Leveraging Open Science for Geographical Indications Environment & Sustainability Study Case

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Introduction：China has rich geographical and biological diversity, and cultural resources, which have enriched people's lives.Its diverse and complex geographical environment has given rise to a wealth of geographical products.Geographical Indications (GIs) products hold significant importance in promoting agriculture, enhancing product quality, preserving cultural heritage, and driving sustainable development. According to the latest data from the China National Intellectual Property Administration, China has been certified a total of 2,547 GIs products by March 2025, demonstrating their critical role in the country. Taking Baoshan Coffee as an example, it has gradually become a vital cash crop in the region. Listed in the inaugural China-EU Geographical Indications Agreement in 2020, Baoshan Coffee has spurred local economic development, improved agricultural quality, and increased farmers' incomes. However, challenges remain in balancing economic benefits with environmental sustainability:1.Unclear delineation of geographical production areas with insufficient scientific basis for geographical boundaries; 2.Low brand awareness and limited consumer understanding of GIs products; 3.Inadequate traceability systems leading to inconsistent product quality and reliability; 4.Weak intellectual property rights protection;5.Incomplete standard. To address this issue, we propose the "Geographical Indications Environment & Sustainability" (GIES) initiative.The initiative focuses on GIs products, Geographical Specific Product, and Geographical Traditional civilized Product. The initiative started from six dimensions: variety, quality, appearance, brand, morality, and taste. By utilizing open science, geographical big data, and IoT technologies, and through open science data publishing, the initiative integrated science, technology, engineering, standards, and culture. It established a case traceability and intellectual property rights protection system.The GIES Initiative through collaborative efforts among multiple stakeholders and partners.Ultimately, it aims to bolster regional ecological protection and foster local sustainable development.
Methods: (1) Open science on the geographical information system, remote sensing, big data, and IoT technologies of physical and human geography, (2) standard management of agricultural products, (3)The traceability of products enabled by IoT technologies.（4）GIES case linking producers the market and consumers to promote economic growth.
Findings:(1)The GIES use of geographical science to define the production boundaries of key GI products and employs remote sensing, big data technology, and IoT technologies to network the product chains for better quality control.
(2）Physical geographic data, including air quality, soil composition, water quality, terrain features, geographical boundaries, land use patterns, and natural ecology data, are comprehensively gathered through remote sensing.This wealth of data provides a scientific foundation for understanding the unique environmental conditions that contribute to the distinct characteristics of GIs products.
(3）Leveraging Open Science, the GIES case datasets, and relevant research papers of each of these cases have been published in the Digital Journal of Global Change Data Repository and Journal of Global Change Data & Discovery.
(4）Participating in product expos, forums, festivals, and training workshops has generated high demand for GIES products and significantly improved local farmers' livelihoods.
Conclusion:The GIES initiative has achieved a balance between economic benefits and environmental sustainability, fostering regional ecological protection and local sustainable development.
Keywords: Geographical Indications;Open Science;Data Publishing;environmental sustainability;economic growth

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