A Comparative Bibliometric Analysis of Agricultural Transformation: Evidence from CNKI and Web of Science

Jiawei Xia
Research Institute of Economics and Management, Southwestern University of Finance and Economics, Chengdu, Sichuan, 611130, China
42320017@smail.swufe.edu.cn

ABSTRACT

Against the backdrop of food security pressure, climate constraints, and rapid technological change, research on agricultural transformation has expanded rapidly in both Chinese and international contexts. Based on CNKI and the Web of Science Core Collection, this paper uses CiteSpace to compare publication trends, collaboration networks, keyword structures, thematic evolution, and research frontiers, and measures cross-database thematic similarity through Chinese-English keyword normalization and Jaccard similarity. The results show that both databases have grown significantly: CNKI responds earlier and more strongly to domestic policy cycles, while WoS has accelerated markedly since 2021. International collaboration is more networked, whereas domestic research remains locally clustered. The two databases share concerns with transformation, modernization, technology, governance, sustainability, land, and farmers, but CNKI is more policy-oriented, while WoS places greater weight on global public issues and evidence-based analysis. Digitalization and green low-carbon development have recently emerged as important bridging themes.

Keywords: Bibliometric analysis; CiteSpace; CNKI; Web of Science; Thematic evolution; Comparative analysis of Chinese and international research

1. INTRODUCTION

Since the beginning of the 21st century, agricultural transformation has moved beyond a narrow issue of sectoral restructuring and has become a broader research field involving production upgrading, resource and environmental governance, rural livelihood improvement, and food-system resilience. CNKI, as a major Chinese-language database, is especially useful for capturing China's policy-oriented literature on rural revitalization, urban-rural integration, and rural transformation (Huang, 2022; Liu et al., 2020; Feng et al., 2025). By contrast, international research often places agricultural transformation within global public issues such as food security and climate change, and pays close attention to the systemic effects of climate shocks and food-system risks (Wheeler & von Braun, 2013; Vermeulen et al., 2012). With the diffusion of digital and intelligent technologies, technology adoption, digital agriculture, and related governance issues have also become increasingly important (Klerkx et al., 2019). As publication volume grows, the field has become more diversified and interdisciplinary.

Existing studies still leave three gaps. First, comprehensive CiteSpace-based bibliometric analysis of agricultural transformation remains limited, especially regarding hotspot structure, thematic evolution, and frontier identification. Second, many studies rely on a single database or language system, which makes it difficult to reveal how Chinese policy-oriented discussions differ from mainstream international frameworks. Third, much of the literature focuses on sub-fields such as digitalization, green transformation, or regional development, rather than describing the overall structure and boundary changes of agricultural transformation as a whole. These gaps raise the central question of this paper: how do Chinese and international studies of agricultural transformation differ in growth pattern, thematic structure, and frontier evolution, and which themes can connect the two research systems?

To answer this question, this paper compares CNKI and WoS literature within the same bibliometric framework. It examines publication trends, collaboration networks, high-frequency keywords, clustering structures, thematic timelines, and burst terms, and then identifies shared and divergent themes through keyword normalization and similarity analysis. The aim is to provide an organized reference for future topic selection and cross-context academic dialogue.

2. RESEARCH METHODS

2.1 Introduction to CiteSpace

CiteSpace, developed by Chaomei Chen, is widely used for visualizing scientific knowledge structures, detecting research fronts, and identifying relationships among authors, institutions, keywords, and cited literature. By presenting co-occurrence, clustering, timeline, and burst patterns, it helps reveal both the overall development path and the changing thematic organization of agricultural transformation research (Chen, 2006).

2.2 Database Selection and Search Strategy

To compare Chinese and international research on agricultural transformation, this study uses CNKI and the Web of Science Core Collection (WoS) as parallel data sources. For WoS, the search statement was Topic Search = "Agricultural transformation", covering 2001.01.01 to 2026.02.10. Because only one article was published in 2000 and no article was published in 2001, meaningful annual analysis begins in 2002. The final WoS sample contains 570 records. For CNKI, the search statement was Topic = "农业转型", covering 2000.01.01 to 2026.02.10, and the source categories were limited to SCI-indexed journals, Peking University core journals, CSSCI, and CSCD. The final CNKI sample contains 1013 records. Both samples were imported into CiteSpace for analysis of publication trends, collaboration structure, thematic organization, and research frontiers.

3. COMPARATIVE ANALYSIS OF LITERATURE CHARACTERISTICS

Knowledge mapping visualizes a knowledge domain and the relationships among its concepts (Speel et al., 1999; Li et al., 2017). Although CiteSpace has been used in studies of agricultural digital transformation, green transformation, and modern agriculture (Zhou et al., 2026; Zhang and Zhao, 2025; He et al., 2019), few studies have analyzed agricultural transformation as an integrated field. A comparative knowledge map can therefore clarify how research topics, theoretical perspectives, and thematic boundaries have changed over time.

3.1 Annual Number of Publications and Stage Division

Annual publication output reflects changes in research attention and field development (Ding et al., 2023). Publication statistics from CNKI and WoS reveal clear differences in volume and growth pattern between Chinese and international literature. Because the 2026 data are incomplete, they are excluded from the trend analysis.

Figure 1 shows that CNKI research follows a pattern of "steady start-accelerated growth-rapid surge". The field can be divided into three stages: initial exploration (2000-2007), when output was low and discussion was mainly conceptual; steady growth (2008-2016), when themes expanded to industrial restructuring, modern agriculture, and institutional innovation; and rapid surge (2017-2026), when digital agriculture, green transformation, rural revitalization, and agricultural-power goals became prominent. This trajectory indicates that Chinese research is strongly responsive to domestic policy cycles, especially after 2017.

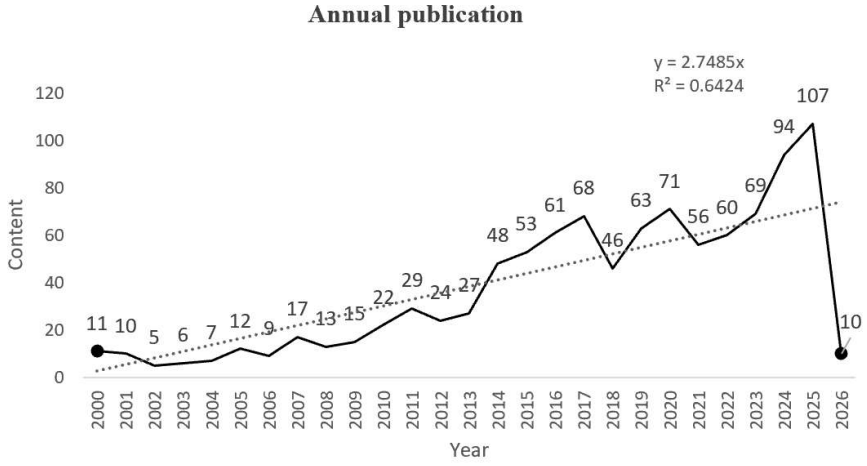

Figure 1. Annual number of publications on agricultural transformation in CNKI, 2000–2026.

By comparison, WoS shows a more gradual but increasingly rapid trajectory (Figure 2). It can be divided into slow growth (2002-2013), initial expansion (2014-2017), structural adjustment (2018-2020), and rapid growth (2021-2026). International research therefore presents a pattern of long-term accumulation followed by recent acceleration. Unlike CNKI, its growth is less tied to a single policy agenda and more closely related to global concerns such as climate change, food security, sustainability, and technology diffusion.

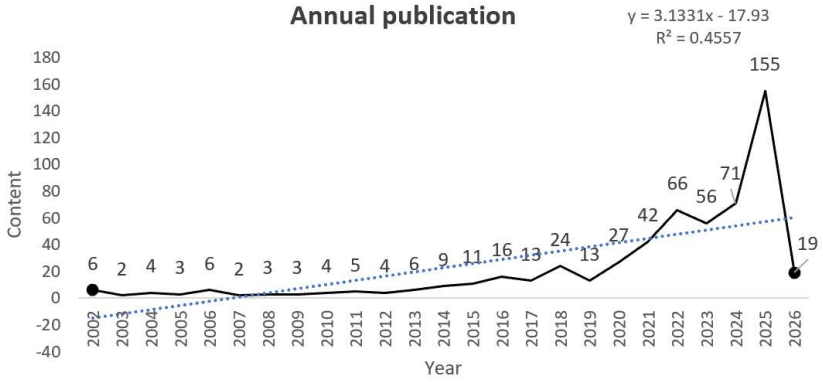

Figure 2. Annual number of publications on agricultural transformation in WoS, 2002–2026.

4. COMPARISON OF RESEARCH FORCES AND COLLABORATION NETWORKS

CiteSpace is used here to visualize author and institutional collaboration networks. Node size indicates publication output, while links represent collaborative relationships. This makes it possible to identify leading researchers, core institutions, and cooperation patterns in agricultural transformation research.

4.1 Author Collaboration Network

The CNKI author network contains 213 nodes and 45 links, with a density of 0.002 (Figure 3). Major teams include those led by Xiong Chunwen of China Agricultural University and Guo Jianxiong of Shaanxi Normal University, as well as smaller groups around An Hongyu, Tang Shiyu, and Liu Weijie. The overall network remains sparse, suggesting that domestic collaboration is fragmented and mainly organized around small teams. This weak connectivity limits cross-team knowledge diffusion and indicates that a mature national academic collaboration network has not yet formed.

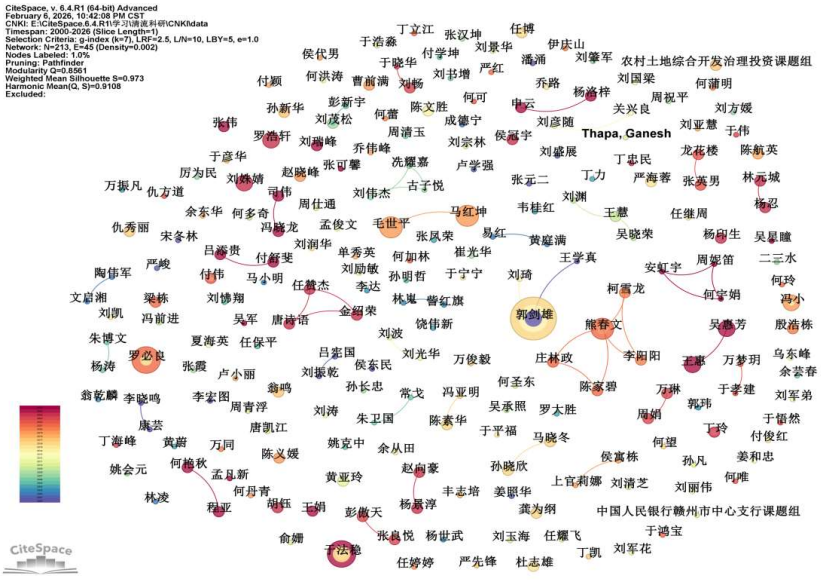

Figure 3. Author collaboration network graph in CNKI

The WoS author network contains 165 nodes and 235 links, with a density of 0.0174 (Figure 4). Daum, Thomas and Biner, Regina are influential collaborative authors, and several larger teams have formed, including groups led by Dlamini, Sikhumbuzo D and Chen Xinping. Compared with CNKI, WoS shows denser cross-team collaboration and a more connected international research community. The existence of multiple teams with four or more members also indicates that international research has developed a more stable cooperative structure.

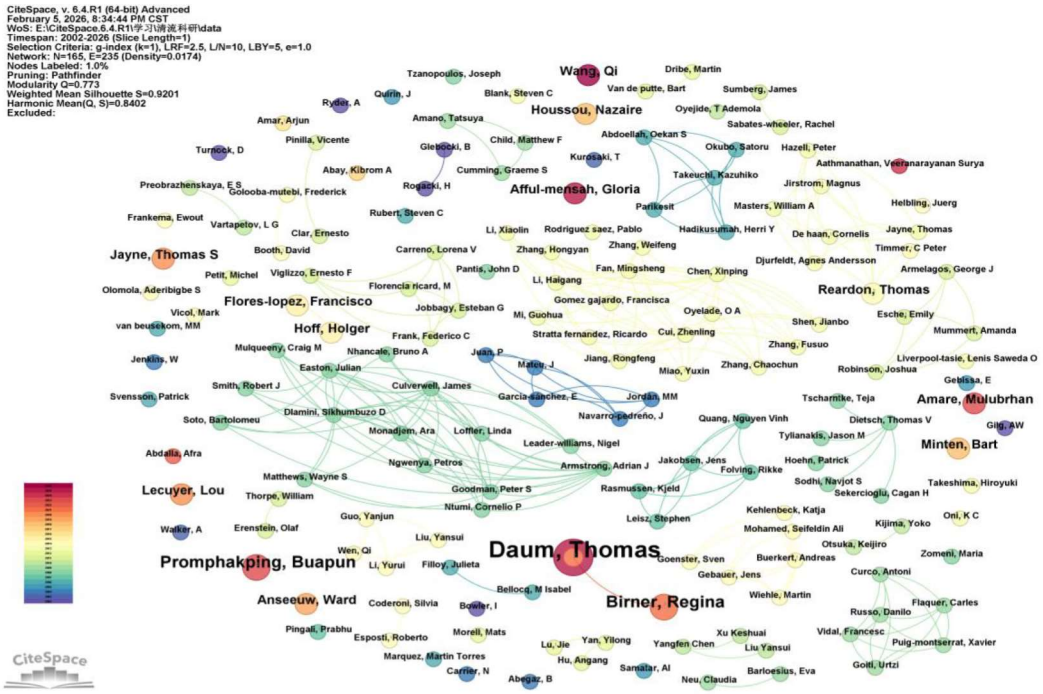

Figure 4. Author collaboration network graph in WoS

4.2 Institutional Collaboration Network

Figures 5 and 6 present the institutional collaboration networks in CNKI and WoS.

In CNKI, 25 institutions have more than three publications. Four institutions publish more than 10 papers: the Institute of Agricultural Economics and Development, CAAS (12); the College of Economics and Management, China Agricultural University (12); the Rural Development Institute, Chinese Academy of Social Sciences (17); and the College of Humanities and Development Studies, China Agricultural University (25). Five institutional collaboration networks with three or more institutions have formed, among which the network centered on the College of Humanities and Development Studies is the largest. However, most institutions remain weakly connected, and inter-institutional cooperation still needs to be strengthened.

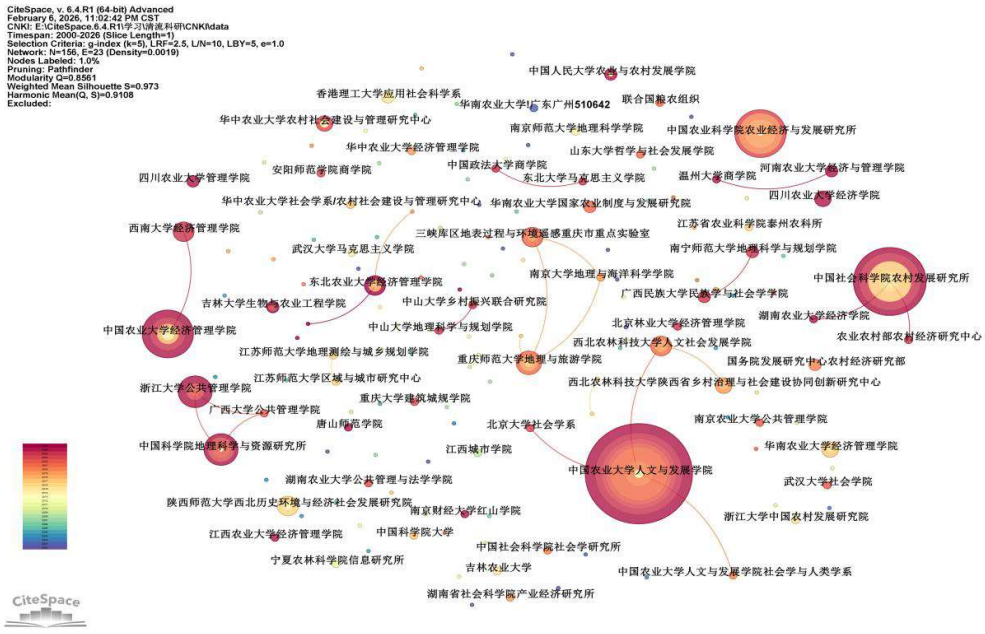

Figure 5. Institutional collaboration network in CNKI

In WoS, CGIAR ranks first with 46 publications, followed by IFPRI with 21 and the Chinese Academy of Sciences with 20. China Agricultural University ranks fourth in output but second in centrality (0.12), indicating a strong bridging role. The top institutions have already formed a close collaboration network, and the overall structure is more networked than CNKI. High-frequency links among core institutions improve knowledge diffusion and bring peripheral institutions into shared research agendas, although the network still depends heavily on a few core platforms and hub institutions.

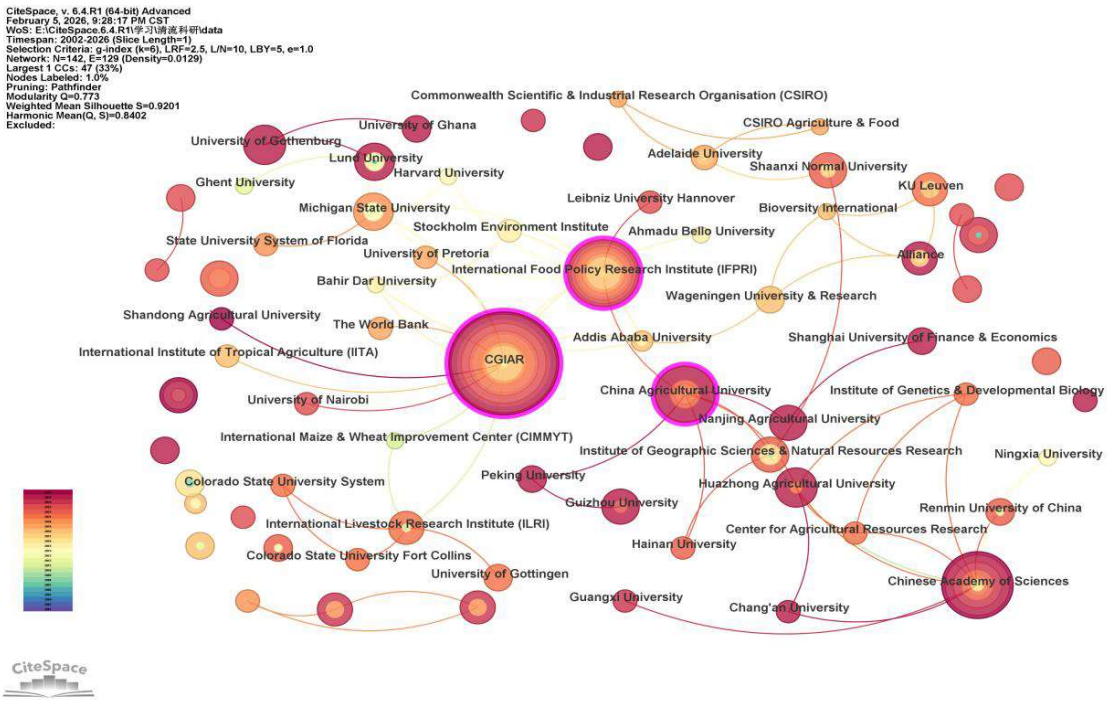

Figure 6. Institutional collaboration network in WoS

4.3 Quantitative Comparison of Differences in Collaboration Structure

Figures 3-6 indicate three main differences in collaboration structure. First, WoS has much stronger cooperation intensity: author and institutional network densities are about 8.7 and 6.8 times those of CNKI, while average degrees are about 6.7 and 6.2 times higher. Second, CNKI is characterized by small teams and localized cooperation, whereas WoS shows more cross-team and inter-institutional cooperation. Third, WoS is more polycentric; although its network density is higher, the largest connected component accounts for only 33%, suggesting that several groups are linked through core platforms and hub institutions. Overall, international research is more collaborative, while domestic research remains more locally clustered.

5. COMPARISON OF RESEARCH HOTSPOTS

Research hotspots refer to topics that receive sustained attention in a field. This study uses keyword co-occurrence, frequency, centrality, clustering, timelines, and burst terms to compare hotspots in CNKI and WoS from 2000 to 2026.

5.1 Keyword Co-occurrence Network and High-Frequency Keywords

Figure 7 presents the CNKI keyword co-occurrence network. The network contains 206 nodes and 196 links, with a density of 0.0093, showing low density and weak connectivity. This indicates that domestic research topics are diverse and relatively scattered, although several core themes are clearly visible. The network therefore reflects both thematic dispersion and concentration around key policy-related concepts.

In terms of frequency, “农业转型” (130) is the core keyword and also has high centrality (0.33), showing its role as both the main theme and a hub connecting multiple topics. Other high-frequency keywords include “乡村振兴” (68), “转型升级” (37), “农业” (36), “转型” (23), and “现代农业” (23). The rise of “乡村振兴” after the 19th National Congress shows that research has shifted from sectoral efficiency and structural adjustment toward a broader framework involving industry, ecology, governance, and livelihoods.

Overall, CNKI keywords form a hierarchical structure in which national strategies guide the field, implementation pathways and policy tools are gradually refined, and agricultural transformation remains the central theme. This structure also suggests an evolution from macro concepts to operational paths and from sectoral transformation to system-wide rural governance. The coexistence of policy terms and operational terms further shows that Chinese scholarship tends to transform national strategic language into concrete research questions about institutions, actors, and implementation mechanisms.

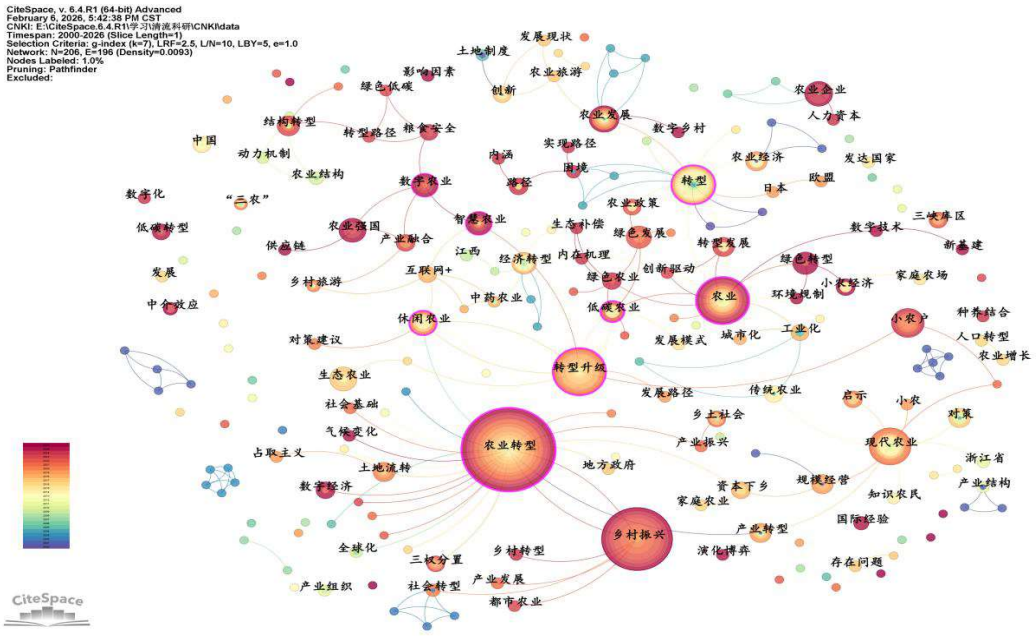

Figure 7. Keyword co-occurrence network in CNKI

Figure 8 shows the WoS keyword co-occurrence network. It contains 191 nodes and 318 links, with a density of 0.0175, indicating stronger cross-topic coupling than CNKI. International research therefore presents more frequent connections among different thematic lines.

The core keyword is “agricultural transformation” (112), around which three lines of research appear: food security and development performance, ecological and environmental constraints, and technology diffusion and management practices. In betweenness centrality, agricultural transformation (0.84), food security (0.33), Africa (0.29), productivity (0.25), and land use (0.19) play bridging roles. This indicates that WoS research connects themes through a chain linking food security, productivity, land use, and regional contexts.

WoS keywords therefore show a parallel thematic structure combining growth goals, ecological constraints, and technology adoption. Compared with CNKI, this reflects a stronger concern with systemic effects, externalities, and evidence-based analysis.

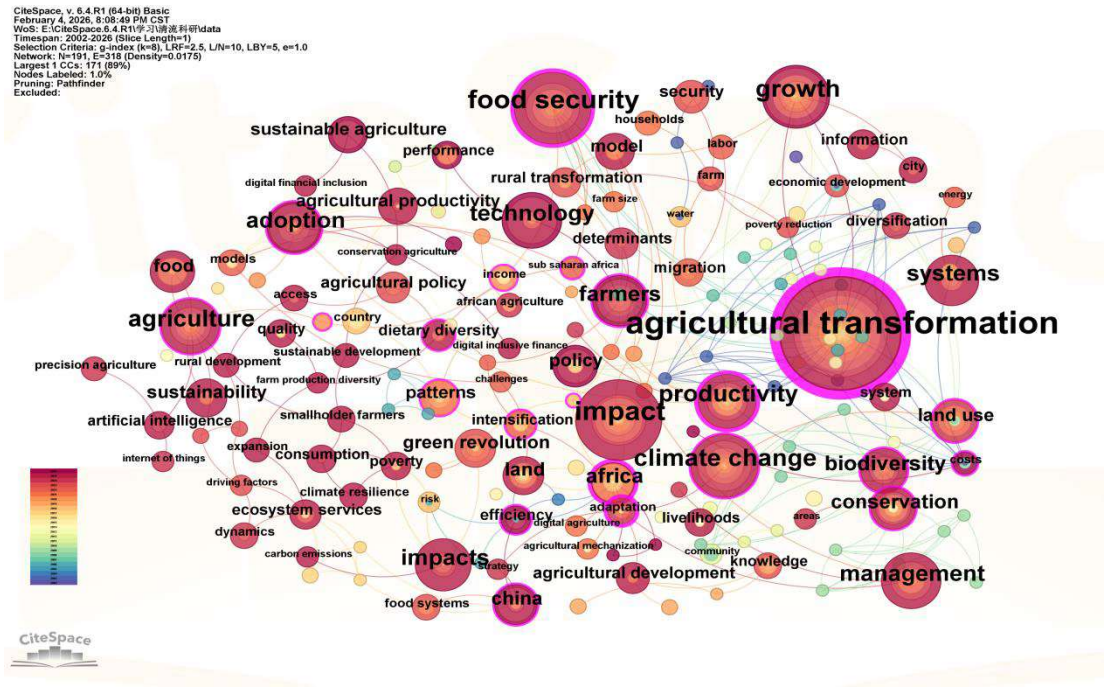

Figure 8. Keyword co-occurrence network in WoS

5.2 Keyword Clustering and Thematic Structure

Keyword clustering further reveals thematic organization. This study uses Modularity Q and Mean Silhouette S to evaluate clustering quality: Q > 0.3 indicates a significant structure, S > 0.5 indicates reasonable clustering, and S >= 0.7 indicates high reliability (Wang and Chen, 2025).

The CNKI clustering map (Figure 9) contains 206 nodes and 196 links, with Q = 0.8561 and S = 0.973, indicating a clear and reliable structure.

Nine major clusters are identified. Cluster #0 “农业转型” is the largest and connects closely with “现代农业”, “转型升级”, and “乡村振兴”. Clusters #3 “现代农业” and #4 “转型升级” emphasize management systems, industrial organization, and operational policy tools, showing a shift from broad transformation narratives to more specific implementation pathways. Cluster #6 “乡村振兴” places agricultural transformation within rural system governance and integrated development, and its connection with industrial development and factor mobility shows the shaping role of national strategy. Other clusters, such as “农业”, “农业发展”, “动力机制”, “转型”, and “经济转型”, support general discussion, mechanism explanation, and links with broader economic change.

Thus, CNKI presents a policy-driven hierarchy moving from macro frameworks to transformation paths and then to strategic governance.

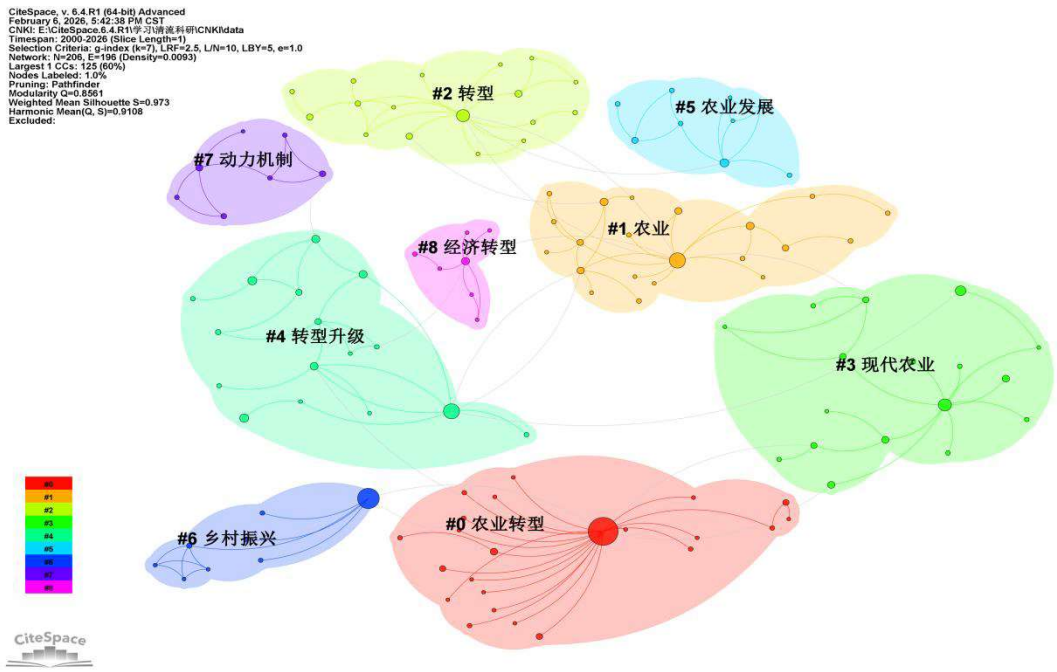

Figure 9. Keyword clustering map in CNKI

The WoS clustering map (Figure 10) contains 191 nodes and 318 links, with Q = 0.773 and S = 0.9201, also indicating a reliable thematic structure.

Ten clusters are identified. Cluster #0 “agricultural transformation” is the main cluster and links with several parallel lines. Clusters #1 agricultural policy and #4 rural transformation reflect policy and governance issues. Clusters #7 climate change, #9 conservation, #6 agroforestry, and #5 adaptability form a climate-ecology-adaptation line, highlighting agricultural transformation under climate pressure, natural resource constraints, and resilience governance. Cluster #2 artificial intelligence represents a relatively independent technological frontier, while cluster #3 impacts emphasizes impact assessment and outcome-oriented research.

Together, these clusters show that international research organizes agricultural transformation around policy and governance, ecology and climate, technology, and evaluation.

Compared with CNKI, WoS pays more attention to systemic constraints, ecological risks, and method-oriented investigation, while CNKI emphasizes policy pathways and strategic governance.

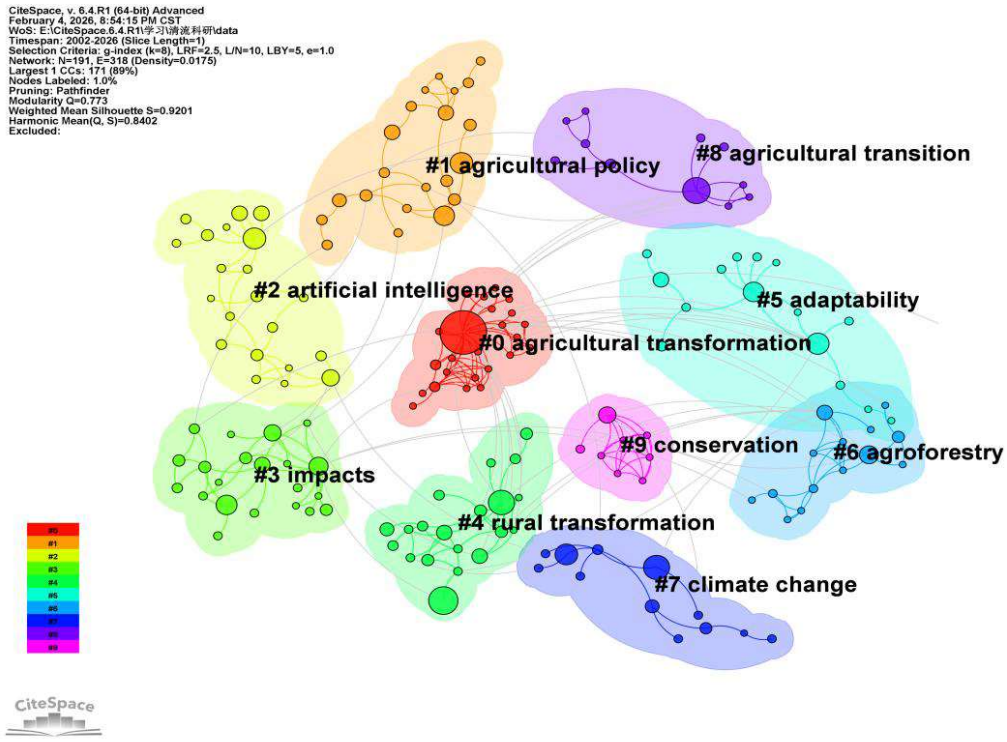

Figure 10. Keyword clustering map in WoS

5.3 CNKI–WoS Thematic Mapping and Shared/Divergent Hotspots

After identifying the clustering structures of CNKI and WoS, this study uses the top 30 high-frequency keywords from each database to compare thematic overlap and divergence. Following common bibliometric procedures, thematic structures are first identified and then compared across samples (Chen, 2006; Donthu et al., 2021; Zupic & Čater, 2015). Table 4 reports the top 30 keywords in each database.

Table 4. Top 30 high-frequency keywords in WoS and CNKI

	Wos				CNKI			
No.	Frequency	Centrality	Year	Keyword	Frequency	Centrality	Year	Keyword
1	112	0.84	2003	Agricultural transformation	130	0.33	2001	农业转型
2	46	0.02	2018	Impact	68	0.08	2019	乡村振兴
3	40	0.33	2007	Food security	37	0.3	2010	转型升级
4	33	0.1	2010	Growth	36	0.37	2005	农业
5	33	0.17	2015	Climate change	23	0.25	2000	转型
6	25	0.25	2003	Productivity	23	0.1	2010	现代农业
7	25	0.15	2014	Agriculture	15	0.02	2019	小农户
8	24	0.02	2021	Technology	11	0.09	2004	农业发展
9	24	0.03	2016	Management	10	0	2006	农业企业
10	23	0.14	2015	Adoption	10	0	2014	生态农业

Table 4. (continued) Top 30 high-frequency keywords in WoS and CNKI

	Wos				CNKI			
No.	Frequency	Centrality	Year	Keyword	Frequency	Centrality	Year	Keyword
11	22	0.02	2018	Impacts	10	0.01	2023	农业强国
12	22	0.06	2018	Systems	9	0.09	2004	经济转型
13	21	0.11	2018	Farmers	9	0.27	2007	休闲农业
14	18	0.19	2008	Biodiversity	9	0.11	2017	智慧农业
15	17	0.29	2004	Africa	8	0.02	2020	绿色发展
16	15	0.13	2009	Conservation	8	0.1	2021	数字农业
17	14	0.15	2017	China	8	0.03	2022	绿色转型
18	14	0.05	2004	Land	7	0.03	2010	结构转型
19	12	0	2020	Food	6	0.02	2001	农业经济
20	12	0.19	2008	Land use	6	0.02	2001	规模经营
21	12	0.09	2010	Policy	6	0.04	2001	产业转型
22	11	0.09	2018	Green revolution	6	0	2004	对策
23	11	0	2022	Sustainability	6	0.26	2011	低碳农业
24	10	0.03	2016	Agricultural productivity	6	0	2015	转型发展
25	10	0.1	2006	Patterns	6	0.01	2017	土地流转
26	10	0.02	2025	Sustainable agriculture	5	0.01	2000	创新
27	10	0.05	2020	Model	5	0.06	2005	传统农业
28	8	0.03	2022	Agricultural policy	5	0	2013	低碳转型
29	8	0.07	2019	Agricultural development	5	0.01	2015	小农经济
30	8	0	2022	Security	5	0.02	2016	资本下乡

To quantify similarity, this study calculates Jaccard similarity for the top 30 keywords after Chinese-English normalization and synonym merging (Jaccard, 1901). The normalized result is Jnorm = 11/29 ≈ 0.3793, indicating partial consensus but clear structural differentiation. Table 5 presents the thematic classification.

Shared hotspots are concentrated in six themes. First, both databases use agricultural transformation as the core concept, though CNKI frames it more through national strategy and WoS through development, risk, and systemic constraints. Second, both discuss modernization and agricultural development, with CNKI emphasizing management systems and industrial upgrading and WoS emphasizing performance and mechanisms. Third, both treat technology as a driver, but CNKI presents it more as a policy tool, while WoS treats it more as a mechanism for testing adoption and effects. Fourth, both address organizational and governance conditions. Fifth, climate change, conservation, and sustainability form a shared frontier, expressed in CNKI as “绿色发展” and “绿色转型” and in WoS as climate risk and ecological externalities. Sixth, both focus on agricultural factors and actors: CNKI stresses “土地流转” and “小农户”, while WoS centers on land use and farmers. This last theme has strong bridging potential because it connects institutions, micro behavior, and system outcomes.

Table 5. Thematic classification of the top 30 high-frequency keywords in WoS and CNKI

Theme label	Type	Corresponding keywords in cnki	Corresponding keywords in wos
Africa	Wos-specific	—	Africa
Agricultural development	Shared	转型升级 现代农业 农业发展	Agricultural development
Agricultural economics	Cnki-specific	农业经济 经济转型	—
Agricultural powerhouse	Cnki-specific	农业强国	—
Agricultural transformation	Shared	农业转型 转型 结构转型 产业转型 转型发展	Agricultural transformation
Agriculture	Shared	农业	Agriculture
Biodiversity	Wos-specific	—	Biodiversity
Capital to countryside	Cnki-specific	资本下乡	—
China	Wos-specific	—	China
Climate change	Shared	低碳农业 低碳转型	Climate change
Conservation	Shared	生态农业	Conservation
Farmers	Shared	小农户 小农经济	Farmers
Food security	Wos-specific	—	Food Food security
Green revolution	Wos-specific	—	Green revolution
Growth	Wos-specific	—	Growth
Impacts	Wos-specific	—	Impact Impacts
Land use	Shared	土地流转	Land,land use
Leisure agriculture	Cnki-specific	休闲农业	—
Management	Shared	农业企业 规模经营	Management

Table 5. Thematic classification of the top 30 high-frequency keywords in WoS and CNKI

Theme label	Type	Corresponding keywords in cnki	Corresponding keywords in wos
Model	Wos-specific	—	Model
Patterns	Wos-specific	—	Patterns
Policy	Shared	对策	Policy Agricultural policy
Productivity	Wos-specific	—	Productivity Agricultural productivity
Rural revitalization	Cnki-specific	乡村振兴	—
Security	Wos-specific	—	Security
Sustainability	Shared	绿色发展 绿色转型	Sustainability Sustainable agriculture
Systems	Wos-specific	—	Systems
Technology	Shared	智慧农业 数字农业	Technology
		创新	Adoption
Traditional agriculture	Cnki-specific	传统农业	—

CNKI-specific themes are rooted in national strategy, institutional reform, and local industrial forms. Terms such as “乡村振兴” and “农业强国” show the guiding role of state goals, while “资本下乡” and “土地流转” reflect attention to factor allocation and policy instruments. Themes such as “休闲农业” and “传统农业” are closely related to local practice and transformation pathways, often appearing together with policy recommendations and local experience.

WoS-specific themes concentrate on global public issues, ecological frameworks, and evidence-based evaluation. Africa reflects the importance of the Global South; biodiversity and conservation indicate concern with ecological externalities; and impacts, systems, model, and patterns show stronger emphasis on quantitative assessment and system-level analysis. Food, food security, and security reflect the influence of global shocks and risks.

5.4 Research Trajectory: Keyword Timeline Analysis

Figures 11 and 12 show keyword timelines and help identify thematic evolution along the theme-time dimension (Wang, Z. et al., 2025). They are used to judge the life cycle of clusters, shifts in research focus, and differences between CNKI and WoS trajectories.

The CNKI timeline has a reliable clustering structure (Q = 0.8561; S = 0.973). Based on cluster distribution, key nodes, and the publication trend in Figure 1, Chinese research can be divided into three stages.

The first stage (2000–2007) was concept introduction and macro-framework formation. Research centered on foundational concepts such as “农业转型” and “转型”, with keywords such as “战略选择” and “全球化”. Output was low, and discussion focused mainly on conceptual clarification, broader development context, and macro-structural adjustment.

The second stage (2008–2016) emphasized pathways, institutions, and factor allocation. Clusters such as “现代农业” and “转型升级” became active, and issues such as scale management, low-carbon agriculture, smallholder economy, and capital to the countryside became more visible. Research shifted from asking what transformation is to explaining how transformation occurs, with growing attention to industrial reorganization, policy tools, land, capital, and management upgrading.

The third stage (2017-2026) was driven by strategic governance, rural revitalization, digitalization, and green low-carbon development. “乡村振兴” became a prominent cluster and remained connected with “产业振兴” and “乡村转型”. At the same time, “智慧农业”, “数字乡村”, “绿色发展”, “生态补偿”, “粮食安全”, “农业强国”, and “创新驱动” became important new sources of research growth.

This indicates that Chinese research has moved from single-sector upgrading toward coordinated transformation of agriculture and rural systems, while research participation and publication output have continued to increase

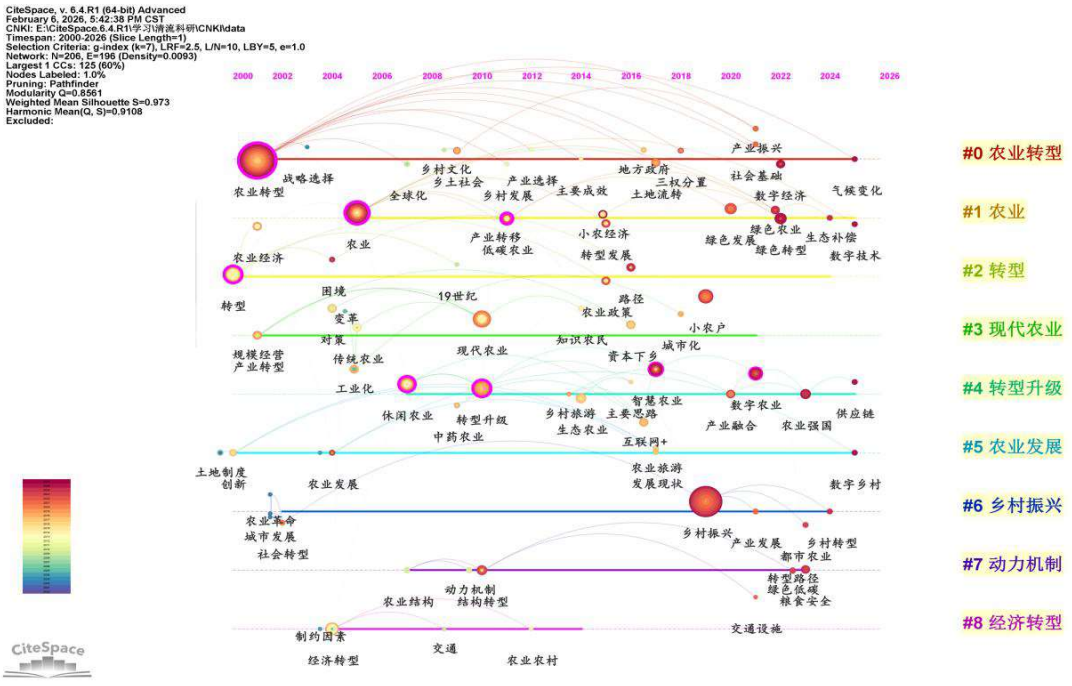

Figure 11. CNKI keyword timeline map

The WoS timeline (Figure 12) also shows a reliable structure (N = 191, E = 318, D = 0.0175; Q = 0.773, S = 0.9201). Combined with Figure 2, international research can be divided into four stages.

The first stage (2002-2013) was basic accumulation, with low output and a focus on concepts, regional experience, and development economics. The second stage (2014-2017) expanded toward policy explanation, model-based research, and productivity measurement. The third stage (2018-2020) broadened into impact, land use, emissions, conservation, and food-system analysis, showing a more systematic evaluation orientation. The fourth stage (2021-2026) shows rapid growth, with increasing attention to digital technology, climate adaptation, resilience, and rural livelihoods under external shocks. This period is especially important because digital agriculture, climate adaptation, food-system resilience, and livelihood security begin to appear together, suggesting that international research is moving toward integrated analysis of technology, risk, and sustainability.

Overall, CNKI shows stronger policy-stage characteristics, while WoS follows a route from development and productivity toward system resilience, impact assessment, and technology-supported transformation.

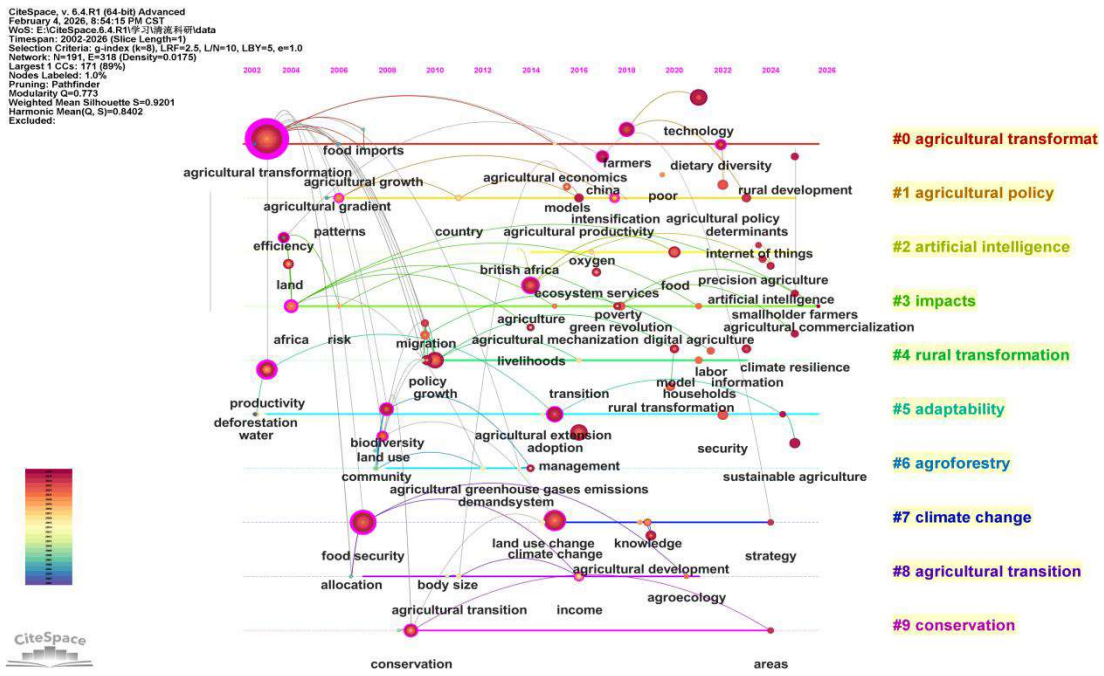

Figure 12. WoS keyword timeline map

5.5 Research Frontiers: A Comparison of Keyword Bursts

Keyword bursts identify terms whose frequency rises sharply over a period and are often used to detect research frontiers (Zhou & Liu, 2025). Based on burst strength, this study analyzes the top 10 burst terms in CNKI and WoS (Figures 13 and 14), focusing on strength, duration, and chronological sequence.

(1) 2004–2015: Long-cycle burst of “转型”

“转型” burst continuously from 2004 to 2015, showing that early CNKI research used transformation as an umbrella concept for development-pattern change, structural adjustment, institutional reform, food security, factor allocation, and urban-rural relations. The long duration of this burst indicates that “转型” provided the common semantic foundation for later differentiation of research hotspots. It also explains why subsequent hotspots could branch into modernization, ecological agriculture, rural revitalization, and green transformation without leaving the general transformation framework.

(2) 2010–2018: Path Instrumentalization and Ecological Constraints Enter the Core Framework

The bursts of “现代农业” (2010-2014), “生态农业” (2014-2017), and “转型升级” (2015-2018) indicate that attention then moved from general concepts toward modernization pathways, ecological constraints, supply-side reform, and upgrading mechanisms. During this period, resource and environmental constraints entered the core explanatory framework, while modernization plans and structural reform pushed scholars to focus on management systems, industrial systems, technological equipment, and performance evaluation. This stage therefore marks the transformation of the research agenda from a mainly economic and structural issue into a combined economic-ecological issue.

(3) 2019–2024: The Dual Burst of “乡村振兴” and “小农户”

The strongest CNKI burst is “乡村振兴” (16.94, 2019-2023), which corresponds to the rise of rural revitalization as a strategic framework after 2017. The burst of “小农户” (2019-2024) shows that research further moved from macro strategy to farm operators, service systems, and mechanisms linking smallholders with modern agriculture. This suggests a shift from goal-oriented strategy to the institutional arrangements and actor relationships required for implementation. The smallholder theme is particularly important because it connects macro-level modernization goals with micro-level participation, benefit sharing, and public service provision.

(4) 2020–2026: The Strengthening of National Goals and Industrial Organization

Since 2020, “绿色发展” has become closely connected with green and low-carbon transformation, while “农业强国” (2023-2026) reflects the strengthening of national goals. Together, these bursts show that agricultural transformation is increasingly discussed under the combined requirements of supply security, technological equipment, management systems, industrial resilience, and competitiveness.

The bursts of “农业企业” (2024-2026) and “绿色转型” (2025-2026) further indicate that recent CNKI frontiers have moved toward industrial organization, value-chain governance, and low-carbon transformation. Under the dual pressure of carbon constraints and the goal of building an agricultural power, scholars increasingly ask how enterprises, industrial chains, and supply chains can support green transformation.

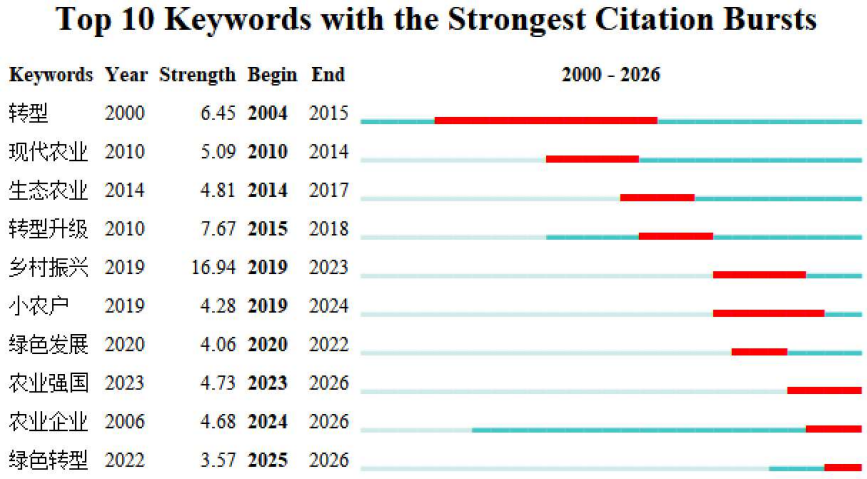

Figure 13. Keyword burst map in CNKI

As shown in Figure 14, WoS burst terms gradually shift from regional development to productivity and pattern identification, then to food-security shocks, impact assessment, determinants, technology, and sustainable agriculture.

(1) 2004–2021: The Long-Cycle Burst of Africa

Africa had a long burst from 2004 to 2021, indicating that the Global South has long been an empirical setting and policy testing ground for agricultural transformation. This reflects the international development agenda’s sustained interest in agriculture as a driver of poverty reduction, productivity improvement, and structural transformation. Africa-related studies therefore formed a stable line linking agricultural transformation with development outcomes and governance experiments. The long burst of Africa also indicates that international agricultural transformation research often uses regional contexts to test broader development theories and policy models.

(2) 2018–2021: The Concurrent Bursts of patterns and productivity

During 2018-2021, patterns and productivity burst strongly, suggesting a shift toward measurable structural characteristics and productivity performance. The increasing availability of remote sensing, geospatial data, and micro-survey data made cross-regional pattern recognition and comparative evaluation more feasible. At the same time, the Sustainable Development Goals and climate-related assessment frameworks increased demand for productivity indicators and spatial models under resource and climate constraints.

(3) 2022–2023: The Concentrated Bursts of security, agricultural policy, and food

From 2022 to 2023, security, agricultural policy, and food became burst terms. This combination reflects the influence of global food-system shocks, supply-chain disruption, grain and fertilizer price volatility, and trade restrictions. Research attention thus expanded from efficiency improvement to supply-chain resilience, policy intervention, and risk management.

(4) 2023–2026: The Continued Bursts of impacts and determinants

Since 2023, impacts and determinants have risen as burst terms. This shows that international research is moving toward impact assessment and mechanism identification, with increasing attention to how agricultural transformation affects production, poverty, livelihoods, ecological externalities, and resilience.

At the same time, determinants-related studies focus on the factors shaping transformation outcomes, including technology adoption conditions, institutional frameworks, policy mixes, market access, and exposure to climate risks.

This turn is consistent with the implementation stage of international governance agendas: once transformation becomes a widely shared goal, research naturally moves toward verifiable evidence and operational mechanisms. This helps explain why WoS frontiers increasingly use terms such as impacts, determinants, model, and systems rather than only policy or development slogans.

(5) 2025–2026: The Simultaneous Bursts of technology and sustainable agriculture

At the end of the sample, technology (2025-2026, 4.17) and sustainable agriculture (2025-2026, 4.05) burst simultaneously, indicating that recent WoS frontiers are developing along the dual lines of intelligent technology and sustainability. AI, the Internet of Things, precision agriculture, and digital platforms increase demand for research on technology governance and performance evaluation. Meanwhile, climate targets and resource constraints push sustainable agriculture from concept to practice, including emission reduction, ecological protection, and resource efficiency. Because 2026 is the cut-off year, the persistence of these frontier terms should be verified with updated data.

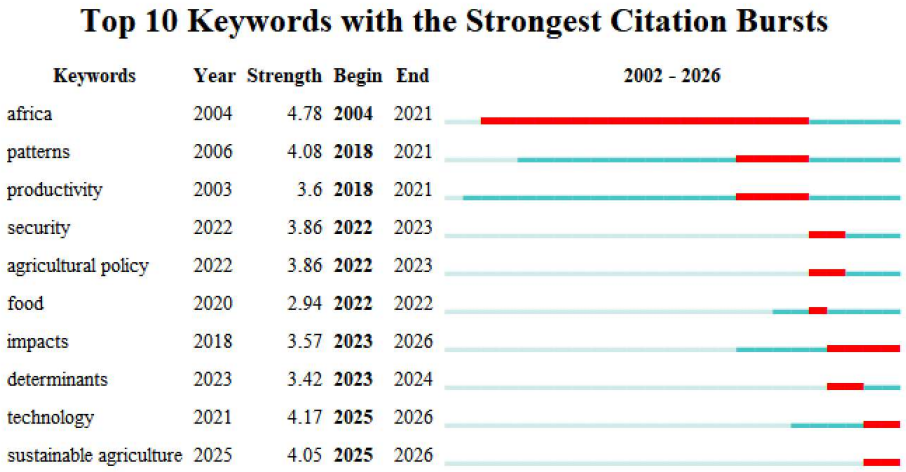

Figure 14. Keyword burst map in WoS

6. DISCUSSION: STRUCTURAL EXPLANATIONS AND IMPLICATIONS OF THE DIFFERENCES BETWEEN CNKI AND WOS

The comparison shows that CNKI and WoS are converging on some topics while remaining clearly different in hotspot structure, thematic evolution, and frontier trends. These differences are not merely linguistic; they are related to problem orientation, data and method traditions, and the organization of academic communities. They also shape what counts as an important question: CNKI asks how agricultural transformation can serve national strategic goals, whereas WoS more often asks how transformation can be measured, compared, and governed under global constraints.

6.1 Structural Explanations for Differences in Research Focus

CNKI research is closely embedded in China's agriculture, rural areas, and farmers policy system. It therefore emphasizes policy goals, governance objectives, and path design under national strategies. WoS research is more often driven by global public issues such as climate risk, ecological externalities, and food security, and thus stresses system constraints, impact assessment, and governance combinations. Even where both databases discuss digitalization and green transformation, CNKI tends to introduce these themes through policy terms such as "智慧农业" and "绿色发展", while WoS places them in analytical chains of technology diffusion, sustainability, and evidence-based evaluation.

Collaboration structure further explains the difference. WoS has a denser network and more stable cross-institutional cooperation, supported by organizations such as CGIAR and IFPRI. This helps standardize methods, share data, and promote cross-regional comparison. CNKI networks are more localized and weakly connected, making domestic research more sensitive to policy cycles and less cumulative across teams. Strengthening cross-institutional and international cooperation is therefore important for improving the comparability and continuity of Chinese research. In contrast, domestic research can better reflect local policy practice and institutional specificity, but it needs stronger mechanisms for accumulating comparable evidence across regions.

6.2 Implications

6.2.1 Implications for Academic Research and Practice

The comparative results suggest three implications for research. First, green low-carbon development, digital technology, land use, and farmer-centered issues can serve as bridging topics for China-international dialogue. Second, Chinese studies can improve international comparability by introducing measurable indicators, impact evaluation, and mechanism identification into policy-oriented topics such as “乡村振兴”, “小农户衔接”, and “农业强国”. Third, international studies can make fuller use of China’s institutional arrangements and policy mixes as observable governance cases.

In collaboration, Chinese research should promote cross-institutional cooperation, data-platform sharing, and stable links with international organizations and universities, so as to support methodological diffusion and cross-regional comparative studies.

6.2.2 Implications for Policymaking

For policymaking, agricultural transformation should be designed as a multidimensional policy mix rather than a single-goal program. WoS burst terms such as food security, climate change, and security highlight the need for resilience and risk governance, while CNKI (Figure 13)bursts such as “绿色发展” and “现代农业” show the domestic importance of green and digital transformation. Policy design should therefore coordinate supply security, low-carbon transformation, digital upgrading, and risk governance, and evaluate these combinations through measurable indicators.

Implementation should focus especially on land and farmers. Land use and farmers or “小农户” have strong bridging potential across the two databases because they connect institutional arrangements, factor allocation, and micro-level behavior. Policies should improve land-related arrangements, strengthen socialized services, and use organizational support and enterprise-led mechanisms to help smallholders participate in modern agriculture and stabilize their returns (Huang, 2022).

Digital transformation should also move beyond equipment provision. Training, financial support, organizational systems, and data governance rules need to be integrated into a complete technology adoption chain.

7. CONCLUSION AND LIMITATIONS

This study uses CNKI and the Web of Science Core Collection as dual data sources and applies CiteSpace to compare Chinese and international research on agricultural transformation. It analyzes publication trends, author and institutional collaboration, keyword co-occurrence, clustering structures, thematic timelines, keyword bursts, and cross-database thematic mapping based on normalized keywords and Jaccard similarity. The results show that CNKI research is more policy-oriented and stage-based, while WoS research is more networked, evidence-oriented, and connected to global public issues. Shared themes include agricultural transformation, modernization, technology, governance, sustainability, land, and farmers; divergent themes reflect China’s national strategies and the international literature’s emphasis on food security, climate risk, ecological externalities, and impact assessment. Digitalization and green low-carbon development are likely to become major interfaces for future cross-context dialogue. The study therefore contributes to the literature by placing Chinese and international research in a single comparative framework and by showing both their shared knowledge base and their different problem orientations.

The study also has limitations. Structural differences in language systems, journal coverage, and indexing rules may affect hotspot intensity and clustering boundaries.

Cross-language keyword mapping may introduce synonym-merging, translation, and semantic ambiguity, especially for policy and governance terms.

In addition, because CNKI does not support CiteSpace visualization of cited authors, cited journals, or disciplinary fields, deeper comparative analysis of intellectual bases remains limited. Future research can update the sample, refine keyword normalization, and combine bibliometrics with qualitative review or case-based evidence.

REFERENCES

[1] Chen, C. (2006). CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. Journal of the American Society for Information Science and Technology, 57(3), 359–377. https://doi.org/10.1002/asi.20317

[2] Ding, Z., Ge, M., & Cao, J. (2023). A review of social media content marketing based on CiteSpace visual analysis. Journal of Commercial Economics, (21), 81–84.

[3] Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. Journal of Business Research, 133, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

[4] Feng, Z., Robinson, G. M., & Tan, Y. (2025). Rural revitalization in China: Reversing rural decline and eliminating poverty. Geography Compass, 19(7), e70039. https://doi.org/10.1111/gec3.70039

[5] Food and Agriculture Organization of the United Nations (FAO). (n.d.). Digital agriculture and AI. https://www.fao.org/innovation/digital-agriculture-and-ai-innovation/en

[6] Food and Agriculture Organization of the United Nations (FAO), International Fund for Agricultural Development (IFAD), United Nations Children's Fund (UNICEF), World Food Programme (WFP), & World Health Organization (WHO). (2023). The state of food security and nutrition in the world 2023: Urbanization, agrifood systems transformation and healthy diets across the rural–urban continuum. https://www.who.int/publications/m/item/the-state-of-food-security-and-nutrition-in-the-world-2023

[7] He, L., Xin, L., & Hu, Z. (2020). Intellectual base,emerging trends,and research fronts of agricultural modernization:A bibliometric review by CiteSpace V. Research of Agricultural Modernization,2020,41(03):373-384. https://link.cnki.net/doi/10.13872/j.1000-0275.2020.0033

[8] Huang, J. (2022). China's rural transformation and policies: Past experience and future directions. Engineering, 18, 21–26. https://doi.org/10.1016/j.eng.2022.03.011

[9] Jaccard, P. (1901). Étude comparative de la distribution florale dans une portion des Alpes et du Jura. Bulletin de la Société Vaudoise des Sciences Naturelles, 37, 547–579. http://dx.doi.org/10.5169/seals-266450

[10] Klerkx, L., Jakku, E., & Labarthe, P. (2019). A review of social science on digital agriculture, smart farming and agriculture 4.0: New contributions and a future research agenda. NJAS: Wageningen Journal of Life Sciences, 90–91, 100315. https://doi.org/10.1016/j.njas.2019.100315

[11] Li, X., Ma, E., & Qu, H. (2017). Knowledge mapping of hospitality research – A visual analysis using CiteSpace. International Journal of Hospitality Management, 60, 77–93. https://doi.org/10.1016/j.ijhm.2016.10.006

[12] Liu, Y., Zang, Y., & Yang, Y. (2020). China's rural revitalization and development: Theory, technology and management. Journal of Geographical Sciences, 30(12), 1923–1942. https://doi.org/10.1007/s11442-020-1819-3

[13] Speel, P. H., Shadbolt, N., De Vries, W., Van Dam, P. H., & O'Hara, K. (1999). Knowledge mapping for industrial purpose. KAW99 Conference, Banff, Canada.

[14] Synnestvedt, M. B., Chen, C., & Holmes, J. H. (2005). CiteSpace II: Visualization and knowledge discovery in bibliographic databases. AMIA Annual Symposium Proceedings, 2005, 724–728. https://pmc.ncbi.nlm.nih.gov/articles/PMC1560567/

[15] Vermeulen, S. J., Campbell, B. M., & Ingram, J. S. I. (2012). Climate change and food systems. Annual Review of Environment and Resources, 37, 195–222. https://doi.org/10.1146/annurev-environ-020411-130608

[16] Wang, Z., & Chen, C. (2025). Hotspots of the policy diffusion research in China and its evolution: An analysis based on CiteSpace knowledge mapping. Soft Science, 39(9), 64–72. https://doi.org/10.13956/j.ss.1001-8409.2025.09.09

[17] Wheeler, T., & von Braun, J. (2013). Climate change impacts on global food security. Science, 341(6145), 508–513. https://doi.org/10.1126/science.1239402

[18] Zhang, B., & Zhao, B. (2025). Progress, hotspots, and trends in China's agricultural green development research:An analysis based on CiteSpace. Journal of Zhengzhou University of Light Industry(Social Science Edition),2025,26(05):95-103.

[19] Zhou, N., Yang, F., He, Y., & An, H. (2026). Realization path of agricultural digital transformation to promote rural revitalization: Knowledge graph analysis based on CiteSpace. Journal of Chinese Agricultural Mechanization, 47(04), 276–283. https://doi.org/10.13733/j.jcam.issn.2095-5553.2026.04.038

[20] Zhou, X., & Liu, Z. (2025). Research trends and hot issues in social governance since the new era—A visualization analysis based on CiteSpace and VOSviewer. Journal of Harbin Institute of Technology (Social Sciences Edition), 27(5), 77–85. https://doi.org/10.16822/j.cnki.hitskb.2025.05.008

[21] Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. Organizational Research Methods, 18(3), 429–472. https://doi.org/10.1177/1094428114562629