ISSN 2409-2665
Journal of Logistics, Informatics and Service Science
Vol. 13 (2026) No. 5, pp. 247-267
DOI:10.33168/JLISS.2026.0514

Trust in Green Agricultural Products: A Bibliometric Review of Traceability, Certification, and Information Transparency (2015–2025)

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Abstract. Trust is pivotal to the market uptake of green agricultural products, yet it is rarely theorized as an explicit outcome of how agricultural food service systems generate, verify, and circulate information. This study analyzed 177 articles in the Web of Science core collection (2015-2025) using Bibliometrix R software and drew on trust theory and signal theory as explanatory frameworks. This study addresses three issues related to key stakeholders, intellectual structure, and research gaps. The study also found that after 2020, publications led by China, the United States, and India steadily increased and significantly accelerated. Keyword co-occurrence reveals four thematic clusters centered on trust–behavior relationships, organic consumption and willingness-to-pay, information assurance and traceability systems, and sustainability-oriented agricultural governance. The co-citation analysis identified three traditions: the attitude behavior gap school, the trust gap school, and the SEM based methodological tradition. The evolution of the theme indicates that blockchain and traceability systems have been transformed into emerging methods for building consumer trust. Key research gaps still exist, including the isolation between authentication research and trust behavior discourse. The moderating role of trust in preference formation and purchasing behavior has not been fully explored, as well as the disconnect between production side sustainability and consumer side trust perception. These findings have implications for researchers, policy makers, marketers, and farmers involved in the certification and promotion of green agricultural products.

Keywords: Consumer Trust; Green Agricultural Products; Bibliometric Analysis

1. Introduction

With the continuous intensification of industrialization and urbanization, the agricultural ecological environment is facing increasing pressure. As a fundamental field for human survival and economic development, green agriculture is particularly vulnerable to these challenges. The environmental pollution caused by economic development has attracted sustained global attention nowadays (Bhardwaj et al., 2020). Therefore, green agricultural products have been recognized by society as an effective means to enhance agricultural economic benefits. The market price of green agricultural products is usually 20% to 30% higher than that of traditional agricultural products (Donnik et al., 2016). Consumers often cannot directly verify their environmental and safety attributes when purchasing, so green agricultural products are often referred to as typical trust goods. Based on this, consumers' acceptance of green agricultural products depends not only on product characteristics, but also on whether the surrounding cultural food service system can reliably disclose and verify the full process information of product production, processing, certification, etc. to consumers. This makes trust no longer a single psychological tendency, but the result of evaluating the information environment of green claims.

Under the framework of sustainable development, green agricultural products refer to agricultural products produced in accordance with specified production standards (Fu et al., 2025). Once certified by authorized bodies, they are entitled to bear the green food label, which indicates that the products are pollution-free, safe, high quality, and nutritionally rich (Ma et al., 2022). This product has the characteristics of efficient resource utilization and limited environmental pollution, so it can provide excellent quality to consumers and society at a lower total cost (Bhardwaj et al., 2020). Therefore, the sustainable expansion of green agricultural products has a dual purpose. It can reduce environmental pollution and alleviate the government's financial burden (Fu et al., 2023). Meanwhile, green agricultural products can improve agricultural quality and extend the industrial chain, opening up new income channels for farmers (Yang et al., 2021). All of these have contributed to broader social and economic progress.

Research on green agricultural products has covered a wide range of topics. Most research has focused on the supply chain (Yu & Rehman, 2022; Li et al., 2023; Hu et al., 2023; Wang et al., 2024), agricultural growth (Li et al., 2021; Habib et al., 2023), perceived value (Xu et al., 2022; Yang et al., 2023; Chen et al., 2025), and purchase intention (Dong et al., 2022; Fu et al., 2025), with emerging attention on block-chain technology (Liu et al., 2023; Camel et al., 2024). Despite this relevance, the role of trust in the green agricultural products context has received limited scholarly attention. Trust has been recognized as a key prerequisite for establishing a functioning green food market (Daugbjerg et al., 2014). However, consumers often doubt the authenticity of green product labels and are concerned about being misled into purchasing fake green agricultural products (Chen et al., 2025). The difficulty in verifying the production process to confirm whether green agricultural products truly meet green standards has further fueled consumer skepticism and affected the development of the green agriculture market. If left unchecked, this distrust may hinder the transition from high-energy-consuming, high-polluting agriculture to sustainable alternatives. When consumers do not trust the claimed benefits of green agricultural products, their perceived value cannot be translated into actual purchasing behavior. Therefore, it will weaken the competitiveness of green agricultural products, deepen consumers' doubts about their quality and authenticity, and ultimately limit market demand. The current low demand for green agricultural products will force the government to bear higher environmental governance costs (Daugbjerg et al., 2014). Therefore, exploring the impact of trust on green agricultural products is crucial for both academic research and industry practice. However, existing literature generally regards trust as a universal psychological construction but fails to fully explain the generation mechanism of trust in the system level information architecture.

A survey of existing reviews through keyword-based searches confirmed that trust has been largely overlooked in green agricultural products scholarship. Prior reviews have concentrated on green products broadly (Bravo et al., 2022), emerging directions in green agriculture (Hoa et al., 2024), and supply chain management (Zuhri et al., 2025). Although these reviews provide an important background for the trust research of green agricultural products, they fail to systematically trace the generation mechanism of trust. This research gap urges the researchers to systematically investigate the conceptualization, trust relevance and characteristics of information mechanisms in the field of green agricultural products over time through bibliometric methods.

Bibliometric findings require a theoretical lens to move beyond description, and two established perspectives anchor the interpretation here, which are trust theory and signaling theory, together with recent meta-analytic evidence on the antecedents of consumer trust. Mayer et al. 's integrative trust model treats trust as a composite of perceived ability, benevolence, and integrity, offering a robust basis for analyzing how consumers judge the credibility of green agricultural product claims (Mayer et al., 1995). These dimensions carry particular weight in markets where compliance with green standards cannot be directly observed in the production process. Signaling theory complements this view: under information asymmetry, producers rely on credible signals such as eco-labels, third-party certifications, and brand reputation, to convey quality attributes that consumers cannot inspect firsthand (Shahid et al., 2024), and green agricultural product certifications are a textbook case of such trust-building signals. Empirical support comes from Khamitov et al.'s large-scale meta-analysis, which found that integrity- and reliability-based antecedents are strengthening as drivers of consumer trust. This strengthens the rationale for studying how these dimensions specifically shape the field of green agricultural products (Khamitov et al., 2024). Overall, these perspectives establish what should have been a descriptive mapping, grounded in a theoretical understanding of the knowledge structure and unresolved gaps in the field, providing an analytical framework for this econometric research.

The main contribution of this study is not only to sort out the literature in the field of green marketing, but also to innovatively regard consumers' trust in green agricultural products as the product of information transparency and information circulation mechanism in the agricultural food service system. At the empirical level, this study reveals the dynamic evolution of trust research by analyzing the growth model of publication and citation, the most influential articles, major institutions and countries, and the co-occurrence structure of key words related to trust formation. At the theoretical level, this study illustrates how certification, compliance signals, traceability infrastructures, and platform-mediated service channels can be integrated into the field of trust research and pointed out the key concept gap. These findings provide an important reference for scholars who explore the evolution of trust in green agricultural products research, as well as enterprises and policy makers who are committed to building a credible agricultural food system.

Based on these perspectives, the study addresses three research questions:

RQ1: Which stakeholders (influential articles, leading countries, and active alliances) are most prominent in the research of trust in green agricultural products?

RQ2: What core themes and intellectual structures underpin this field, and what do keyword co-occurrence and co-citation networks reveal about its theoretical foundations?

RQ3: What critical research gaps remain at the intersection of trust and green agricultural products, and which theoretically grounded directions should future work prioritize?

The conceptual framework in Figure 1 maps these questions onto three analytical dimensions: performance analysis of key stakeholders (RQ1), intellectual structure mapping through co-occurrence and co-citation networks (RQ2), and thematic evolution analysis for identifying research gaps (RQ3). Trust theory and signaling theory cut across all three dimensions as the interpretive lenses through which the bibliometric findings are read.

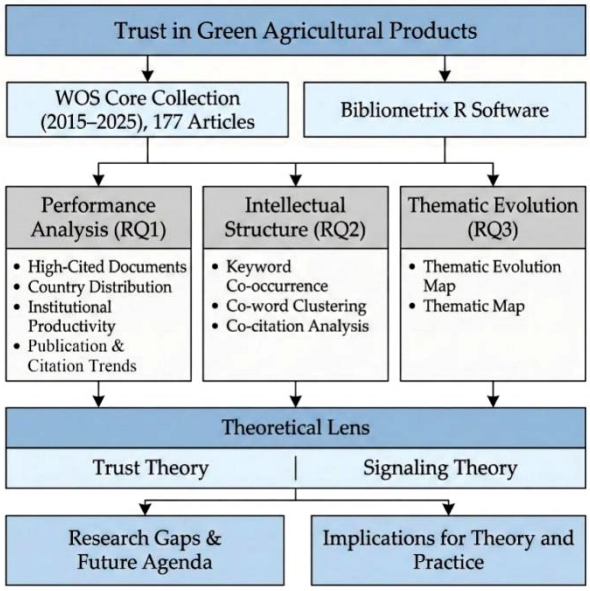

Fig.1: Conceptual framework of this study

2. Methods

The present study used bibliometric methods to map how trust has been conceptualized in the green agricultural products literature as an outcome of information transparency. As a quantitative approach to large-scale scientific data, bibliometric analysis offers a degree of rigor that traditional systematic reviews cannot easily match, with their reliance on manual screening, classification, and qualitative synthesis (Donthu et al., 2021). Where conventional reviews depend on the reviewer's judgment at each stage, bibliometric analysis evaluates the full body of relevant literature in a field and quantifies publication trends, keyword patterns, citation networks, and collaboration structures. Applied here, co-citation and keyword co-occurrence analyses reveal the position of trust within the knowledge base of green agricultural products and gauge its academic influence (Öztürk et al., 2024), while substantially reducing the subjective element that accompanies traditional review methods.

The Web of Science (WOS) core collection was selected as the data source to ensure the authority and quality of the retrieved literature. WOS is widely regarded as one of the most authoritative databases for indexing high-quality academic publications (Donthu et al., 2021). The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework was adopted to guide the data screening process, which consists of four stages: identification, screening, eligibility, and inclusion. In the identification stage, the following search string was applied to the topic field *TS=(("green agricultur*" OR "organic farm*" OR "eco-friendly product*") AND (“trust” OR "consumer trust" OR "seller trust")),* generating a total of 255 articles from the first search. In the screening stage, records were filtered by retrieval year (2015–2025) and language (English), removing 44 records and leaving 211 records. Document types classified as data papers and editorials were further excluded, yielding 210 records. In the eligibility and inclusion stages, records were retained only if they belonged to relevant subject categories, including environmental sciences, environmental studies, agricultural multidisciplinarity, business, management, economics, and agricultural economics policy, resulting in a final dataset of 177 articles.

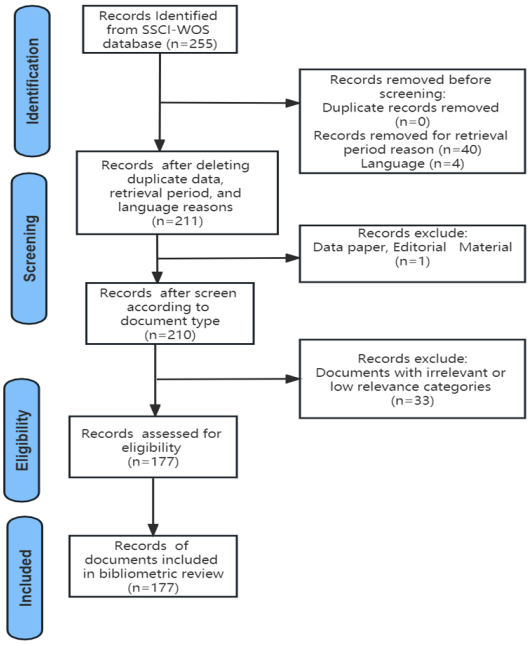

Fig.1: Flow diagram of the search strategy

The bibliometric analysis was carried out with Bibliometrix, an open-source software package built on the R programming language (Kemeç & Altınay, 2023). Bibliometrix integrates a code editor, console, graphical output window, debugging tools, and package manager within a single interface, which streamlines the workflow from raw data import through statistical computation to the generation of publication-level visualizations (Derviş, 2019).

3. Results

3.1. Performance analysis

3.1.1. Publication and citation performance

The bibliometric results cover 177 studies published across 113 sources between 2015 and 2025 (Table 1). In total, 571 authors contributed to this literature, and the average article attracted 25.16 citations. Multi-authored work predominates — only 15 articles were single-authored. Trust in green agricultural products first entered the WOS database as a research topic in 2015; since then, the field has expanded at an annual growth rate of 22.48%. Table 1 summarizes the research on trust in green agricultural products from 2015 to 2025, including data such as the average age of documents and international co-authorships.

Publication records show 5 articles in 2015 and 9 in 2016, with the cumulative count reaching 177 by 2025. Higher living standards and a sharpened consumer awareness of food safety and environmental degradation have together channeled more academic attention toward green agricultural products. Trust sits at the center of this attention, recognized as a key prerequisite for the green agricultural products market to function (Daugbjerg et al., 2014), and is closely tied to the uptake of green production practices. The upward path in publication volume shows no sign of leveling off.

Table 1: Publication and citation matrix

Description	Results
Main information about the data	
Timespan	2015:2025
Sources (Journals, Books, etc.)	113
Documents	177
Annual Growth Rate %	22.48
Document Average Age	3.19
Average citations per doc	25.16
References	9828
Document contents	
Keywords Plus (ID)	453
Author's Keywords (DE)	674
Authors	
Authors	571
Authors of single-authored docs	15
Authors collaboration	
Single-authored docs	16
Co-Authors per Doc	3.39
International co-authorships %	24.86
Document types	
Article	151
Article; book chapter	2
Article; early access	7
Proceedings paper	10
Review	7

3.1.2. Growth trend of publications

Figure 3 shows the annual article count of trust in green agricultural products from 2015 to 2025. The production has steadily increased over the past decade and has significantly accelerated since 2020. The overall research in this field can be divided into three general stages:

1. Slow growth stage (2015-2020): The annual output of this research field is less than 20 articles and has been fluctuating. During this period, due to limited market demand for green agricultural products, researchers' attention to them was relatively low, leading to academic marginalization of this topic.

2. Rapid growth period (2020-2025): After 2020, the publication volume of this research field has continued to increase. This growth is due to consumers' heightened sensitivity to food safety and environmental protection following the COVID-19 epidemic, making live streaming the preferred channel for green agricultural product sales. The issues of information transparency and authenticity involved in live streaming have led researchers to pay more attention to trust mechanisms. This trend adds a micro perspective to green economic growth as well.

3. Approaching saturation (after 2025): With the increasing maturity of information technologies such as blockchain and big data, the production and distribution of green agricultural products have become increasingly transparent. This suggests that research in this field may enter a relatively mature stage, thereby enhance consumer trust and reduce market uncertainty. As foundational trust issues are progressively resolved, the focus of academic inquiry may shift to more specialized subtopics.

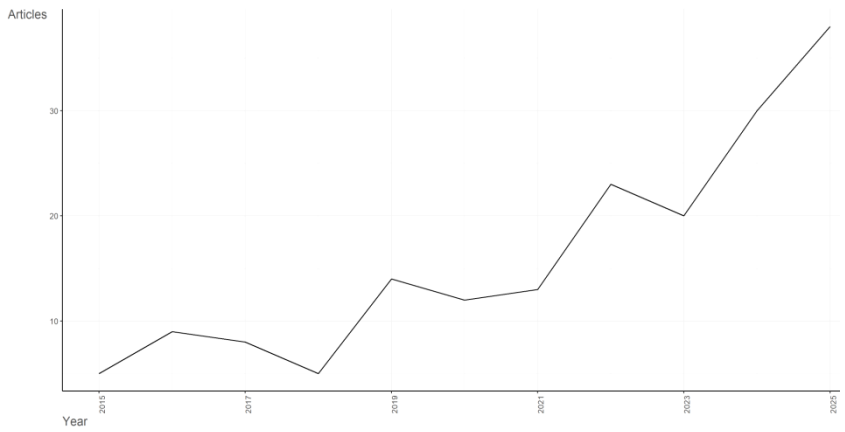

Fig.3: Annual publication trends in green agricultural products research

3.2. Most prolific stakeholders

3.2.1. Most prolific articles

Table 2 ranks articles by total citation count, a widely used proxy for scholarly influence (Chughtai et al., 2018). Aschemann-Witze and Zielke (2017) tops the list with 324 citations (36 per year) for a review of consumer perceptions of organic food pricing and related purchasing behavior, a citation volume that underscores how central price perception remains to this research domain. The second- and third-ranked articles both involve Dhir as co-author: Tandon et al (2020), examining the moderating effects of environmental concern and trust on organic food purchases, has accumulated 274 citations (45.67 per year), while Kushwah et al (2019), on ethical consumption intentions, has reached 206 (29.43 per year). Two of the three most-cited works foreground environmental concern and trust, pointing to the weight these constructions carry in the field. At the other end of the spectrum, Liu et al (2025) have attracted just 1 citation, a figure consistent with the still-nascent standing of blockchain technology in green agricultural research; the technology's potential for resolving trust problems in the food supply chain has yet to translate into sustained scholarly engagement.

Table 2: Most prolific articles in green agricultural products research

Authors	Year	Total Citation	Total Citation per year
ASCHEMANN-WITZEL J	2017	324	36
DHIR A	2020	274	45.67
DHIR A	2019	206	29.43
ALFINITO S	2019	73	10.43
LIU H	2023	71	23.67
HE GY	2023	71	23.67
FU SL	2023	71	23.67
GOMES S	2024	57	28.5
FOGARASSY C	2023	33	11
FOGARASSY C	2019	31	4.43
ALFINITO S	2021	24	4.8
DUONG CD	2024	23	11.5
LIU H	2022	18	4.5
HUANG YT	2022	18	4.5
FU SL	2022	18	4.5
ASCHEMANN-WITZEL J	2023	18	6
FU SL	2025	3	3
DUONG CD	2025	2	2
LIU H	2025	1	1

3.2.2. Most prolific countries

To assess each country's contribution to this field, the number of publications from 54 countries was surveyed using Bibliometrix R software, with the results displayed in Figure 4. Darker shading indicates higher publication volume, while gray denotes zero output. The geographic distribution of publications is notably uneven, with research activity concentrated in a limited number of countries.

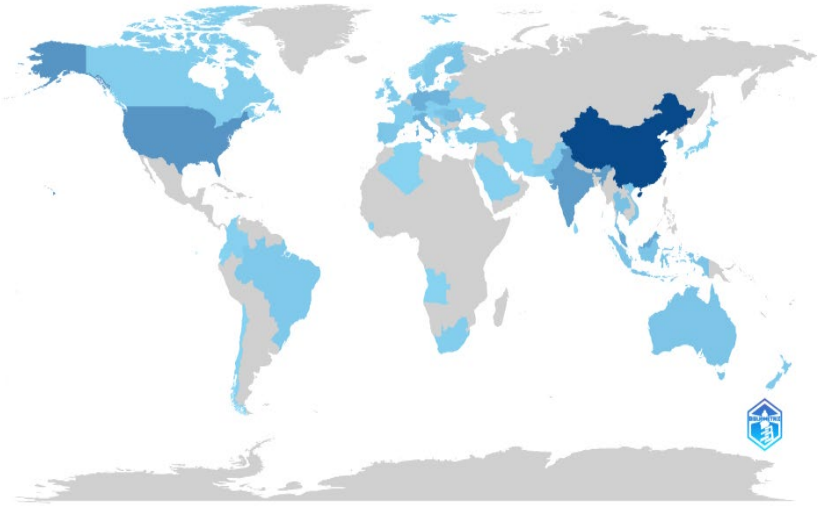

Fig.4: Countries' scientific production in green agricultural products research

Table 3 shows China at the top of the output ranking with 78 publications and 680 citations. This dominance reflects the country's position as a major agricultural economy in which both government policy and public awareness have placed green agricultural products and food safety high on the agenda. A succession of central-government initiatives aimed at promoting green agricultural production, with goals spanning rural employment growth and the integrated development of primary, secondary, and tertiary rural industries, has provided fertile ground for research activity. The USA follows with 34 publications, though its citation total is comparatively modest, barely exceeding that of Finland. Thailand appears in 10 co-authored articles but achieves the highest average citations at 39, because the average citation metric in Bibliometrix is based on corresponding-author papers rather than all co-author affiliations. The gap between the two counts points to Thailand's role as a frequent collaborator rather than a primary research leader in this domain, yet the few Thailand-led papers attracted notably high citations.

Table 3. Countries with the top 10 publication outputs in green agricultural products research

Rank	Country	Publication	Total Citation	Average Citations
1	CHINA	78	680	17
2	USA	34	37	5
3	INDIA	29	459	33
4	MALAYSIA	23	243	27
5	GERMANY	19	136	17
6	ITALY	18	207	19
7	POLAND	17	182	26
8	ROMANIA	12	38	5
9	THAILAND	10	78	39
10	FINLAND	9	7	7

3.2.3. Most prolific affiliations

Figure 5 maps the ten most productive affiliations by node size, with larger circles indicating higher publication counts. South China Agricultural University and Wageningen University and Research share the top position at 7 publications each over the 2015–2025 period. Their joint prominence is not coincidental; the former offers deep contextual knowledge of Chinese agricultural science and food safety, while the latter brings an established European tradition in sustainable agriculture and consumer behavior research, the pairing of complementary strengths that accounts for their visibility in this field. These are followed by the University of Gottingen, with 6 publications, and the "Hungarian University of Agriculture and Life Sciences", with 5 publications, over ten years.

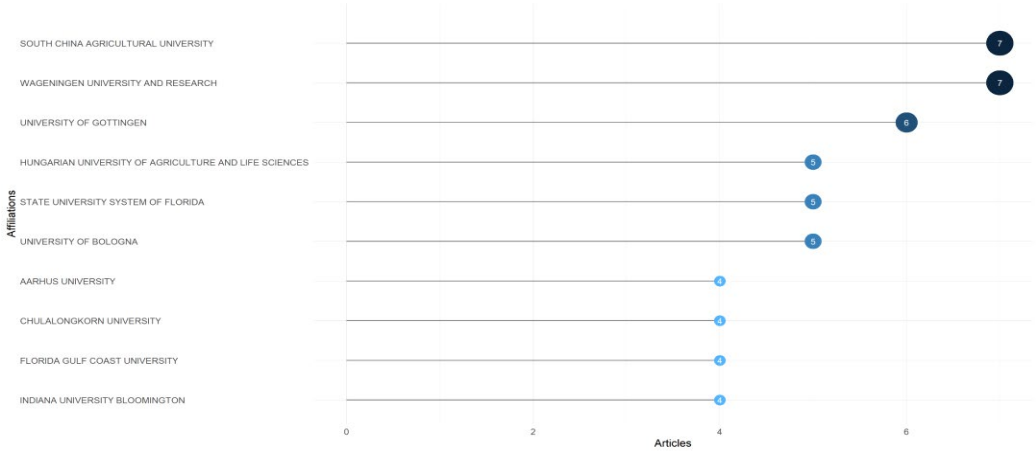

Fig.5: Most prolific affiliations in green agricultural products research

3.3. Intellectual structure about trust in green agricultural products research

3.3.1 Keyword analysis

Keyword analysis captures the thematic backbone of a research field by surfacing recurring topics, cross-disciplinary links, and shifts in scholarly focus (Lardera & Hjorland, 2021). A frequency analysis of author keywords across the 177 articles, visualized as a word cloud in Figure 6 (node size proportional to frequency), placed "trust" at the top with 53 occurrences, which squares with its role as a direct determinant of consumer purchase decisions and, by extension, of market acceptance of green agricultural products and the sustainable trajectory of the agricultural economy. "Consumption" (39 occurrences) and "behavior" (36) followed closely, signaling that the literature gravitates toward the pathways through which trust shapes consumer attitudes, preferences, and decision-making and, downstream, the market share and scale of the green economy. "Organic food" registered 38 occurrences, pointing to a sustained preoccupation with whether organic certification and labeling can close the information gap between producers and consumers and thereby strengthen trust in product quality across diverse consumer segments.

Fig.6: Author keywords' word cloud

Since the topic-field (TS) search captures only author-designated keywords, a supplementary trend analysis was conducted using Bibliometrix R software to examine the temporal evolution of research themes across the 177 articles. As shown in Figure 7, where node size represents keyword frequency, "organic food" and "trust" were the dominant keywords in 2022 and 2023. This pattern reflects the central role of consumer trust in driving market growth for green agricultural products. As market awareness of green products has matured, however, research attention has gradually shifted toward more specific subdivisions. By 2025, research emphasis shifted toward "adoption" and "technology", reflecting growing interest in how technological tools, particularly traceability systems and digital platforms, facilitate consumer adoption of green agricultural products and strengthen trust through improved information transparency.

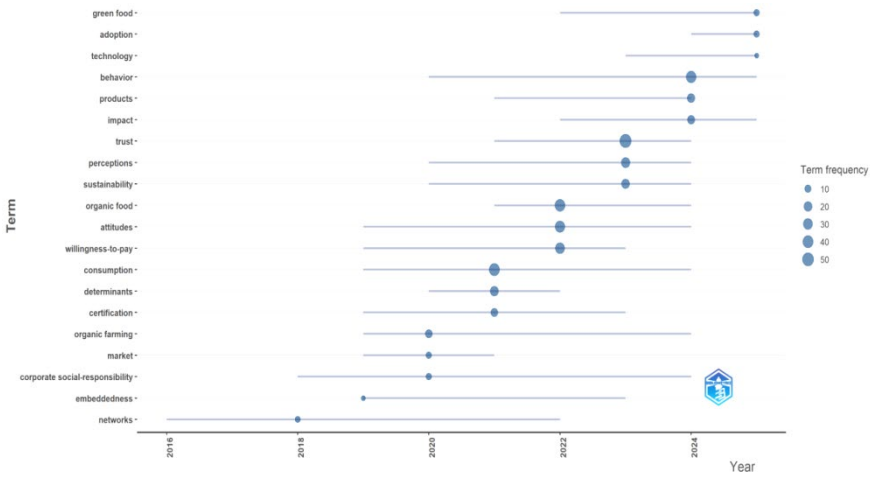

Fig.7: Author keywords trends by years

3.3.2. Co-word Analysis

Co-word analysis is among the most established bibliometric techniques for revealing how themes within a field connect and how its intellectual agenda has shifted over time (Öztürk et al., 2024). The co-word network for trust in green agricultural products (Figure 8) partitions into four color-coded clusters, each corresponding to a distinguishable thematic strand. Node size encodes keyword frequency and edge thickness captures co-occurrence strength, with ties running denser within clusters than

between them (Kemeç et al., 2023). “Trust” anchors the entire network, carries the largest node and the strongest cross-cluster links, leaving little doubt about its centrality to the green agricultural products literature. High-frequency nodes for "consumption", "organic food", "behavior", and "attitudes" cluster closely together, indicating that consumer decision-making serves as the organizing spine of the field.

The blue cluster binds "organic food", "consumption", and "trust" into a tightly knit subnetwork characteristic of a mature line of inquiry. Organic food is a good credence par excellence, quality cannot be assessed prior to purchase, whose elevates trust to a decisive role in consumption decisions. In the red cluster, "trust" links to "behavior", "products", and "impact", shifting the lens from stated intentions to whether trust actually converts into purchasing action.

The green cluster links the four elements of “perception mechanism”, “quality control”, “certification system” and “blockchain technology” to the framework of information assurance and traceability system. In this cluster framework, certification qualification and quality indicators play the role of service governance and compliance signals. At the same time, blockchain technology and traceability tools are used as infrastructure. They can serve as a continuous guarantee of information quality and traceability in the agricultural food service system.

The purple cluster, organized around "agriculture" and "sustainability", takes a macro-level production view in which trust is situated within sustainable agricultural systems. That this cluster sits relatively apart from consumer-oriented clusters signals a disconnect between production-side sustainability efforts and consumer-side trust perceptions, with a gap the current literature has yet to convincingly bridge.

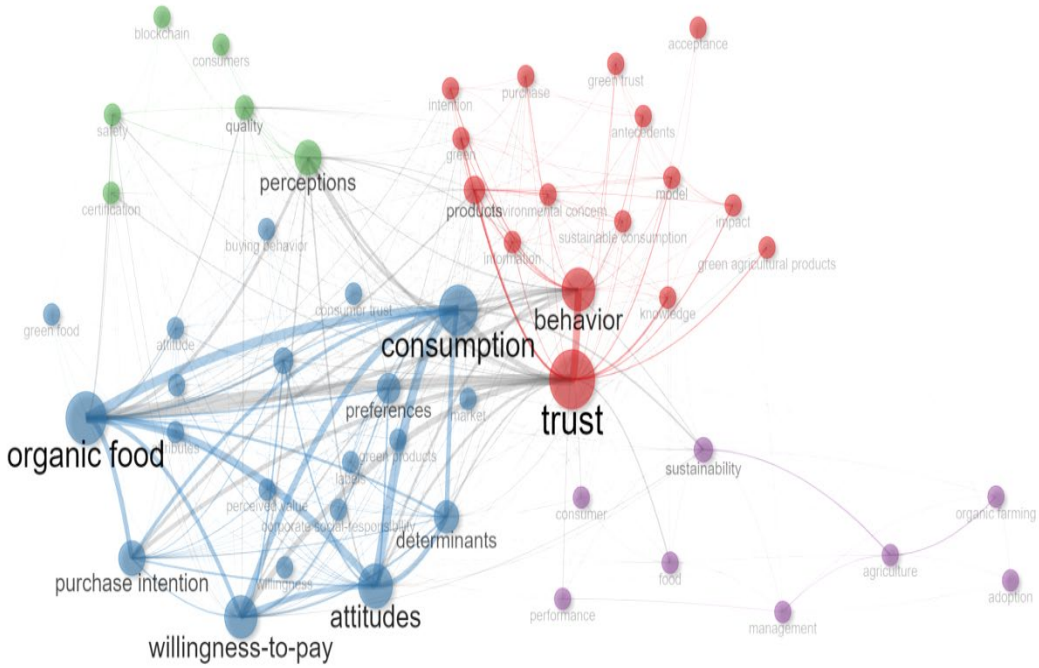

Fig.8: Network of co-word clusters

Table 4 catalogues the keyword nodes belonging to each cluster; what follows reads their theoretical significance. The tight within-cluster pairing of "consumer trust", "attitudes", and "purchase intention" in Cluster 2 aligns with the Theory of Planned Behavior (Ajzen, 1991), where trust operates as an attitudinal antecedent that feeds into behavioral intention, which in turn influences purchase behavior. Cluster 1 approaches the construction from a different direction: with "trust" sitting alongside "behavior" and "environmental concern", the emphasis falls on the direct and conditional effects of trust

on what consumers do. In Cluster 3, the co-occurrence of “perceptions”, “quality”, and “certification” indicates that trust not only stems from symbolic quality claims, but is also closely related to traceability and the reliability of information system operations. Cluster 4 ties "agriculture" to "sustainability" within a broader agricultural-economics frame, yet its thin connections to the consumer-oriented clusters point to a persistent divide between supply-side and demand-side lines of inquiry.

Table 4: Nodes of the cluster

Cluster	Keywords	Nodes of the cluster
1	Trust	Behavior, Products, Impact, Model, Green, Information, Intention, Knowledge, Sustainable consumption, Antecedents, Environmental concern, Green agricultural products, Green trust, Purchase, Acceptance
2	Organic Food	Consumption, Attitudes, Willingness-to-pay, Purchase intention, Determinants, Preferences, Planned behavior, Perceived value, Consumer trust, Attitude, Intentions, Labels, Willingness, Attributes, Corporate social-responsibility, Green food, Green products, Market, Buying behavior
3	Perceptions	Quality, Certification, Safety, Consumers, Blockchain
4	Agriculture	Sustainability, Food, Organic farming, Performance, Management, Consumer, Adoption

Table 5 synthesizes the theoretical mapping of the four co-word clusters, linking each to its dominant theoretical perspective as interpreted from the keyword patterns and cluster structures discussed above.

Table 5: Theoretical mapping of co-word clusters

Cluster	Core Keyword	Dominant Theoretical Perspective	Representative Research Focus
1	Trust	Integrative trust model	Effects of trust (ability, benevolence, integrity) on consumer behavior and purchase acceptance
2	Organic Food	Theory of Planned Behavior	Trust as an antecedent of attitude shaping purchase intention and willingness-to-pay
3	Perceptions	Signaling theory	Certifications, quality signals, and blockchain as mechanisms to reduce information asymmetry and build credibility
4	Agriculture	Institutional trust and sustainability governance	Trust in the macro context of agricultural sustainability and food governance

3.3.3. Co-citation Analysis

Co-citation analysis traces the intellectual linkages among foundational works and, in doing so, lays bare the knowledge of architecture and reigning paradigms of a field. What makes the technique especially revealing is its capacity to surface intellectual schools, with those constellations of publications that are repeatedly cited in tandem because they share theoretical commitments. In the present dataset, the co-citation network resolves into three such clusters (Zaki et al., 2023), each housing a recognizable tradition (Figure 9).

The blue cluster coalesces around the "attitude–behavior gap" school. The core of this school is Padel and Foster's (2005) artcile published in the British Food Journal. The article points out that trust is an important factor in determining whether consumers' positive attitudes towards organic food

translate into actual purchasing behavior. Meanwhile, those who lack trust in organic food will stagnate in the intention stage. Other studies cited alongside Padel (2005) extend this logic to consumer motivation and psychological barriers that hinder green consumption. The above studies collectively clarify that trust is a key mediator between positive attitudes and purchasing behavior.

The red cluster centers on the "trust differentiation" school. At the core is Nuttavuthisit's (2017) article published in the Journal of Business Ethics (Nuttavuthisit & Thøgersen, 2017). This article proposes a conceptual split between system trust (for institutions and certification bodies) and individual trust (for individual producers), and empirical evidence shows that the two have different impacts on the purchase of green food. This refinement has caused the field to move from a single concept of trust to a multidimensional approach to structure. As a result, related research continues to examine how different institutional arrangements and certification systems influence consumer trust.

The third cluster is based on Hair et al's (1998) Multivariate Data Analysis, forming the methodological foundation of literature. Hair's article did not directly explore trust, but its central position in the co-citation map indicates that the main testing tools in this field are highly dependent on structural equation modeling and factor analysis. That Hair et al (1998) is co-cited with empirical studies from both the blue and red clusters confirm SEM-based path modeling as the dominant analytical paradigm for trust-related hypotheses in this domain.

Considering these three clusters, a coherent intellectual curve can be outlined. Among them, the blue cluster believes that trust is the mediator between attitude and behavior. The red clusters decompose the structure into different trust types with independent mechanisms. Based on Hair et al's (1998) methodology, green cluster provides a quantitative tool centered around SEM to empirically test the theoretical propositions. Nevertheless, the dominant position of SEM has also led to weak qualitative and mixed methods design in the field of green agricultural product research. This will limit the in-depth discussion of the context dependent dynamics of trust formation in this research field.

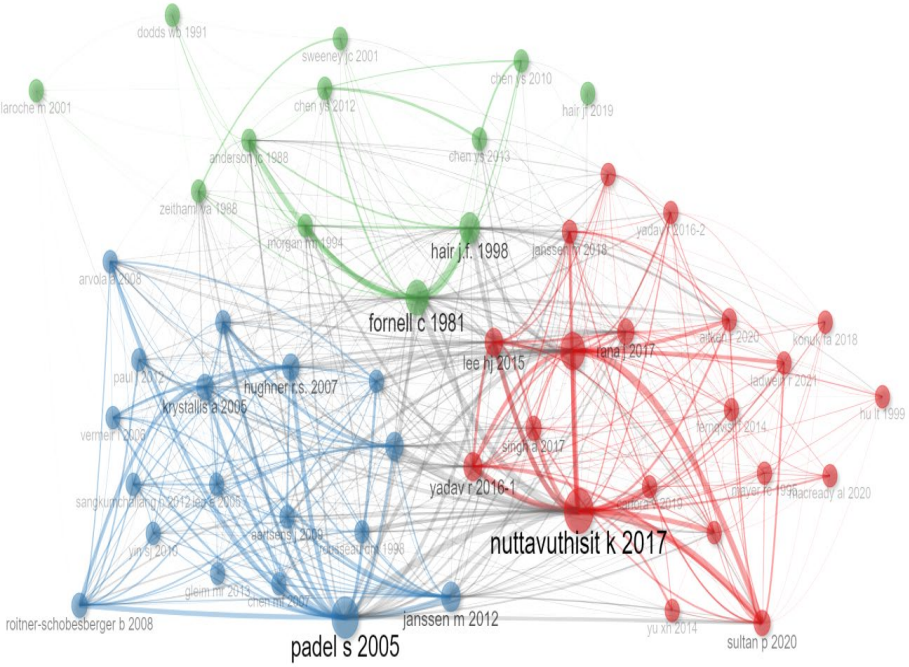

Fig.9: Co-citation network

3.4. Trends and future research avenues

3.4.1. Evolution of themes

Topic evolution analysis can track the emergence, evolution, and decline of research topics, providing insights into the transformation of academic focus within a field (Abdullah, 2021). This study used all keywords as the search scope to generate a thematic evolution map of green agricultural product research from 2015 to 2025 (see Figure 10). Among them, the theme evolution is divided into four stages. The solid lines between different periods represent the keywords shared among related topics. The edge thickness of the connecting line corresponds to the index (Cobo et al., 2011), and the vertical line indicates the boundary between sub-periods.

From 2015 to 2018, the main keywords were "organic agriculture", "food", "certification", "consumption", "willingness", and "behavior". This indicates that organic agriculture is the main topic of research. Meanwhile, "certification" and "consumption" also held important positions during this period. This phenomenon reflects the early academic focus on green agriculture certification standards and consumption patterns as drivers of sustainable agricultural development.

From 2019 to 2020, "food" gradually faded out of the theme, while "will" evolved into a broader theme of "trust". This change is due to the main sales channel for green agricultural products gradually shifting to live streaming. Therefore, consumers' trust depends not only on product description but also on the streamer's reputation, brand transparency, and supply chain traceability. These factors make trust occupy a more important position in this research field.

From 2021 to 2022, "trust", "consumption," and "behavior" continued to exist as core themes. While "authentication" evolved into "willingness to pay", and "behavior" diversified into related sub-themes. This trend shows that researchers gradually pay attention to the psychological motivation and behavior patterns of consumers willing to buy green products at a premium. The emergence of "green" and "management" as different themes shows that people pay more attention to the governance of green agricultural production, distribution, and sales processes. The emergence of "knowledge" as the theme shows that with the maturity of the green agriculture market, the effective dissemination of green product information has become the focus of current research. The evolution from "management" to "food" shows that researchers' focus is shifting from the macro level of supply chain governance to more specific dimensions such as green food quality and safety standards.

From 2024 to 2025, the emergence of "blockchain" represents an emerging method to improve the transparency and traceability of green agriculture. Although "consumption" and "behavior" run through the core themes of the whole period, they show signs of approaching saturation.

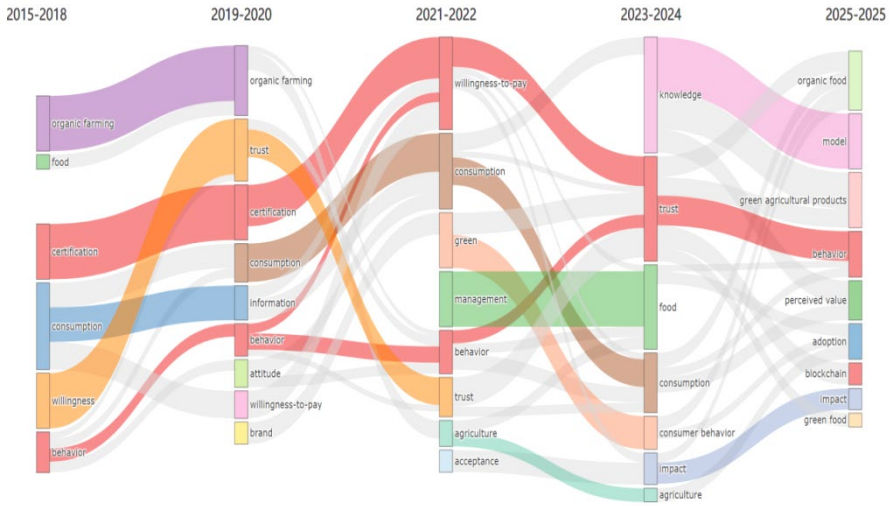

Fig.10: Thematic evolution of research in green agricultural products

3.4.2. Thematic map

The thematic map positions research themes along two dimensions, which are centrality (importance to the field) and density (degree of development), creating four quadrants (Alkhammash, 2023). The upper-right quadrant contains themes that are both important and well developed; the upper-left includes well-developed but peripheral themes. The lower-left quadrant represents marginal or emerging directions, while the lower-right captures themes that are important but not yet well developed, typically reflecting foundational concepts.

From Figure 11, the field's current research landscape centers on behavioral inquiry. "Consumption", "organic food", "behavior", and "trust" occupy the upper-right quadrant as core research hotspots. "Perception", "quality", and “certification” in the upper-left quadrant are well developed but have gradually moved away from the research frontier, likely because consumer awareness of service governance, compliance signals, information quality aspects has matured. "Performance", "sustainability", "agriculture", and "impact" in the lower-left quadrant represent marginal or saturated directions. “Model” and “food” in the lower-right quadrant constitute the field’s foundational base, but their development would be strengthened by closer linkage to information-transparency and service-operation mechanisms.

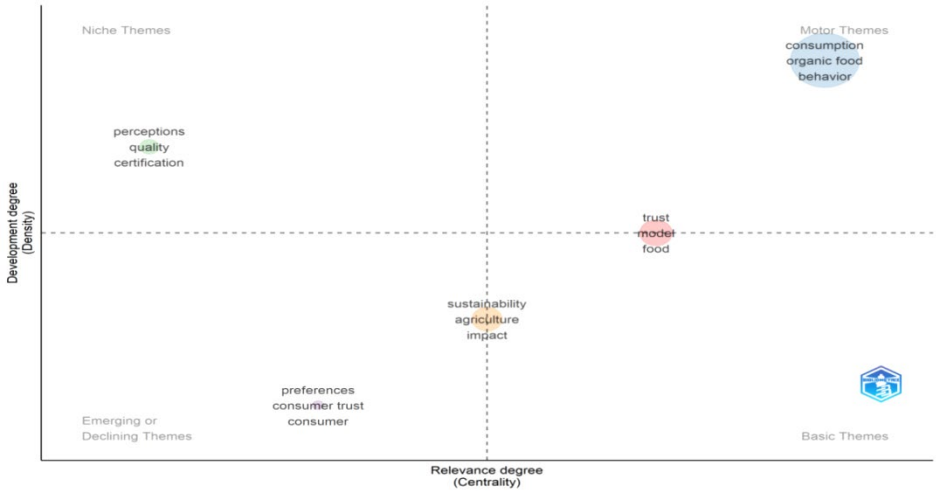

Fig.11: Thematic map quadrant

4. Discussion

This bibliometric analysis analyzed 177 articles on trust in green agricultural products published between 2015 and 2025. The following discussion interprets the key patterns identified in the results, starting with the stakeholders shaping this research field, gradually exploring its academic structure and theoretical basis, identifing the key gaps that have not yet been resolved, and combining the theoretical implication and practical implications from service operations aspect and marketing aspect.

4.1. Key Stakeholders and Their Influence

Bibliometric results place Aschemann-Witzel et al (2017) as the field's most influential single publication. By identifying income, product category, and consumer knowledge as moderators of willingness to pay, the study effectively carved the consumer market into segments and opened several

parallel lines of follow-up research. Tandon et al (2020) and Kushwah et al (2019), both co-authored with Dhir and both heavily cited, brought a moderating-effect lens to trust, redirecting attention from direct effects toward conditional mechanisms and moving the field's treatment of trust beyond simple linear specifications.

Research output is geographically dispersed yet heavily concentrated at the top: China, the USA, and India dominate publication counts but not necessarily citation influence. Thailand and Poland, with substantially smaller publication portfolios, achieve citation rates that are disproportionately high. One plausible explanation is a difference in research orientation, work pitched at a theoretical level tends to draw wider scholarly engagement, whereas context-bound empirical studies may circulate within a more localized readership.

At the institutional level, South China Agricultural University and Wageningen University and Research stand out as the most active affiliations, their prominence rooted in complementary expertise: the former in the Chinese green agricultural products market, the latter in European traditions of sustainable-agriculture methodology. That the most productive institutions are overwhelmingly agriculture-focused universities hints at a disciplinary concentration in agricultural economics, with consumer psychology and marketing departments contributing comparatively little institutional activity.

4.2. Intellectual Structure and Core Themes

The dominant position of “trust”, “consumption”, “behavior pattern”, “organic food” and “attitude tendency” in the high-frequency keywords clearly reveals the core concern in this field: consumer psychology and behavior decision-making mechanism. At the same time, the concepts of “adoption behavior”, “technology application”, “information dissemination” and “blockchain technology” have become increasingly prominent, indicating that trust building is gradually being seen as the result of information configuration at the system level, rather than a simple intrinsic tendency of consumers.

The co-word network (Figure 8) and thematic map (Figure 11) converge on a coherent architecture. Cluster 1 ties "trust" to "behavior" and "impact", foregrounding the behavioral consequences of trust in a manner consistent with the Theory of Planned Behavior (Ajzen, 1991), which positions trust as an attitudinal antecedent of purchase intention. Cluster 2, built around "organic food" and "consumption", constitutes the field's most developed research strand — organic food is inherently a credence good, and its unverifiable quality attributes make trust indispensable for market uptake. Cluster 3 introduces a signaling reading: "certification", "quality", and "blockchain" appear together as instruments for narrowing the information gap between producers and consumers. Cluster 4 ("agriculture", "sustainability"), by contrast, sits apart from these consumer-oriented groupings, a structural isolation exposes the parallel and mostly nonintegrated development between the macro production perspective and the micro consumer perspective. In the third cluster, the emergence of “authentication”, “quality” and “blockchain” means that the current research is gradually focusing on information security and traceability system. In contrast, cluster 4 (“agriculture”, “sustainability”) is still relatively independent of consumer oriented related fields, exposing a structural disconnect between the birth and production side governance mechanism and the results of consumer trust.

The co-citation analysis identified three intellectual traditions, which are the attitude–behavior gap school, the trust differentiation school, and the SEM-based methodological tradition, whose sequence traces a recognizable arc: trust was first installed as a mediator between attitudes and behavior, then disaggregated into distinct typologies, and finally subjected to quantitative testing that coalesced around structural equation modeling. Productive as this path has been, it concentrates the field's methodological repertoire around a single paradigm; qualitative and mixed-methods designs remain thin on the ground and may be precisely what is needed to illuminate context-dependent trust dynamics that survey instruments alone struggle to capture.

4.3. Research Gaps and Future Agenda

Taken together, the thematic evolution network (Figure 10) and the thematic map (Figure 11) expose several gaps that call for closer scrutiny.

"Certification" occupies a telling position on the thematic map: high in density yet low in centrality, a pocket of specialized knowledge that has developed in relative isolation from the core trust–behavior conversation. This indicates that authentication is often seen as a static quality indicator rather than a component of a broader service governance and information assurance architecture. Therefore, future research should focus on how authentication schemes and information disclosure mechanisms interact with information quality, traceability and platform presentation, and build or weaken trust in an environment where consumers are skeptical.

"Preference" and "consumer trust" likewise persist as detached themes on the map, an arrangement that implies the two constructions have been explored in separate silos despite their obvious conceptual kinship. If trust rests on perceived ability, benevolence, and integrity (Mayer et al., 1995), consumer preferences may operate as boundary conditions that alter the amount of information assurance required to trigger purchase. Therefore, future research could verify whether strong environmental preference will replace or amplify the role of high-quality information transparency.

The thematic evolution network adds a further puzzle. During the 2021–2022 window, the "behavior" theme splits into two branches: "willingness to pay" and "trust", suggesting the two have been pursued as independent research streams even though they are logically inseparable. Exactly how trust converts into willingness to pay a price premium remains underspecified. A productive avenue would be to test whether system trust (in certification and regulatory bodies) and personal trust (in individual producers or brands) exert differential effects on price acceptance, a distinction the co-citation analysis already flags as insufficiently explored.

4.4. Implications

4.4.1 Theoretical Implication

The analysis holds implications for both theory and practice, though in different registers. On the theoretical side, the Theory of Planned Behavior and the attitude–behavior gap framework have so far dominated the field's conceptual landscape, whereares signaling theory and institutional trust perspectives have been drawn on only lightly. Embedding signaling theory more deliberately into empirical designs would sharpen understanding of how trust-building mechanisms, certifications, traceability systems, brand reputation, and performanced operate in markets saturated with information asymmetry. The system-trust-versus-personal-trust distinction that surfaced in the co-citation analysis is similarly underdeveloped and warrants dedicated investigation, not least because the two trust types are likely to respond to quite different antecedent conditions and policy levers.

4.4.2 Practical Implications

4.4.2.1 Service Operations Aspect

From the perspective of service operation, the bibliometric analysis results of this literature first reveal that traceability should not only be regarded as an additional function of technology but should be used as an operation trust infrastructure to record the whole process of product source, production, processing and distribution. Based on this, green agricultural production enterprises can effectively reduce the information asymmetry of green agricultural products and make the green certification statement more verifiable in the whole supply chain. Secondly, the certification management system can be coordinated with the service delivery mechanism. Only when the certification authority, manufacturers, platform operators and regulatory agencies cooperate in the aspects of audit standards, certification cycle, data sharing responsibility and implementation mechanism, can the certification system truly establish the foundation of trust. Third, with the rise of platform-based services and live streaming channels, trust

building takes place in service interaction interfaces such as the seller's response speed, the anchor's credibility, real-time product demonstration effect and complaint handling process, which is similar to the impact of product attributes on consumer decisions. Fourth, green agricultural production enterprises should implement information transparency through standardized production practice disclosure, environmental performance evaluation and other information transparency measures.

4.4.2.2 Marketing Aspects

On the marketing side, the findings speak to a range of stakeholders. The gap between certification research and mainstream trust scholarship raises the possibility that existing green certification schemes are failing to communicate their trust value to consumers in any effective way; policymakers stand to gain by designing certifications around consumer trust perceptions rather than treating them as extensions of production-standard compliance alone. The thematic drift toward "adoption" and "technology" carries marketing relevance as well — blockchain-based traceability has already been linked to stronger product trust and higher purchase intention through improved information transparency in the organic agricultural products market (Tao & Chao, 2024), lending practical credibility to technology-driven trust-building strategies. For producers, the geographic clustering of research activity serves as a reminder that trust mechanisms validated in European organic markets cannot be assumed to transfer intact to Chinese or Indian contexts, where institutional structures and consumer expectations differ substantially.

5. Conclusion

This study mapped 177 articles on trust in green agricultural products (2015–2025) through bibliometric analysis and analyzed the results through the twin lenses of trust theory and signaling theory. Across the three research questions — key stakeholders, intellectual structure, and research gaps — several patterns emerged. Publication output has grown steadily and accelerated after 2020, research activity is geographically concentrated in a handful of countries, and the field's intellectual core revolves around consumer trust, attitudes, and purchasing behavior. Co-citation analysis uncovered three intellectual traditions organized around the attitude–behavior gap, trust differentiation, and quantitative methodology, respectively; thematic evolution analysis, in turn, pointed to an ongoing gravitation toward technology-driven approaches to trust-building. Structural gaps persist that certification research remains detached from the mainstream trust–behavior conversation, and production-side sustainability continues to develop in parallel with, rather than in dialogue with, consumer-side trust perceptions. These gaps, taken together, delineate a concrete agenda for future empirical work. The study's contribution lies in offering a theoretically grounded bibliometric portrait of trust research in the domain of green agricultural products.

The study is not without constraints. Reliance on the Web of Science core collection and English-language publications may have led to relevant work indexed elsewhere or published in other languages being missed. Bibliometric analysis, moreover, captures structural patterns in a literature but says nothing about the substantive quality of any individual study. Broadening the dataset to multiple databases and multilingual sources, and pairing bibliometric mapping with systematic content analysis, would go some way toward addressing these limitations.

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