

CHALLENGES AND BARRIERS TO SUSTAINABLE AGRICULTURAL DEVELOPMENT IN CHINA

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Agriculture is one of the most relevant sectors for sustainable development. It depends on natural resources such as water, soil and biodiversity, and it also has a significant influence on these resources. Agricultural practices that are unsustainable can lead to soil degradation, deforestation, water scarcity and loss of biodiversity, which in turn threatens the food security and livelihoods of millions of people. At the same time, agriculture is also vulnerable to the impacts of climate change, such as extremely extreme weather events, changes in precipitation patterns and rising temperatures. Therefore, sustainable development of agriculture is not only necessary but also an important component of global endeavours to achieve sustainable development.

One of the key components of sustainable agriculture is finding a balance between productivity and resource protection. This involves using practices that increase efficiency, reduce waste and minimise harm to the environment. For instance, techniques such as crop rotation, organic farming, precision agriculture and the use of renewable energy sources in agricultural production can help to achieve these objectives. Furthermore, policies that promote sustainable land use, conserve biodiversity and encourage investment in agricultural research and innovation are critical to achieving long-term progress.

Chinese agricultural trade has been growing, but it also faces some challenges, such as flow of rural population, land resource utilization, and the quality and safety of agricultural products. Economic transformation is to achieve the strategic goal of rural revitalization [5].

The sustainable development of agriculture in China faces multiple challenges and barriers. These challenges are particularly evident in the adoption of emerging technologies such as drones, spatial variability analysis, yield prediction, and crop modeling. Variations in soil, climate, sustainability goals, cultivated species, and the scale of producers add complexity to this process. Furthermore, government in-

vestments, export volumes, agricultural practices, and consumption culture directly affect food production methods, and the efforts and investments dedicated to agricultural innovation. While developed and emerging economies have different levels and types of government investment in agriculture, China has been actively developing projects aimed at achieving the digital transformation of its agricultural sector [6].

Despite these efforts, the digital transformation of agriculture is still in its early stages compared to the technological advancements in manufacturing and services. Technologies widely applied in other fields, such as big data, machine learning, blockchain, simulation/mathematical modeling, and augmented reality, are still underexplored in agriculture. This slow adoption highlights a significant gap between the potential of digital tools and their actual use in agricultural practices.

Despite the challenges, the adoption of digital technologies in agriculture presents significant opportunities for improving productivity, efficiency, and sustainability. Technologies such as IoT, blockchain, and machine learning can revolutionize the way farmers manage their crops, monitor field conditions, and make decisions. By leveraging these tools, farmers can reduce waste, conserve resources, and adapt to changing environmental conditions.

In the context of China, the digital transformation of agriculture offers a pathway to addressing some of the country's most pressing challenges, such as food security, rural poverty, and environmental degradation. By investing in research, infrastructure, and education, China can create a more inclusive and sustainable agricultural sector that benefits both small-scale farmers and large agribusinesses.

In conclusion, the sustainable development of agriculture in China faces numerous challenges, from technological complexity and digital infrastructure gaps to gender inequality and data security concerns. However, these barriers are not insurmountable. With targeted investments in digital tools, training, and infrastructure, China can overcome these challenges and unlock the full potential of digital agriculture. By doing so, the country can create a more resilient and sustainable agricultural system that meets the needs of its growing population while protecting the environment [1,2,3,4,6].

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