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Digital Intelligence-Enabled Collaborative Innovation Pathways for Agriculture and Forestry Academic Journals: Postprint

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Abstract

[Objective] To explore effective pathways for empowering collaborative innovation in forestry and agricultural academic journals through digital intelligence technologies, break free from and resolve their development dilemmas, and provide support for accelerating knowledge dissemination in forestry and agricultural disciplines, transformation of scientific and technological achievements, and service to rural revitalization strategies. **[Methods]** Based on collaborative innovation theory, and combining core attributes such as the multi-source nature of forestry and agricultural data, long-term observation, and regional specificity, we systematically construct a digital intelligence-empowered collaborative innovation model and conduct an in-depth analysis of the dilemmas faced during its implementation and breakthrough pathways. **[Results]** The innovation model driven by digital intelligence technology and centered on deep collaboration among multiple stakeholders can effectively integrate fragmented forestry and agricultural research data, overcome problems arising from long-term observation and regional differences, significantly enhance the operational efficiency of forestry and agricultural academic journals and the precision of knowledge services, and strengthen the practical application value and regional adaptability of scientific research achievements. **[Conclusion]** We propose implementation pathways including strengthening institutional guarantees, optimizing technology adaptability and regional collaboration, cultivating digital intelligence talent, and deepening knowledge service innovation, providing new ideas for promoting high-quality development of forestry and agricultural academic journals.

Full Text

Research on the Collaborative Innovation Path of Data-Intelligence Empowering Forestry and Agricultural Academic Journals

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Abstract

[Purpose] This study explores effective pathways for data-intelligence technologies to empower collaborative innovation in forestry and agricultural academic journals, aiming to break through their development dilemmas and provide support for accelerating knowledge dissemination in forestry and agriculture, transforming scientific and technological achievements, and serving the rural revitalization strategy. **[Method]** Grounded in collaborative innovation theory and considering the core attributes of forestry and agricultural data—such as multi-source origins, long-term observation requirements, and regional specificity—we systematically construct a data-intelligence-enabled collaborative innovation model and deeply analyze the implementation challenges and breakthrough pathways. **[Results]** An innovation model driven by data-intelligence technologies and centered on deep collaboration among multiple stakeholders can effectively integrate fragmented forestry and agricultural research data, overcome problems arising from long-cycle observations and regional disparities, significantly improve the operational efficiency and precision of knowledge services of forestry and agricultural academic journals, and enhance the practical application value and regional adaptability of research outcomes. **[Conclusion]** The study proposes implementation pathways including strengthening institutional guarantees, optimizing technology adaptability and regional coordination, cultivating data-intelligence talent, and deepening knowledge service innovation, offering new perspectives for promoting the high-quality development of forestry and agricultural academic journals.

Keywords: Data-Intelligence Empowering; Forestry and Agricultural Academic Journals; Collaborative Innovation; Resource Sharing; Data Characteristics

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Data-Intelligence Empowering (DIE) has emerged as a central focus for both academia and industry, representing not only a competitive frontier for cutting-edge technologies but also a new strategic high ground for national planning [1]. China has successively issued policy frameworks including the *Overall Layout Plan for Digital China Construction* [2], the “*Data Elements × Three-Year Action Plan (2024-2026)*” [3], and the *China Data-Intelligence Empowering Research Report (2023-2024)* Blue Book [4], accelerating theoretical innovation and practical application of data-intelligence empowering. Academic research on the concept of data-intelligence empowering presents diverse perspectives. For instance, Shan Yu et al. [5] view it as a process where data-intelligence capabilities drive transformation and reshaping of enterprise management scenarios; Chu Jiewang et al. [6] emphasize its essence as the deep integration of digital resources to achieve reconstruction and integration of data-intelligence production factors; while Wang Bing et al. [1] identify it as an interactive collaborative mechanism that generates big data through digital-intelligence means to enhance the capabilities and value creation of empowered objects. Regardless of the dimension explored, the core focus remains the deep integration of digitalization and intelligence, leveraging emerging technologies such as Artificial Intelligence (AI), Blockchain, and Cloud Computing to reshape traditional concepts and management methods, optimize full-process efficiency, and drive innovation and growth.

As a key carrier in the data-intelligence agriculture domain, forestry and agricultural academic journals serve as important platforms for disseminating cutting-edge achievements and promoting technological transformation, with content characterized by distinct regional adaptability and production practice relevance. However, traditional publishing models suffer from low efficiency, long cycles, and insufficient integration with production practices, making it difficult to meet the rapid iteration demands of modern agricultural technology. While existing research has explored digital-intelligence transformation in academic journals, such as constructing smart publishing models [7-8], knowledge services empowered by digital-intelligence technologies [9], digital transformation of editorial publishing [10], and path analysis of the entire journal publishing industry chain [11], systematic and in-depth research specifically targeting forestry and agricultural academic journals and their collaborative innovation needs within the rural revitalization context remains lacking. In view of this, this paper employs collaborative innovation theory as a framework to construct a data-intelligence-enabled collaborative innovation model for forestry and agricultural academic journals, deeply analyzing practical dilemmas and breakthrough pathways, with the aim of providing new perspectives for the high-quality development of these journals.

1.1 Theoretical Origins and Connotation of Collaborative Innovation

The concept of Collaborative Innovation was first proposed by American scholar Peter Gloor, defined as “a network group composed of self-motivated individuals

who, driven by a collective vision, exchange ideas, information, and work status through network communication to achieve common goals” [12]. Veronica Serrano and Thomas Fischer further elaborated that collaborative innovation is a process of systematic optimization and cooperative innovation among various innovation stakeholders, analyzable from two dimensions: integration and interaction. The integration dimension primarily includes collaborative integration of information, objectives, performance, and actions, while the interaction dimension encompasses reciprocal information sharing, joint deployment, system matching, and optimal synchronization of actions among innovation subjects [13]. Domestic scholars emphasize that collaborative innovation breaks barriers among various innovation stakeholders through organizational arrangements and mechanism innovation, achieving multi-stakeholder collaboration and resource integration with knowledge value-added as the core to generate systematic superposition effects [14].

Initially focused on technological innovation research in manufacturing, this theory gradually extended to economics and management and subsequently to other fields [15]. In recent years, scholars in the journal publishing domain have also explored its application, noting that different collaborative innovation models produce varying effects [16-17], while a universally accepted explanatory framework for the causal relationship between collaboration and innovation remains lacking [18]. Nevertheless, the ultimate core principle of collaborative innovation development theory lies in breaking subject barriers through factor integration and system optimization to achieve value-added.

In the domain of forestry and agricultural academic journals, collaborative innovation exhibits unique complexity. Forestry and agricultural systems involve multiple factors including natural ecology and socio-economics, with long and multi-stage knowledge transformation chains from generation to application, and high dependence on regional practical knowledge [19]. Scholar Huang Jikun also emphasizes that agricultural technological innovation must consider not only technology itself but also institutional, market, and investment factors, requiring coordination across different innovation domains and thus presenting higher collaborative difficulty compared to other fields [20]. This complexity is essentially determined by the inherent attributes of forestry and agricultural research data. Temporally, biological and plant research requires years of field observation data accumulation, demanding that data-intelligence technologies possess long-cycle time-series data modeling capabilities. Spatially, essential differences exist across climate zones, regional soil physicochemical properties, and crop growth patterns, requiring data-intelligence tools to integrate dynamic parameter calibration modules based on Geographic Information Systems (GIS) for precise analysis of regionally differentiated data. These attributes necessitate that collaborative innovation in forestry and agricultural academic journals address not only academic dissemination efficiency but also embed within the agricultural industry value chain, forming scenario-based characteristics that balance academic dissemination with rural revitalization policy implementation—precisely the core of data-intelligence-enabled collaborative innovation for

forestry and agricultural academic journals.

1.2 Data-Intelligence-Enabled Collaborative Innovation Model for Forestry and Agricultural Academic Journals

This paper constructs a data-intelligence-enabled collaborative innovation model for forestry and agricultural academic journals (see Figure 1 [Figure 1: see original paper]), with collaborative innovation theory as its core. Its factor integration directly addresses the need to resolve practical problems such as data fragmentation and inefficient stakeholder collaboration in forestry and agricultural journals. Institutional innovation elements align with the institutional and mechanism reform objectives in agricultural policies, providing a theoretical foundation for constructing the data-intelligence-enabled collaborative model. This model optimizes resource allocation and enhances collaborative innovation capacity in forestry and agricultural academic journals through the application of data-intelligence technologies (data-driven approaches and cross-boundary integration), ultimately serving rural revitalization.

In internal collaboration, editorial departments utilize intelligent manuscript processing systems and semantic analysis tools to improve handling efficiency; publishing departments achieve precise scheduling through digital typesetting and on-demand printing; management departments employ data analysis platforms such as user behavior analysis and impact assessment to dynamically calibrate journal development strategies. In external collaboration, four major stakeholders are engaged: research institutions, universities, enterprises, and farmers. Research institutions provide academic resources and expert think tanks for joint frontier research and achievement transformation projects; universities play important roles in talent cultivation, forming industry-academia-research collaborative training mechanisms; enterprises deliver technical solutions and financial support; farmers provide practical cases and feedback information, transforming research achievements into agricultural productivity. Data-driven approaches and cross-boundary integration serve as the twin engines of data-intelligence empowering. Data-driven methods employ Python and other tools for multi-source data fusion analysis of crop growth data, pest and disease atlases, and meteorological remote sensing data to construct specialized research trend prediction models and hot topic identification models for the forestry and agriculture domain, providing more forward-looking and targeted bases for journal topic planning and special issue organization. Cross-boundary integration promotes deep intersection between agriculture and artificial intelligence and blockchain technologies, such as using natural language processing to parse professional terminology combined with cross-regional expert databases to achieve dual matching of domain knowledge and regional experience, addressing the problem of insufficient cross-regional review expertise in traditional peer review. Relying on official resources such as the Ministry of Agriculture and Rural Affairs Big Data Platform and the strength of journal alliances, a cross-institutional and cross-regional forestry and agricultural

academic resource sharing hub is built. Based on unified standards such as metadata standards and data interface specifications, diverse resources including journal articles, datasets, patents, standards, policies and regulations, and practical technique videos are integrated. Blockchain technology enables data rights confirmation and traceability, ensuring secure sharing and trustworthy circulation, completely breaking data silos.

Compared with general academic journals, the digital-intelligence transformation of forestry and agricultural academic journals involves not simple transplantation of technical tools but domain-depth adaptation. Big data analysis technologies are extended from user behavior to professional research data mining; technical solutions achieve precise implementation through developing regionally parameterized adaptive models; collaborative goals are tightly anchored to actual rural revitalization needs; and knowledge services emphasize practicality and operability. This balancing mechanism between theoretical universality and domain specificity enables the model to maintain technological generality while highlighting forestry and agricultural disciplinary characteristics, ultimately forming a distinctive innovation ecosystem centered on data-intelligence empowering, linked by multi-stakeholder collaboration, and oriented toward rural revitalization needs.

1.3 Core Value of Data-Intelligence-Enabled Collaborative Innovation

Practical application of this model can generate value in three dimensions. First, in operational efficiency leapfrogging, automation and intelligence substantially shorten publication cycles, reduce labor costs, and enhance information dissemination timeliness. Second, in knowledge service precision, data mining and user profiling provide customized services for different groups. For researchers, personalized literature recommendations and research trend insights are offered; for farmers and agricultural technicians, practical technique information and popular science content adapted to regional needs are delivered, such as pest and disease control atlases and localized cultivation protocols. Third, in value chain extension, breaking away from the traditional “paper warehouse” positioning of journals, through deep integration of industry-academia-research-application, journals can become knowledge transformation hubs connecting research and application and regional development think tanks. For example, high-value research outcomes can be transformed into field demonstration projects, directly empowering the upgrading of characteristic forestry and agricultural industries and enhancing the practical application value and social impact of research achievements.

2. Implementation Dilemmas

The model constructed based on collaborative innovation theory faces multiple dilemmas in practical application, including inherent attributes of forestry and agricultural data, practical constraints in the digital-intelligence process, and deeper institutional mechanisms.

2.1 Regional Development Imbalance

Comprehensive influences of geographical location, economic foundation, and policy support intensity create significant regional imbalances in the digital-intelligence transformation and collaborative innovation of forestry and agricultural academic journals across different regions. Economically developed regions, with abundant resources and advanced technologies, rapidly promote journal digital transformation and collaborative innovation. In contrast, less-developed regions, constrained by funding shortages and technological lag, show slower digital-intelligence progress, resulting in outdated content, information delays, and obstacles to data sharing and collaborative innovation. Moreover, digital-intelligence tools typically require substantial investment and professional technical support, which poses difficulties for resource-limited forestry and agricultural academic journals to acquire. This uneven development intensifies academic information fragmentation and data silos, reduces resource utilization efficiency, and severely restricts the depth of academic exchange and the closeness of cooperation. Although current initiatives such as the “China Agricultural Journals Network” and the “Forestry and Agricultural Journal Group of the Western Science and Technology Journal Alliance” exist, some forestry and agricultural academic journals suffer from low stakeholder participation, loose structures, single cooperation models, and limited objectives. Their operations primarily rely on editorial department quality control and research institution scientific capacity, making it difficult to form stable, efficient, and mutually beneficial collaborative innovation mechanisms.

2.2 Limited Application of Digital-Intelligence Technology

Limited technology application is both a result and a cause of regional imbalance, intertwined with resource collaboration obstacles. First, the promotion and application of digital-intelligence technologies require certain technical support and capital investment, which journals in less-developed regions cannot afford, making resource sharing and collaborative cooperation difficult to achieve and further limiting the application scope and promotion speed of digital-intelligence technologies in forestry and agricultural academic journals. Second, forestry and agricultural data originate from diverse sources, have varied formats, and uneven quality, making standardized cleaning and integration difficult and hindering effective analysis and sharing. Third, enormous differences in soil and climate conditions across regions result in strong regional specificity of forestry and agricultural data, while general models prove ineffective and require substantial localized data training and parameter tuning, further raising technology application costs and complexity. Fourth, imperfect cooperation mechanisms between journal publishers and research institutions or enterprises, lack of unified technical standards and norms, and institutional barriers and interest concerns regarding cross-departmental and cross-institutional data sharing, combined with a severe shortage of compound experts and editorial personnel familiar with both forestry and agricultural professionalism and digital-intelligence tech-

nology capabilities, seriously hinder the deep integration of digital-intelligence technologies with forestry and agricultural academic journals.

2.3 Academic Resource Collaboration Barriers

Rational allocation and utilization of academic resources are key to efficient collaborative innovation. First, with the massive growth of research achievements in forestry and agricultural academia, authors struggle to accurately identify the most suitable journals for their research. This difficulty stems not only from the complexity and diversity of forestry and agricultural disciplines but also from variations in journal positioning, review standards, and publication cycles, leaving authors often confused during submission and increasing submission blindness and time costs. Some research achievements in emerging or interdisciplinary fields face limited publication opportunities due to scarce page resources or preference for established authorities, increasing the risk of academic achievements being buried and hindering academic prosperity and progress. Second, current editorial platforms of forestry and agricultural academic journals operate independently, with uneven quality across regions and journals. Some platforms suffer from incomplete functions and inconvenient operations, with journal directories remaining outdated for years, creating numerous inconveniences for authors and wasting academic resources. Third, some journals lack high-level reviewer expert databases, resulting in most manuscript revisions focusing on formatting issues rather than substantive academic problems. Under such circumstances, even innovative and academically valuable research achievements may be rejected due to oversights or biases in the review process, limiting improvements in journal academic quality and depth of academic discussion. Finally, well-known journals attract more submissions and talented individuals due to abundant resources, creating a Matthew effect where the strong become stronger and the weak become weaker, limiting the breadth and depth of collaborative innovation.

2.4 Data Sharing Barriers and Security/Ethical Risks

Forestry and agricultural data involve germplasm resource information, cultivation technique details, and production data of specific farmers or enterprises, carrying high economic value and potential biosafety risks. Research institutions, enterprises, and farmers show low willingness to share due to interest protection. Research data property rights are complex, lacking clear legal definition and distribution mechanisms, with achievements involving multi-stakeholder cooperation often hindered by benefit distribution disputes. Additionally, research may contain sensitive data such as farmers' personal information and geographical locations, posing leakage risks during digital-intelligence collection, processing, and publication. Ethical review standards for research involving animal and plant experiments and field investigations remain inconsistent, while new ethical issues such as AI algorithm bias and boundaries of large-scale data monitoring urgently need resolution. If these barriers and risks cannot be properly

addressed, they will severely constrain the release of data element value and the depth of collaborative innovation.

3. Implementation Pathways

Addressing the aforementioned dilemmas requires implementation pathways for data-intelligence-enabled collaborative innovation in forestry and agricultural academic journals that are both systematic and targeted, precisely adapted to their unique development needs.

3.1 Strengthen Institutional Guarantees for Data-Intelligence Empowering

Institutional guarantees involve multiple levels including policy support, regulation formulation, and funding investment. Government and academic journal management institutions should formulate clear digital-intelligence development strategies, objectives, pathways, and timelines to unify thinking and build consensus, ensuring all relevant personnel work toward the same direction. Drawing on the framework and concepts of the “*Data Elements × Three-Year Action Plan (2024-2026)*”, collaborative innovation effectiveness indicators for forestry and agricultural journals—such as data sharing rates, achievement transformation cases, and farmer service feedback—can be incorporated into agricultural modernization evaluation systems. A tripartite feedback mechanism involving policy, journals, and farmers should be established to precisely grasp market demands through collecting farmer feedback on journal technique articles, thereby optimizing policy support direction and making it more targeted and effective. Unified technical standards for digital-intelligence technology application in forestry and agricultural academic journals should be formulated to standardize data collection, storage, exchange, and analysis protocols. Governments and relevant institutions should introduce policies and regulations supporting the digital-intelligence transformation of forestry and agricultural academic journals, covering data sharing, privacy protection, copyright ownership and transfer mechanisms, providing solid legal guarantees for digital-intelligence transformation. A scientific digital-intelligence evaluation system should be established to encourage bold attempts and innovative practices during the transformation process, with outstanding forestry and agricultural academic journals receiving recognition and rewards to stimulate enthusiasm and creativity among more journals. Intellectual property ownership issues in cooperation between research institutions and journals should be further clarified, reasonable remuneration systems should be formulated, and mutually beneficial cooperation models between enterprises and journals should be promoted to ensure the sustainability of collaboration.

3.2 Optimize Technology Adaptability and Regional Coordination Mechanisms

On one hand, strengthen cooperation with research institutions, universities, and IT enterprises to establish an industry-academia-research integrated collaborative innovation mechanism, developing customized digital-intelligence tools such as spatiotemporal data analysis platforms integrating LSTM and Transformer models, and models with regionally parameterized adaptive adjustment functions to enhance application effectiveness in forestry and agricultural academic journals. On the other hand, through policy guidance and resource allocation, increase support for ordinary journals, establish 1+N mentoring partnerships between top-tier journals and ordinary journals to share reviewer expert databases and topic planning experience, breaking the resource centralization caused by the Matthew effect and promoting coordinated development of forestry and agricultural academic journals at different levels to build a healthier and more diverse academic ecology. Additionally, develop a knowledge graph-based submission recommendation system, establish a tag library for subdivided fields in forestry and agricultural disciplines, connect with real-time data from journal editorial platforms to display review cycles, accepted topics, and research trends for each journal, enabling AI tools to automatically analyze manuscript content and identify the most suitable journals for authors' research, reducing submission blindness. Simultaneously, strengthen existing journal alliance functions to move beyond simple platform sharing toward deep collaboration in joint data governance, coordinated knowledge services, and co-construction of expert pools and training resources, with government project funding guiding alliances to become substantive and robust.

3.3 Cultivate Digital-Intelligence Editorial Talent

Digital-intelligence editorial talent constitutes the core force driving the digital-intelligence transformation of forestry and agricultural academic journals, requiring not only traditional editorial skills but also data analysis, digital media operation, and information technology application capabilities. Internally, journal publishers should introduce digital-intelligence scenarios, projects, tasks, and processes into actual work for practice, establishing incentives such as awards and professional promotion to encourage editorial staff to actively participate in digital-intelligence transformation practice projects, enhancing digital-intelligence capabilities and professional levels through practical training and stimulating enthusiasm and creativity, thereby improving journals' collaborative innovation capacity and market competitiveness. Externally, recruitment channels should be broadened to strengthen publicity and widely attract compound talents with forestry and agricultural backgrounds who also master data analysis, information technology, or science communication skills, continuously replenishing the editorial team with fresh blood that brings new digital-intelligence concepts and cutting-edge technologies. Furthermore, reviewer expert team construction should be strengthened by establishing dynamically updated high-

level reviewer expert databases, utilizing digital-intelligence tools to assist expert matching and review process management, improving review quality and efficiency, and ensuring the fairness and authority of academic evaluation.

3.4 Deepen Knowledge Service Innovation and Achievement Transformation

Technologies such as NLP and knowledge graphs can be employed to automatically extract core knowledge points, technical essentials, and operating procedures from massive volumes of papers. Differentiated and scenario-based knowledge products should be provided for different user groups—for example, generating domain frontier briefings for researchers, producing intelligent pest and disease diagnosis short videos for agricultural technicians, and providing easy-to-understand popular science graphics or voice-based localized farming reminders for ordinary farmers. Additionally, journal platforms can integrate functions such as technology supply-demand information release, expert online consultation, and successful case demonstration, actively connecting with technology promotion institutions, agricultural enterprises, and industrial parks to promote the transformation of research achievements from “paper” to “field,” tracking and reporting the application effects of important achievements to create demonstration effects.

Data-intelligence technologies have opened infinite possibilities for collaborative innovation in forestry and agricultural academic journals. The collaborative innovation model constructed in this paper, driven by data-intelligence technologies and centered on multi-stakeholder collaboration, can effectively resolve issues such as fragmented forestry and agricultural data and significant regional disparities. The implementation pathways proposed herein can create a stable and standardized external environment by strengthening institutional guarantees for data-intelligence empowering, optimize technology adaptability and regional coordination to promote efficient integration and sharing of forestry and agricultural academic resources, cultivate digital-intelligence talent to provide core driving force, and deepen knowledge service innovation to achieve sustainable development. In the future, forestry and agricultural academic journals must embrace the continuous iteration of data-intelligence technologies, deepen collaborative innovation thinking, continuously expand the breadth and depth of collaborative networks, and revolutionize their publication models and service paradigms with a more open, inclusive, and innovative posture to become knowledge hubs driving forestry and agricultural technological progress, supporting comprehensive rural revitalization, and playing a more important bridging role on the global academic stage.

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