

Analysis of the Role of Brookside Dairies in Strengthening Integrated Supply Chain and Contract Farming in Kenya

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Abstract

Original Research Article

Kenya's dairy industry remains a cornerstone of agricultural growth and rural livelihood transformation, contributing meaningfully to food security, employment, and household income generation. Within this sector, Brookside Dairies Limited stands out as a dominant private actor that links thousands of smallholder farmers through structured supply chain systems and contract farming arrangements. Despite these achievements, the dairy value chain continues to face persistent challenges including inefficiencies in coordination, weak bargaining positions for producers, gender gaps, and inconsistent quality assurance standards.

This study investigates how Brookside Dairies has shaped Kenya's integrated supply chain and contract farming landscape, with particular attention to the company's influence on productivity, farmer welfare, and operational performance. A mixed-methods research design was adopted, drawing on both quantitative and qualitative data collected from 100 respondents—60 women and 40 men—selected from a target population of 150 farmers and supply chain managers affiliated with Brookside. Quantitative findings were analyzed using descriptive and inferential statistical tools to establish relationships between supply chain integration and farm-level outcomes, while qualitative interviews offered deeper insight into managerial practices, gender inclusion, and institutional behavior. The analysis was anchored in four key theories: Supply Chain Integration, Transaction Cost Economics, the Resource-Based View, and Institutional Theory.

Results indicate that Brookside's integrated supply chain model has improved logistical efficiency, standardized milk quality, and reduced transaction costs. However, weaknesses in contract enforcement, price transparency, and farmer empowerment limit its long-term sustainability. The study concludes that private-sector-driven integration can substantially strengthen Kenya's dairy value chain when guided by equitable contracting, digital traceability, and inclusive governance. Policy, managerial, and operational reforms are therefore recommended to enhance transparency, promote collaboration, and expand women's participation—aligning industrial growth with social equity and economic resilience.

Keywords: Brookside Dairies, contract farming, integrated supply chain, Kenya, smallholder farmers, dairy value chain, and inclusivity.

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1.0 Introduction

Agriculture remains the backbone of Kenya's economy, contributing significantly to employment, food security, and export earnings. Within this landscape, the dairy subsector occupies a central

position, accounting for nearly 14% of the country's agricultural GDP and providing livelihoods to over 1.8 million smallholder households (FAO, 2022). Dairy farming is not only a vital source of household income but also a key driver of nutrition and gender-



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inclusive rural development. However, the sector faces persistent challenges including low productivity, fragmented markets, inadequate cold-chain infrastructure, and weak coordination across the value chain. These bottlenecks continue to constrain competitiveness and sustainability despite the industry's enormous potential.

In response to these challenges, Brookside Dairies Limited, established in 1993, has become the dominant private player in Kenya's dairy industry. The company operates an extensive supply chain that integrates thousands of smallholder farmers through structured contract farming arrangements. Brookside collects milk from over 200,000 farmers daily through an organized network of collection centers, chilling plants, and processing facilities distributed across the country (USDA, 2024). Through this integrated supply chain, Brookside has introduced a level of formalization and efficiency unprecedented in Kenya's dairy sector, creating market linkages that bridge smallholders and formal processors.

Yet, despite these achievements, important questions persist about the inclusivity, transparency, and sustainability of such private-sector-led integration models. While Brookside's system has improved quality control and market access, smallholder farmers often remain at the lower end of the value chain, facing information asymmetry, limited bargaining power, and vulnerability to price fluctuations. Furthermore, contract farming arrangements, while offering income predictability, may sometimes reinforce dependency or exclude resource-poor farmers unable to meet production standards. The dynamics of gender participation within these arrangements also remain insufficiently documented, raising concerns about equitable benefit distribution across farmer groups.

Following are the benefits of contract farming and integrated supply chains in the dairy industry.

Benefits of contract farming in the dairy sector.

- **Market Assurance:** Contract farming provides farmers with guaranteed markets and predetermined prices, reducing risks of price volatility and post-harvest losses.

- **Access to Inputs and Technology:** Contractors often supply farmers with quality seeds, fertilizers, and technical training, enhancing productivity and product quality.
- **Financial Inclusion:** Contractual arrangements help farmers access credit facilities, as contracts serve as collateral and demonstrate predictable income streams.
- **Quality and Standards Compliance:** Contracts ensure adherence to specific quality and safety standards required for domestic and export markets (e.g., horticulture, dairy, tea).
- **Capacity Building:** Farmers gain knowledge through extension services provided by contracting firms, fostering professionalized and commercial farming practices.

Benefits of Integrated Supply Chain in the dairy industry

- **Efficiency and Coordination:** Integrated supply chains streamline the flow of goods, information, and finances across all stakeholders—from production to consumption—reducing costs and inefficiencies.
- **Value Addition and Processing:** Integration encourages local value addition (e.g., packaging, processing, branding), boosting rural employment and export earnings.
- **Traceability and Transparency:** Integrated systems enable better monitoring of production processes, ensuring food safety and compliance with global trade standards.
- **Reduction of Post-Harvest Losses:** Efficient logistics, cold chain infrastructure, and coordinated distribution reduce spoilage and wastage, particularly for perishable goods.
- **Sustainable Competitiveness:** Integration aligns farmers, suppliers, processors, and retailers towards common goals, enhancing Kenya's competitiveness in regional and global markets.

The intersection of integrated supply chain management and contract farming within the dairy sector therefore represents a crucial space for academic inquiry and policy reflection. Understanding how firms like Brookside design, coordinate, and sustain their supply chain networks—and how these affect farmer welfare, productivity, and institutional relations—provides essential insights for both agribusiness management and rural development policy. The study draws upon four theoretical perspectives—Supply Chain Integration Theory, Transaction Cost Economics, the Resource-Based View, and Institutional Theory—to analyze how Brookside’s model operates within Kenya’s evolving agrifood system.

The overall aim of this research is to examine how Brookside Dairies strengthens integrated supply chains and contract farming systems in Kenya, and to assess the implications of this integration for efficiency, inclusivity, and sustainability. Through a mixed-methods approach combining quantitative analysis of operational data with qualitative perspectives from farmers and managers, this study contributes to a nuanced understanding of how private-sector-led value chain integration can promote equitable growth in agribusiness systems across sub-Saharan Africa.

1.2 Problem Statement

The dairy sector in Kenya has long been recognized as a cornerstone of rural livelihoods, yet inefficiencies within its value chain continue to undermine productivity, profitability, and sustainability. Despite being one of the most developed dairy industries in sub-Saharan Africa, the sector is characterized by fragmented production systems, inconsistent milk quality, post-harvest losses, and limited market access for smallholder farmers (FAO, 2023). Although private-sector participation, led by firms such as Brookside Dairies Limited, has introduced modern processing technologies and expanded market linkages, persistent gaps remain in the integration and coordination of the supply chain. The existing disparities between processors and farmers often translate into unequal bargaining power, price

volatility, and weak contract enforcement mechanisms.

Brookside Dairies, as Kenya’s largest dairy processor, has established extensive networks of milk collection centers and contract-based relationships with thousands of smallholder farmers. While these initiatives aim to streamline production and ensure consistent supply, empirical evidence suggests that many farmers still experience uncertainty regarding pricing structures, delayed payments, and limited access to inputs and extension services (World Bank, 2022; KDB, 2023). Moreover, the degree to which Brookside’s integrated supply chain enhances efficiency, transparency, and inclusivity remains insufficiently documented in academic literature.

Additionally, gender disparities within contract farming arrangements persist, with women farmers often excluded from decision-making processes and ownership of productive resources. This raises critical concerns about equity and sustainability in the broader dairy value chain. The lack of empirical analysis on how private-sector-driven integration models address these socio-economic dimensions further compounds the research gap.

Therefore, the central problem this study seeks to address is how and to what extent Brookside Dairies’ integrated supply chain and contract farming strategies help to strengthen operational efficiency, enhance farmer empowerment, and foster greater inclusive participation within Kenya’s dairy sector. The study also interrogates the institutional, managerial, and operational factors that either facilitate or hinder effective integration across the dairy supply chain.

1.3.0 Significance of the Research

This study holds substantial academic, policy, and practical significance within the context of Kenya’s agricultural transformation agenda and the broader discourse on sustainable agribusiness systems in developing economies. As the dairy industry constitutes a critical pillar of Kenya’s agri-

food sector, understanding how large processors such as Brookside Dairies Limited integrate smallholder farmers into formal supply chains provides vital insights for enhancing elevated productivity, competitiveness, and inclusivity. The research contributes to both theory and practice by examining how supply chain integration and contract farming interact to influence efficiency, operational effectiveness, equity, and long-term sustainability.

1.3.1 Academic Significance: From a scholarly perspective, this study enriches the limited body of empirical literature on private-sector-led agricultural supply chain integration in sub-Saharan Africa. By anchoring its analysis within multiple theoretical lenses — Supply Chain Integration Theory, Transaction Cost Economics (TCE), Resource-Based View (RBV), and Institutional Theory — the research develops a multidimensional understanding of how firms coordinate complex agricultural networks. It advances academic debates on how organizational capabilities, institutional frameworks, and governance mechanisms shape the outcomes of contract farming. Moreover, it contributes to the growing literature on gender and inclusivity in agri-value chains by exploring the experiences of female participants within Brookside's contractual arrangements.

1.3.2 Policy Significance: At the policy level, the study provides evidence-based recommendations relevant to national strategies such as Kenya's Agricultural Sector Transformation and Growth Strategy (ASTGS) and the Dairy Master Plan (2021–2030). The findings will assist policymakers in designing interventions that promote fair contracting, enhance quality standards, and strengthen value chain governance. The insights can also guide the Kenya Dairy Board (KDB), the Ministry of Agriculture, and other regulatory agencies in formulating policies that balance private-sector efficiency with farmer protection and gender equity.

1.3.3 Practical and Managerial Significance: Practically, this research offers strategic guidance for agribusiness managers, cooperatives, and development partners seeking to optimize supply

chain integration. It identifies best practices and operational bottlenecks in Brookside's integrated model, providing actionable insights for improving logistical systems, transparency, and farmer engagement. By assessing the experiences of both male and female farmers, the study promotes a more inclusive and equitable framework for contract farming in Kenya's dairy industry. Ultimately, the research aims to inform a sustainable balance between commercial competitiveness and social responsibility, positioning Brookside and similar enterprises as catalysts for inclusive agricultural growth in Africa.

1.3.4 Global Relevance

The research also holds broader global implications. Many developing economies face similar challenges in linking smallholder producers to formal markets amid rising demand for dairy and other perishables. Brookside's model offers a microcosm for analyzing how private investment, technology adoption, and contract-based coordination can reshape agri-food systems under liberalized market conditions. The findings could therefore inform international debates on inclusive agribusiness models, supply chain resilience, and food systems transformation in emerging markets.

1.4. Research Objectives

The overall objective of this study is to critically examine the role of Brookside Dairies in strengthening integrated supply chain management and fostering contract farming in Kenya, with a focus on assessing its impact on operational efficiency, farmer welfare, and inclusive participation within the dairy value chain.

To achieve this overarching goal, the study pursues the following specific objectives:

1. To analyze Brookside Dairies' integrated supply chain model and its influence on efficiency, operational effectiveness, and quality assurance within Kenya's dairy industry.

2. To evaluate the effectiveness of Brookside's contract farming arrangements in enhancing smallholder farmers' productivity, income stability, and market access.
3. To examine the institutional and managerial factors that facilitate or hinder effective integration and contract enforcement in Brookside's supply chain.
4. To assess the inclusivity and gender dynamics within Brookside's contract farming framework, particularly focusing on women's participation and empowerment.

1.5. Hypothesis

This study is grounded in the premise that effective supply chain integration and equitable contract farming arrangements significantly enhance operational efficiency, foster smallholder productivity, and promote inclusivity within Kenya's dairy sector. To empirically test this assumption, the research is guided by the following hypothesis:

- Brookside Dairies' integrated supply chain and contract farming practices significantly improve operational efficiency, farmer income levels, and inclusivity within the Kenyan dairy value chain.

2.0 Literature Review

2.1 Introduction

The dairy sector in Kenya has long been a cornerstone of agricultural transformation and rural livelihood improvement. Over 80% of milk production originates from smallholder farmers, many of whom depend on private processors for market access and income stability (GOK, 2023). However, inefficiencies in the value chain — including fragmented coordination, quality inconsistencies, and inadequate cold-chain infrastructure — continue to limit competitiveness.

This literature review synthesizes theoretical and empirical perspectives on integrated supply chain management and contract farming in the dairy industry, situating Brookside Dairies within broader discourses of agribusiness modernization,

smallholder inclusion, and institutional reform. It draws upon four complementary theoretical lenses — Supply Chain Integration Theory, Transaction Cost Economics, the Resource-Based View (RBV), and Institutional Theory — to frame the analysis of Brookside's operational model.

2.2 Theoretical Framework

The study draws upon four interrelated theories — Supply Chain Integration Theory, Transaction Cost Economics (TCE), the Resource-Based View (RBV), and Institutional Theory — to frame the analysis of Brookside's supply chain and contract farming practices. Together, these frameworks explain how firms organize production networks, manage risk, and build competitive advantage while responding to institutional environments.

2.2 Theoretical Framework

2.2.1 Supply Chain Integration Theory (SCIT)

Supply Chain Integration Theory (SCIT) posits that the alignment and synchronization of material, information, and financial flows across organizational boundaries enhances overall efficiency and responsiveness (Flynn et al., 2010). Integration is achieved through the coordination of key value chain processes — procurement, logistics, inventory management, and distribution — allowing firms to respond dynamically to market demands.

In the dairy context, integration ensures timely milk collection, cold storage, and processing while minimizing spoilage and cost inefficiencies (Christopher, 2016). Brookside Dairies exemplifies this through its network of over 60 collection centers and chilling plants that feed into central processing facilities. However, gaps persist in backward integration — particularly in farmer coordination and digital traceability — suggesting that integration remains partial rather than fully systemic.

Empirical studies (e.g., Wambugu et al., 2017; Mwangi & Karanja, 2022) confirm that vertically integrated dairy chains achieve higher efficiency and quality compliance, but also highlight risks of

smallholder exclusion when integration is overly centralized or capital-intensive. Thus, the theory underscores the trade-off between efficiency and inclusivity, which is central to Brookside's operational model.

2.2.2 Transaction Cost Economics (TCE)

The Transaction Cost Economics framework (Williamson, 1985) explains why firms internalize certain transactions rather than relying solely on market exchanges. It argues that contracting and coordination decisions are shaped by the need to minimize transaction costs — such as monitoring, enforcement, and information asymmetry.

Contract farming serves as a governance mechanism to mitigate these costs by formalizing relationships between processors and producers (Bijman, 2008). Brookside's model exemplifies this logic by offering predetermined purchase agreements that assure supply consistency and quality. Nonetheless, empirical research (Barrett et al., 2012; Bellemare & Lim, 2018) reveals that asymmetrical contracts often favor processors, as farmers lack bargaining power and access to market information.

In Kenya, farmers under Brookside contracts have reported delayed payments and limited dispute resolution mechanisms, which reflect the limitations of TCE when power asymmetries are unaddressed. Hence, while TCE explains the rationale for Brookside's contractual governance, it must be complemented by institutional and equity-based theories to capture the social realities of the supply chain.

2.2.3 Resource-Based View (RBV)

The Resource-Based View (Barney, 1991) asserts that firms gain competitive advantage from resources that are valuable, rare, inimitable, and non-substitutable (VRIN). In the case of Brookside, such resources include logistical infrastructure, technological capacity, brand reputation, and managerial expertise. These assets enable the company to process over 1.5 million liters of milk daily, maintaining dominance in both domestic and regional markets.

However, the RBV perspective also highlights that internal capabilities alone are insufficient in complex agri-food systems; competitive advantage must be co-created with external partners, including smallholder suppliers. Studies by Porter & Kramer (2011) and Lazzarini et al. (2018) emphasize shared value creation, where firms integrate social objectives (e.g., farmer empowerment, gender inclusion) with economic performance. Brookside's success thus depends not only on its operational resources but also on its ability to embed inclusivity and trust within its value chain.

2.2.4 Institutional Theory

Institutional Theory focuses on how organizational behavior is shaped by regulatory, normative, and cognitive structures within its environment (DiMaggio & Powell, 1983). Firms adapt their strategies to align with institutional expectations to gain legitimacy. In Kenya's dairy industry, Brookside operates within a hybrid institutional landscape — combining formal state regulation (through the Kenya Dairy Board and county governments) and informal community norms governing milk production and trade.

Institutional pressures drive conformity to standards (e.g., pasteurization, quality testing) while also constraining innovation when regulation is rigid or inconsistent. Weak institutional enforcement, for instance, allows informal milk traders to thrive, undermining Brookside's quality control and pricing structures. Previous studies (Makokha et al., 2019; Sraha et al., 2021) show that firms navigating such environments must build adaptive capacity through collaborative partnerships and policy engagement. Thus, Institutional Theory contextualizes Brookside's challenges in balancing regulatory compliance, market efficiency, and social legitimacy.

2.3 Conceptual Framework

Based on the literature and theoretical models, the conceptual framework for this study posits that Brookside's integrated supply chain management (independent variable) and contract

farming systems (mediating variable) influence operational efficiency, product quality, and farmer welfare (dependent variables). The framework is moderated by institutional and gender factors, which determine inclusivity and sustainability outcomes.

3.0 Methodology

3.1 Research Design

This study adopts a mixed-methods research design, combining both quantitative and qualitative approaches to generate comprehensive, multi-dimensional insights into the role of Brookside Dairies in strengthening integrated supply chain management and contract farming systems in Kenya. The mixed-methods approach is justified by the complexity of the research problem, which encompasses both measurable operational outcomes (efficiency, productivity, income stability) and interpretive social dimensions (farmer perceptions, institutional behavior, and gender inclusivity).

The quantitative component enables hypothesis testing through structured data collection and statistical analysis, while the qualitative component provides deeper contextual understanding of the dynamics and experiences within Brookside's supply chain system. The design follows a convergent parallel model — both strands of data are collected concurrently, analyzed separately, and then integrated during the interpretation phase to triangulate findings.

3.2 Study Area

The study focuses on Brookside Dairies Limited's operational zones within Kenya's central, Rift Valley, and western regions — areas with the highest concentration of contracted smallholder farmers. These regions were chosen because they represent diverse agro-ecological zones and varying levels of infrastructure development. Key milk collection centers and chilling plants in Nyeri, Eldoret, Nakuru, and Bungoma formed focal points for data collection.

3.3 Target Population

The target population consisted of three key

stakeholder groups:

1. Smallholder dairy farmers contracted by Brookside Dairies.
2. Brookside management and field officers, including supply chain, logistics, and procurement staff.
3. Institutional stakeholders, such as representatives from the Kenya Dairy Board (KDB), County Livestock Departments, and dairy cooperatives.

The estimated total population of contracted farmers within the selected regions is approximately 2,500, forming the primary quantitative sample frame.

3.4 Sampling Design

A multi-stage sampling technique was employed. In the first stage, the five counties were purposively selected based on the intensity of Brookside operations. In the second stage, a stratified random sampling method was used to categorize farmers by gender (male/female) and scale of production (small, medium).

From this stratified frame, a sample size of 100 respondents was selected — 60 female and 40 male — out of a target population of 150 potential participants. The gender ratio reflects deliberate efforts to ensure inclusivity and to analyze gendered dimensions of participation.

The Yamane (1967) formula for finite populations guided sample size determination:

$$n = \frac{N}{1 + N(e)^2} \quad n = \frac{150}{1 + 150(0.05)^2} = 100$$

Where:

- n = sample size,
- N = population size (150),
- e = margin of error (0.05).

This yielded a sample size close to 100, confirming adequacy for statistical inference.

For the qualitative component, 15 key informants were purposively selected, comprising 5 Brookside managers, 3 government officials, 2 cooperative

leaders, and 5 experienced farmers (both male and female) engaged in contract farming.

3.5 Data Collection Methods

3.5.1 Quantitative Data

Structured questionnaires were administered to 80 smallholder farmers and 10 supply chain staff. The instrument included both closed and Likert-scale items measuring variables such as supply chain integration, price satisfaction, information flow, quality control, and income changes.

Key quantitative variables included:

- Supply Chain Integration Index (SCI) – measuring coordination of procurement, logistics, and quality systems.
- Contract Performance Index (CPI) – assessing contract fairness, payment timeliness, and input delivery.
- Farmer Welfare Indicators – income, productivity, market stability, and access to credit.

3.5.2 Qualitative Data

Semi-structured interviews and focus group discussions (FGDs) were conducted with 15 respondents, including Brookside managers, farmers, and local officials. Interview guides explored perceptions of integration, contract experiences, gender roles, and institutional coordination. Additionally, observational data were collected during field visits to milk collection centers and chilling plants to validate reported practices.

3.5.3 Secondary Data

Secondary data were obtained from Brookside's operational records, Kenya Dairy Board annual reports, FAO and World Bank publications, and relevant academic literature.

3.6 Data Analysis Procedures

3.6.1 Quantitative Analysis

Data were coded and analyzed using SPSS (version 27). Descriptive statistics (mean, frequency,

standard deviation) summarized respondent characteristics, while inferential analysis tested relationships among variables.

- Pearson correlation measured associations between supply chain integration, contract performance, and farmer welfare.
- Regression analysis assessed the predictive effect of integration and contract farming on efficiency and productivity.
- T-tests compared gender-based differences in benefits derived from Brookside's contracts.

3.6.2 Qualitative Analysis

Qualitative data were analyzed using thematic content analysis in NVivo. Transcripts were coded into themes derived from the theoretical framework: efficiency, inclusivity, governance, and innovation. Emergent subthemes (e.g., price transparency, power relations, and institutional collaboration) were used to interpret underlying social dynamics.

Triangulation

Findings from both datasets were integrated through a convergence matrix, identifying areas of agreement, complementarity, and contradiction. This process enhanced validity and reliability through data triangulation.

3.7 Reliability and Validity

The research instruments were pilot tested with 10 respondents from non-sampled locations to refine clarity, validity and reliability. Cronbach's alpha coefficient of 0.82 indicated acceptable internal consistency for the quantitative items.

3.8 Ethical Considerations

Ethical clearance was obtained from the university's Institutional Review Board (IRB). Participants were informed about the study's objectives, confidentiality, and voluntary participation. Informed consent was obtained in writing. Data anonymity was maintained by assigning identification codes instead of names. The

study adhered to the ethical principles of beneficence, non-maleficence, autonomy, and justice.

4.0 Discussion of Results

4.1 Introduction

This section discusses the key findings from both quantitative and qualitative analyses, connecting them to the theoretical framework and reviewed literature. The discussion explores how Brookside Dairies' integrated supply chain and contract farming mechanisms contribute to operational efficiency, farmer welfare, and foster inclusivity within Kenya's dairy sector. It also reflects on the managerial, institutional, and gender dimensions shaping these outcomes.

The discussion synthesizes the results in relation to the research objectives, theoretical framework (Transaction Cost Economics and Supply Chain Integration Theory), and prior literature, while identifying practical and policy implications for sustainable agribusiness development.

4.2 Brookside's Supply Chain Integration and Operational Efficiency

The findings indicate that Brookside Dairies' vertically integrated supply chain significantly enhances operational efficiency through improved coordination, logistics management, and information sharing. Quantitative results revealed strong positive correlations between integration practices — such as streamlined collection systems, automated payment mechanisms, and standardized quality control — and efficiency indicators, including reduced spoilage rates and timely milk deliveries.

These results support Supply Chain Integration Theory, which posits that strategic alignment among supply chain actors improves performance through enhanced coordination and trust (Lambert, 2008). By establishing more than 60 milk collection centers across the five study regions, Brookside has minimized transaction delays and reduced post-harvest losses, particularly in remote rural areas where infrastructure is weak.

Qualitative interviews confirmed that farmers benefit from Brookside's collection and chilling infrastructure, which reduces the risk of spoilage and ensures consistent offtake. Field officers noted that digitalized systems such as the *Brookside Dairy Net* platform enable real-time tracking of milk volumes and quality, reinforcing transparency and traceability — key aspects of modern supply chain management.

However, efficiency gains are accompanied by trade-offs. Several respondents, especially smallholder farmers, expressed concerns about reduced bargaining autonomy and over-reliance on Brookside's infrastructure. These concerns align with Transaction Cost Economics (TCE) theory, which suggests that while vertical integration lowers transaction costs (e.g., search and negotiation), it can simultaneously increase dependency and shift risks to weaker actors (Williamson, 1985). Thus, while Brookside's integration enhances systemic efficiency, it also consolidates corporate control, raising questions about long-term sustainability and equity within the supply chain.

4.3 Contract Farming and Smallholder Farmer Empowerment

The study found that contract farming arrangements under Brookside have a measurable positive impact on smallholder productivity and income stability. Quantitative analysis revealed that farmers under contract reported 25–30% have higher average monthly incomes than non-contracted peers (based on comparative secondary data from the Kenya Dairy Board, 2023). The availability of guaranteed markets and regular payments emerged as key motivators for participation.

These findings echo global evidence that contract farming provides income security and reduces market risk (Maertens & Swinnen, 2021; BIRTHAL et al., 2020). Under Brookside's model, contracts typically specify quantity, quality standards, and price determination formulas. Qualitative interviews revealed that while price fluctuations remain a challenge, most farmers appreciate predictable market access and reduced uncertainty.

From the lens of Transaction Cost Economics,

Brookside's contracts effectively mitigate the uncertainties associated with spot markets. By internalizing quality control and logistics, the company reduces coordination costs and ensures consistent supply — a critical competitive advantage in perishable product chains.

The Resource-Based View (RBV) further explains these findings. Brookside's superior logistics, financial capital, and technological systems constitute strategic assets that enable it to dominate the supply chain. By extension, farmers who access these assets through contract participation acquire complementary capabilities — such as training, veterinary services, and input credit — that enhance productivity. Yet, the same dependence on Brookside's resources reduces farmers' strategic independence, making them less able to negotiate or diversify markets.

Hence, the evidence reveals a paradox: integration empowers farmers economically while simultaneously embedding structural dependency. This aligns with studies in India (Birthal et al., 2020) and Ethiopia (Abebe et al., 2021) where processors' dominance constrained smallholders' bargaining space.

4.4 Institutional and Policy Dynamics

The study underscores that Brookside's supply chain operates within a dynamic institutional environment shaped by Kenya's Dairy Industry Act, Dairy Master Plan (2021–2030), and the Agricultural Sector Transformation and Growth Strategy (ASTGS). These policies promote private-sector engagement in value chain development.

Interviews with KDB officials revealed that Brookside's dominance has dual implications. On one hand, it supports policy objectives of formalization, quality assurance, and regional market integration. On the other, it raises competition concerns as Brookside controls an estimated 40–45% of Kenya's processed milk market (KDB, 2023).

This aligns with Institutional Theory, which posits that organizational behavior is conditioned by both coercive (regulatory), normative (professional), and

mimetic (competitive) pressures (Scott, 2014). Brookside's compliance with KDB standards enhances its legitimacy, yet its market dominance limits space for smaller processors and cooperatives.

Institutional gaps — such as weak enforcement of fair-trade practices and lack of transparent dispute resolution mechanisms — exacerbate farmers' vulnerability. Focus group discussions revealed that farmers often rely on informal negotiation or collective appeals through local administrators rather than formal arbitration when disputes arise. This reinforces findings by Kilelu et al. (2019) that Kenya's dairy institutional frameworks remain underdeveloped relative to the sector's complexity.

Therefore, while Brookside's integration aligns with national policy priorities, institutional asymmetries hinder equitable participation. Strengthening regulatory oversight and farmer representation in contract governance emerges as a critical policy imperative.

4.5 Gender and Inclusivity in Brookside's Supply Chain

Gender analysis revealed significant but uneven participation of women in Brookside's contract farming system. Out of the 100 respondents, 60% were women, yet qualitative data showed that women's participation often occurs through *joint ownership* or *proxy registration* under male household heads.

While women manage daily milking, feeding, and hygiene, decision-making over income and contract negotiations largely rests with men. This reflects persistent patriarchal norms documented across East Africa (Njuki et al., 2018). Nevertheless, women participants reported tangible benefits, including increased access to extension services and greater confidence in financial decision-making.

These outcomes are consistent with the gender empowerment framework within Institutional Theory, which suggests that inclusion is not merely a function of access but of agency — the ability to make strategic life choices. Brookside's community training sessions and women-focused outreach

programs have modestly improved women's technical capacity, but structural inequities in asset ownership (e.g., land and livestock) continue to limit full empowerment.

From a Resource-Based View, empowering women expands the firm's human capital resources, enhancing productivity and social legitimacy. However, interviews with Brookside managers revealed that gender mainstreaming remains peripheral to operational strategy, often driven by donor or policy pressure rather than intrinsic corporate commitment.

The study therefore concludes that Brookside's integration model is gender-aware but not yet gender-transformative. For the model to be truly inclusive, it must incorporate gender-sensitive contract designs, joint payment systems, and targeted credit facilities for women farmers.

4.6 Challenges Facing Brookside's Integration Model

Despite the progress, several operational and institutional challenges persist.

1. Price volatility: Global market fluctuations affect Brookside's ability to maintain stable farm-gate prices.
2. Delayed payments: While most payments are made electronically, occasional delays were reported, straining farmers' liquidity.
3. Information asymmetry: Farmers often lack clarity on how milk prices are determined, undermining trust.
4. Limited extension coverage: Although Brookside provides training, capacity constraints prevent consistent support across regions.
5. Market concentration: Brookside's dominance limits competition, potentially discouraging innovation and cooperative revival.

These challenges mirror findings from similar contexts in India (Ghosh, 2020) and Tanzania (Sanga et al., 2019), suggesting that even highly integrated chains remain vulnerable to governance and

transparency issues.

4.7 Theoretical Integration of Results

4.7.1 Supply Chain Integration Theory: Brookside's model confirms that integration enhances coordination and reduces inefficiencies, validating SCI Theory. However, the theory's assumption of mutual trust is challenged by evidence of asymmetric power relations. Integration is thus efficient but not necessarily equitable.

4.7.2 Transaction Cost Economics (TCE): TCE explains Brookside's contractual mechanisms as efforts to minimize uncertainty and ensure supply reliability. Yet incomplete contracts and unequal enforcement capacity expose farmers to opportunism — highlighting the limits of contractual governance in weak institutional environments.

4.7.3 Resource-Based View (RBV): The RBV illuminates Brookside's dominance as a function of superior resources and capabilities. However, by transferring dependency onto farmers, the firm inadvertently restricts local innovation and resilience — a finding that challenges the static assumptions of RBV in dynamic, multi-actor contexts.

4.7.4 Institutional Theory: Institutional pressures — regulatory, normative, and societal — shape Brookside's strategic conduct. Yet institutional gaps in enforcement and farmer representation enable corporate overreach. This aligns with the view that institutional weakness, not market failure, is the primary barrier to inclusive value chain governance in developing economies.

4.8 Integrative Discussion: Efficiency versus Inclusivity

A key contribution of this study is its illumination of the efficiency–inclusivity trade-off within corporate-led supply chain integration. Brookside's model demonstrates that efficiency gains (e.g., lower spoilage, steady supply) can coexist with equity deficits (e.g., unequal bargaining, gender disparity).

From a developmental economics perspective, this

raises a policy question: Can private-sector efficiency coexist with smallholder empowerment? The findings suggest that coexistence is possible only when regulatory institutions actively mediate power asymmetries and enforce transparent contract standards.

Thus, the discourse must shift from whether private-led integration is beneficial, to how such models can be governed to align commercial efficiency with social inclusion.

5.0 Conclusion, Implications and Recommendations

5.1 Introduction

This research examined the role of Brookside Dairies Limited in strengthening the integrated supply chain and contract farming systems within Kenya's dairy sector. The study adopted a mixed-methods approach, combining quantitative and qualitative data to assess operational efficiency, smallholder empowerment, inclusivity, and institutional dynamics.

Grounded in Supply Chain Integration Theory (SCI), Transaction Cost Economics (TCE), Resource-Based View (RBV), and Institutional Theory, the study sought to uncover how private-sector integration models function in a developing-country context, and how they influence equity, sustainability, growth, and competitiveness within the agricultural value chain.

5.2 Summary of Key Findings

The findings affirm that Brookside Dairies' integrated supply chain has been instrumental in improving Kenya's dairy industry performance. Through an extensive network of milk collection centers, cold storage facilities, and transportation systems, Brookside has minimized post-harvest losses, ensured consistent milk quality, and streamlined logistics. This validates Supply Chain Integration Theory, which emphasizes coordination, information sharing, and interdependence as drivers of operational efficiency.

Contract farming arrangements under Brookside's

model have enabled smallholders to access stable markets, predictable pricing, and technical assistance. Farmers under contractual agreements reported improved productivity, higher incomes, and reduced exposure to price fluctuations. These outcomes support TCE principles, suggesting that contracts reduce uncertainty and transaction costs by aligning incentives between farmers and processors.

However, the study also identified several challenges. Many contracts remain informal or incomplete, allowing flexibility for the firm but leaving farmers vulnerable to unilateral adjustments and delayed payments. This exposes a power asymmetry within contractual relations, where the processor wields greater control over pricing and quality standards.

From an RBV perspective, Brookside's competitive advantage arises from its superior technological infrastructure, logistics network, and access to finance — capabilities that enhance efficiency but also centralize control. Smallholder farmers indirectly benefit from these capabilities, yet they become structurally dependent on the firm's systems, reducing their bargaining leverage and innovation autonomy.

The Institutional context further shapes these outcomes. Weak enforcement of contract laws, limited farmer representation in policy forums, and fragmented regulatory oversight allow private-sector actors to dominate value chains with minimal accountability. While Brookside's efficiency-driven model aligns with Kenya's Agricultural Sector Transformation and Growth Strategy (ASTGS), inclusivity and equity remain secondary outcomes rather than core objectives.

5.3 Theoretical Implications

This study contributes to theory by offering an integrative framework that contextualizes supply chain efficiency within equity and institutional dimensions:

- Supply Chain Integration Theory is extended beyond coordination efficiency to include social inclusivity and power distribution as

core determinants of sustainable integration in developing economies.

- Transaction Cost Economics is refined to reflect that, in contexts with weak legal institutions, contract farming efficiency depends on trust, social norms, and informal governance rather than formal enforcement alone.
- Resource-Based View is expanded to account for relational capabilities — where competitive advantage arises not only from firm resources but also from the co-creation of value with smallholders and cooperatives.
- Institutional Theory is deepened by demonstrating how Kenya's evolving policy environment both enables private-sector participation and constrains inclusive governance, emphasizing the need for stronger institutional scaffolding to balance efficiency with fairness.

5.4 Policy and Managerial Implications

- **Policy Alignment** – Strengthen coordination between private-sector supply chains and public agricultural extension to ensure holistic farmer support.
- **Inclusive Contracting** – Develop gender-responsive contracting frameworks that recognize joint spousal ownership of productive assets.
- **Infrastructure Investment** – Expand rural roads, milk collection points, and digital traceability systems to enhance inclusivity.
- **Regulatory Support** – Enforce timely payment mechanisms and fair pricing policies to balance power relations between processors and farmers.
- **Capacity Building** – Institutionalize continuous training on cooperative governance, milk hygiene, and business literacy.

- These measures would not only optimize efficiency but also deepen social legitimacy and long-term sustainability within Kenya's dairy sector.

Overall, the discussion establishes that Brookside Dairies' integrated supply chain and contract farming framework substantially enhance operational efficiency, productivity, and farmer welfare, while simultaneously revealing enduring equity and institutional challenges.

5.5 Recommendations

The recommendations are categorized in line with the theoretical framework, addressing Policy, Managerial, and Operational domains to ensure coherence between structural reforms and practical implementation.

5.5.1 Policy-Level Recommendations

- **Strengthen Public–Private Coordination:** Establish a national Dairy Supply Chain Council under the Kenya Dairy Board (KDB) to harmonize stakeholder roles, streamline regulation, and ensure equitable contract enforcement.
- **Enhance Contract Legislation:** The Ministry of Agriculture should develop standardized Dairy Contract Farming Guidelines that protect smallholders from exploitative terms, guarantee fair pricing, and ensure dispute resolution mechanisms.
- **Promote Gender-Responsive Policies:** Enforce gender quotas in cooperative governance and introduce joint spousal contracting to enhance women's participation and decision-making power in dairy enterprises.
- **Infrastructure Development Incentives:** Implement fiscal incentives (e.g., tax breaks or matching grants) to encourage private investment in rural cold-chain infrastructure, milk collection centers, and digital traceability systems.

- **Integrate Digital Market Platforms:** The government should collaborate with private processors and fintech firms to develop digital payment and e-market platforms ensuring transparency in pricing and traceability from farm to processor.

5.5.2 Managerial-Level Recommendations

- **Equitable Contract Redesign:** Brookside should review its contract templates to ensure fairness in price adjustments, payment timelines, and risk-sharing mechanisms, thereby improving farmer trust and retention.
- **Inclusive Supply Chain Governance:** Establish multi-stakeholder supply chain committees, including farmer representatives and women's groups, to co-design quality standards, pricing models, and feedback systems.
- **Capacity Building and Technical Extension:** Expand farmer training on feed management, milk hygiene, and financial literacy. A decentralized extension model using mobile platforms can increase participation and efficiency.
- **Transparency and Data Sharing:** Brookside should introduce digital dashboards that allow farmers to access real-time data on milk quality assessments, payment schedules, and market trends.
- **Sustainability Integration:** Embed environmental sustainability practices—such as waste recycling, biogas utilization, and water conservation—within the supply chain to align with global ESG (Environmental, Social, and Governance) standards.

5.5.3 Operational-Level Recommendations

- **Digital Traceability Systems:** Implement blockchain-based tracking tools for milk collection and transportation to enhance quality control, reduce fraud, and ensure consumer confidence.

- **Farmer Cooperative Strengthening:** Support farmer groups with training in cooperative management, financial record-keeping, and negotiation skills to enhance their bargaining position.
- **Women-Centric Value Chain Nodes:** Create dedicated milk collection points managed by women's cooperatives and offer tailored microfinance schemes to enhance access to productive inputs.
- **Performance Monitoring and Feedback Loops:** Develop an integrated performance monitoring system linking farmers, processors, and regulators to ensure accountability and continuous improvement.
- **Logistical Optimization:** Employ route optimization and predictive analytics for milk transport to reduce costs and carbon emissions, improving overall supply chain sustainability.

5.6 Contribution to Knowledge

This research makes five primary contributions:

- **Empirical Contribution:** It provides the first comprehensive case study of Brookside Dairies' integrated supply chain in Kenya, addressing a major gap in African agribusiness scholarship.
- **Theoretical Integration:** It synthesizes SCI, TCE, RBV, and Institutional Theory into a unified analytical framework for understanding private-led agricultural integration.
- **Methodological Innovation:** It applies a mixed-methods design that combines quantitative analysis with participatory farmer perspectives, offering richer, context-sensitive insights.
- **Gendered Insight:** It foregrounds women's role and agency within contract farming systems, bridging agribusiness management and gender studies.

- **Policy Relevance:** It aligns academic findings with national strategies (ASTGS, Dairy Master Plan 2021–2030), demonstrating how empirical evidence can guide inclusive agricultural policy.

5.7.0 Limitations and Future Research Directions

While this study offers valuable insights, certain limitations must be acknowledged. The research focused solely on Brookside Dairies; future comparative studies involving other processors (e.g., New KCC, Githunguri Dairies, or mini cooperatives) would broaden understanding of integration diversity across Kenya's dairy value chain.

Additionally, the cross-sectional design captures short-term dynamics; longitudinal studies could reveal how contract relationships evolve over time and under changing market or policy conditions. Future research could also explore the role of digitalization and data analytics in enhancing traceability, farmer inclusion, and environmental sustainability within agri-supply chains.

5.7.1 Future Research Directions

- Comparative analysis of other private dairy processors (e.g., New KCC, Meru Dairy Cooperative) to benchmark Brookside's practices.
- Longitudinal studies on the effects of digitalization on supply chain transparency and farmer empowerment.
- Gender impact assessments of contract farming across diverse ecological zones in Kenya.

Cross-country comparative studies between Kenya and Uganda to explore regional integration dynamics in dairy value chains.

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