DATA-DRIVEN ECOSYSTEM BUSINESS MODELS IN AGRICULTURE WITH FOCUS ON SUSTAINABILITY: A SYSTEMATIC LITERATURE REVIEW

SHAHIN REZVANIAN

University of St. Gallen, Institute for Media and Communication Management,
St. Gallen, Switzerland
shahin.rezvanian@unisg.ch

DOI
https://doi.org/
10.18690/um.fov.4.2025.41

ISBN
978-961-286-998-4

Digital transformation is reshaping agriculture through data-driven business models leveraging emerging technologies. Understanding these models' sustainability contributions is crucial given agriculture's challenges with climate change, resource constraints, and food security. Following PRISMA, Scopus and Web of Science were searched, yielding 1538 articles. After screenings, 80 papers were analyzed thematically. 32 distinct data-driven ecosystem business models were identified, categorized into three primary groups: Technology-Focused Models, Value Chain Integration Models, and Data & Governance Models. These models contribute to economic sustainability through resource optimization and new revenue streams; environmental sustainability through precision management and emissions reduction; and social sustainability through knowledge sharing and community development. Implementation challenges include technical integration, organizational adoption barriers, data governance concerns, and policy gaps. These models show significant potential for enhancing agricultural sustainability. Trust emerges as fundamental for implementation, while power dynamics remain critical concerns. Future research should focus on governance frameworks, user-centric design, and impact assessment.

Keywords:
digital transformation,
sustainability,
data-driven agriculture,
ecosystem business models,
value chains

University of Maribor Press

1 Introduction

Digital transformation is reshaping agriculture through data-driven business models that leverage emerging technologies to create value within ecosystem—driving the twin transitions of digitalization and sustainability. Despite growing research on digital agriculture, there remains limited synthesis regarding how specific business models leverage data to enhance sustainability. This review addresses that gap by examining how data-driven ecosystem business models (DDEBMs) contribute to economic, environmental, and social sustainability, while identifying implementation challenges and future directions. DDEBMs in agriculture can be defined as interconnected value creation systems that utilize digital technologies, data analytics, and collaborative networks to generate, process, and exchange agricultural data for economic, environmental, and social benefits. These models typically involve multiple stakeholders working together through platforms or networks to create and capture value from agricultural data (Vial & Tedder, 2017; Graf-Drasch et al., 2023; Rijanto, 2021; Gowri & Ramachander, 2024).

Sustainability—meeting present needs without compromising the ability of future generations to meet their own (Brundtland Commission, 1987)—is critical as agriculture faces mounting challenges from climate change, resource constraints, and food security. Agricultural output must increase 70% by 2050 despite shrinking farmland and declining workforce (Cavazza et al., 2023). Digital agriculture offers a path forward by enabling informed, data-driven decisions that address sustainability across value chains (Hrustek, 2020). This review addresses three research questions: What types of data-driven ecosystem business models exist in agriculture? How do these models contribute to sustainability (environmental, social, or economic)? What are the key challenges, limitations, and future directions for implementing these models? The goal is to synthesize current knowledge base on DDEBMs, identify and categorize model types, assess their contributions to various sustainability dimensions, and highlight implementation challenges and future research directions.

2 Methods

This systematic literature review followed PRISMA guidelines and searched Scopus and Web of Science up to January 2025, using terms related to digital technologies, business models, ecosystems, and agricultural contexts. The selection process involved two stages. First, titles, abstracts, and keywords were screened using five criteria: digital technologies, business models, ecosystems, agriculture, and sustainability. Studies meeting at least four criteria advanced to full-text review. Second, full texts were evaluated for relevance to the research questions, with those scoring at least four out of five included, resulting in 80 papers. To ensure coding reliability, the results were triangulated by independently coding 20 papers (25% of the sample), reaching 81% agreement. Discrepancies were resolved through discussion before final coding. Figure 1 illustrates the review process, including identification, screening, eligibility, and inclusion.

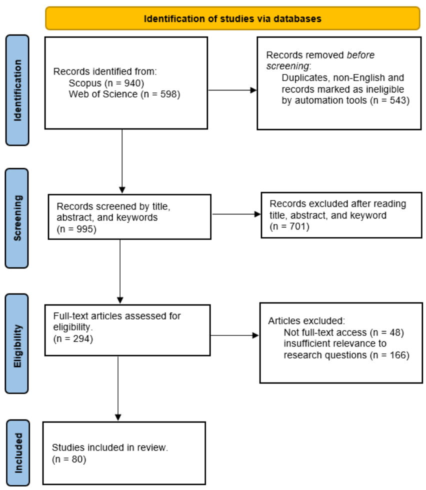

Figure 1: PRISMA Flow Diagram

Source: Own

Data were extracted on publication metadata, technologies, business model types, sustainability impacts, implementation challenges, and research directions. Business model categorization combined deductive and inductive approaches. Deductive coding used established frameworks such as Osterwalder's Business Model Canvas and the Triple Bottom Line (Elkington, 1997), while inductive analysis identified emergent value creation patterns through open coding, cross-case comparison, and iterative refinement. Sustainability impacts were assessed using the triple-bottom-line framework—economic, environmental, and social—and rated as strong, moderate, or limited based on explicit statements, quantitative evidence, frequency of mention, and comparative emphasis across studies.

3 Results

The literature on data-driven ecosystem business models in agriculture shows growing interest, with 72.5% of publications appearing between 2020-2025, reflecting the accelerating twin transition in the sector (Figure 2).

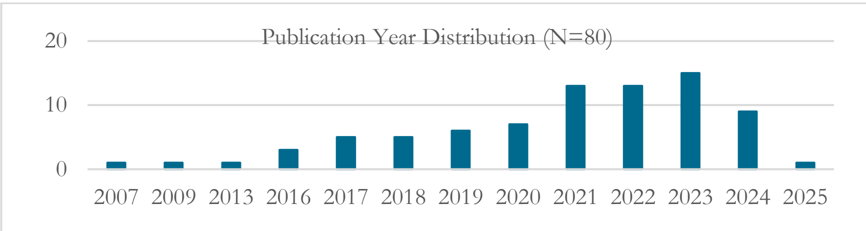

Figure 2: Temporal distribution of publications on data-driven ecosystem business models in agriculture (2007-2025)
Source: Own

Studies are geographically diverse, with major contributions from Asia (25%), Europe (25%), and Africa (20%), especially India, China, Indonesia, and various European countries (Figure 3). Developed economies often emphasize advanced digital infrastructures and regulation, while developing regions focus on smallholder inclusion and mobile-based solutions.

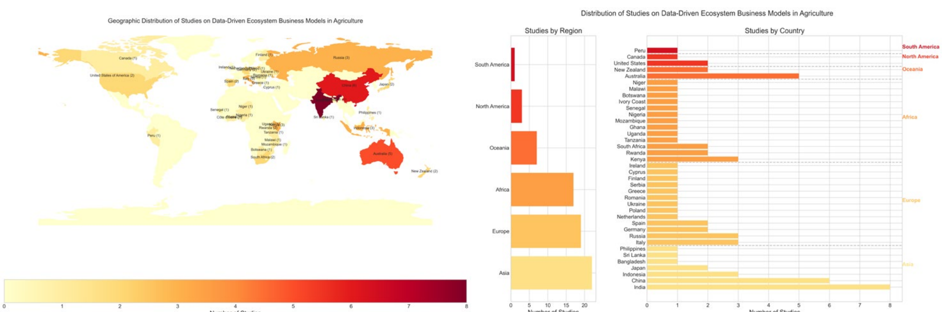

Figure 3: Geographical Distribution of Studies
Source: Own

Empirical studies dominate (55%), suggesting the field remains exploratory. From a technology perspective, IoT and sensor systems are most common (29.2%), followed by AI (17.2%), data analytics (16.7%), and blockchain (11.2%). Environmental sustainability is addressed most frequently (82%), with climate action and resource efficiency as dominant themes. Economic sustainability appears in 70% of studies, and social sustainability in 55%. Key implementation challenges include organizational barriers (37%), technical issues (29.5%), knowledge gaps (13%), financial constraints (11%), and data governance concerns (9.5%). The urban–rural digital divide is a cross-cutting issue.

3.1 Typology of Data-Driven Ecosystem Business Models in Agriculture:

Our analysis identified 32 distinct data-driven ecosystem business models in agriculture. These models were classified into three overarching categories (Figure 4): Technology-Focused, Value Chain Integration, and Data & Governance Models.

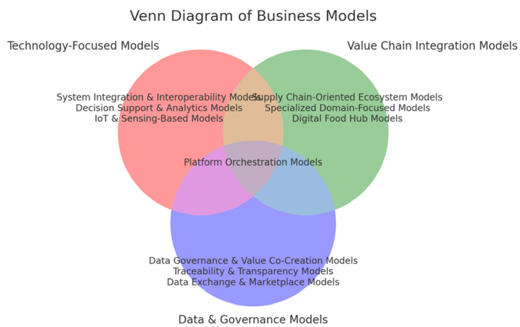

Figure 4: Venn Diagram of Data-Driven Ecosystem Business Model Categories
Source: Own

The classification was developed through an iterative coding process combining deductive and inductive reasoning. Deductively, the analysis drew on established frameworks such as Osterwalder's Business Model Canvas and the Triple Bottom Line. Inductively, emergent value creation patterns were identified by analyzing model characteristics, technologies, stakeholder configurations, and value mechanisms. Several models span multiple categories. At the center of the typology are Platform Orchestration Models, which integrate technological infrastructure, value chain coordination, and data governance.

Technology-Focused Models emphasize technological solutions and infrastructure as their primary value proposition, organized into three sub-categories: **IoT & Sensing-Based Models** leverage Internet of Things technologies for data collection and processing, creating digital counterparts of physical entities. Examples include IoT-enabled livestock management (Alves et al., 2021), IoT-blockchain field integration through layered architectures (Tasic & Cano, 2024), and autonomous robot swarms for precision farming (Braun et al., 2018). **Decision Support & Analytics Models** process data to generate actionable insights, exemplified by platforms that analyze data to provide decision support (Kampker et al., 2018), systems minimizing greenhouse gas emissions in livestock (Bălănescu et al., 2020), and AI applications in food sorting, quality control, and vertical farming (Di Vaio et al., 2020; Cavazza et al., 2023). **System Integration Models** focus on connecting diverse agricultural systems through common semantic data models (Brewster et al., 2017), multi-partner interoperability frameworks (Huber & Markward, 2021), and administrative burden reduction systems (Poppe et al., 2021).

Value Chain Integration Models connect different components of the agricultural supply chain: **Supply Chain-Oriented Models** reshape operational decisions through Big Data (Issa et al., 2024), establish multi-level collaboration frameworks (Braun et al., 2018), and create closed vertical networks with high ICT investment, as exemplified by ITC's eChoupal in India (Rao, 2007). **Digital Food Hub Models** function as "intermediary organizations based on an innovative digital strategy followed by small farms forming coopetition networks" (Berti et al., 2018, p. 427), creating shared value through quality, sustainability, and locality differentiation. **Specialized Domain-Focused Models** address specific sectors through digital livestock tools (Daum et al., 2021), bundled climate information services (Kagabo et al., 2025), holistic digital agriculture frameworks (Cook et al., 2021), and integrated renewable energy-agriculture systems (Hu et al., 2022).

Data & Governance Models focus on data exchange, management, and governance issues: **Data Exchange & Marketplace Models** enable farmers to share data for collective value creation (Vial & Tedder, 2017) and establish data broker platforms that aggregate agricultural data for external customers or create comprehensive marketplaces (Kampker et al., 2018). **Traceability & Transparency Models** leverage blockchain for wine supply chain integration (Malisic et al., 2023), connect sustainability certification with market access in sugar production (Kealley et al., 2022), track products from production to consumption (Kosior & Młodawska, 2024), and build on cooperative structures for intelligent traceability (Giagnocavo et al., 2017). **Data Governance & Value Co-Creation Models** identify distinct ecosystem roles in value creation (Azkan et al., 2022), emphasize fairness, accountability, and transparency principles (Stitzlein et al., 2021), enable progressive trust development between farmers and buyers (Kumarathunga & Ginige, 2022), and propose precompetitive platforms with standardized vocabularies (Holden et al., 2018).

Platform Orchestration Models operate at the intersection of all three domains, integrating technological capabilities, value chain coordination, and data governance. They include comprehensive frameworks connecting multiple stakeholders (Gebresenbet et al., 2023), complex architectures with device, network, and application layers (Grabher, 2020), and digital orchestrators like AgriCircle that bring together diverse stakeholders while specializing in modeling and decision support (Huber & Markward, 2021). For organizational purposes in the remainder of this paper, these cross-cutting models will be grouped under the Value Chain Integration Models category. Having established this typology, the following section examines how these business models contribute to economic, environmental, and social sustainability dimensions.

3.2 Sustainability Impacts of Data-Driven Ecosystem Business Models

To provide a comprehensive overview of how each business model type contributes to different sustainability dimensions, a matrix framework developed that maps the 32 identified business models against their economic, environmental, and social sustainability impacts (Figure 5). The matrix reveals several important patterns regarding how digital business models contribute to sustainability: **1) Strong Economic Focus:** Most business models demonstrate strong economic impacts, particularly Platform Orchestration Models, Data Exchange Models, and Supply Chain Integration Models; **2) Varying Environmental Impact:** Environmental sustainability shows greater variation, with the strongest contributions from IoT-Blockchain Integrated Systems, Renewable Energy Agricultural Integration, and Climate Information Services Models; **3) Less Pronounced Social Dimension:** Social sustainability received comparatively less emphasis in the literature, though several models demonstrate strong social impacts, including Cooperative-Based

Traceability Systems, Trust-Based Big Data Ecosystems, and Digital Food Hubs; **4) Balanced Models:** Some models show relatively balanced contributions across all three dimensions, particularly Platform Orchestration Models, Sustainability Credential Systems, and System-of-Systems Architecture Models; **5) Specialized Models:** Other models demonstrate specialized sustainability profiles, such as Trust-Based Blockchain Market Models (strong emphasis on economic and social but limited emphasis on environmental). This matrix highlights how the twin transition of digital and sustainability transformations manifests in agriculture.

Business Model			Chain	Economic	Environmental	Social	Tech	Key Citations
A. TECHNOLOGY-FOCUSED MODELS	A.1 IoT & Sensing-Based	A.1.1 Smart Livestock Management Systems	Production	...	..	..	B,H	Alves et al. (2021); Issa et al. (2024)
		A.1.2 IoT-Blockchain Integrated Systems	Cross-value chain	..	...	..	A,B	Tasic & Cano (2024)
		A.1.3 Autonomous Agricultural Systems	Production	...	...	.	B,G	Braun et al. (2018)
	A.2 Decision Support &	A.2.1 Farm-Level Decision Support Systems	Production	...	...	.	C	Bălănescu et al. (2020)
		A.2.2 AI-Driven Agricultural Models	Processing	...	..	..	C	Cavazza et al. (2023); Di Vaio et al. (2020)
		A.2.3 Collaborative Decision Support Frameworks	Cross-value chain	..	..	...	C	Beaumont De Oliveira et al. (2021)
	A.3 System Integratio	A.3.1 System-of-Systems Architecture Models	Cross-value chain	..	..	..	E	Brewster et al. (2017)
		A.3.2 Interoperability-Focused Ecosystems	Cross-value chain	...	..	.	E	Huber & Markward (2021)
		A.3.3 Administrative Burden Reduction Systems	Cross-value chain	...	..	..	E	Poppe et al. (2021)
B. VALUE CHAIN INTEGRATION MODELS	B.1 Platform Orchestrat	B.1.1 Integrated Technology Platforms	Cross-value chain	...	...	..	B,C,E	Grabher (2020); Gebresenbet et al.(2023)
		B.1.2 Ecosystem Orchestrators	Cross-value chain	...	..	..	D,E	Huber & Markward (2021)
		B.1.3 Digital Agriculture Value Platforms	Cross-value chain	...	..	..	D,E	Cook et al. (2021)
	B.2 Supply Chain-Oriented Ecosystem	B.2.1 Big Data-Driven Supply Chain Models	Distribution	...	..	.	D	Issa et al. (2024)
		B.2.2 Blockchain-Based Supply Chain Models	Cross-value chain	..	..	..	A	Malisic et al. (2023)
		B.2.3 Multi-Level Collaborative Supply Chain Models	Distribution	...	..	..	B	Braun et al. (2018)
		B.2.4 Closed Vertical Supply Chain Networks	Distribution	...	.	..	R	Rao (2007)
	B.3 Specialized Domain-Focused	B.3.1 Digital Livestock Management Models	Production	...	.	..	F	Daum et al. (2021)
		B.3.2 Climate Information & Smart Agriculture Models	Production	..	...	..	H	Kagabo et al. (2025)
		B.3.3 Vertical Farming Decision Support Systems	Processing	...	...	.	C	Beaumont De Oliveira et al. (2021)
		B.3.4 Renewable Energy Agricultural Integration	Processing	...	...	..	H	Hu et al. (2022)
C. DATA & GOVERNANCE MODELS	C.1 Data Exchange & Marketpla	C.1.1 Data Exchange Communities	Cross-value chain	...	..	...	D	Vial & Tedder (2017)
		C.1.2 Data Marketplaces	Cross-value chain	...	.	.	D	Kampker et al. (2018)
		C.1.3 Digital Food Hubs	Retail	...	..	..	F	Berti et al. (2018)
		C.1.4 B2B Agricultural E-Marketplaces	Retail	...	.	..	F	Zheng et al. (2009)
	C.2 Traceability & Transpare	C.2.1 Sustainability Credential Systems	Cross-value chain	..	...	..	A	Kealley et al. (2022)
		C.2.2 Digital Food Passport Systems	Retail	..	..	..	H	Kosior & Mlodawska (2024)
		C.2.3 Cooperative-Based Traceability Systems	Cross-value chain	..	..	..	G	Giagnocavo et al. (2017)
		C.2.4 Trust-Based Blockchain Market Models	Cross-value chain	...	.	...	A	Kumarathunga & Ginige (2022)
	C.3 Data Governance & Value Co-	C.3.1 Data Ecosystem Value Co-Creation Models	Cross-value chain	...	.	..	D	Azkan et al. (2022)
		C.3.2 Trust-Based Big Data Ecosystems	Cross-value chain	..	.	.	D	Stitzlein et al. (2021)
		C.3.3 Data Space and Transparency Models	Cross-value chain	..	..	..	A	Klug & Prinz (2023)
		C.3.4 Internet of Food Ecosystem Models	Cross-value chain	..	...	..	D	Holden et al. (2018)

Legend: Sustainability Impact: Strong emphasis, Moderate emphasis, Limited emphasis (based on relative emphasis and evidence in the literature); Value Chain Position: Production, Processing, Distribution, Retail, Cross-value chain; Technologies: A:Blockchain, B:IoT, C:AI/ML, D:Big Data, E:Cloud, F:Mobile, G:Drones, H:Edge Computing.

Figure 5: Matrix Framework of Data-Driven Ecosystem Business Models and Their Sustainability Impacts

Source: Own

Data-driven ecosystem business models contribute to economic sustainability through multiple pathways: Improved access to financing via blockchain platforms connecting farmers with financial institutions (Rijanto, 2021); Resource optimization enabling more precise resource use and cost reduction (Vial & Tedder, 2017); New revenue streams through data monetization platforms (Kampker et al., 2019); Enhanced decision-making efficiency, illustrated by disease detection two years earlier than human discovery in the Höcklistein vineyard case (Huber & Markward, 2021); Increased yields, demonstrated by a 5% yield increase per hectare using digital twins for potato harvesting (€560 additional revenue/hectare) (Kampker et al., 2019); Diversified revenue sources through integrated systems, exemplified by a 200 MW PV fishery project with a net present value of ¥352.1253 million (Hu et al., 2022).

The digital transformation enables environmental benefits through: Water reduction, exemplified by rice irrigation systems reducing consumption by 10-25% (Routis et al., 2022); Emissions reduction, with a 200 MW digital PV fishery project reducing emissions by approximately 119,241 tons annually (Hu et al., 2022); Early intervention capabilities enabling targeted rather than widespread interventions (Huber & Markward, 2021); Waste reduction through B2B marketplaces addressing the 20 billion pounds of "ugly" produce lost annually in the US (Vlachopoulou et al., 2021); Sustainable land use through integrated systems enhancing land usage by 32.2% compared to traditional approaches (Hu et al., 2022); Circular economy approaches establishing closed-loop farming ecosystems (Abdillah et al., 2023).

Social sustainability is addressed through: Empowerment of small-scale producers, with digital food hubs positioning farmers as "price negotiators" rather than "price takers" (Berti et al., 2018); Knowledge sharing facilitating exchange across stakeholder groups (Routis et al., 2022); Rural development through digital technologies (Hrustek, 2020) and cooperatives functioning as both social and economic networks (Giagnocavo et al., 2017); Social capital formation through blockchain-enabled trust networks (Kumarathunga & Ginige, 2022); Gender inclusion with platforms helping female farmers achieve financial stability (Abdillah et al., 2023); Financial inclusion providing access to services in previously underserved rural areas (Abdillah et al., 2023).

This analysis demonstrates how the digital transition in agriculture enables multi-dimensional sustainability impacts, with the most substantial evidence for economic benefits, but significant potential across all sustainability dimensions.

3.3 Implementation Challenges

Implementing data-driven ecosystem business models for sustainability faces several challenges that can impede both digital transformation and sustainability goals: **Technical and Infrastructure Challenges** include: Interoperability issues between systems from different manufacturers (Huber & Markward, 2021; Routis et al., 2022); Digital infrastructure limitations affecting rural and developing regions, with Hansen et al. (2023, p. 526) noting that "poor network connectivity in Australia presents major barriers"; Data integration complexity when combining diverse agricultural and environmental data (Gebresenbet et al., 2023); System complexity in technical implementation and maintenance (Satya et al., 2021); Environmental conditions affecting hardware durability in agricultural settings with "moisture, dust, ammonia, and pests" (Neethirajan & Kemp, 2021); and lack of standardized vocabularies for data integration (Holden et al., 2018). **Organizational and Adoption Challenge**s include: Significant skills and knowledge gaps among farmers and agricultural professionals (Kagabo et al., 2025; Di Vaio et al., 2020); Technology-driven rather than needs-driven innovation, with businesses "driven by technological advancements rather than providing tailor-made solutions to farmers" (Mahdad et al., 2022, p. 1865); Stakeholder diversity creating tension in developing shared value propositions; Business model transition difficulties as manufacturers struggle to shift from product-centric to solution-oriented approaches (Kampker et al., 2019); Fragmented implementation of technologies without comprehensive management systems; and Organizational support structures inadequate for maintaining complex digital systems (Cook et al., 2021). **Data Governance and Power Dynamic Challenges** include: Data ownership concerns with platform orchestrators collecting farming data while farmers have limited control (Grabher, 2020); increasing farmer dependency on technology; Trust issues regarding data use by competitors or governments (Rijswijk et al., 2019); Power asymmetries affecting farmer autonomy; Aftermarket lock-in where manufacturers maintain exclusive control over equipment-collected data (Atik & Martens, 2021); and fears about consumer misinterpretation of agricultural data (Kosior & Młodawska, 2024). **Policy and Institutional Challenges** encompass: Regulatory gaps with insufficient governance frameworks, as "Australia lags in providing appropriate regulation and governance frameworks for the sector" (Hansen et al., 2023, p. 530); Inadequate public sector support for digital food value frameworks (Cook et al., 2021); Administrative burdens from redundant reporting requirements (Kosior & Młodawska, 2024); Inter-firm collaboration barriers around economic incentives and strategic alignment (Zheng et al., 2009); Policy uncertainty affecting business models relying on subsidies (Hu et al., 2022); and weak quality standards limiting ecosystem functioning (Abdillah et al., 2023).

4 Discussion

This review highlights a fundamental shift from supply chain to ecosystem thinking in agricultural business models—reflecting how digital transformation enables sustainability transformation. As Mahdad et al. (2022, p. 1859) note, "the interdependencies among agri-food actors call for bringing in the innovation ecosystems perspective to replace the static supply chains perspective." This evolution aligns with Adner's (2017) Ecosystem Theory of Value Creation, which emphasizes coordinated alignment among complementary actors rather than merely optimizing individual supply chain elements. This evolution moves from precision farming and platform models toward integrated digital ecosystems delivering tailored solutions for farmers. Successful implementation requires balancing farmers' needs with market demands, as "the space for developing a collaborative and open business model is prepared" only when these align (Mahdad et al., 2022, p. 1857). This supports Stakeholder Theory principles (Freeman, 1984), demonstrating how technology-driven approaches that neglect key stakeholders lead to adoption reluctance. Trust is a foundational requirement for data-driven ecosystem business models. Fairness, accountability, and transparency (FAT) are essential principles for agricultural data ecosystems, with blockchain technologies showing potential to address power imbalances that have historically disadvantaged smallholder farmers—directly addressing the data governance challenges highlighted in the analysis. These observations resonate with Trust-Based Collaboration Theory (Bachmann & Inkpen, 2011), particularly in how blockchain-enabled mechanisms can facilitate collaboration where interpersonal trust may be limited. The matrix framework reveals distinct sustainability profiles: Technology-Focused Models excel at resource optimization, Value Chain Integration Models show balanced contributions, and Data & Governance Models emphasize social sustainability through trust-building. This suggests comprehensive sustainability requires complementary business models, aligning with Triple Bottom Line principles (Elkington, 1997). While this study reflects literature-based patterns, empirical validation is still needed. Future research should apply Value Sensitive Design (Friedman, 1996; Van de Poel, 2020) to embed normative values like trust and fairness into ecosystem model development.

5 Conclusion

This systematic review examined data-driven ecosystem business models in agriculture with a focus on sustainability, identifying 32 distinct models across three categories: Technology-Focused, Value Chain Integration, and Data & Governance Models. These approaches demonstrate diverse applications of digital technologies that create agricultural value while advancing sustainability goals—exemplifying the twin transition of digitalization and sustainability. The models contribute to sustainability through multiple pathways, including resource efficiency, improved financing, environmental management, equitable value chain participation, and rural community development. However, implementation challenges persist—particularly around power asymmetries, data ownership, farmer autonomy, and equitable value distribution. Economic value remains the dominant adoption driver across studies. Recommendations for policymakers and practitioners include: (1) developing user-centric value propositions; (2) creating robust governance frameworks that promote equitable data use and trust-building; and (3) fostering public–private partnerships to address infrastructure gaps. Future research should: (1) build on this study's framework to develop integrated sustainability assessment tools that are supported by interoperable data frameworks and applicable in real-world agricultural ecosystems; (2) explore user-centered design in relation to Global North–South power dynamics; and (3) empirically validate the conceptual patterns presented. The matrix framework (Figure 5) offers a practical tool for researchers and practitioners to evaluate and design business models addressing specific sustainability dimensions. Its relevance extends beyond agriculture to other sectors including healthcare, smart cities, energy transition, and financial services. Despite methodological limitations in identifying emerging models, this paper provides a foundation for understanding and implementing digital technologies for a more sustainable agricultural future, contributing to the broader goal of achieving twin digital and sustainability transitions across economic sectors.

Acknowledgements

This work was funded by the European Commission under the Doctoral Networks Programme (MSCA-DN-101073381-EnTrust) within the Horizon Europe (HORIZON) Marie Sklodowska-Curie Actions.

References

Abdillah, A. F., Kusuma, C. S. D., Astuty, S., & Abdillah, M. L. W. (2023). The role and challenges of the food and agriculture digital platform ecosystem as driver for the creation of sustainable national food security. https://doi.org/10.1063/5.0142824

Adner, R. (2017). Ecosystem as structure: An actionable construct for strategy. Journal of Management, 43(1), 39-58.

Alves, R., Ascensão, J., Camelo, D., & Matos, P. (2021). eWeightSmart - A smart approach to beef production management. In S. Boumerdassi, M. Ghogho, & É. Renault (Eds.), Smart and sustainable agriculture (pp. 57-70). Springer International Publishing. https://doi.org/10.1007/978-3-030-88259-4_5

Atik, C., & Martens, B. (n.d.). Competition problems and governance of non-personal agricultural machine data: Comparing voluntary initiatives in the US and EU.

Azkan, C., Möller, F., Ebel, M., Iqbal, T., Otto, B., & Poeppelbuss, J. (2022, December). Hunting the treasure: Modeling data ecosystem value co-creation. ICIS.

Bachmann, R., & Inkpen, A. C. (2011). Understanding institutional-based trust building processes in inter-organizational relationships. Organization Studies, 32(2), 281-301.

Balanescu, M., Badicu, A., Suciu, G., Poenaru, C., Pasat, A., Vulpe, A., & Vochin, M. (2020). Decision support platform for intelligent and sustainable farming. In 2020 IEEE 26th International Symposium for Design and Technology in Electronic Packaging (SIITME) (pp. 89-93). IEEE. https://doi.org/10.1109/SIITME50350.2020.9292196

Berti, G., Mulligan, C., & Yap, H. (2017). Digital food hubs as disruptive business models based on coopetition and 'shared value' for sustainability in the agri-food sector. In S. Sindakis & P. Theodorou (Eds.), Global opportunities for entrepreneurial growth: Coopetition and knowledge dynamics within and across firms (pp. 415-438). Emerald Publishing Limited. https://doi.org/10.1108/978-1-78714-501-620171023

Braun, A.-T., Colangelo, E., & Steckel, T. (2018). Farming in the era of Industrie 4.0. Procedia CIRP, 72, 979-984. https://doi.org/10.1016/j.procir.2018.03.176

Brewster, C., Roussaki, I., Kalatzis, N., Doolin, K., & Ellis, K. (2017). IoT in agriculture: Designing a Europe-wide large-scale pilot. IEEE Communications Magazine, 55(9), 26-33. https://doi.org/10.1109/MCOM.2017.1600528

Cavazza, A., Dal Mas, F., Paoloni, P., & Manzo, M. (2023). Artificial intelligence and new business models in agriculture: A structured literature review and future research agenda. British Food Journal, 125(13), 436-461. https://doi.org/10.1108/BFJ-02-2023-0132

Cook, S., Jackson, E. L., Fisher, M. J., Baker, D., & Diepeveen, D. (2022). Embedding digital agriculture into sustainable Australian food systems: Pathways and pitfalls to value creation. International Journal of Agricultural Sustainability, 20(3), 346-367. https://doi.org/10.1080/14735903.2021.1937881

Daum, T., Ravichandran, T., Kariuki, J., Chagunda, M., & Birner, R. (2022). Connected cows and cyber chickens? Stocktaking and case studies of digital livestock tools in Kenya and India. Agricultural Systems, 196, 103353. https://doi.org/10.1016/j.agsy.2021.103353

De Oliveira, F. J. B., Ferson, S., & Dyer, R. (2021). A collaborative decision support system framework for vertical farming business developments. International Journal of Decision Support System Technology, 13(1), 1-33. https://doi.org/10.4018/IJDSST.2021010103

Di Vaio, A., Boccia, F., Landriani, L., & Palladino, R. (2020). Artificial intelligence in the agri-food system: Rethinking sustainable business models in the COVID-19 scenario. Sustainability, 12(12), 4851. https://doi.org/10.3390/su12124851

Dwi Satya, R. R., Marimin, Eriyatno, & Ismayana, A. (2021). A digital business modelling for green supplier selection of potato chips agroindustry. IOP Conference Series: Earth and Environmental Science, 709(1), Article 012084. https://doi.org/10.1088/1755-1315/709/1/012084

Elkington, J. (1997). Cannibals with forks: The triple bottom line of 21st century business. Capstone Publishing.

Freeman, R. E. (2020). The stakeholder approach revisited. Wirtschafts-und Unternehmensethik, 657-671.

Friedman, B. (1996). Value-sensitive design. interactions, 3(6), 16-23.

Gebresenbet, G., Bosona, T., Patterson, D., Persson, H., Fischer, B., Mandaluniz, N., Chirici, G., Abebe, A., Andersson, C., Arlt, H.-J., Berg, S., Bernet, D., Bottek, S., Cazzato, E., Duffy, C., Gallardo, M., Ghirmai, W., Grace, P., Grosse-Lochtmann, J., ... Vieri, M. (2023). A concept for application of integrated digital technologies to enhance future smart agricultural systems. Smart Agricultural Technology, 5, 100255. https://doi.org/10.1016/j.atech.2023.100255

Giagnocavo, C., Bienvenido, F., Ming, L., Yurong, Z., Sanchez-Molina, J. A., & Xinting, Y. (2017). Agricultural cooperatives and the role of organisational models in new intelligent traceability systems and big data analysis. International Journal of Agricultural and Biological Engineering, 10(5), 115-125. https://doi.org/10.25165/j.ijabe.20171005.3089

Gowri, D. P., & Ramachander, A. (2024). Digital agricultural ecosystem: Revolutionary advancements in agriculture (Chapter 8). In K. Singh & P. Kolar (Eds.), Digital agriculture: Transforming farming practices and food systems for a sustainable future. Wiley. https://doi.org/10.1002/9781394242962.ch8

Grabher, G. (2021). Enclosure 4.0: Seizing data, selling predictions, scaling platforms. Sociologica, 241-265. https://doi.org/10.6092/ISSN.1971-8853/12107

Graf-Drasch, V., Kauffeld, L., Kempf, L., Oberländer, A. M., & Teuchert, A. (2023, May). Driving twin transformation-the interplay of digital transformation and sustainability transformation. In European Conference on Information Systems 2023.

Hansen, B. D., Leonard, E., Mitchell, M. C., Easton, J., Shariati, N., Mortlock, M. Y., Schaefer, M., & Lamb, D. W. (2022). Current status of and future opportunities for digital agriculture in Australia. Crop & Pasture Science, 74(6), 524-537. https://doi.org/10.1071/CP21594

Holden, N. M., White, E. P., Lange, M. C., & Oldfield, T. L. (2018). Review of the sustainability of food systems and transition using the Internet of Food. Npj Science of Food, 2(1), 18. https://doi.org/10.1038/s41538-018-0027-3

Hrustek, L. (2020). Sustainability driven by agriculture through digital transformation. Sustainability, 12(20), Article 8596. https://doi.org/10.3390/su12208596

Hu, B., Zhou, P., & Zhang, L. P. (2022). A digital business model for accelerating distributed renewable energy expansion in rural China. Applied Energy, 316, 119084. https://doi.org/10.1016/j.apenergy.2022.119084

Huber, F., & Markward, D. (2021). AgriCircle: Innovating agricultural ecosystems. In O. Gassmann & F. Ferrandina (Eds.), Connected business (pp. 325-331). Springer International Publishing. https://doi.org/10.1007/978-3-030-76897-3_21

Issa, A. A., Majed, S., Ameer, A., & Al-Jawahry, H. M. (2024). IoT and AI in livestock management: A game changer for farmers. E3S Web of Conferences, 491, 02015. https://doi.org/10.1051/e3sconf/202449102015

Kagabo, D. M., Byandaga, L., Gatsinzi, P., Mvuyibwami, P., Munyangeri, Y. U., Ntwari, N., & Ouedraogo, M. (2025). Scaling climate information services and climate smart agriculture through bundled business models. Climate Services, 37, 100526. https://doi.org/10.1016/j.cliser.2024.100526

Kampker, A., Jussen, P., & Moser, B. (2018). Industrial smart services: Types of smart service business models in the digitalized agriculture. In 2018 IEEE International Conference on

Industrial Engineering and Engineering Management (IEEM) (pp. 1081-1085). IEEE. https://doi.org/10.1109/IEEM.2018.8607270
Kampker, A., Stich, V., Jussen, P., Moser, B., & Kuntz, J. (2019). Business models for industrial smart services – The example of a digital twin for a product-service-system for potato harvesting. Procedia CIRP, 83, 534-540. https://doi.org/10.1016/j.procir.2019.04.114
Kealley, M. J., Murdoch, E. M., & Shannon, T. J. (n.d.). Emerging opportunities for Australian sugar using blockchain technology.
Klug, L., & Prinz, W. (2023). Fair prices for sustainability in agriculture and food. Requirements and design options for a data-based transparency system. In Proceedings of the 24th Annual International Conference on Digital Government Research (pp. 496-507). ACM. https://doi.org/10.1145/3598469.3598525
Kosior, K., & Młodawska, P. (2024). Understanding market actors' perspectives on agri-food data sharing: Insights from the digital food passports pilot in Poland. Agriculture, 14(12), 2340. https://doi.org/10.3390/agriculture14122340
Kumarathunga, M., & Ginige, A. (2022). Business model transformation with technology-enabled social capital in agriculture domain.
Mahdad, M., Hasanov, M., Isakhanyan, G., & Dolfsma, W. (2022). A smart web of firms, farms and Internet of Things (IOT): Enabling collaboration-based business models in the agri-food industry. British Food Journal, 124(6), 1857-1874. https://doi.org/10.1108/BFJ-07-2021-0756
Malisic, B., Misic, N., Krco, S., Martinovic, A., Tinaj, S., & Popovic, T. (2023). Blockchain adoption in the wine supply chain: A systematic literature review. Sustainability, 15(19), 14408. https://doi.org/10.3390/su151914408
Neethirajan, S., & Kemp, B. (2021). Digital livestock farming. Sensing and Bio-Sensing Research, 32, 100408. https://doi.org/10.1016/j.sbsr.2021.100408
Poppe, K., Vrolijk, H., & Van Dijk, R. (2021). Design of a system for information transfer to reduce administrative burdens in the agrifood sector. International Journal on Food System Dynamics, 12, 301-313. https://doi.org/10.18461/IJFSD.V12I4.92
Rao, N. H. (2007). A framework for implementing information and communication technologies in agricultural development in India. Technological Forecasting and Social Change, 74(4), 491-518. https://doi.org/10.1016/j.techfore.2006.02.002
Rijanto, A. (2021). Business financing and blockchain technology adoption in agroindustry. Journal of Science and Technology Policy Management, 12(2), 215-235. https://doi.org/10.1108/JSTPM-03-2020-0065
Rijswijk, K., Klerkx, L., & Turner, J. A. (2019). Digitalisation in the New Zealand agricultural knowledge and innovation system: Initial understandings and emerging organisational responses to digital agriculture. NJAS: Wageningen Journal of Life Sciences, 90-91(1), 1-14. https://doi.org/10.1016/j.njas.2019.100313
Routis, G., Paraskevopoulos, M., Vetsikas, I. A., Roussaki, I., Stavrakoudis, D., & Katsantonis, D. (2022). Data-driven and interoperable smart agriculture: An IoT-based use-case for arable crops. In 2022 IEEE International Conference on Omni-Layer Intelligent Systems (COINS) (pp. 1-8). IEEE. https://doi.org/10.1109/COINS54846.2022.9855001
Stitzlein, C., Fielke, S., Waldner, F., & Sanderson, T. (2021). Reputational risk associated with big data research and development: An interdisciplinary perspective. Sustainability, 13(16), 9280. https://doi.org/10.3390/su13169280
Tasic, I., & Cano, M.-D. (2024). An orchestrated IoT-based blockchain system to foster innovation in agritech. IET Collaborative Intelligent Manufacturing, 6(2), e12109. https://doi.org/10.1049/cim2.12109
Van de Poel, I. (2020). Embedding values in artificial intelligence (AI) systems. Minds and machines, 30(3), 385-409.

Vial, F., & Tedder, A. (2017). Tapping the vast potential of the data deluge in small-scale food-animal production businesses: Challenges to near real-time data analysis and interpretation. Frontiers in Veterinary Science, 4, 120. https://doi.org/10.3389/fvets.2017.00120

Vlachopoulou, M., Ziakis, C., Vergidis, K., & Madas, M. (2021). Analyzing AgriFood-Tech e-Business models. Sustainability, 13(10), 5516. https://doi.org/10.3390/su13105516

World Commission on Environment and Development. (1987). Our common future. Oxford University Press.

Zheng, X., Wu, C., Tian, D., & Zhang, X. (2009). B2B e-marketplace adoption in agriculture. Journal of Software, 4(3), 232-239. https://doi.org/10.4304/jsw.4.3.232-239