



A Review of Research on Influencing Factors and Governance of the Quality of Geographical Indication Agricultural Products Brand

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Abstract. Geographical Indication (GI) agricultural product brands are an important support for China's rural revitalisation, and the quality of GI agricultural product brands determines the process of rural development and sustainable development. To provide research support for brand quality management of GI agricultural products and clarify the current research status of brand quality of GI agricultural products, this paper combines quantitative and qualitative research methods and uses CiteSpace software to visualise and analyse the existing literature. Firstly, this paper combed the authoritative academic literature at home and abroad to clarify the relevant concepts of brand quality of GI agricultural products. Then, this paper conducted a metrological analysis of the literature, explored the temporal distribution and development process of the foreign and Chinese literature, and used Citespace software to conduct keyword co-occurrence analysis, keyword clustering analysis and emergent word analysis of the literature in this field, so as to depict the knowledge map of the research on the quality of the brand of GIs of agricultural products, and analysed the hotspots of the research in this field. Secondly, the results of the comprehensive econometric analysis summarise the four hot topics in this research field. Finally, based on the above analyses, the future research direction of GI agricultural product brand research is proposed.

Keywords: GI Agricultural Brands; Regional Public Brands for Agricultural Products; Brand Quality; Influencing Factors; Governance Research

1 Introduction

1.1 Definitions

Geographical Indications (GIs) are the protection of products characterised by a certain geographical area¹. From the perspective of laws and regulations, according to Chinese

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law, GI is a unique agricultural product mark that indicates that a certain commodity originates from a certain region, and that the specific quality, reputation, or other characteristics of the commodity are mainly determined by the natural or human factors of the region, and that the name of the region is used as the name of the unique agricultural product. The China-EU agreement on GIs Agreement provides that "GIs are an internationally recognised emerging type of intellectual property with distinct regional characteristics, and are essentially a collective joint proprietary right, premised on the sharing of benefits". From the viewpoint of ownership and source, GIs of agricultural products belong to the collective intellectual property rights of agricultural product producers in a specific region, and are the crystallisation of the wisdom of agricultural product producers who have carried out long-term production and practice activities in a specific region.

GI agricultural product brands, also known as regional public brands of agricultural products, are the result of branding of GI agricultural products, and their naming is usually composed of the form of "name of origin + product name"², such as "Zhenjiang Balsamic Vinegar", "Dandong Strawberry", "Ningxia wolfberry" and so on. From the perspective of status, regional public brands of agricultural products, together with enterprise brands and product brands, constitute an important part of China's agricultural industry branding system². From the perspective of ownership, the exclusive right of regional public brand of agricultural products is jointly enjoyed by multiple producers and operators. From the perspective of generating factors, the generation of GI agricultural product brands is related to the natural region of agricultural product production, and also affected by historical factors.

The characteristics of GI agricultural product brands encompass attributes such as Regionality, trust, publicity, multi-party synergy, scarcity, and cultural significance^{11,3}, coupled with branding elements like exclusivity, intangible assets, risk, and uncertainty⁴. These amalgamated traits include regional specificity, public product nature, brand effect, and value attributes.

Regionality stems from unique regional factors, encompassing natural environment and historical context. Public product nature manifests in uniform quality, promotional strategies, and external image, distinct from traditional corporate brands. Brand effectivity, as a trademark, is legally protected and enhances product visibility and consumer loyalty, thereby fostering regional economic development⁵. The value attribute underscores the economic significance of GI agricultural product brands as intangible assets, representing consumers' rational and emotional needs and accruing value through enhanced reputation and awareness.

Brand quality includes the quality of the brand itself and the quality of the brand embodiment^{6,7}, while the quality of the brand itself is the quality of the product represented by the brand itself, and the quality of the brand embodiment is the quality of the brand image that the brand shows to the consumers.

The quality of the GI agricultural product brand itself refers to the fact that the product meets the green, safe and diversified consumption demand of consumers for agricultural products, which is specifically reflected in the quality of the environment of the origin of the landmark agricultural product brand products, the processing and operation of the products, the degree of industrialisation of the products, the added value

generated by the brand, the maturity of the industrial chain of landmark agricultural products, and the brand culture, and so on⁸.

The quality embodied in the brand of GI agricultural products refers to whether the brand of agricultural products has an impact on the environment and sustainable development. This is reflected in the impact on environmental resources such as land and water resources, such as carbon emissions from the production of GI agricultural product brands, the use of raw materials including pesticides and chemical fertilisers, and the treatment of product faeces.

1.2 Benefits and Challenges

The benefits of GI agricultural product branding are reflected in its contribution to rural revitalisation. The branding of GI agricultural products runs through all aspects of rural revitalisation, and is an important hand and breakthrough direction in the process of rural revitalisation⁸. Firstly, the brand of GI agricultural products can increase the market awareness and influence of special agricultural products², and then expand the sales of agricultural products to achieve economic benefits. Then, the construction of brands of GI agricultural products can promote the formation of agricultural economic industry chain and the transformation and upgrading of modern agriculture⁹.

However, GI agricultural product brands face challenges. Firstly, due to its obvious collective sharing characteristics, as a collective product, GI agricultural product brands inevitably produce problems such as unclear characteristics and quality degradation. This is manifested in the external phenomenon of "free-rider" counterfeiting¹⁰ and the internal "prisoner's dilemma"¹¹, which has a significant impact on GI agricultural brands, which negatively affects the sustainable development of GI agricultural brands. In addition, with the growing concern for environmental protection and green food, consumer preferences for healthy quality and green ecology of agricultural products influence the impact of GI agricultural product brands. When there is a risk of harming the environment and health, the brand reputation of GI agricultural products is greatly reduced, and consumers will deliberately avoid the brand, and the situation is difficult to be resolved quickly, which is not conducive to its sustainable development.

1.3 Significance and Structure of the Research

In the context of comprehensively promoting rural revitalisation, research focusing on the quality of GI agricultural product brands has significant theoretical and practical significance. From the theoretical level, the brand quality of GI agricultural products has gradually received attention and focus in the field of agricultural revitalisation research in recent years. However, GIs, as a fledgling research field, a systematic research system has not yet been established. From a practical level, the brand of GI agricultural products is a grip for the revitalisation of the agricultural economy, and the brand quality problem faced today is gradually becoming an obstacle to the revitalisation of China's countryside. Therefore, it is extremely necessary to systematically sort out and analyse the research literature on the brand quality of GI agricultural products at home and abroad and clarify the current research status of brand quality of GI agricultural

products, which can not only provide inspiring ideas for scholars on the research of the brand quality of GI agricultural products, but also provide certain insights for the practice in this field.

This paper combines quantitative and qualitative research methods to analyse the existing literature. Firstly, the authoritative academic literature at home and abroad is systematically sorted out, and the concept of brand quality of GI agricultural products is clarified. Secondly, the literature is statistically analysed to study the temporal distribution. Thirdly, scientometric research was conducted using CiteSpace software to map the knowledge map of the research on brand quality of GI agricultural products in order to perform keyword co-occurrence analysis, keyword clustering analysis and emergent word analysis. Fourthly, based on quantitative and qualitative analyses, the hot topics of research in this field of study are summarised and highlighted. Lastly, future research directions in the field of GI agricultural product branding research are proposed.

2 Methodology

2.1 Research Framework

Based on the above literature, this paper searched the literature on brand quality of GI agricultural products published between 2000 and 2023 through statistical and scientometric analyses. The research framework is shown in Figure 1.

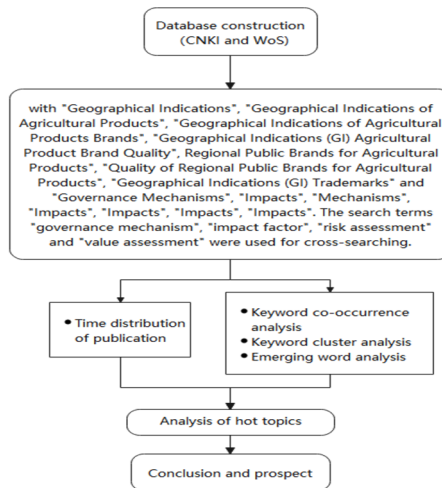


Fig. 1. Research Framework

2.2 Database Construction

In order to understand the existing research on the brand quality of GI agricultural products in an all-round way, based on the above definitions, this paper collects English

literature from the SSCI indexed database of Web of Science (WoS) and Chinese literature from the CSSCI database of China Knowledge Network (CNKI), cross-searching with “GI”, “GI Agricultural Products”, “GI Agricultural Product Brands”, “GI Agricultural Product Brand Quality”, “Agricultural Product Regional Public Brands”, “Regional Public Brand Quality of Agricultural Products”, “GI Marker”, “GI Marks” and “Governance Mechanisms”, “Influencing Mechanisms”, “Influencing Factors”, “Risk evaluation” and “Value evaluation” as search terms. 728 English and 216 Chinese documents were obtained (see Table 1 for the specific search process and rules). The titles and abstracts of the Chinese literature were translated and imported into CiteSpace for analysis together with the English search samples.

Table 1. Specific search process and rules

Data Sources	Web of Science core dataset - SSCI database, China Knowledge Network - CSSCI database		
Search Subjects	“Geographical Indication (GI)”	AND	“Governance Mechanisms” or “Influencing Mechanisms” or “Influencing Factors” or “Risk evaluation” or “Value evaluation”
	“GI Agricultural Products”		
	“GI Agricultural Product Brands”		
	“GI Agricultural Product Brand Quality”		
	“Agricultural Product Regional Public Brands”		
	“Regional Public Brand Quality of Agricultural Products”		
	“GI Marks”		
Time Span	All Years		
Language Type	English, Chinese		
Search Result	728 Foreign and 216 Chinese active documents		

3 Literature Measurement Analysis

3.1 Statistical Analysis

Temporal Distribution of Chinese and Foreign Literature

Figure 2 shows the temporal distribution of foreign language literature from 2000 to 2022 and summarises some characteristics of literatures evolution. From the figure, the number of literatures has an overall upward trend, which can be divided into 3 phases: newborn, growth and twisty.

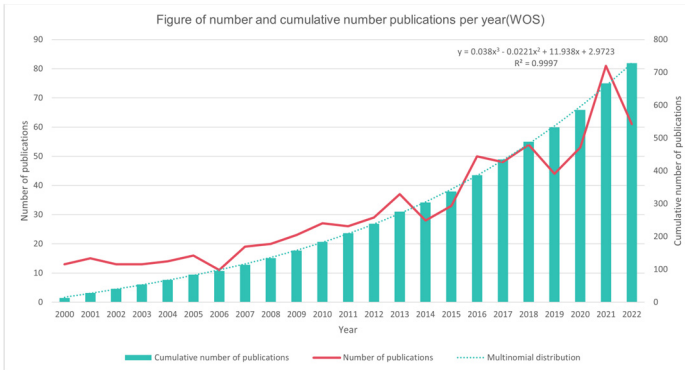


Fig. 2. Figure of annual publications and annual cumulative publications (WOS)

Phase 1(2000-2007): Newborn period. The number of literatures per year was less than 20, with an overall decline. There are few related literatures, because of the small impact of GIs in society.

Phase 2(2008-2013): Growth period. The number of literatures per year is steadily increasing. Starting from 2008, the number of literatures per year exceeds 20 and grows to 37 literatures per year. Due to the rise of the Internet and the gradual maturity of transport and communication methods, GI agricultural products were known to the public. The transformation of economy, infrastructure, and consumption concept improves the brand awareness of GI agricultural products and promotes the development of related research.

Phase 3 (2014-2022): Twisty period. The number of annual literatures zigzagged up. The number of literatures experienced low troughs in 2014, 2017 and 2019. The most notable trough period was from 2018 to 2021, during which the number of literatures in this field dropped to the bottom in 2019 due to the impact of the epidemic and started to rebound with the following year until it rose to the highest number of literatures in 2021.

Temporal Distribution of Chinese Literature

Figure 3 demonstrates the temporal distribution of Chinese literature from 2008 to 2022 and summarises some of the literature's evolution characteristics. From the figure, the number of literatures has an overall upward trend, which can be divided into four development phases: budding, growth, scale, and twisty.

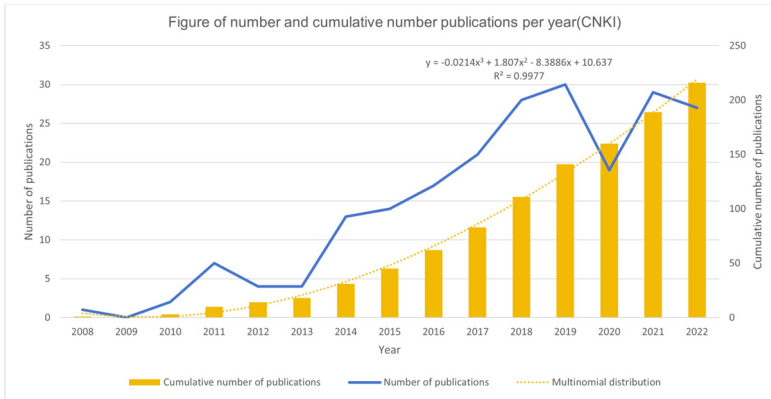


Fig. 3. Figure of annual publications and annual cumulative publications (CNKI)

Phase 1 (2008-2012): Budding period. In this stage, the number of literatures was less than 10 per year, with a decreasing trend from 2011 to 2013, and the number of literatures peaked in 2011, which may be mainly because the first batch of GI agricultural products was announced in 2008, and researchers carried out more studies on GI agricultural products. Overall, there were few research literatures on GIs because they had little social impact at that time.

Phase 2 (2013-2016): Growth period. In this stage, the number of literatures showed a steady growth trend. Starting from 2013, the number of literatures per year continued to increase, exceeding 10 literatures in the following year, and growing to 17 literatures per year. Chinese language literature has appeared since 2013. Due to the rise of the Internet, as well as the gradual maturity of transport and communication methods, GI agricultural products are therefore known to the general public. In addition, the personalisation and differentiation of GI agricultural products have received more attention due to the shift in the retail model of agricultural products from sales in farmers' markets to sales in shopping malls and supermarkets. The shift in economic base, infrastructure development and consumption concepts has increased the visibility of GI agricultural product brands and effectively promoted the development of related research.

Phase 3 (2017-2019): Scale period. In this stage, the number of literatures rises substantially. Starting from 2017, the number of literatures issued each year has been increasing, exceeding 30 literatures in 2019. It is worth noting that in the rural revitalisation strategy proposed by the Chinese government in 2017, the term "regional agricultural product public brand" was proposed for the first time, and the government document explicitly proposed to promote the construction of regional agricultural product public brand, and to support localities to build regional characteristic brands with advantageous enterprises and industry associations as the main body (State Council, 2018). These policy documents have increased the visibility of GI agricultural product brands and effectively promoted the development of related GI fields in China.

Phase 4 (2020-2022): Twisty period. In this stage, the number of literatures experienced a zigzag development process and showed a positive development trend. In 2020, the number of literature postings suddenly dropped to 19 due to the impact of the

epidemic. In 2021-2022, the number of literatures issued rapidly rebounded to more than 26 due to the easing of the epidemic. It is worth noting that China's Ministry of Agriculture and Rural Development (MARD) explicitly proposed a development plan related to strengthening the quality management of GI agricultural product brands in 2020. Due to the policy guidance and support of China's Ministry of Agriculture for GI agricultural products, although research related to GI agricultural product branding has been greatly affected by the epidemic factor, the research began to rebound rapidly from 2021 onwards and will continue to receive extensive attention in China's research.

3.2 Scientometric Analysis

Keyword Co-Occurrence Analysis

Keywords are the highly condensed core themes and main contents of a literature, and the research hotspots can be understood by counting and organising the keywords of literatures related to the brand quality of GI agricultural products. In this paper, we selected the Keyword node in CiteSpace 6.1.6 software and analysed the co-occurrence of keywords in 944 GI agricultural brand quality research documents. The analysis yields a keyword co-occurrence map of GI agricultural and tea product brand quality, as shown in Figure 4. There are 648 nodes and 1615 co-occurrence connecting lines in the graph. Each node in the graph represents a keyword, the node size indicates the co-occurrence intensity of the keyword, and the connecting lines indicate the association relationship. In the keyword co-occurrence map, keywords with high frequency of co-occurrence with the brand quality of GI agricultural products can be observed, and they are interrelated and interpenetrating.

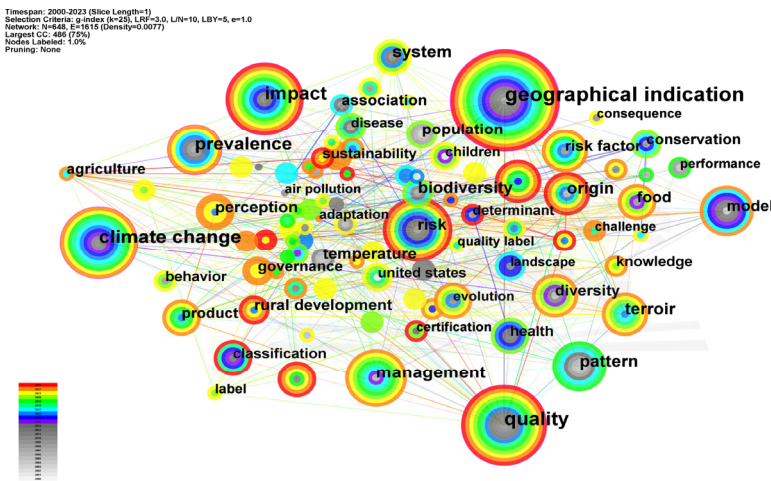


Fig. 4. Keyword co-occurrence analysis

There are more keyword nodes, so this paper is screened as follows. Firstly, GI, quality, impact, agriculture, product, governance is the theme of this paper, which is

not considered as a research hotspot. Next, some of the keyword nodes are small, which indicates that this type of node has a small association or no association with the quality of GI agricultural product brands, so this paper does not select it as a research hotspot in the keyword co-occurrence analysis. For example, behaviour, sustainability, population, system, children, USA, label, outcome, etc. Next, some keyword nodes are larger, but their frequency of occurrence is less, which indicates that although this type of node has a greater association with the brand quality of GI agricultural products, the number of studies is less, so this paper does not select it as a research hotspot in the keyword co-occurrence analysis. For example, cognition, food, evolution, health, classification, rural development, etc.

After screening, in order to clearly show the research progress on brand quality of GI agricultural products, Table 2 shows the top 20 terms of keyword co-occurrence intensity, including GI, quality, climate change, impact, management, epidemiological, terroir, origin, risk, pattern, influencing factors, etc., as is showed in table 2.

Table 2. High-frequency keywords for the study of brand quality of GI agricultural products

No	Keyword	Count	Centrality	No	Keyword	Count	Centrality
1	geographical indication	104	0.23	11	pattern	18	0.08
2	quality	46	0.13	12	model	17	0.04
3	climate change	34	0.19	13	influencing factor	16	0.03
4	impact	27	0.14	14	food	15	0.05
5	management	24	0.1	15	spatial distribution	15	0.02
6	prevalence	23	0.14	16	system	15	0.07
7	terroir	20	0.02	17	diversity	14	0.1
8	origin	19	0.02	18	biodiversity	13	0.08
9	risk	19	0.06	19	classification	12	0.05
10	risk factor	19	0.05	20	health	12	0.03

Observing the frequency of keywords, geographic indication, quality, climate change, impact, management, epidemics, terroir, origin, risk, and diversity were the highest with 104, 46, 34, 27, 24, 23, 20, 19, 19, and 19 times, respectively; and observing the closeness of keywords, geographic indication, climate change, impact, quality, epidemics, management, diversity, pattern, biodiversity, and systems centrality was the highest, 0.23, 0.19, 0.14, 0.13, 0.1, 0.1, 0.08, 0.08, 0.07. Therefore, climate change, management, epidemiology, terroir, origins, risk, pattern, diversity were more relevant and frequent to the quality of GI agricultural product brands, and therefore, were included in the research hotspots.

Keyword Clustering Analysis

Keyword co-occurrence analysis can capture hotspots in a research area, but has limited ability to reveal evolutionary patterns. The timeline view of keyword clustering analysis can be used to explore a large number of subject terms with a high frequency of change, thus reflecting changes in research hotspots over time¹². In order to better demonstrate the evolution of research and theoretical transitions, this paper used the K-clustering approach in CiteSpace 6.1.6 software, the LLR calculation method, to cluster analyse the keywords in 944 GI agricultural product brand quality research literatures, as shown in Figure 5.

As shown in Figure 5, in the past 20 years, the research focuses on the brand quality of GI agricultural products are: GIs, epidemics, climate change, cancer, phylogeography, determinants, and influencing factors. Among them, epidemics, climate change, and phylogeography appeared several times as research focuses, so this paper discusses them as research hotspots. The remaining clustered key-words are less relevant to the topic of this paper, so they are not included in the research hotspots.

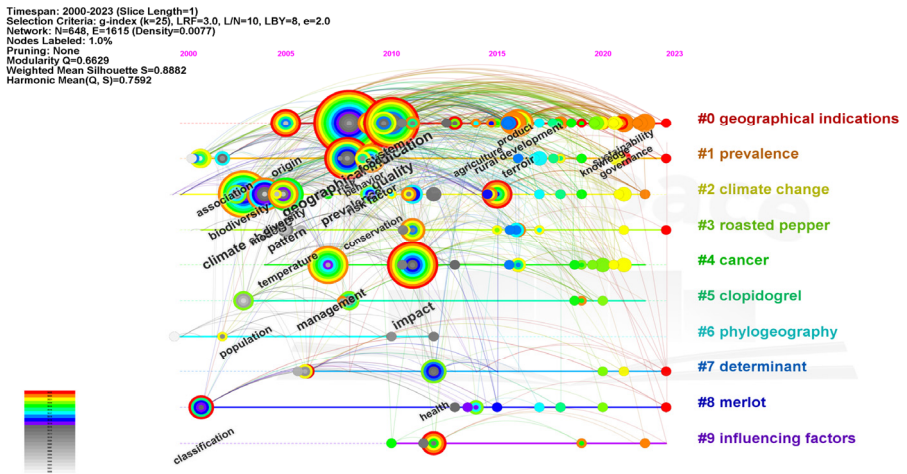


Fig. 5. Keyword clustering analysis

Burst Word Analysis

Analyzing the prominence of keywords of GI agricultural products can intuitively obtain the research frontiers in the field of GI agricultural products in different periods¹³. This paper performs burstiness operation using CiteSpace and take γ as 0.7 to get 25 keywords, as shown in Figure 6.

Top 25 Keywords with the Strongest Citation Bursts

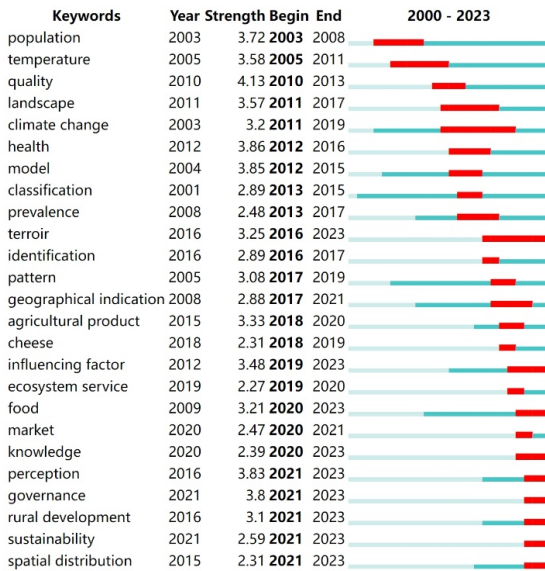


Fig. 6. Analysis of burst words

The following conclusions can be drawn. Firstly, “climate change” and “landscape” are mentioned consecutively in 2011-2019 and 2011-2017, indicating that they are more relevant to the brand quality of GI agricultural products and are time-sensitive. Second, “terroir and culture” is mentioned continuously in 2016-2023, indicating that it is more relevant to the brand quality of GI agricultural products and has the prospect of being widely discussed. Third, “knowledge” is mentioned continuously in 2020-2023, indicating that it is closely related to the current stage of research and development of GI agricultural product brand quality, which is innovative and promising. Finally, “rural development” is mentioned consecutively in 2021-2023, indicating that it is closely related to the current stage of research development on the brand quality of GI agricultural products, with contemporary characteristics and prospects.

Except for the above keywords, other keywords have less relevance to the brand quality of GI agricultural products. Therefore, they are not studied as hot emergent words.

3.3 Research Hot Topics Analysis

Based on the above quantitative analysis of the literature and qualitative analysis of the literature, combined with qualitative reading of the literature, this paper summarizes 11 research hot keywords, i.e., origin, terroir, diversity, phylogeography, climate change, epidemiology, patterns, management, knowledge, and rural development, which are grouped into the following four research hot themes.

Style and Image of GI Agricultural Product Brands

The Impact of Origin on Brand Image and Related Protective Measures.

Origin refers to a geographical area with uniform environmental conditions suitable for cultivating GI agricultural products, whose special qualities are due to unique climate, soil, or traditional methods. The geographical origin significantly influences consumers' purchasing intentions and value perceptions¹⁴⁻¹⁶.

The focus of origin protection has shifted from a legal to an ecological perspective. Legally, post-WTO accession, China's protected products of origin were subject to intellectual property rights under the TRIPS Agreement and domestic trademark law. The 2005 Provisions on the Protection of GIs Products offered a comprehensive protection and supervision system.

Ecologically, rising consumer demand and green trade barriers have highlighted the environmental issues of GI origins¹⁷. The ecological environment affects the quality and lifecycle of agricultural products and vice versa²⁰¹⁸.

The attributes of ecological origin products include local characteristics, environmental protection, and resource conservation. Achieving both economic development and ecological diversity protection is a key goal. Sustainable agriculture requires maintaining biodiversity, counteracting the negative impacts of industrial agriculture.

The goal of ecological diversity protection is dual: providing agricultural products and a good ecological environment. GI brand protection sustains ecological and cultural diversity¹⁹. Models integrating agricultural development and biodiversity conservation include the green agricultural development model ecological restoration compensation mechanisms^{20,21}, multifunctional agricultural development²², and systematic governance of the whole industry chain .

The Influence of Terroir on Brand Style.

The terroir, i.e., the natural and human environment of the place of production, gives GI agricultural products their unique style and reputation²³, which specifically includes climate (macroclimate and microclimate), soil (composition and structure), geographic location (topography and geomorphology), and cultural traditions (technology and craftsmanship), etc^{24,25}.

For the natural environment, whether for primary agricultural products, agricultural machinery, raw materials or processed products, the natural environment inevitably determines the characteristic quality and taste of the agricultural products produced in this region, invariably becoming one of the most important parts of the brand's promise of quality²⁵. Terroir is not only innate, natural and material, but also acquired, social and anthropogenic. For the humanistic environment, GIs reflect the different ways in which people in a particular geographic environment interact with natural conditions by means of production processes, procedures, recipes, tools, storage, transport, and packaging^{26,27}. This is due to: different awareness and understanding of innate elements within a given territory, different levels of respect and improvement of traditional ways of doing things, and different levels and ways of passing on relevant experiences²⁶.

A distinctive terroir contributes to brand style and favours the sales and export profile of GI agricultural products²⁸. Therefore, although more advanced processes and

equipment, as well as production models, are being used in the production of agricultural products, agricultural producers and related practitioners around the world are still trying to create GI brands with distinctive “terroir” characteristics. For example, wine and coffee products are closely linked to the terroir of their regions of production. The aroma and flavour of French Bordeaux wines directly reflect the terroir of the vineyard²⁹. Yunnan coffee has a unique flavour and brand image influenced by the unique local natural environment and cultural atmosphere in Yunnan³⁰.

Risks of Gi Agricultural Product Brands

Impact of Climate Change on The Production of Products.

Climate change and increased extreme weather events may exacerbate the livelihood vulnerability of growers of GI agricultural products³¹. In terms of the exposure-sensitivity-adaptation vulnerability analysis framework³², the impacts of climate change are manifested in the adverse effects of climate change on the ecological environment and growth process of GI agricultural products, the high impacts of climate change on the production of GI agricultural products, and the poor adaptability of producers to the impacts of climate change. Therefore, in the face of the negative impacts of climate change, producers of GI agricultural products need to adopt adaptation strategies to cope with the impacts of climate change, such as the reduction of agricultural yields and income.

Prevalence Risk.

The dissemination of infectious diseases and epidemics significantly disrupts agricultural supply chains, impacting the brand integrity of Geographical Indication (GI) agricultural products³³⁻³⁶. These disruptions manifest both directly on the products and indirectly through broader implications for brand reputation during infectious outbreaks.

Concerning GI agricultural products, diseases primarily diminish yields and quality, especially in regions susceptible to recurrent outbreaks, exemplified by the decline in potato yields in Kenya due to plant diseases. Conversely, inadequate management of GI products fosters pathogenic organisms and agricultural fraud, posing threats to consumer health and brand perception, as evidenced by the presence of pathogenic bacteria in traditional Turkish cheeses³⁷.

Within the epidemiological context, the traditional distribution model for agricultural products is inherently limited by numerous distribution links, lengthy channels, and high costs. During major infectious disease outbreaks, this model faces exacerbated challenges, leading to supply shortages, transport obstacles, supply chain disruptions, and sales stagnation for GI agricultural products³⁸. Consequently, there has been a significant shift towards innovative e-commerce strategies, exemplified by the adoption of "Internet + Agriculture," as seen in the marketing of Dandong strawberries.

Moreover, agricultural products, serving as potential vectors for virus transmission during infectious outbreaks, engender substantial concerns across public health, economic, and societal domains. This concern is particularly pronounced for epidemic

infectious diseases linked to livestock and poultry, including COVID-19, Avian Influenza (H5N1), Influenza A (H1N1), SARS, MERS, and Ebola.

Industry Risks.

Industry risks faced by GI agricultural product brands include policy change risks and industry barrier risks.

From the perspective of policy change risk, GI agricultural product brands are affected by changes in the scope of trade agreements, GI application conditions, and GI management mechanisms. This is manifested in the following ways: firstly, the inclusion of some GI varieties in trade agreements may provide opportunities for GI agricultural producers to increase their market access³⁹, while brands that are not included in trade agreements will be hindered in inter-regional transactions. Next, to protect the reputation of GI agricultural brands and increase the international recognition of China's GI certification, the GI application conditions, and quality requirements will increase accordingly. Finally, GIs are a new type of intellectual property, and their management mechanisms will be specifically established to keep up with the times and iterate^{40,41}.

In terms of the risk of industry barriers, green barriers and technical barriers can hinder the development of GI agricultural product brands. Green trade barriers lie in protecting the health of humans, plants and animals, while technical trade barriers ensure product quality and safety. Firstly, the main forms of green barriers encountered by agricultural products include strict restrictions on pesticide residues, quarantine measures, green labelling and packaging, and the imposition of environmental surtaxes⁴². In addition, technical barriers are mainly realised through technical regulations, technical standards and conformity assessment procedures. What's more, when individual countries use the WTO's SPS (sanitary and phytosanitary) and TBT (sanitary and phytosanitary) provisions as trade protection measures to protect the interests of domestic producers, the existence of barriers not only increases the cost of trade and restricts international trade, but also restricts the choice of goods for consumers and puts developing countries in a disadvantaged position with regard to agricultural exports⁴³. Statistically, in terms of agricultural exports being blocked due to these two types of barriers, FDA (US Food and Drug Administration) notification data from 2009-2013 show that exports of 1,944 products with agricultural and food products as the main products have been blocked.

Management of GI Agricultural Product Brands

Internal Brand Management of GI Agricultural Products.

From a brand management perspective, governmental bodies, enterprises, agricultural cooperatives, industry associations, and other stakeholders play crucial roles in the branding of Geographical Indication (GI) agricultural products^{44,45}.

Each entity can enact appropriate measures within its capacity and responsibility. Governments can offer policy, financial, and infrastructure support while enhancing brand quality awareness through training and publicity efforts⁴⁶. Enterprises can bolster brand marketing and introduce technology and talent to refine GI product management

^{44,47}. Agricultural cooperatives can provide training and disseminate knowledge to enhance local GI brand management and alleviate poverty. Moreover, improving agricultural producers' skills contributes to technological advancements and fosters the high-quality development of agriculture.

Collaboration among various stakeholders is essential to enhance the quality of GI agricultural product brands, encompassing four key perspectives: Firstly, the government and enterprises should maintain continuous quality supervision, including strict control of access standards, standardized management of production processes, and continuous supervision^{47,48}. Secondly, collaboration between the government, leading enterprises, and academic institutions should prioritize research and development to increase the added value of agricultural products through technological innovation⁴⁸. Thirdly, cooperation between the government, agricultural producers, and cooperatives is vital for cultivating regional brands and promoting industrial upgrading⁴⁷. This involves aligning the industrial chain with market demands, emphasizing green ecological concepts, and expanding the scale of production while ensuring unified standards. Lastly, internal coordination among the government, agricultural cooperatives, and industry associations is necessary to prevent conflicts and ensure harmonious relationships within the agricultural GI industry⁴⁹. Collaboration should be structured around contract-based mechanisms supplemented by legal norms to facilitate cooperative relationships.

External Protection System of GI Agricultural Products.

The legal framework governing GI agricultural product brands suffers from imperfections and insufficient promotion of agricultural modernization⁵⁰. Issues include convoluted registration processes, conflicts between GI rights and trademarks, redundant protection measures, and inadequate supervision.

This is attributed to the disjointed "triad model", wherein legislation pertaining to GI agricultural product brands lacks coherence and overlaps⁵¹. Consequently, traditional intellectual property mechanisms and regulatory bodies struggle to address this complexity.

The imperfect protection mechanism results in inconsistent enforcement and duplicative measures⁵¹. For instance, GI trademark protection encompasses both products and agricultural products, leading to redundant declarations and protections⁵².

Furthermore, regulatory bodies are inadequately equipped to handle the multifaceted nature of GI agricultural product brands^{50,51,53}. This complexity involves various entities registering the same brand through different avenues, exacerbating the challenges of registration, supervision, and protection. Consequently, there is a growing demand for specialized legislation and enhanced regulatory frameworks.

Strategic Guidance of GI Agricultural Product Brands

Science, Technology and Talent.

Science, technology and talent strategy refers to the strategy of developing agriculture through science and education, the strategy of strengthening agriculture through talents, and the strategy of innovation-driven development, which is embodied in three

aspects: first, the quality of GI agricultural products, the production tools, the production methods, and the management methods, etc., need to be innovated and developed in accordance with local conditions^{54,55}. Secondly, the enhancement of the competence of producers of GI agricultural products provides the scientific and cultural basis for agricultural modernisation, i.e., the application of high and new technologies in efficient agricultural production⁵⁶. Finally, the construction and protection of GI agricultural product brands should take scientific and technological innovation as the new motive force for development, i.e., strengthening the use of science and technology in the development of GI agricultural product brands. For example, big data can promote the development of intelligent agriculture, and green technology can be applied to environmental protection^{57,58,59}.

Rural Development.

GI agricultural product brands present different brand images influenced by rural development^{60,61}. For example, the Inner Mongolia Hulunbeier lamb brand is more likely to be perceived as “high quality” than the Inner Mongolia Ulanqab lamb brand. This means that local development can indirectly affect the brand of GI agricultural products by influencing the image and popularity of the place.

3.4 Research Result

In summary, China's research on the factors influencing the quality and governance of GI agricultural product brands started later than abroad, and has experienced ups and downs and a downturn in development, but the overall trend is upward. Table 3 summarises the comparison of research directions in domestic and international literature.

Table 3. Comparison Table of Domestic and International Research Topics

Comparison Table of Domestic and International Research Topics		
Region	China	Domestic and international
Research themes		
Research Topics		
	Existing research	Existing research
Style and image	Research on the Mechanism and Evolution of Legal Protection of Origin Research on ecological protection model and strategy of origin	Research on the Impact of Brand Image of Origin on Consumption Preference Research on the origin protection mode and its influence mechanism on the brand quality of GI agricultural products

		Research on the Influence of Terroir on the Formation and Brand Effect of GI Agricultural Product Brands		
Risks	Existing research	Missing research	Existing research	Missing research
	Research on GI Agricultural Products Marketing Model Innovation	Research on the Green Warehouse Logistics Construction and Improvement Measures	<p>Research on the negative impacts of climate change on GI agricultural brands and a framework for analyzing them</p> <p>Research on the impact of epidemiological and infectious disease contexts on the supply chain of GI agricultural brands</p> <p>Research on the impact of policy changes on GI agricultural brands</p> <p>Research on the Formation of Industry Barrier Risks and the Mechanism of Impact on GI Agricultural Product Brands</p>	<p>Research on Strategies for Facing Climate Change and Epidemics</p> <p>Research on strategies for Facing Industry Barriers</p>
	Existing research		Existing research	
Management	<p>Research on the Establishment and Improvement of Green Logistics System for GI Agricultural Products</p> <p>Research on the Construction of Public Information Service Platform for GI Agricultural Products</p> <p>Research on the Influence and Strategy of E-commerce Operation Mode on the Brand Quality of GI Agricultural Products</p> <p>Research on the Role of Economic Co-operation Organizations on Brand Quality Construction of GI Agricultural Products</p> <p>Research on the Establishment and Improvement of Protection Mechanisms and Regulatory Institutions</p>		<p>Research on economic model combining landscape value and economic value</p> <p>Research on the Role and Strategies of Various Subjects in the Branding of GI Agricultural Products</p>	

Strategic Guidance		Research on the Promoting Role of Science and Technology Innovation on the Development of GI Agricultural Product Brand Quality Research on the Contributing Role of Regional Development to the Quality Improvement of GI Agricultural Product Brands
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4 Research Conclusion and Prospect

4.1 Research Conclusion

This paper presents a literature analysis of research on the factors influencing the quality and governance of GI agricultural product brands, based on statistical and scientometric analysis methods and using CiteSpace software as a tool. Two main conclusions were drawn from the analysis. (1) Through quantitative research, this paper finds that the foreign research trend of GI brand quality is divided into three stages, which are: newborn, growth and twisty period; the research trend of domestic GI brand quality is divided into four, which are: budding, growth, scale, and twisty period. (2) Through qualitative research, this paper finds that there are 11 research hot words receiving attention, and summarises them into four research hot themes, namely, "the style and image of geographical indication agricultural product brands", "the risk of geographical indication agricultural product brands", "the risk of geographical indication agricultural product brands" and "the risk of geographical indication agricultural product brands". "Governance of Geographical Indication Agricultural Product Brands" and "Strategic Guidance of Geographical Indication Agricultural Product Brands".

4.2 Research Prospect

To improve the brand quality of GI agricultural products, based on the above research, this paper believes that it can be studied in the following three aspects.

(i) Research on brand governance system of GI agricultural products in the new era

Although the existing legal and regulatory systems are comprehensive, they still face many problems in the process of certifying and protecting GI agricultural product brands. Therefore, attention needs to be paid to research related to clarifying the conditions for certification of GIs, promoting standardised production, improving the supervision mechanism, innovating the operation mode and exploring the benefit linkage mechanism, so as to adapt to the context of the new era and make up for the shortcomings of the existing management system.

(ii) Research on the use of science and technology in the quality management of GI agricultural product brands

The development of science and technology brings more possibilities for brand quality management

of GI agricultural products. As the level of technology improves, how to fully apply innovative technology and high technology to the ecological protection (e.g.

product innovation and research and development, scientific use of pesticides and fertilisers, greening of cultivation methods, digital supervision, etc.) and economic enhancement (e.g. improving the quality of agricultural practitioners, modernising cultivation methods, building digital platforms, and smart agriculture, etc.) of GIs agricultural products will be of continued interest to the field.

(III) Research on quality risk management of GI agricultural product brands

External risks pose challenges to the quality management of landmark agricultural brands. Climate change and epidemics are hitting supply chains, and there is still a gap in research on strategies for how relevant actors can cope with this blow, such as research on the marketing model of agricultural products during epidemics, access standards, quality control systems, and green logistics and warehousing systems.

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