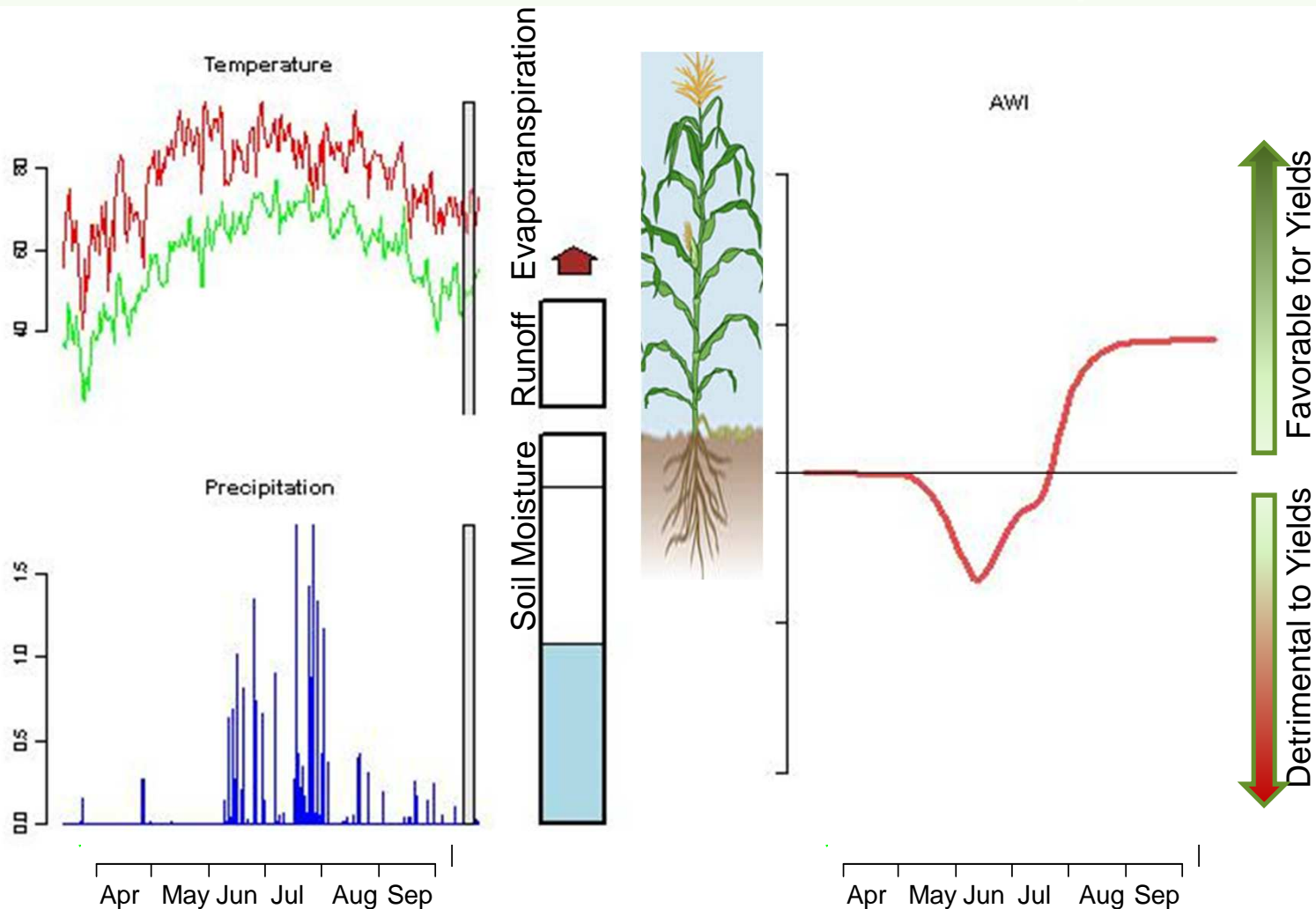
Crop Performance Is a Physical Process and Can Be Modeled in a Fashion Similar to Other AIR-Modeled Perils



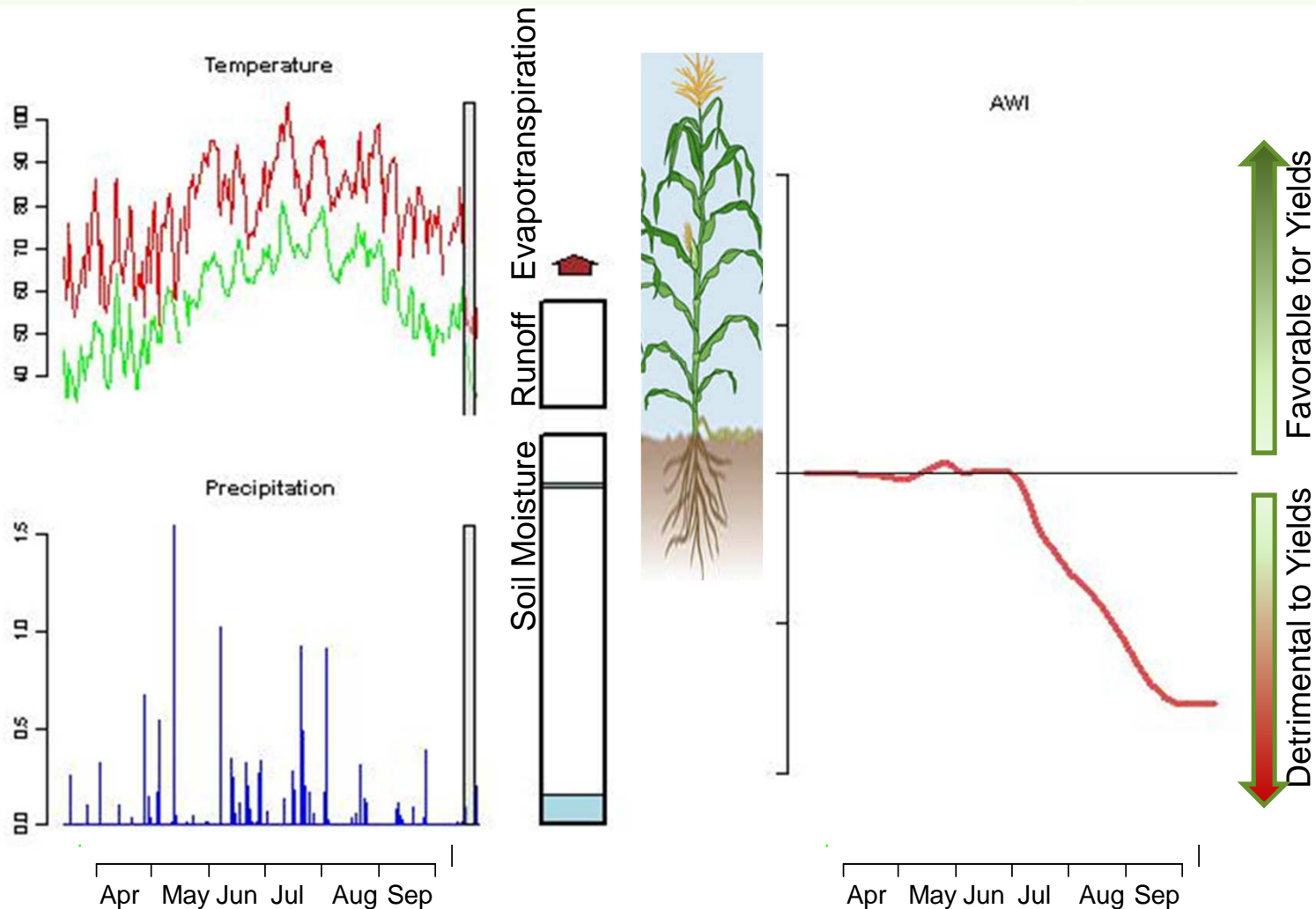
In a Normal Year, Water Supply and Water Requirements Are Balanced and AWI Indicates Positive Yield Outcome



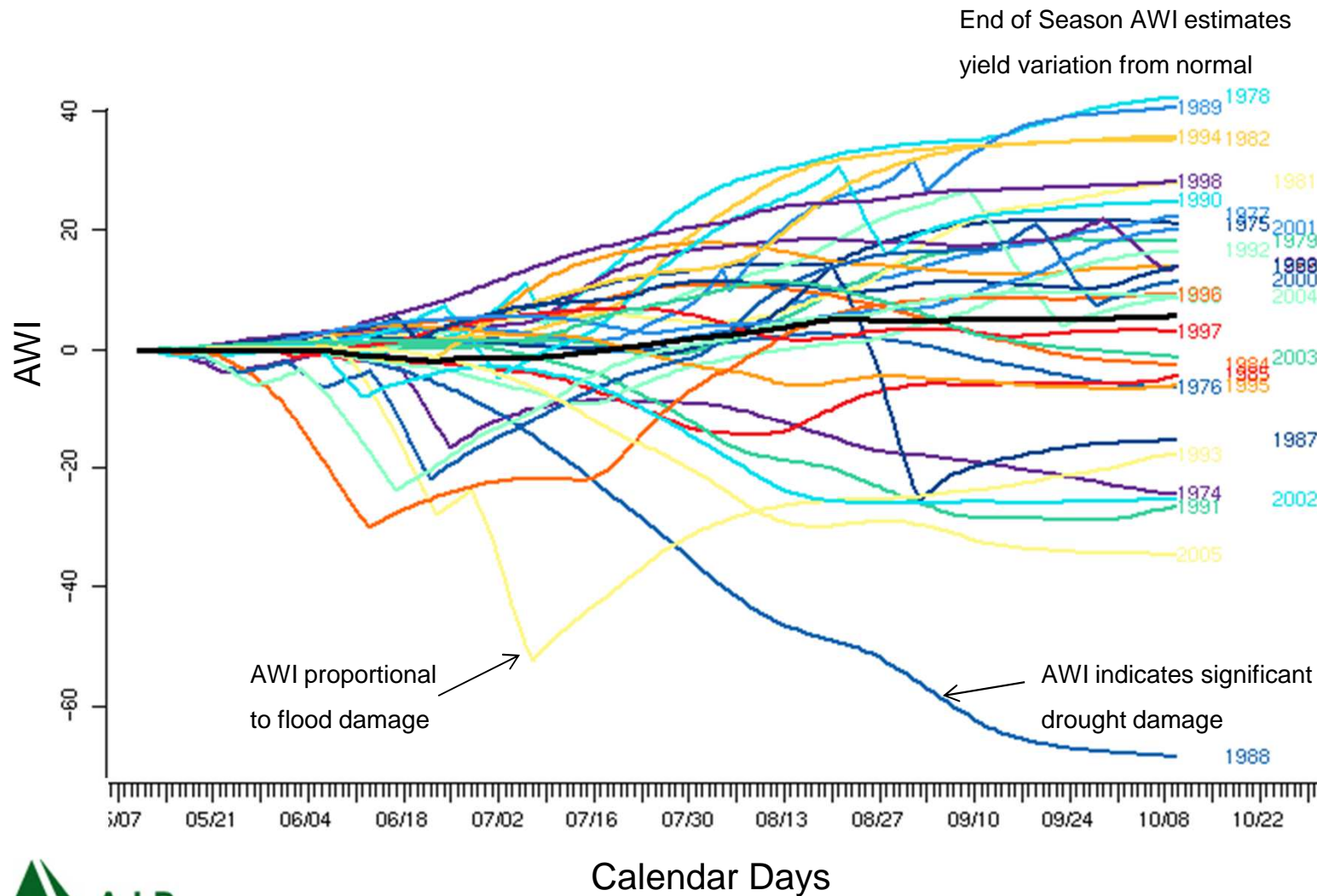
In a Normal Year, Water Supply and Water Requirements Are Balanced and AWI Indicates Positive Yield Outcome



In a Drought Year, Water Requirements Exceed the Water Supply and AWI Indicates Plant Damage

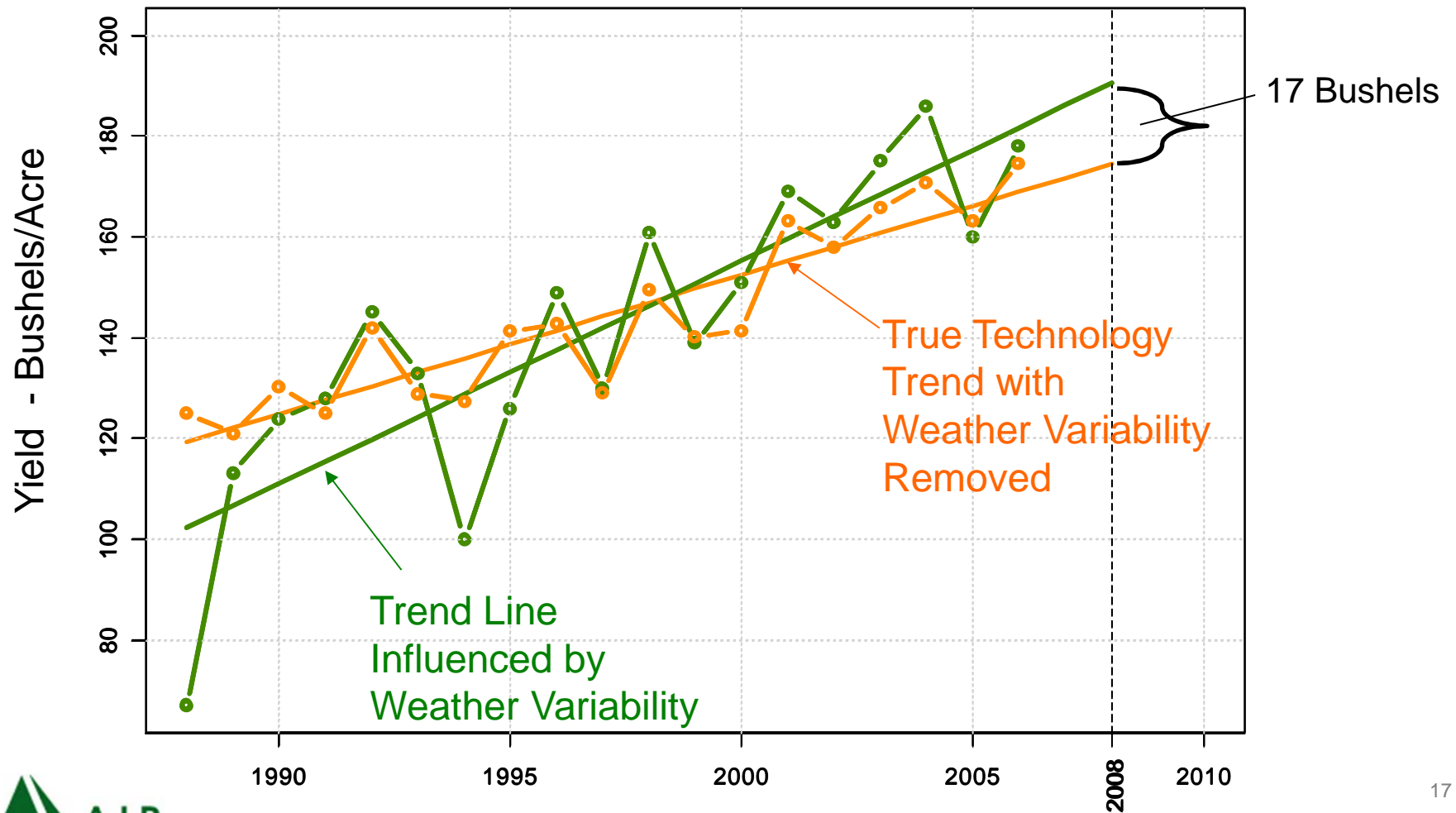


AWI Measures County-level Crop Performance During the Season



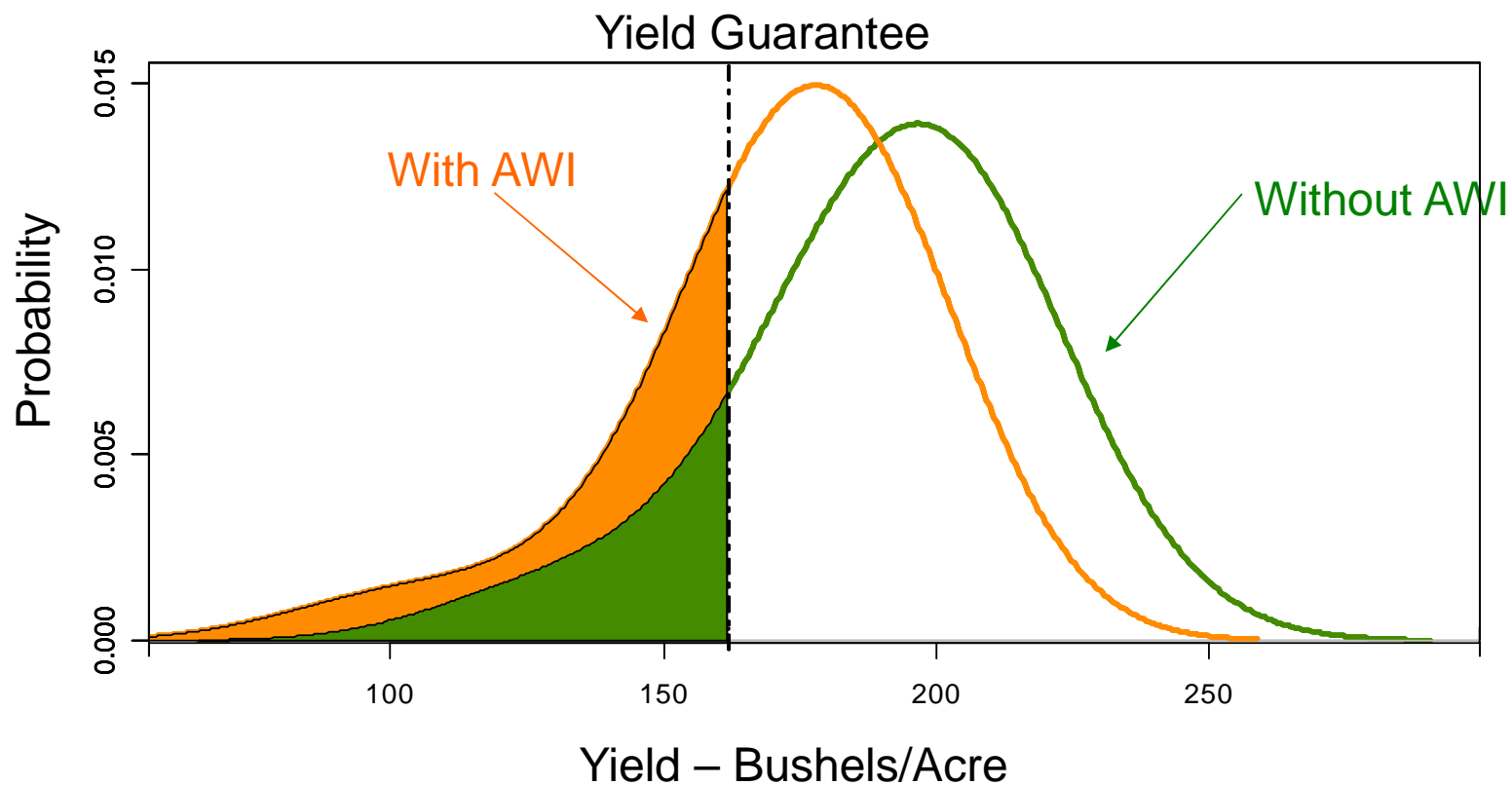
AWI Removes Weather Variability from the Historic Yields to Reveal True Technology Trend

Yield Time Series

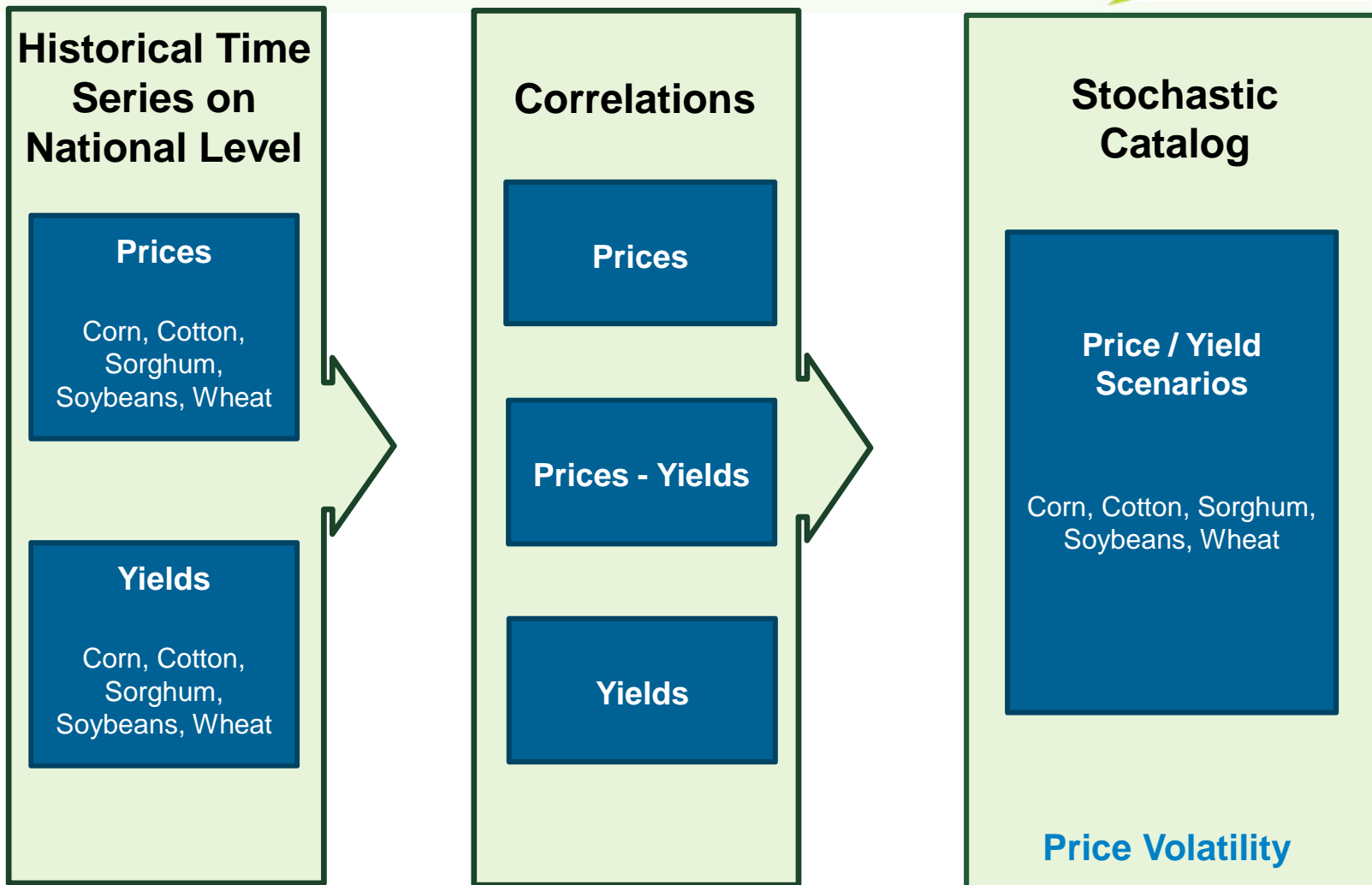


The Choice of Methodology Can Have a Large Impact on Insurance Contract Risk

Probability Density Function of Detrended Yield Time Series



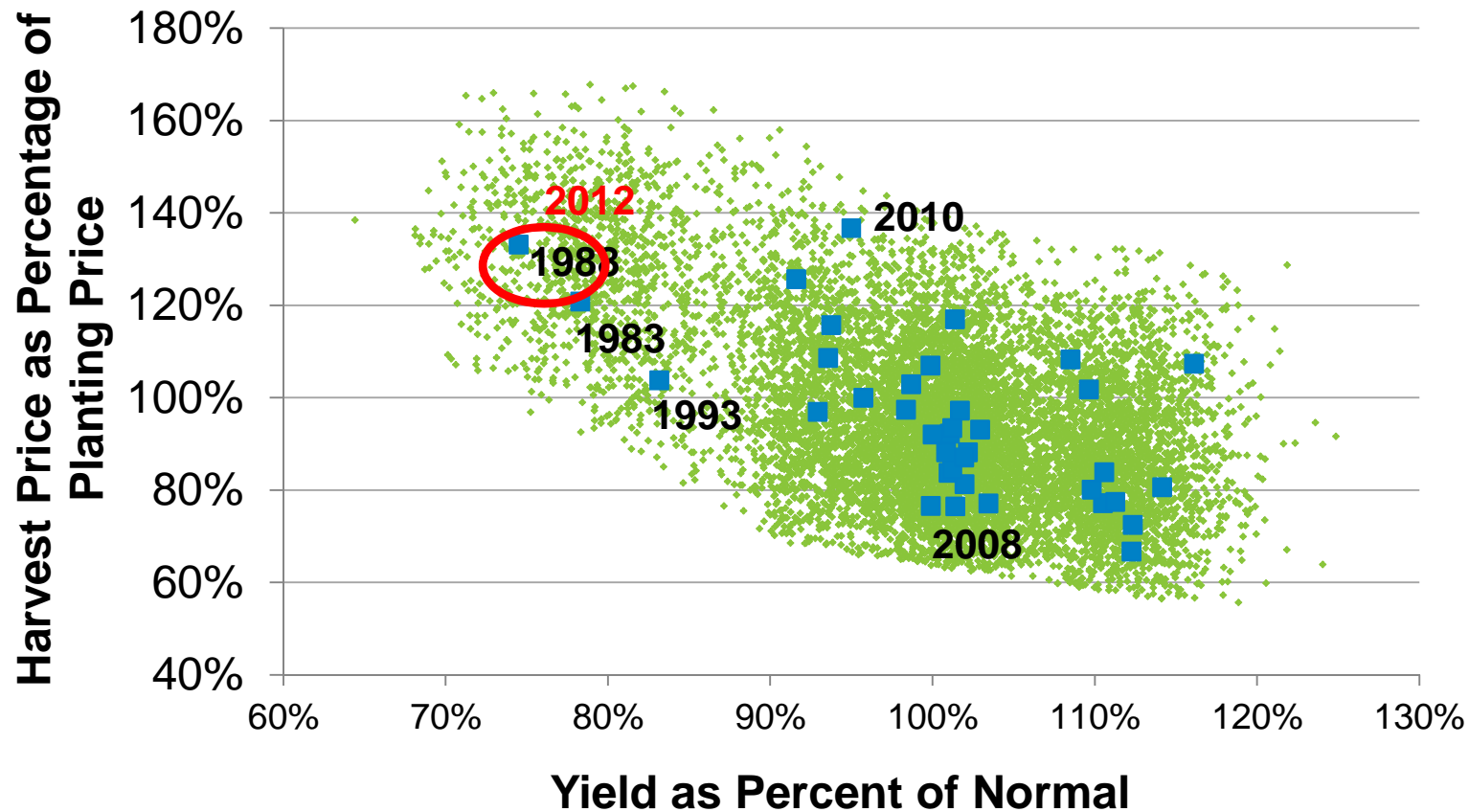
... and all Other Crops Modeled in Detail as well as all Potential Interactions



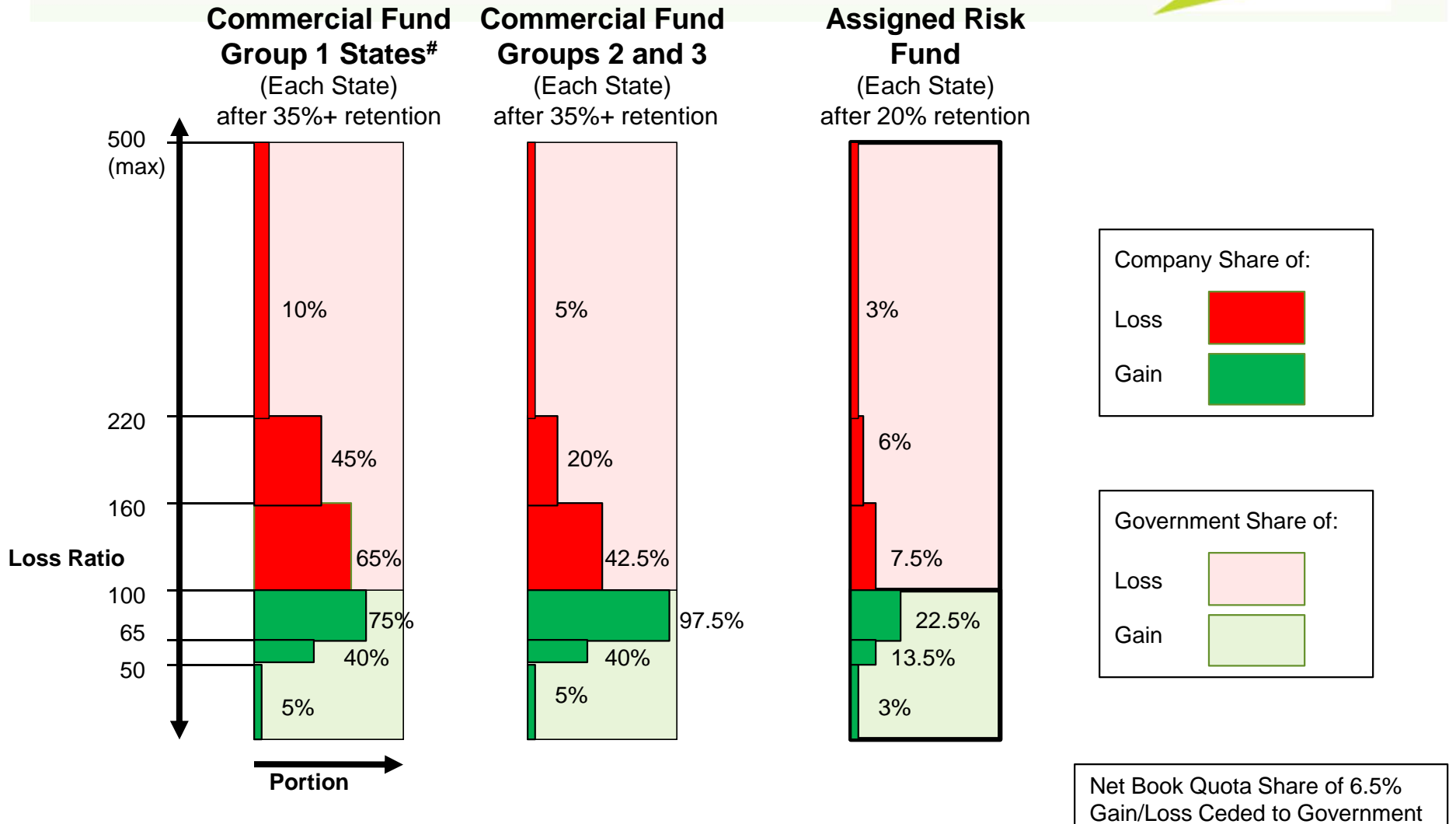
The Price Risk Component Takes Into Account Correlations Between Total US Production and Harvest Price

CORN - PRICE RATIO

Stochastic Catalog ■ Historical



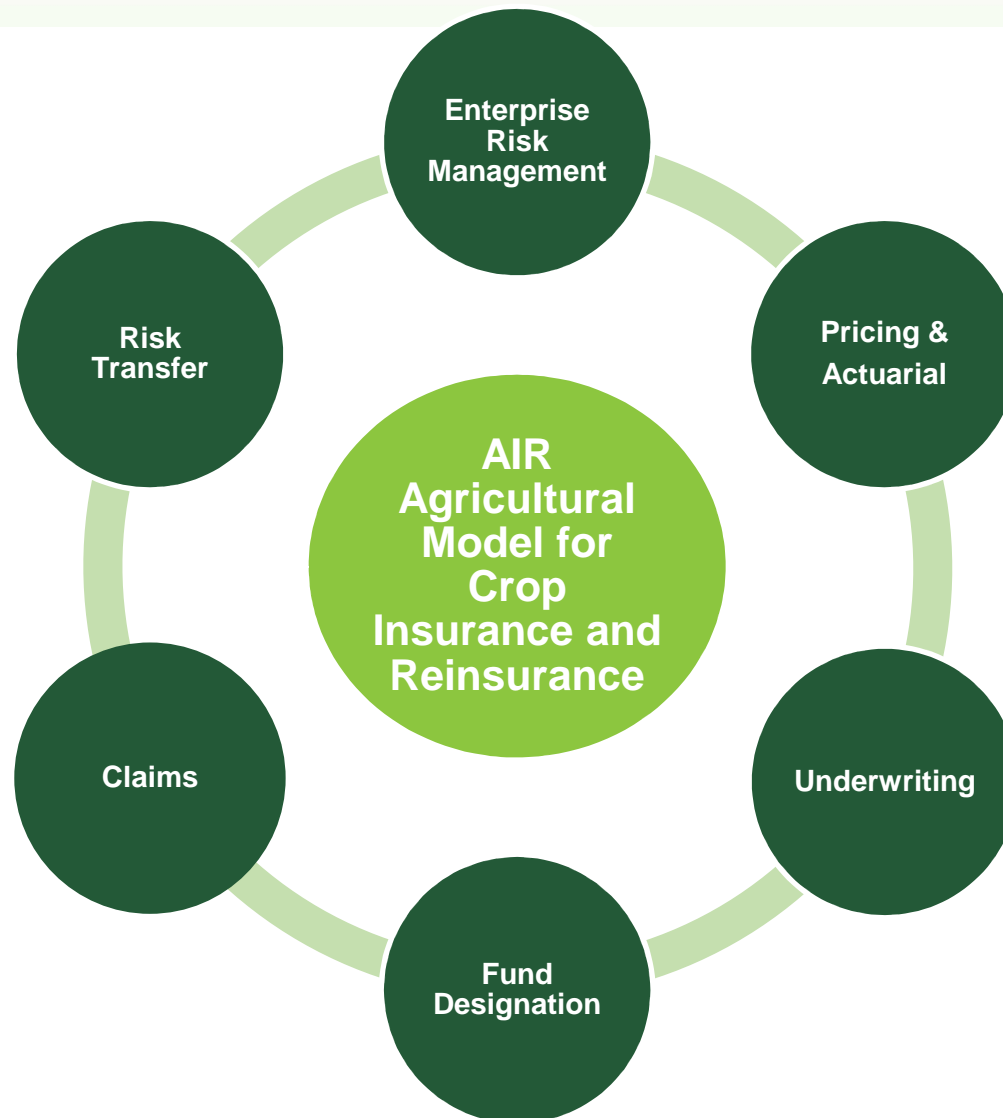
County Level Results Are Aggregated to State Level and Subject to SRA Rules and Regulations



Group 1 States: Illinois, Indiana, Iowa, Minnesota, Nebraska



AIR Agricultural Model Applications in CATRADER®



Summary

- Crop insurance and reinsurance are increasingly important lines of business worldwide
- Weather is the most important peril for agricultural portfolios; therefore, crop risk models need to account for the weather impact on crop yields
- AIR MPCl models are weather-based and maintain the natural geographical yield correlations that are key for unbiased crop portfolio analyses
- In addition to U.S. and China MPCl models already available, future models will include U.S. crop-hail, India and Brazil/Argentina