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STRATEGIC MANAGEMENT

PRODUCT INNOVATION AND ORGANIZATIONAL PERFORMANCE AMONG DAIRY COOPERATIVES

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ABSTRACT

Purpose of the Study: The purpose of this study was to examine the relationship between product innovation and organizational performance in dairy cooperatives.

Statement of the Problem: Despite growing recognition of product innovation as a driver of competitiveness in the dairy sector, empirical and cooperative-focused evidence remains limited. Existing studies often lack causal analysis and provide insufficient understanding of how innovation practices translate into measurable performance outcomes within dairy cooperatives.

Methodology: The study adopted a desktop review methodology, synthesizing global, regional, and sector-specific literature from peer-reviewed articles, institutional reports, market analyses, and technological assessments related to dairy innovation and performance.

Findings: The findings indicate that product innovation significantly enhances organizational performance by supporting product diversification, advanced processing, and market alignment. New product development strengthens differentiation in functional dairy categories, value-added processing improves efficiency and market penetration, and market responsiveness enables adaptation to evolving consumer trends.

Conclusion: The study concludes that product innovation is a critical determinant of competitiveness and long-term viability in dairy cooperatives.

Recommendations: The study recommends that dairy cooperatives strengthen innovation capacity through technological investment, institutional coordination, and structured market intelligence systems.

Keywords: *Product innovation, New product development, Value-added processing, Market responsiveness, Dairy cooperatives*

BACKGROUND OF THE STUDY

Innovation is widely recognized as a central driver of growth, competitiveness, and long-term sustainability across economic sectors (Rybowska et al., 2022). In agrifood systems, product innovation has gained prominence due to rapid shifts in consumer preferences, intensifying competition, and rising demand for healthier, value-added food products (Roobab et al., 2023). As consumers increasingly prioritize quality, nutrition, and functional attributes, agrifood enterprises are compelled to renew product offerings and differentiate portfolios to remain competitive (Paula et al., 2022).

Within the dairy sector, product innovation has become particularly critical as traditional products are complemented by fortified beverages, functional yogurts, flavored milk, lactose-free options, and clean-label formulations (Roobab et al., 2023). Empirical studies show that consumers increasingly scrutinize ingredient composition and favor minimally processed products aligned with wellness-oriented lifestyles, prompting firms to adopt advanced processing technologies such as high-pressure processing (Rybowska et al., 2022; Roobab et al., 2023). Marketing scholarship further emphasizes that innovation is essential for differentiation in saturated or import-exposed markets (Paula et al., 2022).

Organizational performance is conceptualized as a multidimensional construct encompassing financial outcomes, operational efficiency, strategic adaptability, and stakeholder value creation (Maaz & Ahmad, 2022). Recent literature emphasizes that performance extends beyond profitability to include competitiveness, resilience, and the ability to respond to environmental change (Matangaidze et al., 2025). In dairy enterprises, performance is closely linked to quality management, supply chain coordination, and responsiveness to market expectations (Sutar et al., 2023; Maaz & Ahmad, 2022).

In cooperative-based dairy systems, organizational performance is further shaped by governance structures, member participation, and internal coordination mechanisms (Matangaidze et al., 2025). Scholars argue that cooperatives achieve stronger performance outcomes when strategic capabilities, resource management, and market responsiveness are effectively integrated into operational design (Sutar et al., 2023). This positions performance as a relational and institutional outcome, rather than a purely financial metric (Maaz & Ahmad, 2022).

The relationship between product innovation and organizational performance is consistently highlighted in strategic management and agribusiness literature (Paula et al., 2022). Innovation

enables firms to differentiate offerings, strengthen market presence, and align products with evolving consumer values, thereby improving organizational outcomes (Rybowska et al., 2022). In dairy cooperatives, innovation is portrayed as a catalyst for enhancing agility, reinforcing competitiveness, and supporting long-term viability in dynamic markets (Charalampidou et al., 2025; Khan & Arif, 2025).

Theoretical discussions further suggest that innovation strengthens internal processes and improves alignment between organizational capabilities and market expectations, contributing to sustained performance trajectories (Kiboori & Misango, 2023). By facilitating product variety, quality enhancement, and responsiveness, product innovation functions as a strategic resource that enables dairy cooperatives to adapt and deliver sustained value in competitive environments (Paula et al., 2022; Charalampidou et al., 2025).

Statement of the Problem

The global dairy sector remains one of the most economically significant agricultural industries, reflecting both rapid market expansion and rising structural pressures. The global dairy market was valued at approximately USD 1,065 billion in 2024 and is projected to reach USD 1,762.6 billion by 2032, driven largely by increasing demand for nutrient-dense, value-added, and functional dairy products (Data Bridge Market Research, 2025). Global milk production continues to grow, with output estimated at about 965.7 million tonnes in 2023, signaling sustained consumption growth across regions (Wisconsin Extension, 2025). At the same time, innovation-related segments such as dairy herd management—which reflect technological adoption and operational modernization—are projected to expand from USD 5.76 billion in 2025 to USD 15.23 billion by 2034, indicating intensified investment in productivity-enhancing technologies (Custom Market Insights, 2025). These trends illustrate the scale and complexity of the dairy industry as it balances market growth with innovation, sustainability, and efficiency demands.

Despite strong market performance, the organizational effectiveness of dairy enterprises and cooperatives remains uneven. Existing literature highlights persistent challenges linked to structural inefficiencies, limited innovation capacity, and weak alignment with changing consumer and regulatory expectations (Bhat et al., 2022; OECD-FAO, 2025). Traditional dairy business models often struggle to respond effectively to rapid product diversification, clean-label requirements, and sustainability pressures, constraining competitiveness, profitability, and market responsiveness. Environmental concerns further intensify these challenges, as

leading dairy firms and cooperatives face criticism for insufficient mitigation strategies, particularly regarding methane emissions, despite the sector's contribution to global greenhouse gas levels (Changing Markets Foundation, 2025). This tension between sectoral growth and organizational performance underscores the difficulty of translating expansion into sustained effectiveness.

The literature suggests that dairy organizational performance is shaped by multiple interacting factors, including governance structures, technological adoption, leadership capabilities, supply chain integration, and product innovation orientation. However, many studies examine these drivers in isolation, offering limited integrative understanding of how innovation processes connect to performance outcomes across cooperative and enterprise models (Savickienė & Galnaitytė, 2024; Kuipers et al., 2024; Beber et al., 2021). Although product innovation is widely recognized as a strategic capability that enhances competitiveness and consumer value, there remains insufficient synthesis linking innovation dynamics to organizational performance. This study addresses this gap by examining the relationship between product innovation and organizational performance in dairy cooperatives, providing a consolidated foundation for future empirical research and policy development.

Objective of the Study

The study sought to examine the relationship between product innovation and organizational performance in dairy cooperatives, examining how innovation-oriented practices, technological advancements, and value-added product development shape overall cooperative effectiveness and competitiveness.

Scope of the Study

This desktop review examines the conceptual link between product innovation and organizational performance in dairy cooperatives using secondary literature. It analyzes innovation dimensions such as new product development, value addition, and technology adoption across global dairy systems. The study establishes how innovation enhances cooperative performance amid changing consumer, environmental, and market conditions.

THEORETICAL FRAMEWORK

This study is grounded in the Schumpeterian Theory of Innovation, which explains how innovation drives organizational transformation, competitive advantage, and long-term performance (Schumpeter, 1934). The theory posits that economic progress arises from "new combinations," including new products, production methods, markets, and organizational

forms, which disrupt existing routines through the process of creative destruction (Schumpeter, 1942). Within cooperative systems such as dairy enterprises, this perspective clarifies why continuous product innovation enables firms to respond to changing consumer demands, differentiate offerings, and sustain competitiveness in dynamic agrifood markets.

At its core, the Schumpeterian framework views innovation as a strategic mechanism rather than a mere operational improvement, reshaping industries and reallocating resources to more productive uses (Fagerberg, 2005). Evolutionary economics further emphasizes that innovation is cumulative, emerging from learning and the recombination of capabilities, thereby strengthening organizational performance over time (Nelson & Winter, 1982). Modern interpretations highlight product innovation as a key pathway through which firms enhance customer value, renew markets, and reinforce competitive resilience (Archibugi & Filippetti, 2018).

In the dairy sector, the Schumpeterian lens is particularly relevant because product innovation is closely linked to technological change, market differentiation, and evolving consumer preferences. Growing demand for fortified products, clean-label formulations, and functional dairy items requires cooperatives to innovate continually to remain relevant (Rybowska et al., 2022; Roobab et al., 2023). Although the theory underemphasizes collective and institutional dimensions of innovation, it provides a strong foundation for conceptualizing product innovation as a strategic resource that enhances adaptability, competitiveness, and organizational performance in dairy cooperatives.

EMPIRICAL REVIEW

The role of employee support mechanisms, comprising health and wellness services, mental health support, and financial well-being initiatives has been increasingly recognized as vital for organizational resilience in hospitals. These mechanisms are designed to mitigate stress, reduce burnout, and promote workforce stability, which are essential for maintaining operational continuity and adaptability, especially in high-pressure healthcare environments. However, a closer review of the literature reveals several gaps, limitations, and the need for further exploration into how these interventions collectively enhance resilience in hospital settings.

New Product Innovation

New Product Development (NPD) has long been recognized as a central dimension of innovation in dairy systems. Modern scholarship positions NPD as the driver of product

diversification, functional improvement, and strategic differentiation in a highly competitive global dairy sector. The literature demonstrates that NPD is shaped by evolving consumer trends, advancements in dairy technology, nutritional expectations, and market competition—factors that collectively push dairy enterprises and cooperatives toward continuous product renewal.

Rybowska *et al*. (2022) highlight that modern dairy consumers increasingly prefer *novel, functional, and health-oriented products*, such as yogurts with additives, flavored milk beverages, and cheeses enriched with herbs or nutrients. Using a CAWI survey of 195 dairy consumers, the study shows statistically significant preferences for products with added value, demonstrating that NPD closely tracks lifestyle and nutritional expectations. Likewise, Roobab *et al*. (2023) emphasize that consumers are shifting toward *clean-label dairy products*—those with fewer synthetic additives and processed through non-thermal technologies such as high-pressure processing. Their review consolidates over 120 scientific studies, showing that these technologies support NPD by preserving sensory and nutritional attributes while enabling new product categories such as minimally processed milk drinks and probiotic-rich beverages.

A strong consumer-driven pattern emerges in the literature, indicating that **new product development (NPD)** is increasingly shaped by health, nutrition, and lifestyle considerations. Walther et al. (2022) document sustained global growth—exceeding 7 percent annually—in functional dairy categories such as high-protein milk, lactose-free products, and fortified yogurts, underscoring the role of NPD in maintaining competitiveness across both advanced and emerging markets. OECD-FAO (2024) similarly identifies value-added and functional dairy products as major growth segments, confirming that product diversification is no longer optional but central to market relevance. These studies collectively show that NPD responds directly to evolving consumer expectations and drives demand expansion.

Technological capability is consistently identified as the key enabler of effective NPD in the dairy sector. Anedda (2025) and Hill (2024) demonstrate that modern dairy innovation has shifted toward science-driven formulation, supported by membrane filtration, high-pressure processing, microbial optimization, and bioactive enrichment technologies. Walstra et al. (2023) further show that ingredient engineering and processing innovation have expanded NPD boundaries by enabling fortified drinks, improved low-fat products, shelf-stable probiotics, and hybrid dairy formulations. This body of evidence indicates that technological advancement directly conditions the scope, quality, and scalability of NPD outcomes.

From a performance perspective, empirical studies link diversified NPD portfolios to stronger competitiveness and efficiency, although outcomes depend on market alignment. Paula et al. (2022) show that customized products and pricing strategies outperform generic innovation orientation in predicting competitive advantage, highlighting the need for responsiveness alongside NPD. At the macro level, Savickienė and Galnaitytė (2024) find that EU dairy exporters with diversified product portfolios achieve superior performance under market volatility, while Beber et al. (2021) demonstrate that Brazilian processors with broader NPD portfolios exhibit higher technical efficiency. These findings suggest that NPD enhances performance when integrated with strategic and market-oriented practices.

In cooperative contexts, emerging evidence indicates improving NPD capacity, driven by organizational learning and innovation ecosystems. Charalampidou et al. (2025) show that Greek dairy cooperatives with structured NPD practices display stronger strategic alignment and responsiveness, while Makundi and Thomas (2023) emphasize the role of knowledge flows, extension services, and institutional linkages in strengthening cooperative NPD pathways. Kuipers et al. (2024) further position NPD as a resilience mechanism that reduces dependence on single markets under climate and labor pressures. Overall, the literature converges on the view that NPD is a strategic capability whose performance impact depends on technological readiness, market responsiveness, and organizational coordination.

Value-Added Processing

Value-added processing has emerged as a defining component of product innovation in the dairy sector, representing the transformation of raw milk into differentiated, higher-value products with enhanced quality, nutrition, shelf stability, and market appeal. Contemporary scholarship emphasizes that value-addition is no longer a marginal practice but a strategic imperative for firms and cooperatives facing competitive markets, evolving consumer expectations, and pressure to diversify revenue streams.

Value-added dairy processing is widely regarded as a mechanism for upgrading traditional dairy enterprises into competitive, market-responsive systems. According to Minten, Tamru, and Reardon (2020), value-addition—especially in milk processing—creates new market opportunities and stabilizes producer income by shifting value capture away from raw milk sales toward processed, branded products. Their large-scale assessment of dairy value chains demonstrates that processing diversification (cheese, yogurt, cultured milk, UHT milk) improves enterprise viability and enhances sector modernization.

Similarly, the FAO (2023) stresses that product value-addition is essential for meeting global demand for fortified, functional, and convenience-oriented dairy products. The FAO's *Dairy Market Review* reports that value-added dairy products such as UHT milk, cheese, and flavored yogurts account for more than 50% of global retail dairy revenue, underscoring how processing innovation drives industry growth.

A parallel view is presented by the OECD-FAO (2024), which projects that global consumption of value-added dairy products will grow at 5–6% annually, largely driven by nutritional diversification, convenience preferences, and advancements in processing technologies.

Technological advancements underpin modern value-added dairy processing. Roobab *et al*. (2023) provide an extensive review of non-thermal processing technologies, including high-pressure processing (HPP), pulsed electric fields (PEF), and high-pressure homogenization. Their findings confirm that these technologies preserve nutritional attributes, reduce microbial load, and facilitate the production of minimally processed, clean-label dairy variants. These technologies are critical enablers of value-addition, allowing processors to develop innovative products such as extended-shelf-life milk, fortified functional drinks, and probiotic products without compromising sensory quality.

In an analysis of membrane filtration and enzymatic modification, Anedda (2025) shows that processing innovations such as ultra-filtration, reverse osmosis, and enzymatic hydrolysis expand value-addition possibilities by enabling the creation of high-protein concentrates, lactose-free milk, and improved-texture fermented products. This aligns with Walstra *et al*. (2023), who highlight that protein standardization and microfiltration have transformed yogurt and cheese manufacturing, leading to greater textural consistency and functional diversity.

Moreover, Khan and Arif (2025), in their study of disruptive innovation in dairy systems, emphasize that technologically supported value-addition—particularly in packaging, pasteurization, and digital processing—enhances operational efficiency and supports the development of niche product lines, contributing to improved organizational outcomes.

Paula *et al*. (2022), examining marketing strategy and competitive advantage in dairy firms, found that *customized products and differentiated value-added variants* (such as flavored yogurts, specialty cheeses, and fortified milk) are instrumental in positioning firms competitively, especially in markets with high import penetration. Their study, involving 150 employees across 15 dairies, emphasizes that consumer-facing product differentiation through value-addition is central to market success.

Rybowska *et al*. (2022) reinforce this perspective, noting that consumers increasingly favour dairy products with added functional or sensory attributes, including yogurts with fruits or granola, flavored milk beverages, and cheeses with spices or herbs. Their consumer survey reveals strong preferences for products enhanced through value-addition, demonstrating the direct link between processing innovation and market acceptance.

Similarly, studies in the EU dairy market show that value-added processing strongly correlates with enterprise performance. Savickienė and Galnaitytė (2024) report that dairy exporters with diversified value-added portfolios experience greater resilience against market volatility and achieve stronger export performance, due to the premium pricing associated with processed dairy products.

Cooperatives increasingly adopt value-added processing as a means of enhancing member incomes, improving milk utilization, and strengthening organizational sustainability. Charalampidou *et al*. (2025), developing an innovation measurement indicator for Greek dairy cooperatives, observe that cooperatives with advanced value-added processing capabilities (e.g., specialty cheeses, branded yogurts, differentiated packaging) achieve higher innovation scores and better strategic positioning.

Makundi and Thomas (2023), studying dairy system evolution in Tanzania, emphasize that cooperatives engaged in value-added processing are better integrated into formal value chains and demonstrate improved organizational cohesion due to shared processing and branding initiatives. Their analysis links value-addition to collective capability building within cooperatives.

Beber *et al*. (2021) further add that value-addition supports technical efficiency within processing plants, based on econometric efficiency modelling of the Brazilian dairy industry. Firms with diversified processing lines demonstrated superior resource utilization and productivity.

Market Responsiveness

Market responsiveness, often conceptualized within the broader construct of market orientation, has gained growing prominence in innovation scholarship as an essential driver of product development and competitiveness in the dairy sector. Early theoretical foundations laid by Kohli and Jaworski (1990) and reinforced empirically by Narver and Slater (1990) established that organizations capable of generating market intelligence, disseminating it internally, and responding effectively to emerging consumer needs tend to demonstrate

stronger innovation outcomes. These studies, grounded in multi-industry survey methodologies and regression-based validation, highlight responsiveness as a strategic capability that enables firms to align product characteristics with shifting market preferences, thereby enhancing the performance and acceptance of new products.

Contemporary dairy literature confirms that responsiveness has become pivotal in shaping product innovation trajectories. Empirical work by Rybowska *et al*. (2022), based on a CAWI survey of 195 dairy consumers in Poland, demonstrates that the most preferred dairy products are those that incorporate customized attributes such as added fruits, flavored milk variations, and cheeses enhanced with herbs or other sensory elements. The study underscores that consumer expectations are no longer static but are increasingly influenced by nutritional awareness, lifestyle transitions, and the desire for products that provide both functional and sensory value. Correspondingly, Walther *et al*. (2022) identify a global surge in personalized dairy nutrition, noting that demand for high-protein beverages, lactose-free milk, probiotic-enriched yogurts, and omega-3 fortified dairy products continues to rise at annual rates exceeding 7 percent. Such findings underscore that customization is not peripheral but central to meeting evolving dietary patterns, with firms compelled to reconfigure formulations, sensory properties, and packaging to maintain competitive relevance.

Processing and packaging innovations further facilitate market responsiveness by enabling firms to tailor products to diverse consumer segments. Hill (2024), in a comprehensive review of dairy technology and marketing interactions, highlights that customized packaging formats—including single-serve containers, convenient resealable bottles, and environmentally friendly alternatives—have become essential features of product differentiation, particularly in markets where convenience and sustainability shape purchase decisions. Anedda (2025) expands this discussion by demonstrating how modern biochemical and sensory engineering techniques are used to customize sweetness profiles, textures, and flavor intensity in dairy products, ensuring that processors can precisely target demographic groups with distinct sensory expectations. These enhancements are supported by Paula *et al*. (2022), whose empirical work on dairy firms shows that product customization, combined with targeted branding and packaging strategies, is a powerful determinant of market positioning under competitive conditions, particularly in import-exposed markets.

Cooperatives, despite their distinct governance structures, are increasingly integrating market responsiveness into their innovation strategies. Charalampidou *et al*. (2025) reveal through their innovation assessment framework for Greek dairy cooperatives that organizations with

stronger mechanisms for interpreting market signals tend to produce more tailored product lines and score higher on innovation capability. Complementary qualitative findings from Makundi and Thomas (2023) in the Tanzanian dairy sector show that responsiveness is strengthened when cooperatives maintain strong linkages with processors, service providers, and consumers, facilitating real-time feedback and enabling timely product adjustments. Parallel insights from Ofosu *et al*. (2023) in Ghana confirm that responsiveness depends on organizational learning systems and leadership commitment to understanding market dynamics—factors that allow cooperatives and small agro-processing firms to customize products and improve competitiveness.

Emerging global trends further reinforce the strategic role of responsiveness in shaping innovative dairy products. The FAO (2023) notes that digital platforms are increasingly being used to monitor consumer behavior and support data-driven adjustments to product features, facilitating more precise customization. Khan and Arif (2025) add that disruptive digital technologies in emerging economies enable processors to tailor product specifications, optimize pricing strategies, and align production with niche market requirements. These developments align with OECD-FAO (2024) projections showing that personalized dairy nutrition encompassing nutrient-specific milk drinks, custom probiotic blends, and diet-adapted dairy products is expected to grow at compound annual rates of 6 to 10 percent, illustrating the commercial significance of responsiveness in contemporary dairy markets.

Across this body of literature, a consistent narrative emerges: market responsiveness is a critical mechanism through which product innovation translates into meaningful organizational outcomes. By incorporating consumer insights, leveraging processing and packaging technologies, and aligning product attributes with emerging trends, dairy enterprises and cooperatives enhance the relevance, acceptance, and market performance of their innovations. Responsiveness, therefore, functions not only as an innovation input but as a strategic capability that supports adaptation, differentiation, and sustained competitiveness in dynamic agrifood environments.

Conceptual Framework

The conceptual framework for this study was developed through an extensive review of theoretical perspectives, global literature, and empirical studies on innovation and performance in agricultural and cooperative-based enterprises.

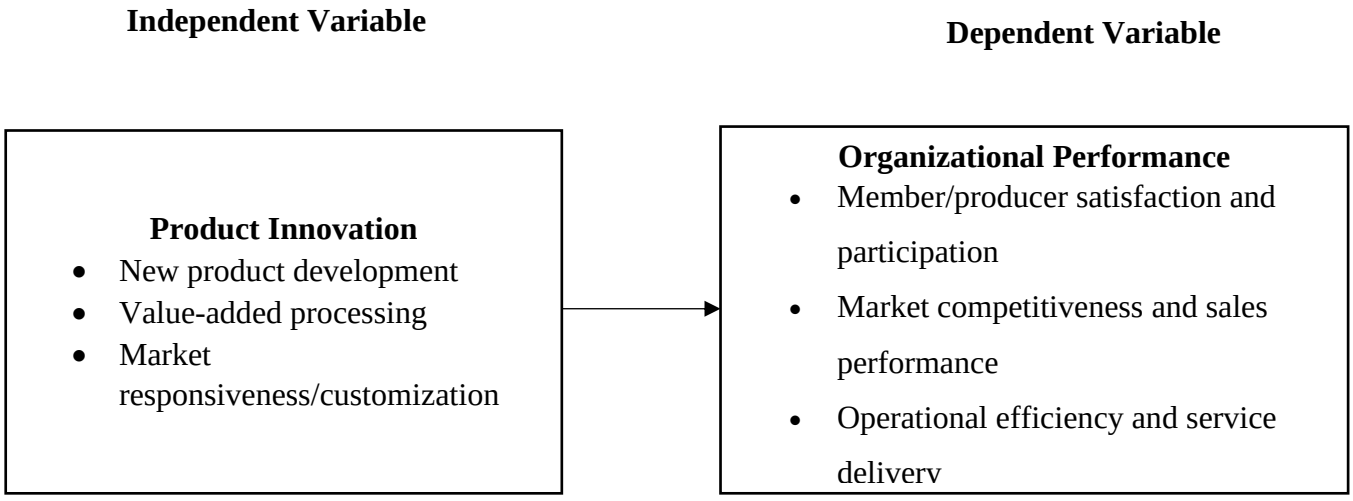

Figure 1: Conceptual Framework

Across these sources, product innovation consistently emerged as a central strategic capability influencing the adaptability, competitiveness, and effectiveness of dairy organizations. The review highlighted three core indicators that capture the essence of product innovation in dairy systems: new product development, value-added processing, and market responsiveness or customization. These indicators reflect the strategic, technological, and market-driven dimensions of innovation emphasized in contemporary agribusiness scholarship.

Similarly, the literature identifies organizational performance in dairy cooperatives as a multidimensional construct shaped by internal processes, member relations, and market engagement. From the reviewed studies, three primary indicators of performance were distilled: member or producer satisfaction and participation, market competitiveness and sales performance, and operational efficiency and service delivery. Together, these indicators represent the economic, relational, and operational outcomes most frequently associated with performance in cooperative enterprises. The conceptual framework therefore positions product innovation as the independent variable and organizational performance as the dependent variable, proposing that innovation-driven practices play a significant role in shaping performance outcomes in dairy cooperative systems.

RESEARCH METHODOLOGY

The study employed a desktop review methodology, a structured literature-based approach used to synthesize existing theoretical and empirical evidence from secondary sources. This methodology was appropriate for examining the relationship between product innovation and organizational performance in dairy cooperatives, as it enabled systematic consolidation of findings across global, regional, and sector-specific contexts without primary data collection

(Cooper, 2010). The approach supported comparative analysis of key innovation dimensions—new product development, value-added processing, and market responsiveness—while allowing identification of patterns, gaps, and conceptual linkages within agrifood and cooperative systems.

The review covered literature published between 2014 and 2024, ensuring relevance to contemporary debates on agrifood innovation and cooperative performance (Gough et al., 2012). A structured search strategy was applied across major academic databases, including Google Scholar, Scopus, ScienceDirect, JSTOR, Wiley Online Library, Emerald Insight, and SpringerLink. Search strings combined Boolean operators with targeted keywords related to product innovation, dairy cooperatives, and organizational performance (Higgins & Green, 2011). Only English-language sources were included, prioritizing peer-reviewed articles, systematic reviews, and credible institutional reports (Petticrew & Roberts, 2006).

The study followed the PRISMA framework to guide identification, screening, eligibility assessment, and inclusion of studies, enhancing transparency and replicability. A structured extraction matrix captured study characteristics, innovation dimensions, performance indicators, and key findings (Petticrew, 2006). Data were synthesized thematically, and methodological quality was critically appraised to inform interpretation of evidence gaps (Booth et al., 2016). Ethical standards were upheld through proper citation and scholarly integrity (Fink, 2014).

FINDINGS

Findings for the study are presented on core subjects; product development, value added processing and market responsiveness. The findings are as detailed in the sections below.

New Product Development and Organizational Performance

The review of literature reveals that new product development (NPD) forms the most widely recognized pillar of product innovation in the dairy sector, functioning as a primary mechanism through which enterprises differentiate products, adapt to evolving consumer lifestyles, and pursue long-term competitiveness. Studies consistently demonstrate that enterprises engaging in continuous product reformulation—such as flavored dairy drinks, functional yogurts, fortified milk, and lactose-free variants—are better positioned to respond to shifting nutritional and sensory expectations. Evidence from Rybowska *et al*. (2022), based on a CAWI survey of 195 consumers, shows strong consumer preference for dairy products enriched with fruits, herbs, and probiotic ingredients, suggesting that firms that prioritize NPD are more likely to

sustain relevance in dynamic marketplaces. Similar patterns emerge in the work of Walther *et al*. (2022), where functional dairy categories—high-protein beverages, probiotic yogurts, omega-3 fortified milk—demonstrate annual growth of over 7 percent globally, indicating that NPD activities are directly tied to expanding consumer segments.

Technological advancements play a central role in shaping NPD outcomes, as reviewed by Anedda (2025), who highlights the role of non-thermal processing, membrane filtration, enzymatic modification, and advanced microbial cultures in enabling new formulations with improved nutritional, sensory, and shelf-life characteristics. These technologies not only broaden the scope of product categories but also enhance safety and quality attributes, reinforcing the competitiveness of dairy enterprises adopting them. However, a critical limitation across much of the literature is the heavy reliance on industry reviews and technical syntheses rather than empirical assessments linking NPD activities to organizational performance metrics. Although research by Paula *et al*. (2022) indicates that customized products contribute to competitive advantage, their model did not retain innovation orientation, suggesting that the effectiveness of NPD may depend on its alignment with broader strategic or market conditions. The absence of longitudinal or causal studies connecting NPD intensity to long-term performance outcomes within dairy cooperatives remains a substantive gap, particularly in emerging economies where cooperative structures and resource constraints influence innovation capacity. Overall, the literature positions NPD as essential for competitiveness, but the evidence base lacks rigorous evaluations of its direct impact on organizational performance within cooperative settings.

Value-Added Processing and Organizational Performance

A second key finding from the literature is the centrality of value-added processing in enhancing product innovation and strengthening dairy enterprise performance. Across global and regional studies, value-addition is repeatedly described as the mechanism through which dairy firms transition from low-margin raw milk sales to higher-value products such as cheese, yogurts, UHT milk, whey derivatives, and fortified beverages. FAO (2023) reports that value-added dairy products account for more than half of global retail dairy revenue, underscoring the financial and strategic importance of value-addition. Empirical studies such as Beber *et al*. (2021), which analyzed 457 dairy processing units in Brazil using econometric efficiency modelling, demonstrate that firms with diversified processing lines exhibit significantly higher levels of technical efficiency and operational productivity, linking value-addition directly to performance enhancement.

Technical studies show that technologies such as high-pressure processing, pulsed electric fields, membrane filtration, and bioactive enrichment not only enable new product categories but also improve microbial safety, extend shelf life, and support clean-label positioning (Roobab *et al*., 2023; Anedda, 2025). These technological innovations expand the strategic possibilities for enterprises seeking to differentiate their products in saturated or import-exposed markets. However, despite the clear technological and commercial rationale for value-added processing, the literature reveals significant variation in adoption capacity across firms and cooperatives. While well-resourced processors in advanced markets benefit from sophisticated processing equipment and R&D structures, cooperatives in emerging economies often lack the capital, expertise, or infrastructure required to implement similar innovations, a finding reinforced by Makundi and Thomas (2023), who describe infrastructural and institutional limitations in East African dairy systems.

Another limitation in the evidence base is that most studies examine value-added processing from a technological or market perspective rather than assessing its organizational implications, such as impacts on member incomes, internal coordination, or cooperative governance. Although Charalampidou *et al*. (2025) link value-added capability to higher innovation scores in Greek cooperatives, empirical work connecting value-addition to performance in cooperative contexts remains sparse. Nevertheless, the literature is consistent in asserting that value-added processing enhances product portfolios, improves competitiveness, and strengthens enterprise resilience, even though rigorous causal evidence in cooperative settings is limited. This indicates an important area for further inquiry.

Market Responsiveness, Customization, and Organizational Performance

The literature consistently shows that market responsiveness—the ability to adjust product attributes, packaging, and pricing in alignment with emerging consumer needs—plays an increasingly important role in driving innovation effectiveness and organizational performance in dairy enterprises. Foundational marketing scholarship by Kohli and Jaworski (1990) and Narver and Slater (1990) demonstrates that responsiveness is a critical strategic capability linked to business profitability, a finding that remains highly relevant to modern dairy systems. Empirical studies confirm that responsiveness shapes which dairy innovations succeed in the marketplace. For example, Rybowska *et al*. (2022) show that consumers prioritize flavored, fortified, and sensory-enhanced dairy products, while Walther *et al*. (2022) highlight rapid global growth in personalized dairy nutrition, including lactose-free milk, high-protein drinks,

and functional yogurts. These findings imply that the success of any innovation is contingent upon how well it meets evolving lifestyle, health, and convenience preferences.

The literature further emphasizes that responsiveness is increasingly supported by technological and institutional mechanisms. Hill (2024) and Anedda (2025) demonstrate that sensory engineering and customized packaging technologies allow processors to tailor products to different demographic and market niches. Studies such as Paula *et al*. (2022) further confirm that product customization strengthens competitive positioning. In cooperative settings, Charalampidou *et al*. (2025) show that market-responsive cooperatives score higher on innovation indicators, while Makundi and Thomas (2023) indicate that strong farmer–industry linkages facilitate timely product adjustments and responsiveness.

Despite this strong narrative, several limitations are evident. Much of the evidence focuses on consumer preference surveys or conceptual discussions rather than empirical models linking responsiveness directly to measurable organizational performance outcomes. Additionally, most studies are situated in high-resource environments or advanced markets, raising questions about applicability in resource-constrained cooperative systems in Africa or Asia. Furthermore, few studies examine how institutional factors—such as governance structures, member coordination, capital access, or regulatory pressures—mediate the effectiveness of responsiveness strategies. These gaps suggest that although responsiveness appears to be a key driver of effective product innovation, its direct performance implications remain under-explored in cooperative contexts.

In summary, the findings from the literature demonstrate that market responsiveness is a critical capability that enhances the success of innovative dairy products, improves competitive positioning, and strengthens organizational adaptability. However, the lack of longitudinal, cooperative-focused, and performance-specific studies limits the ability to draw causal conclusions, highlighting a need for deeper empirical work.

CONCLUSION

The reviewed literature affirms that product innovation through new product development, value-added processing, and market responsiveness is pivotal to organizational performance in the dairy sector. These dimensions enhance competitiveness, adaptability, and efficiency by meeting evolving consumer needs and improving product quality. Nonetheless, empirical studies within cooperative contexts remain limited and largely descriptive. Significant disparities in innovation adoption persist between developed and resource-constrained dairy

systems. Overall, the evidence underscores innovation's centrality while calling for more rigorous, cooperative-focused, and longitudinal research to link specific practices to performance outcomes..

RECOMMENDATION

Dairy enterprises, particularly cooperatives in resource-constrained settings, should prioritize structured investment in product innovation to enhance organizational performance. This includes developing consumer-aligned new products, expanding value-added processing through appropriate technologies and skills, and institutionalizing market responsiveness systems. Future efforts should integrate market intelligence, collaborative research, and innovation monitoring frameworks to support sustained competitiveness.

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