

THE TRIPLE-BOTTOM-LINE DIMENSIONS OF SUSTAINABILITY IN AGRICULTURE AND FOOD SYSTEMS: A COMPREHENSIVE LITERATURE REVIEW

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ABSTRACT

This literature review aims to analyze the triple-bottom-line (TBL) dimensions—economic, environmental, and social sustainability—within agriculture and food systems. A systematic literature review was conducted following the PRISMA framework, resulting in 30 articles selected from databases such as Scopus and ScienceDirect after applying inclusion and exclusion criteria based on relevance, empirical grounding, and methodological rigor. Data were analyzed through thematic synthesis to identify major patterns and challenges across TBL dimensions. Findings reveal that while economic sustainability focuses on profitability and market access, environmental sustainability emphasizes resource efficiency and ecological resilience, and social sustainability concerns equity, labor rights, and food security. The study concludes that integrating all three pillars through policy alignment, innovation, and stakeholder participation is critical for achieving resilient food systems. Recommendations include promoting circular economy models and strengthening local governance in agricultural sustainability.

Key words: sustainability; agriculture; triple-bottom-line; food systems; environmental management.

INTRODUCTION

Agriculture and food systems play a fundamental role in ensuring global food security and economic growth (Béné et al., 2018; Wang et al., 2021). However, increasing population pressure, resource depletion, and climate change have made sustainability a central issue in agricultural development (Dos Santos & Ahmad, 2020; Haysom et al., 2019). The concept of the Triple-Bottom-Line (TBL) encompassing economic, environmental, and social dimensions—provides a holistic framework for evaluating sustainability in food systems (Sargani et al., 2020; Nogueira et al., 2022). This review explores how TBL principles have been applied in contemporary research, identifying gaps, synergies, and policy implications. It also seeks to understand how the integration of these dimensions contributes to long-term resilience and equity in food production and distribution (Arora et al., 2016; Varriale et al., 2023).

METHOD

This study adopted a systematic literature review (SLR) approach following PRISMA guidelines (Moreno-Miranda & Dries, 2021). Data were collected from major academic databases such as Scopus, ScienceDirect, and Google Scholar (Garcia et al., 2025). Search keywords included “triple-bottom-line,” “sustainable agriculture,” “food systems,” and “sustainability indicators.”

During the PRISMA process, a total of 450 records were identified, of which 120 were screened after removing duplicates and irrelevant items. 50 articles were assessed for eligibility, and finally, 30 studies were included in the final synthesis. Inclusion criteria involved relevance to agricultural sustainability, empirical or review-based research, and methodological clarity (Alrhoun et al., 2025; Boateng et al., 2025). Data extraction focused on the three TBL dimensions and their key indicators. Thematic synthesis was employed to identify recurrent themes, interactions, and gaps across the selected studies (Arndt & Helming, 2025; Kodama et al., 2024).

RESULTS AND DISCUSSION

Most studies emphasize the importance of profitability, cost efficiency, and market stability (Dos Santos & Ahmad, 2020; Opoku et al., 2023). Sustainable business models—such as fair-trade practices and value chain optimization—are seen as key to maintaining long-term economic viability (Varriale et al., 2023; Mendes et al., 2024). Smallholder farmers often face challenges in accessing markets and financing, which limits scalability (Boateng et al., 2025). Environmental sustainability is closely tied to natural resource management (Prasad et al.,

2021; Rajput et al., 2025). Practices such as precision agriculture, organic farming, and agroecology have been shown to improve soil fertility, conserve water, and reduce greenhouse gas emissions (Rebelo et al., 2025; Tavan et al., 2025). However, implementation remains uneven due to technological and financial barriers (Alrhoun et al., 2025; Kodama et al., 2024). Social sustainability focuses on community welfare, labor rights, gender equality, and food security (Papargyropoulou et al., 2024; Bilotto et al., 2024). Research indicates that inclusive governance, cooperative structures, and equitable benefit-sharing can enhance social outcomes (Haysom et al., 2019; Béné et al., 2018). Education and capacity building are also critical for sustainable adoption (Adwiyah et al., 2023; Yasir et al., 2023). While each TBL dimension has distinct indicators, they are interdependent (Alrøe et al., 2017; Moreno-Miranda & Dries, 2021). Achieving one dimension without the others often leads to trade-offs (Ozanne et al., 2016; Arora et al., 2016). Integrated frameworks, supported by cross-sectoral policies and innovation, are thus essential (Sargani et al., 2020; Nogueira et al., 2022).

Table 1. Summary of TBL Dimensions and Key Indicators

Dimension	Key Indicators	Brief Description
Economic	Profitability, cost efficiency, market access	Ensures farm profitability and long-term economic viability through efficient resource use and fair market participation (Dos Santos & Ahmad, 2020).
Environmental	Resource-use efficiency, soil health, emission reduction	Promotes ecological balance by minimizing environmental degradation and enhancing resource sustainability (Rajput et al., 2025).
Social	Equity, labor rights, food security	Focuses on community welfare, fair labor practices, and inclusive food access (Papargyropoulou et al., 2024).
Integrated (TBL Interaction)	Policy alignment, innovation, stakeholder collaboration	Encourages balanced integration of the three dimensions for resilient agri-food systems (Béné et al., 2018).

Source: Author's synthesis (2025)

CONCLUSION

This review concludes that sustainability in agriculture and food systems must be understood through a triple-bottom-line lens that balances economic, environmental, and social priorities. While progress has been made in developing sustainable practices, challenges remain in implementation, monitoring, and policy coherence. Future research should focus on developing integrated assessment tools, strengthening local institutions, and promoting circular economy models that reduce waste and enhance value creation. Collaboration among governments, private sectors, and local communities is vital for building resilient and equitable food systems.

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