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Digital Technology Empowers Agricultural Insurance to Achieve Dual Precision

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Abstract

As an important policy-based financial tool in China, the precise underwriting and precise claims settlement of agricultural insurance are key to its stable and sustainable development. Digital technology is a crucial enabler for achieving "dual precision" in agricultural insurance. This paper reviews the current state of "dual precision" in agricultural insurance and highlights the most widely used technologies in this regard, such as remote sensing, big data, and artificial intelligence. However, the application of these technologies faces challenges including high technical barriers, severe data silos, lack of uniform standards, and talent shortages. Therefore, this paper proposes countermeasures such as developing digital technology-related industries, building a unified agricultural insurance data platform, standardizing practices, and cultivating interdisciplinary talent.

Keywords

Agricultural Insurance; "Dual Precision"; Digital Technology.

1. Introduction

Underwriting and claims settlement constitute two pivotal aspects of agricultural insurance development. The Chinese government has increasingly prioritized the implementation of precision underwriting and claims settlement mechanisms, with heightened focus on the "Dual Precision" policy during 2024 and 2025. In recent years, accelerated digital transformation among insurance companies has significantly enhanced the impact of digital technologies across all dimensions of agricultural insurance. Insurance providers can effectively apply digital technologies to underwriting and claims processing, with "3S" technologies (Geospatial, Remote Sensing, and Geoinformation), big data, and artificial intelligence playing pivotal roles in achieving "Dual Precision." Addressing challenges such as high technical barriers, severe data silos, inconsistent operational standards, and talent shortages is essential for advancing digital technology-related industries, establishing a unified agricultural insurance data platform, standardizing practices, and cultivating interdisciplinary professionals to facilitate the effective implementation of the "Dual Precision" policy.

2. Current Status of the "Dual Precision" in Agricultural Insurance

2.1. National Emphasis on Implementing the "Dual Precision"

In 2019, the "Guiding Opinions on Accelerating the High-Quality Development of Agricultural Insurance," jointly issued by the Ministry of Finance and three other ministries, explicitly called for "significantly improving underwriting and claims settlement efficiency, and establishing a scientific, precise, and efficient loss assessment mechanism."[1]

The 2024 Central Document No.1 explicitly calls for "promoting precise underwriting and claims settlement in agricultural insurance." The State Administration of Financial Regulation, the Ministry of Finance, the Ministry of Agriculture and Rural Affairs, and the National Forestry and Grassland Administration jointly issued the "Notice on Promoting Precise Underwriting

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and Claims Settlement in Agricultural Insurance and Related Matters," emphasizing the need to strengthen precision management in underwriting, further improve the verification and comparison mechanisms between basic data (e.g., forest land and pig farming data) and insurance records, establish a data-sharing framework, and enhance technological empowerment to improve the authenticity, accuracy, and timeliness of underwriting and claims processing. The document also outlines clear requirements for advancing agricultural insurance operations toward online, digital, and intelligent development, covering underwriting, claims settlement, premium collection management, and data sharing, thereby better protecting farmers' rights and interests.[2]

In June 2025, the China Banking and Insurance Regulatory Commission mandated that each insurance institution complete at least two "Dual Precision" pilot projects in townships across all provinces (autonomous regions, and municipalities directly under the central government) by 2025; expand the pilot scope to 10% of townships by 2026; and achieve nationwide coverage of the "Dual Precision" initiative by 2029. Institutions are required to develop comprehensive five-year implementation plans, advance the initiative in phases, ensure underwriting information is precise to individual land parcels, and identify all major and minor landowners within each parcel, thereby enabling accurate linkage between parcel data and ownership records while ensuring efficient and transparent claims services.

2.2. Technological Advancements Have Created Favorable Conditions for Achieving the "Dual Precision" Objectives.

With the widespread adoption of 3S technologies (Remote Sensing RS, Geographic Information System GIS, and Global Positioning System GPS) and drones, agricultural insurance has undergone its first qualitative transformation. The practice of "underwriting and claims settlement based on maps" has become feasible, enabling insurance companies to create precise digital land maps through satellite remote sensing or drone imagery, providing clear visibility of area, location, and boundaries while reducing instances of false reporting and duplicate coverage. Furthermore, with the deepening development of digital technologies, we are now entering an intelligent era characterized by Artificial Intelligence (AI), big data, and the Internet of Things. Digital technologies are not isolated tools but collectively form an interconnected digital network that collectively drives the realization of the "dual precision" policy goals in agricultural insurance.

3. Application of Digital Technology in the "Dual Precision" of Agricultural Insurance

3.1. "3S" Technology Empowers Insurance Companies in Loss Assessment and Claims Settlement

The "3S" technology encompasses modern agricultural information collection, processing, and application systems, including remote sensing (RS), geographic information systems (GIS), and global positioning systems (GPS). Traditional agricultural insurance faces challenges such as imprecise coverage determination during underwriting and low underwriting efficiency; during claims settlement, adverse disaster conditions hinder insurers' vehicle and personnel access to disaster sites, resulting in inefficient loss assessment and damage evaluation services that compromise both accuracy and fairness. The "3S" technology enables insurers to more conveniently obtain precise land parcel data from farmers during underwriting, ensuring clearer coverage determination, while also reducing costs and improving efficiency in claims settlement.[3]

In underwriting and claim verification, satellite remote sensing (RS) offers extensive coverage, high timeliness, and excellent data continuity. By acquiring high-resolution images via satellites,

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it enables precise plot demarcation through remote sensing software. Geographic Information Systems (GIS) facilitate the creation of electronic map databases, allowing rapid verification of plot locations and areas, thereby significantly reducing the workload for insurance agents involved in door-to-door claim inspections and underwriting processes.

When handling claims during disasters, insurance companies can first use the Global Positioning System (GPS) to precisely locate the affected areas, then employ remote sensing technology (RS) to determine the extent of damage and assess crop losses. For locations inaccessible to claims assessors, drones can conduct aerial photography to assist on-site inspections and evaluate loss conditions. This approach not only enhances the accuracy of disaster assessment and loss determination but also enables large-scale surveys within a short timeframe, significantly reducing the overall assessment cycle. [4]It eliminates discrepancies between insured and reported crop conditions, minimizes issues such as duplicate or insufficient claims, and facilitates faster, more accurate claim settlements.

3.2. Integration of Big Data with Remote Sensing and Large AI Models

Big data provides data support for precise underwriting and claims settlement in agricultural insurance. The insurance industry has long relied on extensive data for decision-making; consequently, many insurers have established data platforms. By leveraging vast historical underwriting data and conducting actuarial analysis, they determine optimal premiums and coverage amounts, thereby facilitating the development of underwriting and risk assessment operations and implementing the "Dual Precision" policy.

During underwriting, insurance companies can integrate the ownership verification data held by the Agricultural and Animal Husbandry Bureau with remote sensing technology, importing the data into remote sensing software. This software displays the exact locations and cultivated areas per mu (approximately 0.067 hectares) for all farmers' plots. When conducting claim verification, insurers can directly locate the farmers and verify the details on-site. The underwriting process achieves precision down to each individual plot per farmer, better meeting the requirements of precision underwriting policies.

In claims processing, insurance companies can leverage AI and big data technologies to develop intelligent agricultural insurance claims models, thereby reducing fraudulent claims and enhancing the effectiveness of claims management systems. This enables more precise data verification of farmers' fraudulent activities during claims settlement, ensuring accurate and efficient claims processing.

3.3. AI-powered Precise Livestock Identification

Artificial intelligence technology enables accurate identification in agricultural and livestock insurance applications. During underwriting, it can distinguish between livestock with similar appearances, while claims processing allows for more precise identification of the insured animals.

Insurance companies can utilize artificial intelligence recognition technology to identify livestock assets, enabling precise underwriting verification. Using AI-based scoring technology, insurance staff attach electronic collars to the insured assets, establishing a unique correspondence between each animal and its collar. This creates a recognizable database for livestock underwriting, facilitating accurate risk assessment.

When a claim is required following livestock death, claims adjusters can simply use an electronic scanning device to detect the electronic tag on the deceased animal. By analyzing the tag's information, they verify the identity of the insured animal and process precise claims payments for the livestock.

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4. Challenges in Applying Digital Technology to "Dual Precision"

4.1. High Implementation Threshold of "3S" Technology

The "3S" technology presents a significant implementation barrier, requiring specialized personnel for operation. Consequently, the associated costs for technical application during underwriting and claims processing are correspondingly higher.

First, in the practical application of technology, most insurance industry professionals lack a background in remote sensing and mapping. Multidisciplinary talents proficient in both agricultural insurance operations and remote sensing/geospatial information technologies are extremely scarce, and insurance companies often lack technical personnel capable of independently processing and analyzing remote sensing data. Second, utilizing Geographic Information Systems (GIS) and Global Positioning Systems (GPS) for surveying equates to insurance companies undertaking rural land mapping and title confirmation themselves-a task with substantial costs that small and medium-sized insurers cannot afford. Finally, establishing an agricultural insurance platform based on 3S technologies requires significant investment in technology procurement, data acquisition, and technical team development and maintenance, imposing considerable financial pressure on insurers in economically underdeveloped regions.[5]

4.2. Incomplete Agricultural Insurance Data Sharing Mechanism

The current agricultural insurance data sharing mechanism in China is insufficiently developed, with inadequate updates and timely maintenance, requiring further standardization and oversight. The data obtained by insurance companies lacks accuracy, rendering it incapable of enabling precise underwriting and claims settlement, thereby hindering the implementation of the "Dual Precision" policy.

Currently, some insurance companies maintain their own databases, and many prefecture-level cities also possess agricultural insurance-related databases. However, these datasets have not been officially integrated. Official agricultural insurance data are scattered across more than ten departments and agencies, including the Ministry of Agriculture and Rural Affairs, the National Meteorological Administration, and the Ministry of Natural Resources-such as land ownership certification data from the Ministry of Agriculture and Rural Affairs, historical and real-time meteorological data from the National Meteorological Administration, and cultivated land data from the Third National Land Survey conducted by the Ministry of Natural Resources. Timely data sharing is hindered due to the absence of a unified sharing platform.

Meanwhile, in some regions, data related to agricultural insurance is not permitted for use by insurance companies. Even when shared, the data lacks timeliness as it is not updated promptly and fails to remain synchronized with the insured farmers of the current year. In some remote and impoverished areas, data updates are entirely absent. Insurance companies relying on outdated ownership verification data for underwriting verification not only significantly increase their workload but also severely compromise underwriting accuracy. Therefore, it is essential to integrate and maintain up-to-date agricultural insurance data nationwide.

4.3. Inconsistent Standards for Digital Technology Applications

Regarding current technological advancements, relevant authorities have not established unified procedural standards for innovative agricultural insurance technologies. The existing Agricultural Insurance Regulations are increasingly inadequate in supporting the precision underwriting and claims settlement requirements of modern agricultural insurance. The China Insurance Association and the China Agricultural Risk Management Association have only established guidelines for wheat, cotton, rice, and corn using remote sensing technology; however, these crops are not the primary crops in some regions, and crops such as soybeans,

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potatoes, and yellow mustard are cultivated extensively across diverse areas. For large-scale applications.

5. Development Recommendations

5.1. Promote the Development of Third-party Industries Related to "3S" Technology to Lower Entry Barriers

Encourage specialized remote sensing technology companies to provide insurance companies with "on-demand customized" technical services (such as underwriting verification and claim assessment), enabling insurers to adopt advanced technologies at lower costs and avoid the high expenses associated with building in-house teams. Meanwhile, local governments may include the procurement of "3S" technical services in fiscal subsidy programs or implement centralized procurement to reduce costs per insurance company, ensuring that all insurers offering agricultural insurance services have access to "3S" -related technologies.

5.2. Establishing a Unified Agricultural Data Platform

First, regarding data sharing, insurance companies should collaborate with government authorities to jointly develop a national agricultural insurance data platform. This platform will integrate data such as land ownership certification and remote sensing information, establish a standardized sharing mechanism, and enable centralized data management and sharing.

Secondly, regarding data updates, the national agricultural insurance big data platform should centrally manage all relevant information pertaining to agricultural insurance, facilitate the sharing and timely updating of underwriting data and disaster claim data, and oversee foundational tasks such as the integration and updating of agricultural insurance data by the government. This enables insurance companies and third-party providers to access the most up-to-date agricultural insurance data, prevents violations such as fraudulent or duplicate insurance applications, eliminates barriers between data departments and regions, and achieves data sharing and integration with functional departments including finance, agriculture, meteorology, forestry, and land resources.

5.3. The Government and Insurance Companies Should Establish Unified Standards and Regulations

First, government departments should improve the existing "Agricultural Insurance Regulations" and "Measures for the Administration of Agricultural Insurance Underwriting and Claims Settlement," and formulate laws and regulations specifying the application of digital technologies and standardized digital underwriting and claims settlement processes in agricultural insurance, thereby providing a legal foundation for the digital transformation of agricultural insurance.

Secondly, governments, insurance companies, and relevant technology enterprises need to establish unified technical standards and guidelines for the application of agricultural insurance technologies-including standards for remote sensing, artificial intelligence, and big data in agricultural insurance. This involves standardizing satellite maps and data processing protocols for remote sensing software, regulating the application processes and parameter settings of artificial intelligence for livestock identification and loss assessment, and ensuring consistency in technology implementation.

Finally, insurance companies should establish detailed operational procedures and standards for all stages of technology-driven underwriting and claims processing in agricultural insurance. These should specify the exact steps and technical requirements for policy application, crop assessment, loss evaluation, and claims settlement, ensuring that insurance institutions and practitioners adhere to unified standards to enhance operational accuracy and fairness.

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Additionally, companies must strengthen supervision and inspection of these procedures to guarantee effective compliance with all established protocols.

5.4. Building a Multidisciplinary Talent Pool

First, insurance companies should develop and innovate their own agricultural insurance apps, continuously improving their agricultural insurance products-such as China People's Insurance's Yunzhibao and China Property & Casualty Insurance's "E-Key Agricultural Insurance" -to make them more convenient and user-friendly, lowering the adoption threshold so that the majority of employees can utilize them.

Second, insurance companies should enhance internal training programs for sales personnel specializing in agricultural insurance, ensuring employees become proficient in using relevant agricultural insurance software. Finally,insurance companies can strengthen industry-academia collaboration by recruiting students with relevant majors for internships and subsequently hiring them to engage in related business operations.

6. Conclusion

Digital technology has become a key support for promoting China's agricultural insurance to achieve the goals of "accurate underwriting" and "accurate claims settlement" (dual accuracy). This paper systematically sorts out the application status of remote sensing, GIS, GPS, big data, artificial intelligence and other technologies in the links of underwriting inspection, disaster loss assessment, livestock identification and other links, and confirms that these technologies can significantly improve the operational efficiency, data authenticity and service fairness of agricultural insurance.

Overall, digital technology provides a feasible path for the "dual accuracy" of agricultural insurance, but the effective release of its potential depends on the simultaneous advancement of policy guidance, industrial coordination, system improvement and talent reserve. In the future, with the further decline of technical costs, the gradual breaking of data barriers and the increasingly sound standard system, digital technology will play a more far-reaching role in the field of agricultural insurance, and help China's agricultural insurance achieve high-quality and sustainable development.

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