

## KEY POINTS

- Climate change impacts increase the significance of agricultural insurance as a tool to manage risk. The People's Republic of China, with strong government commitment, has developed the world's second largest agricultural insurance market.
- Successful risk management policy in agriculture is a holistic process, involving farmers reducing risks, agricultural insurance products transferring risks, and the government closing gaps and removing market anomalies and inequities.
- An agricultural insurance pool can fill the gap between domestic and international reinsurance markets. Agricultural insurance pools, in the form of a public-private partnership, can better absorb risk and support the development of agricultural insurance through data gathering, sharing, and analyses; management of technology platforms and industry risk research; and longer engagement of insurance providers.
- Investments in agritech solutions can make agricultural insurance sustainable, efficient, and affordable by enhancing farm-level risk management, risk reduction, risk monitoring, yield estimation, and loss assessment.

## Developing a Sustainable Agricultural Insurance System in the People's Republic of China

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## INTRODUCTION

Climate change and resource scarcity are projected to increase the intensity and frequency of climate-related shocks, heighten uncertainties in agriculture, and accentuate other risks. In developing economies, agriculture absorbs 63% of the damage and loss caused by climate-related disasters across all economic sectors.<sup>1</sup> Developing risk management tools in agriculture is increasingly important for mitigating and diversifying the impact of short-term weather and market risks together with investments in capacity building of food supply chains to absorb, adapt, and transform in response to long-term risks.

This evolution of agricultural insurance systems and the People's Republic of China's (PRC) present challenges offer important lessons for developing countries. The PRC's efforts toward modernizing the agricultural sector are challenged by pests and epidemics affecting livestock and crops, natural resource exhaustion, pollution, and climate change impacts. By building resilience (i.e., the ability to plan and prepare for, absorb, recover from, and adapt to adverse events), farmers are better placed to cope with risks and uncertainties and even benefit from new opportunities. The development of national crop insurance schemes is critical for expanding coverage, especially among vulnerable Asian farmers, and building their climate resilience. In the past 2 decades, agricultural insurance systems led

Notes: In this publication, "\$" refers to United States dollars and "CNY" refers to yuan. ADB recognizes "China" as the People's Republic of China.

<sup>1</sup> Food and Agriculture Organization of the United Nations 2021. *The impact of disasters and crises on agriculture and food security: 2021*. Rome. <https://doi.org/10.4060/cb3673en>.

by public-private insurance arrangements have evolved and expanded quickly in the Asia and Pacific region (Asian Development Bank 2021). The agricultural insurance market in the PRC developed rapidly and became the second largest in the world, behind the United States market.<sup>2</sup>

## EVOLUTION OF AGRICULTURAL INSURANCE IN THE PEOPLE'S REPUBLIC OF CHINA

Since 2004, the PRC has developed a policy-based agricultural insurance system. In this model, the government transfers parts of or all its operational responsibility to the private insurance sector. The government plays the role of “collaborator” and “supervisor” for commercial insurance companies. The efficiency of the agricultural insurance system has increased compared to the state-owned operation model (Box 1).

**Expanding insurance premium subsidies.** In 2007, the PRC introduced agricultural insurance premium subsidies. As shown in Figure 1, premium subsidies have increased steadily since then. In a purely commercial operation, the cost of covering agricultural risk would require a significant premium rate. In its current form, the financial support given by the government in the form of exclusivities and subsidies allows agricultural insurance to be offered at a reasonable premium rate. In many countries, agricultural insurance receives government support to make it affordable for farmers.<sup>3</sup> In the PRC, premium subsidies reached CNY60.3 billion in 2020, accounting for 74% of the total premium. There are more than 270 varieties of subsidized insurance covering agriculture, forestry, animal husbandry, and fishery.

Government and commercial insurance companies share responsibility for insurance product design, insurance loss determination, claims, performance assessment, and supervision of agricultural insurance projects.<sup>4</sup> Different levels of government share the cost of premium subsidies. Central government financing will kick

### Box 1: Stages of Development of the Agricultural Insurance System in the People's Republic of China

**Initial phase government-led mode (1982–1992).** The Government of the People's Republic of China (PRC) was the direct operator of agricultural insurance. The state-owned People's Insurance Company of China (PICC) operated all domestic insurance businesses, including agricultural insurance. Because of the high risk and high cost of agricultural insurance, the PICC was facing significant losses. But, with assistance from government subsidies, the company was able to support the development of the agricultural insurance during this period.

**Market-led mode (1993–2003).** During this period, the PRC began to accelerate its transformation into a market economy. The PICC gradually transformed into a commercial insurance company, and the pursuit of profit maximization became the main goal of the company. Agricultural insurance, as a branch or department of commercial insurance, was completely market-oriented and no longer received undisclosed subsidies. At this stage, the agricultural insurance business shrank significantly, and operations in many places were in trouble.

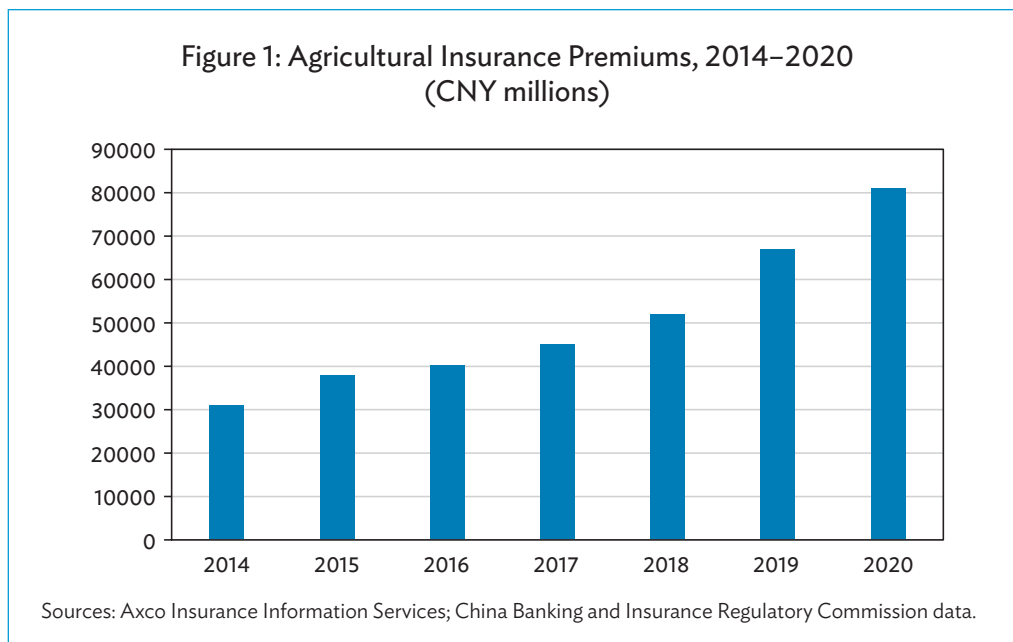
**Government-market cooperation mode (2004–present).** In 2004, the No. 1 Document of the Central Government proposed for the first time that the PRC should “speed up the establishment of a policy-based agricultural insurance system.” Since then, the threshold for institutions to engage in agricultural insurance has been lowered. The central and local governments started to subsidize agricultural insurance premiums and management costs and to shape several aspects of the policy, basically forming the framework for government guidance, market operation, and coordinated promotion. Under this model, insurance companies achieved commercial competition under a high level of regulation, and the agricultural insurance market in the PRC developed rapidly. By 2020, the country's agricultural insurance premium income had reached CNY81.50 billion, providing risk protection worth CNY4.13 trillion for 189 million households and paid CNY61.66 billion in compensation to 51 million affected households, becoming an important source of funds for farmers' post-disaster reconstruction and recovery of production and life.

Sources: Public data of the Government of the PRC, Ministry of Finance; Yu Qi. 2021. Ministry of Finance: Agricultural Insurance Has Become an Important Means of Guaranteeing Agricultural Production, Allowing Insured Farmers to “Guarantee Income from Droughts and Floods.” *Baidu*. 30 June. <https://baijiahao.baidu.com/s?id=1703961706276798400&wfr=spider&for=pc> (in Chinese).

<sup>2</sup> By 2020, the country's agricultural insurance premium income had reached CNY81.50 billion, providing risk protection worth CNY4.13 trillion for 189 million households and paid CNY61.66 billion in compensation to 51 million affected households, becoming an important source of funds for farmers' post-disaster reconstruction and recovery of production and life.

<sup>3</sup> For some perils in agricultural insurance, like hail, the market is fully competitive. When covering all risks, loss ratios range from 60% to 75%, with some catastrophic years, making insurance affordable and sustainable through subsidies. Australia is the significant exception, operating without subsidies. It offers no direct subsidies for agricultural insurance policies. However, the government has set up a new drought fund for farmers who experience difficulties after making claims through insurance companies.

<sup>4</sup> Agricultural insurance is dominated by the People's Insurance Company of China (PICC) Property and Casualty Co., Ltd. The PICC generates almost half of all premiums (45.8% in 2018), followed by the China United Property Insurance Co., Ltd. (13.5%), China Pacific Property (7.3%), China Life Property & Casualty (6.1%), and Sunshine Agricultural Mutual Insurance Company (5.0%). Besides the multiline nonlife insurers writing agricultural insurance, there are five officially recognized agricultural monoline insurers.



in after the provinces provide supporting subsidies. At present, for the four types of insurance subjects (i.e., plantation, breeding, forest, and Tibetan special insurance) and the three regions in the East, Middle, and West, the central government differentiates the national coverage of premium subsidies. All are higher than the proportion at the provincial level. In most cases, subsidy expenditures are shared at the central, provincial, municipal, and county level. However, there are different practices across provinces, as presented in Table 1 for Jiangsu Province, Henan Province, and Sichuan Province.<sup>5</sup>

**Increasing commodity coverage and innovation.** The range and risks covered by agricultural insurance have been increasing. From the initial coverage of corn and wheat, the availability of products has expanded to cover fruit, tea plants, medicinal herbs, tobacco, wood frogs, silkworms, and mulberry trees.<sup>6</sup> In many cases, the expanded coverage only comes in the form of pilots or small-scale and dedicated areas (Box 2).<sup>7</sup> This rapid and positive development in the increased scope of coverage of insurance products is

supported by (i) the creation of an agricultural insurance research institute; (ii) government and international insurers and reinsurers to improve product development, including index-based insurance; and (iii) risk pricing by the government.<sup>8</sup> Livestock insurance has evolved from covering compulsory slaughter for cows to most livestock varieties and a wider range of mortality causes.<sup>9</sup>

**Linking coverage to other financial products.** Insurance coverage, together with loan default insurance, allows banks to increase the number of affordable loans to the rural population while increasing overall protection for farmers (Box 3). Health, life, morbidity, and physical loss or damage to farm buildings and machinery are protected by microinsurance products. A significant amount of the insurers' assets are designated for investment in rural areas to foster development.<sup>10</sup> Insurance companies can compete on the use of these donated assets to provide insurance services in rural areas.<sup>11</sup> State-owned financial institutions are expected to serve the less prosperous regions in the PRC.

<sup>5</sup> The central government has not clearly stipulated the expenditure responsibilities of governments below the provincial level (municipal and county), as these responsibilities are independently arranged by the provincial financial departments in consideration of the situation in the province.

<sup>6</sup> Policies have been developed for 270 crop types (nonlife insurance market reports of PRC-Axco, July 2021).

<sup>7</sup> The opinions of the Chinese Communist Party Central Committee and the State Council on comprehensively promoting rural revitalization and accelerating agricultural and rural modernization clearly put forward that “insurance + futures” should play a role in serving the development of rural industries. The principal insured crop perils are fire, hail, frost, floods, and wind. Other perils being insured on an experimental basis include drought, excessive rain, low temperatures, plant diseases, and insect damage (particularly locusts) (nonlife insurance market reports of PRC-Axco, July 2021).

<sup>8</sup> Swiss Re has entered a reinsurance protection scheme with the government of Heilongjiang Province and the PRC's Sunlight Agricultural Mutual Insurance Company. This is the first time that the PRC government has employed commercial insurance programs to protect farmers against financial risks from natural catastrophes. (Source: Swiss Re. 2016. First Parametric Insurance Programme Against Risks of Natural Disaster for Farmers in China. 3 August. [https://www.swissre.com/media/news-releases/2016/nr\\_20160803\\_chinaparametric.htm](https://www.swissre.com/media/news-releases/2016/nr_20160803_chinaparametric.htm).)

<sup>9</sup> In September 2018, a month after the first case of African swine fever was reported, African swine fever was included in the scope of subsidies for mandatory culling, with a subsidy standard of CNY1,200 per head. In addition, from 1 May 2019, the Ministry of Finance has temporarily increased the coverage amount for live pig insurance. After the government implements compulsory culling, farmers can apply for culling subsidies from the county-level agricultural and rural departments, and they can also obtain the difference between the insurance amount and the subsidy from the insurance agency.

<sup>10</sup> The People's Insurance Company of China (Group), for example, has established a CNY25 billion (\$3.57 billion) fund specifically for this purpose (nonlife insurance market reports of PRC-Axco, July 2021).

<sup>11</sup> Competition for the use of donated assets by insurers takes place on a platform of the Shanghai Stock Exchange.

**Table 1: Division of Expenditure Responsibilities of Governments below the Provincial Level for Agricultural Insurance Premiums**

Insurance Variety	Jiangsu (East)	Henan (Central)	Sichuan (West)
Subsidized by the central government (crop)	<ul style="list-style-type: none"> <li>Total amount shall not be less than 70%.</li> <li>Premium subsidies: 35% central, 25% provincial, and the remainder from the municipality and county (according to the actual situation).</li> </ul>	<ul style="list-style-type: none"> <li>Premium subsidies: 40% central, 25% provincial, 5% municipal, and 10% county</li> </ul>	<ul style="list-style-type: none"> <li>Premium subsidies: 40% central, 25% provincial, and 15% municipal and county</li> </ul>
Subsidized by the central government (aquaculture)	<ul style="list-style-type: none"> <li>Total amount shall not be less than 80%.</li> <li>Premium subsidies: 40% central, 10% (southern), 20% (central), and 30% (northern) by the province and the remainder from the municipality and county.</li> </ul>	<ul style="list-style-type: none"> <li>Premium subsidies: 50% central, 15% provincial, 5% municipal, and 10% county</li> </ul>	<ul style="list-style-type: none"> <li>Premium subsidies: 50% central, 21% provincial, and 9% municipal and county</li> </ul>
With local characteristics	<ul style="list-style-type: none"> <li>Premiums on vegetables in greenhouses, lotus roots, broilers, and meat geese: 50% provincial and 15% county.</li> </ul>	<ul style="list-style-type: none"> <li>Premium on tobacco leaf: 30% municipal and county</li> <li>Premium on broilers: 50% municipal and county (specific sharing proportion determined by the municipal and county governments)</li> </ul>	<ul style="list-style-type: none"> <li>Premium on walnuts: 60% provincial, 10% municipal, and 10% county</li> <li>Premium on apples: 45% provincial, and 5% municipal and county</li> </ul>

Source: Documents from the provincial Department of Finance of Jiangsu, Henan, and Sichuan Provinces

### Box 2: Development of Revenue Insurance in the Fuyang City, Anhui Province

Fuyang City is the main corn-producing area in Anhui Province. However, corn production is affected by natural disasters and market price fluctuations. In 2017, a corn revenue insurance pilot project was launched by the local government in cooperation with Guoyuan Agricultural Insurance Company. The project provided premium subsidies to more than 200 large corn growers, insured according to 900 kilograms per *mu*, ensuring 450,000 tons of corn in Fuyang City, Anhui Province, and covering an area of more than 100,000 *mu*.<sup>a</sup> After obtaining the insurance order, Guoyuan Agricultural Insurance Company purchased a put option on yellow

corn futures contract in Dashang through Guoyuan Futures Company, covering the period 7 August–7 December 2017 to hedge the risk of corn price decline. In this model, farmers do not need to understand the complex futures market but benefit from price risk protection. The insurance company managing the risk transfers the price risk to the futures market and uses reinsurance against large losses related to other risks. This is an innovative model of combining crop insurance and futures markets, allowing smallholders to manage both yield and price risks. A *mu* is a Chinese unit of measurement (1 *mu* = 666.67 m<sup>2</sup>, 100,000 *mu* = 66 km<sup>2</sup>).

<sup>a</sup> Source: Lu Shuangmei. 2018. "Insurance + Futures" Benefit Farmers and Agricultural Enterprises. *Futures Daily*. 18 July. <https://wap.cnki.net/touch/web/Newspaper/Article/QHBR201807180020.html> (in Chinese).

### Box 3: Insurance Used as Collateral in the Zhaoqing City, Guangdong Province

Zhaoqing City is a major pig-breeding city in Guangdong Province, with more than four million pigs sold annually. The shortage of loan collateral and high financing costs have always been a major challenge for pig breeding enterprises.

With encouragement and support from the Zhaoqing Banking and Insurance Regulatory Bureau and government departments, China United Property Insurance Co., Ltd., together with the Zhaoqing Agricultural Bureau and the Zhaoqing branch of the Postal Savings Bank of China, established a coordinated support system in 2016. Under this scheme, animal husbandry and veterinary departments

and insurance companies are responsible for (i) verifying the health conditions of pigs and applying a unified ear mark management system; (ii) implementing the entire process of joint supervision on pig breeding, immunization, and production; and (iii) employing a tripartite information exchange among government, banks, and enterprises.

The insurance company provides insurance on live pigs, which allows farmers to use them as collateral for bank loans. This scheme reduces the financing costs and makes loans more accessible to pig breeding enterprises.

Source: *China Bank Insurance News*. 2021. "Live Pig Mortgage" Insurance Model in Zhaoqing City. 12 March. [http://www.cbimc.cn/zt/2021-03/12/content\\_385755.htm](http://www.cbimc.cn/zt/2021-03/12/content_385755.htm) (in Chinese).

**Advancing regulatory frameworks at all levels.** The Insurance Law of the PRC has been amended several times since 1995, with the latest amendments in 2015. The regulatory framework in the PRC has made important progress toward stricter observance of international standards, including a risk-based approach to supervision and a risk-sensitive capital regime, the China Risk-Oriented Solvency System (C-ROSS).<sup>12</sup> The insurance supervisor, the China Banking and Insurance Regulatory Commission (CBIRC) issued substantial regulations and guidelines implementing the insurance law.<sup>13</sup>

The provincial governments play a critical role in administering agricultural insurance. To qualify for provincial insurance subsidies, besides the CBIRC license for agricultural insurance, the insurer needs to be licensed by the provincial government. In practice, the provincial government specifies the qualifications for insurance operators, unifies service standards for insurance agencies, sets the principles for the bidding process, and then entrusts the relevant departments at the county (city, district) level to take responsibility for the specific local bidding process.

For example, Jiangxi Province requires that a county (city or district) can select only one insurance company to underwrite agricultural insurance with a three-year operating cycle. To ensure continuity and stability, the company may not abandon its operation without authorization. However, more provinces are taking townships as the unit and multiple insurance companies are being selected to undertake their respective contracting areas, with one-to four-year operating cycles. The role of some local governments goes beyond providing subsidies to filling gaps. Some local governments have agreements with insurance companies to get involved in product distribution, premium collection, settlement, and claims payments, and even carrying or co-insuring risk. Such direct engagement by local governments usually takes place in remote areas because of the high costs that commercial insurers would incur to operate in those areas.

**Developing a reinsurance system.** The PRC's risk pooling mechanism for agricultural insurance is in transition from a pool system to a reinsurance structure.<sup>14</sup> In 2021, the state-owned XL

Insurance (China) Co., Ltd. became China National Agriculture Reinsurance Co., Ltd. (CNAR), a licensed reinsurer exclusively underwriting agricultural business. To support the development of this new reinsurer, a 20% agreed cession is in force.<sup>15</sup> At the same time, since 2015, the existing reinsurance pool, China Agricultural Reinsurance Pool (CARP), operated under the leadership of China Property & Casualty Reinsurance Co., Ltd. (China Re P&C), was put under runoff insurance in 2021, and all new business is written by CNAR. The reinsurers, however, are allowed to continue participating in the agricultural insurance business, including directly reinsuring local government schemes but not reinsuring insurers. Currently, some local government schemes are reinsured by China Re P&C and Swiss Re.<sup>16</sup>

### CHALLENGES AND OPPORTUNITIES FOR AN AGRICULTURAL INSURANCE SYSTEM IN THE PEOPLE'S REPUBLIC OF CHINA

**Despite a rapid increase in the agricultural insurance market, penetration remains comparatively low.** Only 16% of the total value of the PRC's agricultural production is insured compared to over 28% coverage in the United States.<sup>17</sup> Around 70% of premiums are for crops and the rest for livestock and forestry. In 2016, the national coverage rate for ordinary farmers was 53.2% and 58% for large-scale agricultural households (i.e., larger than six hectares). Among those with coverage, 98% of ordinary farmers and 94% of large-scale agricultural households relied on policy-based insurance. The remaining used commercial insurance and some used both.

**An agricultural insurance system should evolve into a more market-oriented system.** A clear government policy to protect rural livelihoods and reduce demands on the state budget for natural catastrophe relief has resulted in extraordinary growth in agricultural insurance. However, the sustainability of an agricultural insurance system should be enhanced by reducing its dependency on subsidies over time and increasing the role of commercial agricultural insurance products. Current premium

<sup>12</sup> The second improved version of C-ROSS, known as C-ROSS II, entered into force in 2021. C-ROSS II has the same three-pillar structure as Solvency II (quantitative capital requirements, qualitative supervisory requirements, and market discipline). But contrary to Solvency II, C-ROSS II includes, in a quantitative manner, the quality of risk management of the insurers through existing supervisory tools known as the Integrated Risk Rating and the Solvency-Aligned Risk Management Requirements and Assessment. Among the important changes under C-ROSS II, besides the new capital charges calibration affecting all lines of business, are the lifting of the catastrophic reserve required to be set up by agricultural insurers and the management of risk through additional catastrophic-related capital.

<sup>13</sup> The CBIRC is a ministerial public service department formally inaugurated on 8 April 2018, reporting to the State Council. The organization is financed by levies on insurers' capital and net retained premiums. The CBIRC is responsible for issuing insurance regulations and for licensing and supervising all insurance market participants, including insurers, reinsurers, and intermediaries.

<sup>14</sup> In a pool system, insurers participate on agreed percentages of the agricultural insurance policies sold and placed in the pool. In a reinsurance scheme, each insurer has a direct responsibility and a specific reinsurance contract only on the policies sold by that company.

<sup>15</sup> A cession is the portion of the underwritten business that the insurance company reinsures.

<sup>16</sup> Some local government schemes have been reinsured by local and international reinsurers.

<sup>17</sup> According to the Federal Crop Insurance Primer issued in February 2021 by the Congressional Research Service (<https://crsreports.congress.gov/product/pdf/R/R46686>), in the 2019 crop year, more than 2 million policies were sold insuring crops and livestock valued at more than \$116 billion, corresponding to 28% of the US agricultural production value. More than 85% of wheat-planted acres, and more than 90% of planted acres of soybeans, corn, and cotton were insured through the Federal Crop Insurance Program (FCIP). Overall, the FCIP provided coverage for 124 commodities and offered 19 types of insurance policies. Around 16 companies sold crop insurance to farmers through the program, and farmers enrolled a record high of 379.9 million acres in 2019.

subsidies reach 75% and reducing this percentage remains a challenge, with only 1.7% of farmers enrolled in fully commercial insurance.<sup>18</sup> The current policy channels government support through insurance companies and controls competition among insurance providers.<sup>19</sup> The central government decides which crops and agricultural activities to subsidize, while the provincial and local governments decide on the financial support for specific local agricultural activities and the level of premiums. These subsidies are financed by the local governments, resulting, in many cases, in a shortage of financing for locally required insurance and leading to suboptimal choices for local insurance needs.

**Inefficiency and risk in the subsidy system.** A list of underwritten policies is submitted to the local government to collect subsidies. Based on this list, the central government sends a payment to the provincial government, which sends it to the county government to pay to the insurers. Multiple steps to collect subsidies add a cost to the operation and underscores the liquidity issues faced by insurers. Claims are reported at the village level and confirmed by a third-party organization (local government authorities, the farmers, and the insurers' staff). This can lead to unprofessional claims settlement. For subsidized products, reinsurance is bought, or retained by the local government. The government might underestimate the risk it retains, or the reinsurance contracts bought might not be ideal and leave significant risk with the government.<sup>20</sup>

**Limited incentives for innovation.** Under the current system, insurance companies are selected to participate in counties or villages through a tendering process based on a grading system. Companies need to have their products approved by the local government, including price and coverage. The premium is not technically determined and could be insufficient. At the same time, risks might not be effectively covered by the policies, reflecting the needs of farmers with respect to coverage and risk appetite. The duration of the assignment is limited to 1–3 years, resulting in a lack of continuity, thereby curtailing the investment interests of the insurers in the project. At the same time, data collection is limited by time.

**Inefficient information sharing systems, premium collection, claims, and payment processes.** There is no formal channel or mechanism for communication or sharing data and information among authorities, companies, and farmers. Such cross-level, cross-sector, and cross-department information sharing barriers affect the rationality and precision of agricultural insurance policies and decisions. The Phase I system of the national

agricultural insurance information management platform uniformly deployed by the CBIRC, although not yet fully opened to and shared with local governments, is expected to provide local and provincial governments with a formal channel for data and information sharing.

**Sustainability hinges on the economic performance of the insurance sector.** The sustainability of the insurance sector exclusively providing agricultural insurance is affected by economic conditions and extreme natural hazards in the sector. The capacity for managing large catastrophic risks is a critical success factor for any agricultural insurance system. Agricultural insurance premiums are moving toward technical pricing, although with important hurdles to overcome. Existing statistics on claims are not credible and of limited use because of climate and other changing conditions affecting the frequency and severity of agricultural losses. Controlled ratings, low deductibles, and lack of diversification in some cases result in economic losses to the agricultural insurance sector. There is a need for holistic risk reduction (including at the farm and enterprise levels) and risk diversification through a wider geographic and product spread, notwithstanding the large amount of subsidies flowing in to cover insurance premiums.

## CONCLUSIONS AND POLICY RECOMMENDATIONS TO DEVELOP A SUSTAINABLE AGRICULTURAL INSURANCE SYSTEM

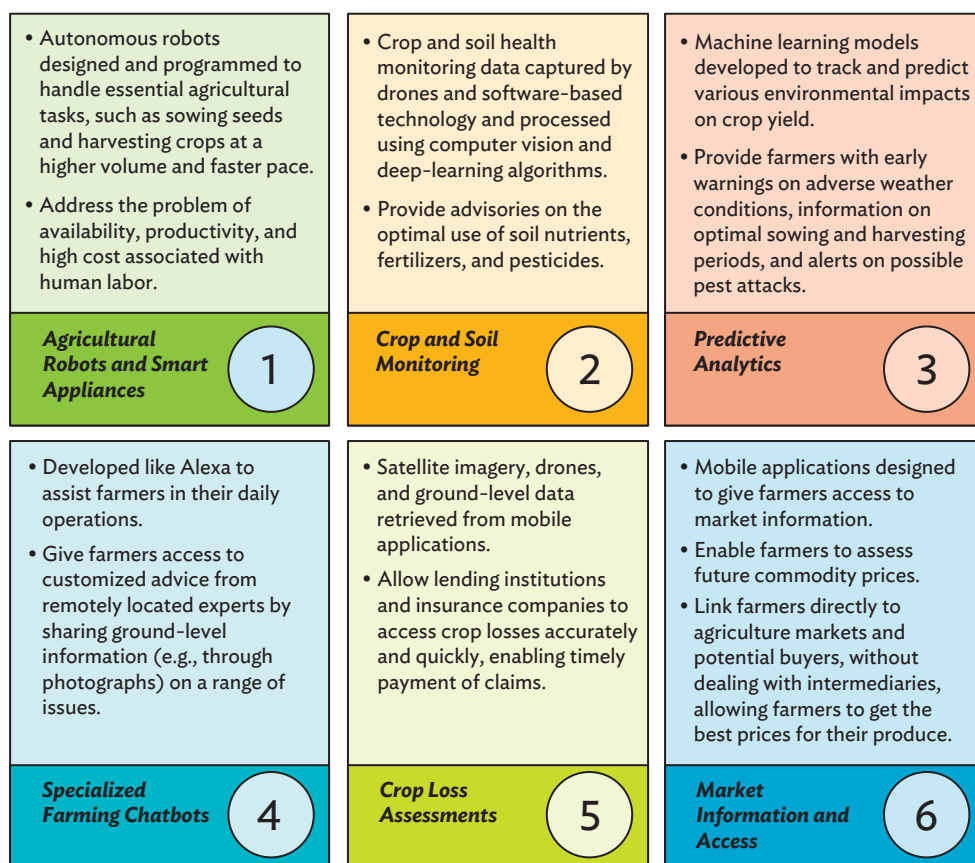
As climate change impacts increase the significance of agricultural insurance as a tool to manage risk, a successful risk management policy is key. This means closely working with farmers, reducing and transferring risks, closing gaps, and removing market anomalies and inequities. Public-private partnerships (PPP) in establishing an agricultural insurance pool (AIP) allows the government and insurance providers to better absorb risk through pooling financial risks and filling the gap between domestic and international reinsurance markets. The consolidation, sharing, and analyses of historical agricultural insurance data through an AIP would support the development of innovative agricultural insurance products, management of technology platforms, industry risk research, and longer engagement of insurance providers. In this regard, investments in agritech solutions become a key facilitator across the agricultural insurance sector.

<sup>18</sup> For example, in Henan Province, based on the proportion of subsidies provided for 14 insurance types currently valid and covered by premium subsidies at or above the provincial level, the overall proportion of premium subsidies for agricultural insurance from the central, provincial, municipal, and county-level governments is maintained at 80%–100%.

<sup>19</sup> Government of the PRC, General Office of the State Council. 2016. Document No. 42 on *Guiding Opinions on Promoting PPP Model in the Field of Public Services Forwarded by the General Office of the State Council to the Development and Reform Commission, the Ministry of Finance and the People's Bank of China*. Beijing.

<sup>20</sup> There are a variety of reinsurance programs that address different risk management needs. For instance, a stop loss that protects the whole portfolio above a certain level of losses is ideal for systemic risk management, while an excess of loss scheme will cover losses in excess of a certain amount. In addition, a quota share scheme shares the risk in a fixed proportion to a co-insurance agreement. Lastly, variable reinsurance premium schemes allow for protection that benefits the insurer when the claims are low.

Figure 2: Developments in Agritech Solutions



Source: Authors' own elaboration.

**Create an enabling environment to support the development of agritech.**

The use of information technology will support further development and sustainability of the agricultural sector, benefiting insurers as well as farmers, lending institutions, agri-input providers, traders, economists, climate scientists, policymakers, and agricultural researchers. Voice recognition, face recognition, machine learning, and artificial intelligence are widely used in all phases of insurance activity (distribution, premium collection, underwriting, customer servicing, and claims settling).<sup>21</sup> The efficiency of premium collection, including the subsidies and claims payment processes, can be improved by introducing technology to collect premiums and automatically assign subsidies in all government programs. Distribution and claims processes should also be revised to improve efficiency and reduce fraud by using machine learning and other modern technology. Agritech solutions can enhance farm-level risk

management, risk reduction, risk monitoring, yield estimation, and loss assessment. Some opportunities are presented in Figure 2. The government can create an enabling environment to foster innovative technologies. This could include the creation of a “sandbox regulation” dedicated to piloting new agricultural insurance and other risk management tools.<sup>22</sup>

**Make sure farmers' risk exposure and risk appetite is technically determined and are reflected in premiums and coverage.**

If a premium is not technically determined, it could be too high to pay claims, resulting in an excessive cost to farmers, or it could be too low to pay claims, resulting in a non-sustainable operation. The availability of historical data, both at the aggregate and granular levels, is necessary to develop and design more market-oriented agricultural insurance products and deter fraud. There is a need, therefore, to complement the recent government centralized

<sup>21</sup> For a comprehensive overview of information technology development in the PRC's agricultural insurance sector, see Swiss Re Institute and Fudan University. 2021. *Insurtech in China*. Shanghai. <https://www.swissre.com/institute/research/topics-and-risk-dialogues/china/expertise-publication-insurtech-in-china.html> (in Chinese).

<sup>22</sup> A regulatory sandbox is a framework set up by a regulator that allows innovators to conduct live experiments in a controlled environment under a regulator's supervision.

information platform for agricultural insurance with an effective data collection policy to achieve complete relevant data to support advancing the development and technical pricing of agricultural insurance products and reducing fraud. A prioritization framework should be developed to take into consideration both farmer and market needs and regional risk exposures. The process of deciding what to insure and promote at the local level should include strong interaction with farmers. It should also relate to the risks farmers face and have difficulty managing.

#### **Incentivize innovation in the agricultural insurance system.**

The duration of the assignment for commercial insurance companies is limited to 1–3 years under the current government program. Longer engagement for insurers in different counties and villages providing agricultural insurance will motivate insurers to commit long-term investments in innovative products, promote stronger identification with local policyholders, and allow for data continuity. At least 5–10-year assignments are recommended, accompanied by a strong oversight and review process of the insurers' performance. This will require dedicated staff and a process that facilitates changing insurers because of poor performance. To avoid possible monopolistic operations by the selected insurers, at least a few insurers should be selected or, ideally, if an AIP is created, an automatic license of the pool to operate in all regions should be considered.

**Establish public–private partnerships.** PPPs can help improve the efficiency of agricultural insurance system activities and allow the government to transfer its operational functions to efficient private operators, while retaining and improving its core functions, such as oversight, compliance, and social commitment, including sustainability and climate change reduction initiatives.<sup>23</sup> If properly implemented, PPPs can reduce government cash expenditures

and provide consumers with high-quality, low-cost services.<sup>24</sup> Additionally, the government should monitor the performance of insurance subsidies so that they do not discourage farmers from taking on their risk management responsibilities and provide adequate capacity building and resources to farmers, including early warning systems.

#### **Ensure provincial and local governments assess risks**

**thoroughly.** Thorough assessments are necessary to avoid excessive exposure and eventually being liable for extreme losses. The risk retention analysis of a provincial or local government should be carried out by an actuary, and the recommended reinsurance protection should be purchased. An AIP can fill the gap between domestic and international reinsurance markets and can become an important tool for retaining risk domestically. The success in the creation of the pool, with the participation of local commercial insurers and reinsurers, the government, banks, and multilateral agencies, will be determined by the structure chosen by the pool, its governance, and allocated resources. For example, a risk-sharing arrangement between farmers' cooperatives and insurers can be designed such that idiosyncratic risks are borne by farmers' collectives, while catastrophic risks are carried by reinsurers.

**Empower farmers to manage their own business risks.** A study by Cole, Gine, and Vickery (2017) on financial innovation of small Indian agricultural producers found that, while insurance provision has little effect on total agricultural investments, it significantly shifts the composition of investments toward riskier production activities.<sup>25</sup> Insurance should de-risk farming rather than induce farmers to take up riskier farming activities. Hence, policy should incentivize them to reduce risk and adopt better farm management approaches such as crop rotation.

<sup>23</sup> The agriculture sector, including animal husbandry, must intensify efforts to reduce greenhouse gas emissions from around 30% emissions. There was a 10.1% increase in greenhouse gas emissions since 1990. A 7% increase in nitrous oxide from soil management and a 58.7% growth in combined methane and nitrous oxide emissions from livestock manure management systems are the drivers for this increase. 2020 U.S. Inventory of Greenhouse Gas Emissions and Sinks report.

<sup>24</sup> A PPP is “a long-term partnership between the public and private sectors for the provision of public goods or services based on an equal contract”. PPPs can mobilize local, regional, or international private capital that has been idle and is seeking investment opportunities.

<sup>25</sup> S. Cole, X. Gine, and J. I. Vickery. 2017. How Does Risk Management Influence Production Decisions? Evidence from a Field Experiment. *Review of Financial Studies*. 30 (6). pp. 1935–1970. DOI:10.1093/rfs/hhw080.



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