

RMS® China Agricultural Model

Advanced Agricultural Modeling for China Mainland



KEY FEATURES

- Model crop, forestry, and livestock
- County resolution (2862)
- Insurance term database
- Exposure mapping
- Scenario losses
- Exceedance probability curves, other risk metrics (contract and portfolio)
- Crop model
 - Drought, flood, typhoon, frost, wind/hail
 - Detailed modeling of 12 main and 60 secondary crops
 - Modifiers (irrigation, flood protection)
- Forestry model
 - Fire, typhoon, drought and pest/diseases
 - Natural forest and plantations
- Livestock model
 - Disease, epidemics, natural disaster, and accident/fire
 - Cattle, swine, sheep and poultry
 - Modifiers (operation size)

Overview

China's agricultural sector is developing, as it responds to the rising and increasingly sophisticated demands of domestic consumers, adapts small-scale farm structure to global food markets, and competes for labor, investment capital, and scarce land and water resources.

As the second largest market for agriculture insurance after the US, China has the largest livestock and forestry insurance portfolio in the world. The Chinese agriculture insurance market has grown from a premium volume of USD 100 million in 2006, to more than USD 6 billion in 2016. The Chinese government's intention is to achieve an average insurance penetration in the coming years of 60% for the main crop, livestock, and forestry types. Named-peril based insurance and premium rates are applied at the province level per risk type, in agreement between the insurer and the province government.

The RMS China Agricultural Model (CAM) is the first model that covers crop, livestock and forestry risks at county level in a consistent way with the insurance coverage in China mainland. It includes a database of current insurance conditions, additional modifiers, historical scenarios, and a portfolio module for reinsurance pricing/accumulation.

Insurance Terms and Conditions Database

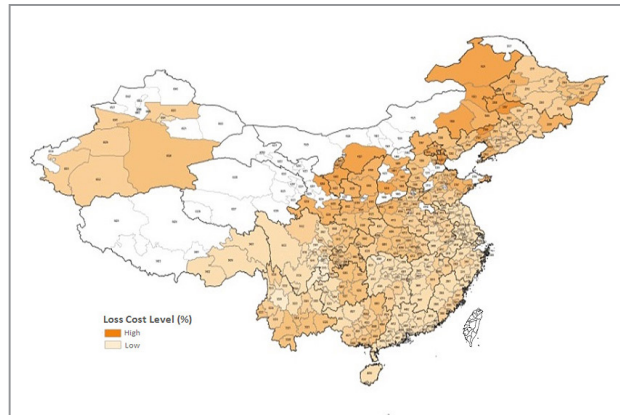
Insured losses are highly dependent on insurance conditions, which often change over time, and expand to accommodate further risk types with increased complexities. CAM contains a comprehensive database with the latest insurance terms and conditions which are updated frequently, enabling the user to easily edit, modify, and create a customized database.

Modeling Approach

CAM uses a flexible stochastic modeling methodology that allows for the joint simulation of large dataset necessary to model crop-, forestry-, and livestock-risk types at the resolution of a county. Stochastic model parameters, for each modeled risk type and associated perils, are calculated using the latest science and data, including climate and crop science, satellite-based forest fire patterns, and livestock mortalities data. Correlations are derived by distance, across perils, and across risk types based on historical reports. Users can import exposure at county level, and when importing exposure at province / prefecture resolution, the model disaggregates exposure to counties.

Crop Modeling

Daily rainfall and temperature data on a 25-km grid, form the basis of the hazard models – both for historical scenarios and stochastic events. Consistent with the insured perils in China mainland,



Example of drought average annual risk for rice

the CAM Crop Model covers the following five perils: drought, flood, typhoon, frost, and wind/hail for a variety of crop types. The crop modeling methodology simulates for each crop product and peril, to provide the loss characteristics at county level.

A total of 12 main crop types (rice, wheat, corn, cotton, rapeseed, soybean, peanut, sugar beet, sugar cane, sunflower, tobacco and rubber) are individually modeled. Minor crop types (e.g., vegetables, fruits, mushrooms) are also represented. The impacts of irrigation and flood mitigation are included through modifiers.

Forestry Modeling

CAM is consistent with the two types of insurance coverages for forestry risks in China mainland, i.e., modeling fire insurance to represent fire risk-only coverage and comprehensive coverage, including fire, typhoon, drought, and pest/diseases, depending on the province.

Users can reflect certain loss mitigating measures that are specified in insurance terms, conditions, using modifiers, including ownership (commercial vs natural woodland), and typhoon risk.

Livestock Modeling

Following the Chinese livestock insurance policy, CAM covers four perils: disease, epidemics, natural disaster, and accident/fire for the main livestock categories, which include cattle, swine (split into breeding sows and hogs), sheep and poultry (chicken).

Modifiers are introduced to reflect certain loss behavior that are specified in insurance terms and conditions, including the size of livestock operation, and the source of the livestock (imported or domestic).

Financial Model

For contract analytics, a detailed database of insurance terms for each risk type is available. Output is an Exceedance Probability Curve with/without secondary uncertainty, peril-specific losses from historical scenarios, and exposure map.

For portfolio analytics, the definitions of reinsurance structures and terms, including quota share, stop loss, and umbrella/whole account stop loss are available. Output is an Exceedance Probability Curve for net reinsurance losses, and other risk metrics (e.g. TVaR).

Software Technology

CAM is delivered through a laptop/desktop application supporting a standalone or client/server configuration. The user interface is based on .Net framework 4.0 and Windows Presentation Foundation (WPF). SQL Server database can support multiple-user access.

Find out more

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