

STRATEGIC MANAGEMENT CHALLENGES OF AGRI-BUSINESS ORGANISATIONS IN THE EMERGING BIOECONOMY

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Abstract

The transition towards a bioeconomy has become a key policy priority in the European Union and globally. The bioeconomy refers to economic activities based on renewable biological resources used to produce food, materials, and energy. This transition aims to reduce dependence on fossil resources, mitigate climate change, and promote sustainable development. However, it also introduces significant strategic management challenges for agri-business organisations operating within increasingly complex agri-food supply chains. The aim of this study is to identify and analyse the strategic management challenges faced by agri-business organisations in the emerging bioeconomy framework. The research is based on conceptual analysis and a systematic review of scientific literature and policy documents. The findings indicate that agri-business organisations must address multiple challenges, including environmental sustainability requirements, technological transformation, and supply chain coordination. The study highlights that the integration of sustainability practices, adoption of technological innovations, and effective stakeholder collaboration are essential for improving organisational resilience and competitiveness.

Keywords: bioeconomy; agri-business management; sustainability; agri-food supply chains; strategic management

Introduction

The bioeconomy has become a growing concern over the past decades as nations seek a sustainable approach to economic growth and environmental conservation. Economic activities that make use of renewable biological resources like plants, animals, and microorganisms in the generation of food, materials, and energy are known as the bioeconomy (European Commission, 2018). In the European Union, the bioeconomy has been closely linked to policies on climate change mitigation, sustainable resource management, and food security (Robert et al., 2020). The shift to bio-based production systems should lead to a decrease in the use of fossil resources and to increased innovation and sustainable development across sectors, including agriculture, forestry, and biotechnology. The bioeconomy is focused on agriculture since it supplies the major biological resources used in bio-based production systems. It is noted that in the European Union, agriculture plays an important role in generating employment and value in the bioeconomy (Nowak & Kasztelan, 2021). Although there are these opportunities, the shift towards a bioeconomy brings new challenges for agri-business organisations. Among them are mounting environmental regulations, rising demand for sustainable production methods, accelerated technological change, and the need for greater coordination along a complex supply chain. The process of transitioning to a bioeconomy is not only about technological and environmental change, but also about the emergence of trade-offs between economic efficiency and sustainability. Agribusiness companies need to find the proper balance between achieving economic gains on the one hand and protecting the environment on the other, amid regulatory ambiguity and market fluctuations. Often, sustainable actions come at a high initial cost, whereas economic gains are realised only over time. That poses difficult decisions for smaller companies, which have limited resources.

Furthermore, the bioeconomy is seen as part of global sustainability agendas, such as the European Green Deal and the UN Sustainable Development Goals. These agendas focus on resource efficiency, the circular economy, and green production. Consequently, agri-business organisations are expected not only to perform economically but also to contribute to sustainability in terms of the environment and society. This complexity in the decision-making task of agri-business organisations again underscores the need to analyse management challenges in the context of the bioeconomy. The development of the bioeconomy is also closely linked to circular economy principles, which emphasise resource efficiency and waste reduction (Kirchherr et al., 2017). In terms of theory, the shift toward bioeconomy could be considered from the perspective of dynamic capabilities, which focus on the organisation's capacity to cope with environmental change through resource integration and reconfiguration (Teece, 2007). In addition, the concepts behind the circular economy stress the need for resource efficiency and closed-loop processes (Geissdoerfer et al., 2017). These theories imply that agribusiness organisations need to become more flexible and innovative in their approaches. Despite extensive research on the bioeconomy and sustainable agri-food systems, existing studies tend to address environmental, technological, and supply chain challenges in isolation. However, recent literature emphasises that these dimensions are increasingly interconnected within complex bio-based systems (Bugge et al., 2016; Adamowicz, 2021; Wang et al., 2022). Therefore, there is a need for integrated analysis that examines how these interrelated challenges jointly influence strategic management in agri-business organisations.

Research aim: To identify and analyse the strategic management challenges faced by agri-business organisations in the emerging bioeconomy.

The following **objectives** have been set to achieve the aim:

1. To examine the role of agri-business organisations in the bioeconomy.
2. To identify key strategic management challenges affecting agri-business enterprises.
3. To determine strategic approaches that support sustainability and competitiveness.

Research object and methods

The research object of this paper will focus on the strategic management practices of agribusinesses in the context of the emergence of the bioeconomy. In this regard, sustainability issues and problems associated with agri-food supply chain coordination will serve as the main focal point. To address the research question, it is appropriate to conduct a qualitative literature review. Given that a literature review and conceptual analysis will be conducted, the chosen methodology is well-suited, as it allows for thorough exploration of a relatively underdeveloped field without testing specific hypotheses.

The literature review was conducted across several academic databases, namely Scopus, Web of Science, and Google Scholar. Furthermore, sources from the policy and institutional documents of the European Commission, FAO, and OECD were used for their relevance, credibility, and high authority in bioeconomy, sustainable development, and the management of agribusinesses. In total, 35-45 academic and institutional sources were analysed to ensure adequate depth of analysis and coverage of the relevant literature. Selection of sources was guided by a set of inclusion criteria, including relevance to bioeconomy/agri-business management, a focus on sustainability/circular economy/innovation, or agri-food supply chain dynamics, and publications from 2015 to 2024. In addition, some of the earlier works considered foundational were selectively incorporated as needed for the conceptual part of the study.

The sources were found through a keyword search. Key terms included bioeconomy, agribusiness, sustainability, circular economy, agri-food supply chains, and strategic management. Once retrieved, the sources underwent systematic screening based on title, abstract, and full-text relevance. Sources which failed to meet the inclusion criteria or lacked sufficient rigour were excluded. Thematic and comparative analysis allowed for the identification of patterns and strategic challenges faced by agribusinesses in the age of the bioeconomy, as well as corresponding responses and practices. Therefore, a rather comprehensive picture of the issue could be obtained. Given that this work focuses on analysing existing literature and does not involve the use of any primary data sources, some limitations, including limited availability and potential publication bias, must be recognised. Nevertheless, the chosen approach allows conducting a thorough examination of the topic and providing a solid basis for further empirical work in this field. It should also be noted that this work used ChatGPT, a language model (OpenAI, 2026), solely for linguistic refinement.

Research results and discussion

The conclusions regarding agri-business management and the development of the bioeconomy in Europe are drawn from an evidence-based synthesis of scientific literature, reports, and policy documents on bioeconomy development. This literature review identifies that the transition to the bioeconomy should be considered a multidimensional, systematic transformation influenced by numerous interdependent factors, including environmental changes, economic development, and technological advancements. As noted in the existing literature, the bioeconomy is recognised as a strategic solution to major environmental and food security issues. It is also viewed as an engine of sustainable economic growth. However, existing literature indicates that the bioeconomy does not inherently guarantee sustainability outcomes, particularly where increased biomass demand leads to land-use pressures and resource trade-offs (Bugge et al., 2016; OECD, 2019). This implies that organisations in the bioeconomy sector must balance economic performance, operational requirements, and sustainability criteria. Furthermore, the bioeconomy is increasingly conceptualised as a system-level transformation requiring integrated approaches across production, technological innovation, and supply chain networks (Adamowicz, 2021; OECD, 2019).

Agribusinesses face an exceptionally dynamic and unpredictable environment, in which strategic decisions must balance sustainability requirements with economic performance. Agri-business organisations play an essential role in the bioeconomy, as they are the main suppliers of biomass for developing bio-value chains. In contrast to traditional agricultural production focused mainly on food production, the bioeconomy extends the functions of agriculture to incorporate biomaterials, bioenergy, and other elements required to support its value chains. Research demonstrates that agribusiness is crucial to developing the EU's bioeconomy, serving as the largest source of biomass and playing an important role in supporting employment and creating value within Europe's bioeconomy value chains. At the same time, involvement in the bioeconomy requires that agribusinesses adapt their production processes to align more closely with sustainability criteria, such as reducing greenhouse gas emissions and improving resource utilisation efficiency.

Three main strategic challenges, including environmental sustainability pressure, technological transformations, and increasing supply chain complexity, define the agri-business's strategic context in the era of bioeconomy. One of the key drivers of change in this environment is pressure for environmental sustainability, as organisations are required to comply with increasingly stringent requirements on emissions, resource utilisation, and other environmental concerns. These regulations increase companies' operational expenses and drive them to invest in eco-friendly, sustainable technologies. At the same time, the literature argues that the successful implementation of the sustainability transition requires considerable support from public policies, investment in innovation, and participation in stakeholder initiatives. Thus, environmental regulations can be viewed both as constraints and as drivers of innovation.

Along with environmental challenges, the bioeconomy requires considerable organisational effort and investment in technological transformation. Technological advancements, including those in precision agriculture, biotechnology, and digital agriculture, are viewed as important enablers of productivity, resource optimisation, and environmental protection in the era of the bioeconomy. However, these changes are associated with substantial capital expenses, technological uncertainty, and organisational complexity. For instance, the existing literature notes substantial disparities between technologically advanced and less advanced enterprises in digital agriculture adoption, thereby creating inequality among organisations operating in the sector. This finding is consistent with recent studies indicating that digital transformation in agri-food systems is uneven and often constrained by resource limitations and knowledge gaps, particularly among smaller enterprises (Wang et al., 2022).

Along with sustainability and technological transformations, the bioeconomy is increasing the complexity of supply chains by incorporating numerous participants and stakeholders into production processes. The integration of various stakeholders within supply chains, as well as the application of circular-economy principles related to recycling, reusing materials, and other aspects, makes supply chains more complex. The literature points out that bioeconomy develops at various levels, ranging from individual organisations to regional and even global systems, making coordination of efforts crucial for successfully implementing changes. Therefore, transitioning to the bioeconomy involves not only improving company efficiencies but also effectively coordinating various entities within supply chains. Similarly, research highlights that agri-food supply chains are becoming increasingly complex due to globalisation, technological integration, and sustainability requirements, thereby necessitating new coordination mechanisms and governance structures (Butu et al., 2020; OECD, 2019).

Table 1. Key strategic management challenges in agri-business

Challenge	Description	Strategic impact	Strategic response
Environmental regulation	Compliance with sustainability policies	Cost pressures and regulatory burden	Adoption of eco-efficient practices
Technological transformation	Adoption of digital technologies and biotechnology	High capital investment and technological risk	Innovation partnerships and capability development
Supply chain complexity	Coordination among multiple stakeholders	Increased organisational and managerial complexity	Stakeholder integration and digital coordination
Resource efficiency	Sustainable utilisation of inputs and by-products	Competitive differentiation and long-term efficiency gains	Circular economy models and resource optimisation

Source: compiled by the author based on literature analysis.

Importantly, these challenges are not independent; environmental regulation drives technological adoption, while technological capabilities enable improved supply chain coordination, indicating systemic interdependencies. The challenges presented in Table 1 demonstrate that the essence of strategic management in the bioeconomy lies in addressing issues that span multiple aspects and spheres and cannot be considered independently. On the contrary, these challenges can be seen as interdependent and mutually reinforcing. These findings suggest a tri-dimensional strategic tension between sustainability compliance, technological adaptation, and supply chain coordination, which must be simultaneously managed rather than sequentially addressed. For example, technological innovations facilitate the solution of environmental issues. Moreover, efficient coordination within supply chains will enable compliance with regulatory requirements and improve the overall operational performance of agribusinesses. Hence, the need to integrate all three aspects into a coherent strategic approach arises.

As for the theoretical implications of the results, they can be explained considering the dynamic capabilities theory. According to Teece (2007), the ability to cope with rapidly changing conditions is enabled by combining diverse resources, which should be reconfigured to ensure adaptation. In turn, the bioeconomy poses adaptation challenges for agribusinesses, as organisations are exposed to rapid changes in regulations, technological progress, and changing market needs. Hence, they need to combine innovative capabilities with the principles of the circular economy to create a sustainable competitive advantage.

Based on the review, some strategic actions that companies can take to overcome the identified problems and successfully transition to the new business model can be recommended. First, the application of sustainable production practices will be crucial, namely the implementation of eco-efficient innovations and improvements in resource efficiency. Secondly, investment in innovation should remain an essential strategy, and organisations should also invest in organisational learning, staff training, and participation in innovation networks. Finally, supply chain management will require strategic collaborations, vertical integration, and stakeholder involvement. According to the literature review, such approaches to the problem seem promising.

In conclusion, the research demonstrates the increasing complexity, interdependencies, and transformations associated with strategic management in the bioeconomy. As a result, the need for companies to transition to more advanced, innovative strategies becomes evident. They must focus on sustainability and learn how to balance economic benefits and environmental issues at the strategic level. The contribution of this study lies in providing an integrated perspective on strategic management challenges in the bioeconomy, highlighting the interdependence between environmental sustainability, technological transformation, and supply chain coordination. Unlike previous studies that address these dimensions separately, this research emphasises their combined impact on organisational strategy and decision-making.

Conclusions

1. This study affirms the significance of agri-business organisations in the bioeconomy sector by providing and processing renewable sources of biological materials on which the bio-based value chain is established. This is important in the production of foodstuffs, the development of bio-based materials, and the production of renewable energy systems while promoting employment and wealth creation in the European Union.

2. According to the findings of the study, there are three strategic management challenges facing agri-business organisations. Firstly, the increasing environmental and sustainability demands pose an additional challenge to the operational and financial demands of these organisations, especially the small and medium-sized ones. Secondly, the technological transformation of the sector demands significant investment and organisational change in the sector. Finally, the increasing complexity of the agri-food supply chain demands greater integration of various actors in the chain, thus making the management process more complex.

3. This highlights the necessity for agri-business organisations to transition towards adaptive, innovation-driven, and sustainability-oriented strategic models. In this context, the ability to effectively balance economic performance with environmental and social objectives emerges as a critical determinant of long-term competitiveness in the evolving bioeconomy landscape. Furthermore, future research should focus on empirical validation of integrated strategic frameworks and explore the role of policy and innovation ecosystems in supporting this transition.

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