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**THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE SYNERGISTIC
EFFECTS OF POLLUTION REDUCTION AND CARBON MITIGATION IN
AGRICULTURE**

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Against the backdrop of increasing climate uncertainty, environmental degradation, and mounting pressure on agricultural systems, reducing agricultural pollution and greenhouse gas emissions has become a critical policy and academic concern. Artificial intelligence (AI) is increasingly being integrated into agricultural production, environmental monitoring, and resource management, yet its role in promoting agricultural pollution reduction and low-carbon transformation remains insufficiently understood. This study explores whether and how different applications of artificial intelligence contribute to agricultural pollution control and carbon mitigation. Rather than focusing solely on aggregate emission outcomes, this study emphasizes the channels through which artificial intelligence contributes to agricultural pollution and carbon emission reduction. The study distinguishes different impact factors as key

channels through which AI may influence agricultural environmental performance. By integrating insights from the literature on artificial intelligence, sustainable agriculture, and environmental governance, this research develops an analytical framework to examine the potential mechanisms linking AI adoption to pollution reduction and carbon mitigation in agriculture. Drawing on regional-level data from China, the empirical analysis is designed to capture both dynamic changes and spatial heterogeneity in agricultural environmental outcomes. The findings are expected to shed light on the heterogeneous environmental effects of AI across regions and to provide policy-relevant implications for leveraging intelligent technologies to support agricultural pollution reduction and low-carbon development in the context of increasing climate and environmental uncertainty.

Palavras-chave: ai; agriculture; the synergistic effects; pollution reduction; carbon mitigation.