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AGRICULTURAL RISK AND THE CROP INSURANCE MARKET IN CHINA

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EDITOR'S NOTE: AIR is leveraging its considerable experience and success in modeling Multi-peril Crop Insurance (MPCI) portfolios in the U.S. in developing a model for China. In this article, AIR Asia Regional Manager Helen Ye and Senior Account Executive Dr. Oscar Vergara take the opportunity to provide an overview of China's agricultural sector, the natural perils that can affect crops during the growing season, and the rapidly expanding crop insurance market in China.

By Helen Ye and Dr. Oscar Vergara

A recent major expansion in the premium volume of the Chinese crop insurance program coupled with renewed international attention with respect to the role of China as a major producer and importer of agricultural commodities has prompted an interest in probabilistic models to analyze the risk associated with crop insurance portfolios in the country. This article is intended to shed light on the exposure, the nature of the risk and current risk management practices within China's crop insurance market.

AGRICULTURE IN CHINA

China is the world's most populous country and one of the largest producers and consumers of agricultural products. Although China's population is more than four times that of the United States, its cropland area is only 75% of the U.S. total. China uses intensive farming practices to produce large amounts of food and fiber from limited supplies of land, water, and other natural resources. Indeed, the value of China's agricultural output is about twice the U.S. total.

China is one of the world's leading importers of agricultural products, but it is also a major exporter of agricultural commodities. China's trade pattern in agricultural commodities follows its comparative advantage: it tends to import land-intensive commodities (such as soybeans, cotton, wheat, and barley), and it exports labor-intensive commodities (such as fish, fruits, and vegetables). China has also been a major exporter of corn in most years.

The value of China's agricultural portfolio rose sharply in 2008 due to sharply higher international commodity prices for grains (mostly corn, soybean and wheat) and fibers (cotton). That year, China's agricultural imports totaled an estimated US$57 billion and its agricultural exports totaled US$29 billion. Historically, the United States has supplied a significant (although varying) portion of China's imports of soybeans, cotton, and wheat. Bilateral agricultural trade in 2008 consisted of US$12.2 billion in U.S. exports to China, and US$3.4 billion in imports from China.

Figure 1. China-United States Agriculture Statistical Comparison

	China	United States
Population, 2007 (millions)	1,321	304
Cropland, 2007 (millions acres)	301	406
Agricultural gross receipts, 2007 (billions USD)	643	341
Crop insurance gross premiums, 2008 (billions USD)	1.63	9.85
Agricultural exports, 2008 (billions USD)	29	115
Agricultural imports, 2008 (billions USD)	57	81

Sources: USDA, China Insurance Regulatory Commission (CIRC)

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DIVERSITY IN CROPS AND AGRICULTURAL REGIONS

It is difficult to generalize Chinese agriculture because the climate, environmental characteristics and the variety of crops that are cultivated vary widely from one part of the country to another. For agricultural insurance purposes, four main regions can be identified: the west, the north, the south-central and south-east.

Figure 2 shows mainland China's 31 major administrative divisions (left-hand panel), consisting of 22 provinces, 5 autonomous regions and 4 municipalities. It also shows a geographic map of the high agricultural production regions located in south-central and south-east China (right-hand panel). Three major rivers, the Pearl River, the Yangtze River, and the Yellow River run primarily west to east for over 2000 km across the southern, middle, and northern latitudes of the country.

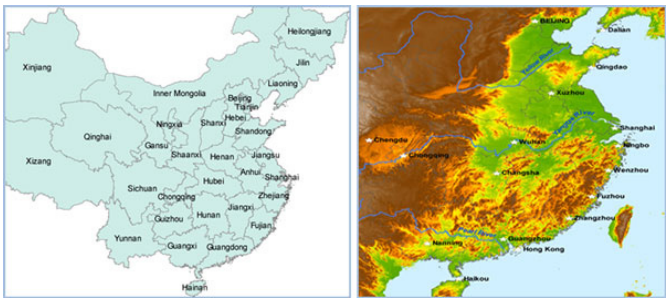

Figure 2. China Administrative Divisions and Geography. Source: AIR

The middle and lower Yangtze River basin in the Hunan and Jiangxi provinces of south-central China is the country's richest and most productive agricultural region—the "Rice Bowl" of China. The lowlands contain large tracts of rich, river-borne alluvial soils. Precipitation is abundant and the winters are mild. Rice is the main insured crop, but cotton, tea, and oilseed are also important. Half of the country's rice is produced in this region. The farming methods are very intensive and yields are high. Much of the fertile land of the middle and lower Yangtze Basin is farmed all year round.

China's southeast is a land of rugged hills and low mountains interspersed with river basins. Much of the region lies within the tropics. Precipitation is abundant and the growing season is long, but only 10% of the area is flat enough to permit row cropping. The main insured crop here is rice. Vast amounts of sugarcane, mulberries (grown primarily for silkworm culture), and fruit are produced, as well as freshwater fish raised in ponds or rice paddies. The Pearl River delta plain in Guangdong province is one of the most productive farming regions in China.

The Xizang (or Tibet) Autonomous Region in western China is high, cold, dry and extremely rugged, with a short growing season. Farmers have few resources and usually grow only enough wheat, barley and potatoes and raise enough sheep to provide for the needs of their own families. Also in western China, Xinjiang is known for its aridity. The region gets less than 12 inches of precipitation and in some areas less than one inch. Herding is the primary economic activity, though agriculture is undertaken where water is available. Major insured crops include cotton, corn, soybean, and wheat.

Northern China is dry and has long, cold winters. Drought-tolerant crops such as sorghum are common. Wheat and corn are also planted extensively, especially where irrigation exists. The northeast region also is deficient in rainfall. The main crops are wheat, barley, cotton, corn, sorghum, and peanuts. A great deal of land reclamation has taken place in Heilongjiang province; farms here are large and heavy farm machinery is used extensively. The key insured crops include spring wheat, corn, sorghum and soybeans.

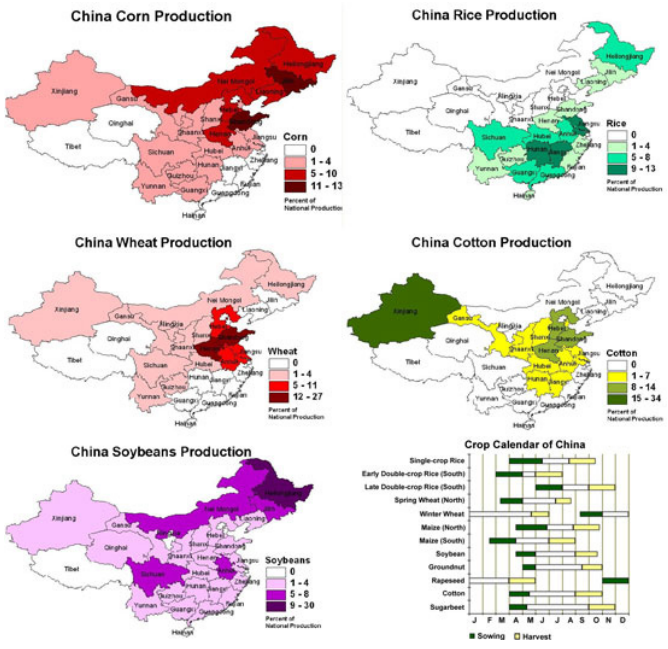

Figure 3. China Agricultural Regions and Planting/Harvesting Dates by Insured Crops of Importance. Source: FAO

THE CHINESE CROP INSURANCE PROGRAM

The Chinese crop insurance program has a long history of providing protection to farmers that grow crops under difficult environmental conditions. According to the World Bank, more than 20 percent of the total farmland (estimated at 301 million acres) has been affected by natural disasters during the last 30 years. During 2004 alone, it is estimated that Chinese farmers lost close to $18 billion worth of crop value due to adverse weather conditions.

The most common form of crop insurance in China is Multi Peril Crop Insurance (MPCI), which acts as a loss-of-yield guarantee against a variety of climatic perils. Even though most (if not all) Chinese provinces currently have a crop insurance program under way, the most well-established ones are those operating in the Heilongjiang, Xinjiang, Jilin, Shanxi, Shandong, Jiangsu, Shanghai, Henan, Anhui, Zhejiang, Hunan, Guangdong, and Hainan provinces, which not surprisingly are also the country's key agricultural regions.

Interestingly, for most of the 1990's and until 2006, crop insurance premiums remained flat, well below the $100 million mark. Historically, this low participation has been explained by the lack of a crop insurance program suitable to the needs of limited resource farmers, a lack of education about crop insurance instruments, issues concerning the computation of premium rates that biased the actuarial fairness of the program in some key regions, a lack of capacity of the domestic crop insurance companies to maintain and support the program, and the lack of high quality, detailed loss and claims data that could be used for pricing.

The Chinese government has been working to solve the regulatory and informational constraints affecting the program. A major shift in farmer participation occurred in 2007 when the Chinese government introduced an agricultural insurance premium subsidy program that increased the subsidy rate by 200%. Compared to the flat growth of the past decades, participation in the program exploded: the crop insurance premiums in 2007 were close to $800 million. Most recently, in November 2008 the China Insurance Regulatory Commission (CIRC) reported that premium volume reached $1.6 billion, thus becoming the second largest crop insurance program in the world behind the U.S. program (Figure 4).

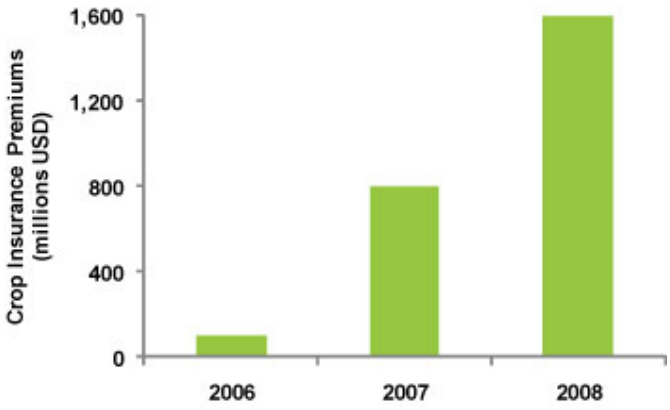

Figure 4. Explosive Growth in Crop Insurance Premium. Source: CIRC

Many companies currently participating in the crop insurance program are also very well established in the Property and Casualty market and include People's Insurance Company of China (PICC), China United Property Insurance Company (CUPIC) and the Chinese branch of the French insurance company Groupama. Others, such as Sunlight Agricultural Insurance Company, Anxin Agricultural Insurance and Anhua Agricultural Insurance do not have a Property and Casualty division that, through diversification, could cushion losses derived from their agricultural portfolios.

THE PERILS FACED BY GROWERS

China agriculture is very susceptible to weather conditions detrimental to the normal development of crops in the field. The occurrence of adverse weather events is relatively high. According to the World Bank, the four major weather perils affecting crop insurance portfolios in China are droughts, floods, hail and frost.

In terms of crop value lost, droughts are the most detrimental type of weather event; on average, 52% of all agricultural losses are the result of drought. Floods are second, responsible for 28% of all agricultural losses. China's major rivers and the tributaries that feed them have been the source of many historical floods. Hail comes in third with 10% of the losses, frost events are fourth with 6% of the losses and, finally, typhoon winds are responsible on average for 4% of all the agricultural losses in China. No country experiences more typhoons (tropical cyclones) than China.

Droughts, hail and frost events are more pervasive in the northern provinces of Jilin, Liaoning, Hebei, Shanxi, Shaanxi, Henan, Shandong, Inner Mongolia, Gansu, and Qinghai while the flood risk is more pervasive in the southern provinces along the valleys and deltas of the major rivers, the Pearl River, the Yangtze River, and the Yellow River. Typhoon risk, including typhoon-induced floods are more pervasive in the coastal provinces of Hainan, Guangdong, Guangxi, Hunan, Jiangxi, Fujian, Zhejiang, Anhui, and Jiangsu.

While high frequency/low severity losses can be absorbed by the local crop insurance companies, catastrophic losses derived from major events such as widespread droughts, floods or typhoons can significantly alter the profitability of a company during any given year. The general consensus is that domestic crop insurance companies would benefit from additional risk transfer mechanisms offered by the international reinsurance community. These reinsurers could take some of the burden from China Re, which is the state owned reinsurer. Currently the number of programs placed in the international reinsurance market remains limited, mostly due to a cautious approach from the reinsurance sector due to unfamiliarity with the real portfolio risk of domestic companies conducting business across vast regions with different climate environments and exposure to risk.

An important area of research is the interrelated effects that different weather events can have on a geographically diversified portfolio of crops. For example, in February of this year drought conditions were affecting more than 141 million mu (9.3 million hectares) of key wheat cropland in the northern provinces of Gansu, Shaanxi, Henan, Shanxi, Hebei, Shandong and Anhui. It had not rained in the region since October 2008, a period of 120 days. Even though the wheat crop largely escaped the worst of the February drought, billed as the worst in decades in the country's major wheat areas, an important question for modelers is whether the low activity of typhoons in the South China Sea during the previous autumn correlates with the hydrological drought observed in the provinces of the interior. In fact, typhoons and the precipitation they bring to the interior help replenish the moisture content of depleted soils.

AN MPCI MODEL FOR CHINA

China's crop insurance market is growing rapidly, and companies will undoubtedly find many opportunities for profitable growth. Assessing the risk, however, presents challenges. Crop yields have improved over time due to progress in technology; crop insurance programs are changing, and; farmer participation is increasing. These complexities alone would limit the appropriateness of risk analysis techniques that rely on historical losses or yields. Yet even if they did not, high quality historical loss data is in scarce supply. The international reinsurance market is taking a cautious approach because of a lack of familiarity with the market and the true portfolio risk of domestic companies conducting business across vast regions with different climates and facing different perils.

The need for a probabilistic Multiple Peril Crop Insurance Model for China is clear. Fortunately, the data needed to build one—including historical high resolution weather and yield data—is indeed available. AIR is currently leveraging that data and its expertise not only in modeling MPCI, but also in modeling China's weather-related perils to develop a model that meets the needs of the market.

ABOUT AIR WORLDWIDE CORPORATION

AIR Worldwide Corporation (AIR) is the scientific leader and most respected provider of risk modeling software and consulting services. AIR founded the catastrophe modeling industry in 1987 and today models the risk from natural catastrophes and terrorism in more than 50 countries. More than 400 insurance, reinsurance, financial, corporate and government clients rely on AIR software and services for catastrophe risk management, insurance-linked securities, site-specific wind and seismic engineering analyses, and property replacement cost valuation. AIR is a member of the ISO family of companies and is headquartered in Boston with additional offices in North America, Europe and Asia. For more information, please visit www. air-worldwide.com.