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TRANSFORMING SUSTAINABILITY AND HEALTH SYSTEM IN DAIRY COOPERATIVES: AN INNOVATIVE BUSINESS MODEL CANVAS FOR VALUE CREATION IN WESTERN JAVA, INDONESIA

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Abstract: The dairy industry is in need of a paradigm shift from traditional practices to a contemporary, enhanced system. This study aims to analyze and characterize business models that bring added value to the conventional dairy business, fostering a more sustainable approach to cattle healthcare. While the amalgamation of sustainable practices and cattle health within dairy business models remains relatively unexplored, this study bridges the gap. In the month of April 2022, a cross-sectional study was carried out in selected dairy cooperative (KPS Cianjur Utara), West Java, Indonesia. By conducting a comprehensive analysis of business model frameworks pertinent to the management and staff of dairy cooperatives, a practical approach has been developed. This approach serves the purpose of assisting cooperatives in meticulously evaluating their existing models while also facilitating the creation of novel and innovative business approaches. This tool involves augmenting the Business Model Canvas (BMC), introducing novel dimensions that operationalize dairy farm and cooperative dynamics. The proposed dairy cooperative BMC framework presents a pragmatic structure for formulating and disseminating a holistic, improved model. Diverse dairy cooperative business models have been identified and extensively deliberated upon. Despite varying organizational architectures and approaches to value creation, a common thread of collaboration and adaptability to external fluctuations runs through all these models. This study lays the foundation for transformative change within the dairy sector, aligning it with contemporary sustainability objectives.

Keywords: sustainable business, business model canvas, animal health, dairy business, KPS Cianjur Utara

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Abstrak: *Industri sapi perah membutuhkan pergeseran paradigma dari praktik bisnis tradisional menuju sistem yang lebih kontemporer dan ditingkatkan. Studi ini bertujuan menganalisis dan mengkarakterisasi model bisnis yang memberikan nilai tambah bagi bisnis sapi perah konvensional, mendorong pendekatan yang lebih berkelanjutan terhadap kesehatan hewan sapi perah. Integrasi praktik yang berkelanjutan dan kesehatan hewan dalam model bisnis susu masih relatif belum tereksplorasi, studi ini menjembatani kesenjangan tersebut. Pada bulan April 2022, dilakukan studi cross-sectional di koperasi susu terpilih (yaitu KPS Cianjur Utara), Jawa Barat, Indonesia. Dengan melakukan analisis komprehensif terhadap kerangka kerja model bisnis yang relevan bagi manajemen dan staf koperasi susu, pendekatan praktis telah dikembangkan. Pendekatan ini bertujuan untuk membantu koperasi dalam mengevaluasi model-model yang ada sekaligus memfasilitasi penciptaan pendekatan model bisnis yang baru dan inovatif. Metode ini menggunakan pengayaan pada Business Model Canvas (BMC), dengan memperkenalkan dimensi-dimensi baru pada dinamika peternakan sapi perah dan koperasi susu. Kerangka kerja BMC koperasi susu yang telah dirumuskan menyajikan struktur model bisnis yang lebih holistik dan ditingkatkan. Berbagai model bisnis koperasi susu telah diidentifikasi dan dibahas secara ekstensif. Meskipun memiliki arsitektur organisasi yang beragam dan pendekatan terhadap penciptaan nilai yang berbeda, peran penting kolaborasi dan adaptabilitas terhadap fluktuasi eksternal tergambarkan melalui model bisnis ini. Studi ini meletakkan dasar perubahan transformatif dalam sektor sapi perah, sejalan dengan tujuan keberlanjutan terbaru.*

Kata kunci: *bisnis berkelanjutan, business model canvas, kesehatan hewan, bisnis sapi perah, KPS Cianjur Utara*

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INTRODUCTION

The trend of milk and its derivative products consumption within Indonesia has marked a significant and consistent ascent. This surge can be ascribed to a confluence of influential factors, including the expanding populace, an increased emphasis on health-conscious lifestyles, and the continuous rise in per capita income levels. Notably, the per capita income in Indonesia reached a substantial USD 4,175 in 2019 (Statistics Indonesia, 2020). The growth trajectory of milk consumption becomes even more pronounced when examining the period from 2017 to 2020. During this time span, the consumption of milk has showcased a commendable and steady annual growth rate, averaging approximately 4% (Secretariat General of the Ministry of Agriculture, 2016). This remarkable growth in milk consumption underscores the evolving preferences and priorities of Indonesian consumers. The confluence of a burgeoning population, an increased awareness of the importance of health and nutrition, and the improving economic prosperity of individuals collectively contribute to the thriving demand for milk and its derived products in the Indonesian market. As these trends continue to shape the country's consumer landscape, it is likely that the trajectory of increased milk consumption will persist, influencing various aspects of the dairy industry and the broader economy.

The persistent gap between production and consumption can be attributed to a multitude of factors, including the intricate supply chain mechanisms, the intricacies of dairy farming practices, and the complexities associated with scaling up production to meet mounting consumer preferences. Addressing this dissonance is pivotal not only for achieving self-sufficiency in milk production but also for bolstering the overall resilience and sustainability of Indonesia's dairy sector. Strategic interventions are required to bridge this gap effectively (Moran and Morey, 2015). This may encompass initiatives to enhance local production capacities, promote technological advancements in dairy farming, and foster collaborations between industry stakeholders to create a more integrated and efficient supply chain. As Indonesia continues to grapple with the interplay of production and consumption dynamics, a multifaceted approach becomes essential to realize a more harmonious equilibrium in the dairy market and cater to the evolving preferences of its population.

Indonesia's dairy landscape is distinctly shaped by the prevalence of smallholder farmers who form the bedrock of the sector. This characteristic is underpinned by the prevalence of farms with modest dimensions, wherein the average ownership of milking cows per farm remains strikingly low (Guntoro et al. 2016). Within this framework, Java Island emerges as a pivotal epicenter of milk production, exerting a dominant influence on the nation's dairy output. An astonishing 98.6% of Indonesia's overall dairy cattle population is concentrated within the confines of Java Island (Table 1). This pronounced concentration underscores the island's status as a key contributor to the country's milk production. East Java, West Java, and Central Java assert their prominence as leading contributors, collectively contributing to a significant portion of the nation's annual milk output. The intricate interplay of these regions, collectively shaping Indonesia's dairy sector, underscores the dynamic and multifaceted nature of the industry. While smallholder farmers form the backbone of dairy operations, it's the strategic alignment of geographical and regional dynamics that propels the nation's milk production, enabling Indonesia to address the demands of its burgeoning population and evolving consumer preferences.

Table 1. Dairy Cattle population in Indonesia from 2017 to 2021

Province	Number of Cattle (head)					Average (head)	Contribution (%)
	2017	2018	2019	2020	2021		
East Java	273,881	295,809	287,196	293,556	305,708	291,230	51.3
West Java	115,827	118,800	122,505	118,434	119,939	119,101	21.0
Central Java	138,560	154,202	140,520	141,395	142,513	143,438	25.3
DI Yogyakarta	4,003	3,747	3,873	3,520	3,500	3,729	0.7
DKI Jakarta	1,897	2,023	2,024	2,053	1,349	1,869	0.3
Other provinces	6,273	6,941	8,883	9,042	9,160	8,060	1.4
Indonesia	540,441	581,522	565,001	568,000	582,169	567,427	100

Source: Statistics Indonesia (2022)

West Java has the highest productivity level among other provinces, reached 2,175 kg milk per year. The dairy sector in West Java contributes substantially to livelihoods especially to smallholder households in rural areas (Jahroh et al. 2020). In general, the dairy value chain in West Java Province consists of farm input suppliers, farmers, cooperative, milk processors, distributors, retailers, and consumers (Jahroh et al. 2020). Cooperative plays important role in West Java dairy value chain and becomes hub for farm input supplier, farmer, milk processor, and home industry. The value chain of dairy in West Java is shown in Figure 1. Generally, milk prices received by farmers are set by the milk collecting center (MCC) and are based on milk quality parameters, such as Total Plate Count (TPC), fat, Total Solid (TS), and protein as regulated by The National Standardization Agency (SNI 3141.1-2011) (BSN, 2011).

The challenges faced by smallholder dairy farmers within the realm of on-farm technicalities and supply chain intricacies paints a complex tapestry, intricately interwoven with multifaceted relationships (Devendra, 2001). The intricacy of on-farm challenges in the dairy sector becomes even more evident when considering the intricate links that connect farmers with the value chain (Hetherington et al. 2023). The stark reality reveals that merely 12% of the milk received adheres to the national standard for bacterial contamination (Total Plate Count; TPC) and milk solids (fat and protein; TS). The genesis of this situation is a complex amalgamation - the high prevalence of mastitis, suboptimal milk harvesting hygiene, and the limited availability of cooling infrastructure on-farm and during transit to processing facilities via milk collection centers (MCCs) and village unit cooperatives (KUDs) (Fadillah et al. 2023). Despite processors offering incentive programs to bolster milk quality, the absence of sufficient capital to upgrade cooling infrastructure and the dearth of rapid, cost-effective quality testing pose formidable obstacles to tackling this challenge (Fadillah et al. 2023).

Addressing the predicament of smallholder dairy farmers necessitates a comprehensive consideration of the roles played by cooperatives and processors. Given the perishable nature of fresh milk, the role of cooperatives in orchestrating the collection of milk from farmers and its seamless delivery to processors is pivotal. Cooperatives often extend an array of on-farm services to their members, collaborating with processors and governments to provide training in dairy farm management, veterinary support, artificial insemination, and access to essential inputs (Parikesit et al. 2005). However, a gap exists in disseminating pertinent information to smallholders concerning post-farm gate factors like milk quality, emerging market opportunities, and shifting consumer trends. These services have the potential to alleviate information asymmetry, where smallholders are disadvantaged by their limited knowledge about quality prerequisites and market dynamics compared to traders and processors. Furthermore, as intermediaries, cooperatives play a crucial role in assisting government efforts to distribute support, such as government-purchased dairy cows and credit subsidies (Nugraha, 2010). Notably, variations in performance across cooperatives have been observed in previous studies, underscoring the significance of understanding factors that enhance their efficacy. This whole-of-chain analysis becomes instrumental in bridging the gap between smallholders and markets (Andri and Shiratake, 2005; Nugraha, 2010).

Concurrently, insights into successful strategies deployed by processors in West Java to augment smallholders' milk production and quality are indispensable. The transformation of the dairy industry from a conventional to a modern and improved system necessitates the incubation of novel business models. Circular economies, sustainable business practices, and innovative value chain organization emerge as pivotal components in shaping these progressive models. By introducing added value through innovative approaches to cattle healthcare, the study endeavors to foster a more sustainable trajectory for the dairy sector. This study aims to analyze and characterize business models that bring added value to the conventional dairy business, fostering a more sustainable approach to cattle healthcare.

METHODS

In the month of April 2022, a cross-sectional study unfolded its narrative within the confines of a carefully selected dairy cooperative, namely KPS Cianjur Utara, nestled in the West Java, Indonesia. This deliberate choice of locale was selected due to the pronounced role that dairy cooperatives play in the intricate web of the dairy supply chain, particularly resonating within the Western Java. This study encompassed a diverse group of respondents, including, 3 dairy cooperative

leaders (comprising heads, secretaries, and managers), 3 paramedics, 2 local government staff, 3 academic professionals, and 6 leaders of farmers' groups. The study's focus on this region aimed to unravel the pivotal contributions of dairy cooperatives in shaping the dairy landscape.

Guided by the intent of crafting an innovative and practical tool, the study embarked on a voyage of comprehensive analysis and research framework (Figure 2). These methods delved into the business model frameworks specifically tailored to harmonize with the distinct cadence of dairy cooperative management and the roles undertaken by staff. The result was the meticulous development of a practical approach, poised to act as a guiding beacon for cooperatives. This approach not only facilitates a methodical assessment of their existing models but also extends its influence to inspire the genesis of novel and inventive business strategies. Central to this tool's functionality is the augmentation of the conventional Business Model Canvas (BMC) – a transformation that infuses novel dimensions, effectively operationalizing the intricate dynamics intrinsic to dairy farming and cooperative interactions. This culminates in the inception of a proposed dairy cooperative BMC framework, a pragmatic structure designed to enable the formulation and dissemination of a comprehensive and refined model, inherently adaptive to the evolving needs of the industry.

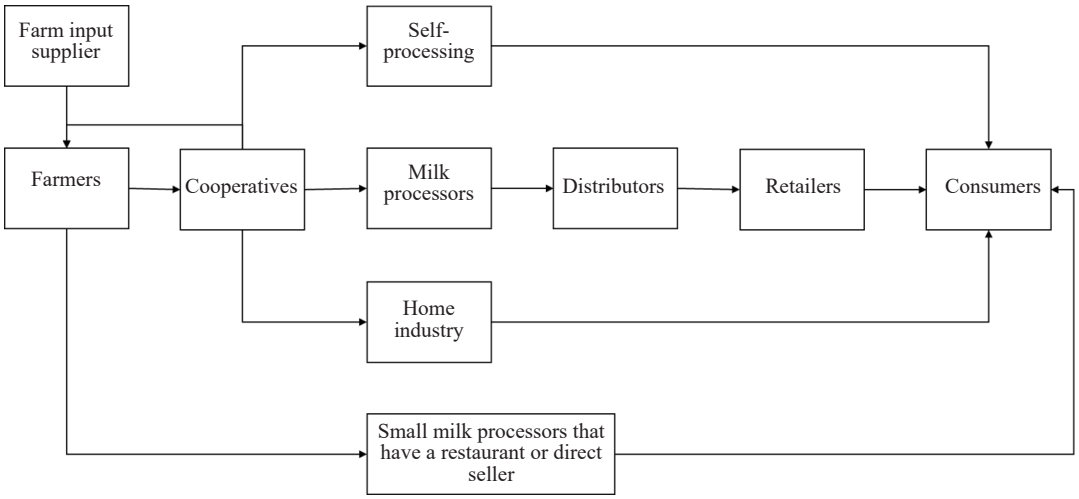

Figure 1. The dairy value chain in West Java Province (Jahroh et al. 2020)

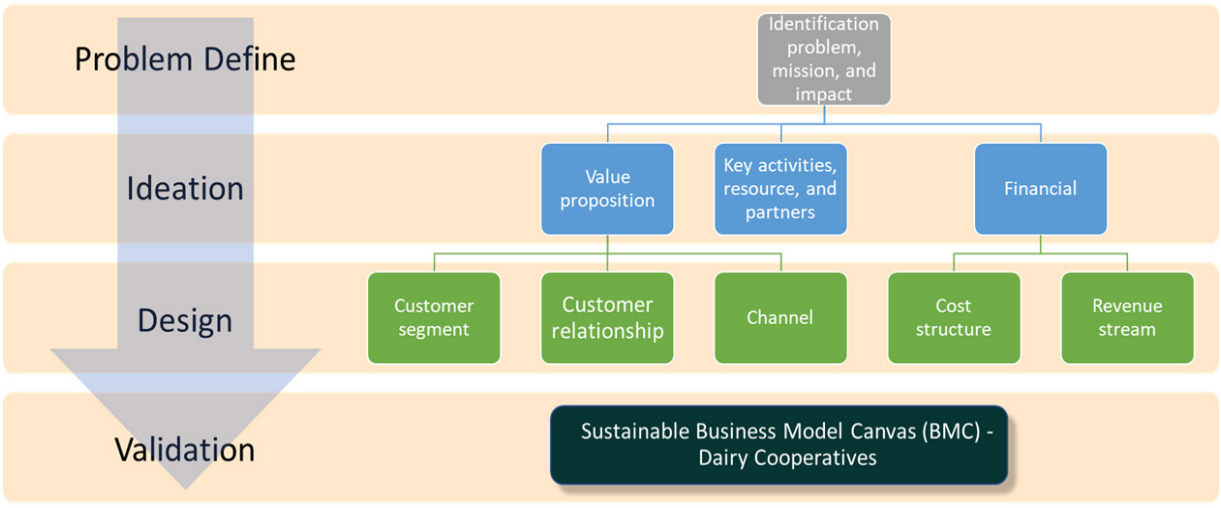

Figure 2. Research framework

The qualitative approach was employed in synergy with the art of business model development, resulting in a nuanced exploration of the subject matter. Moreover, the study capitalized on the analytical prowess of the business model canvas analysis tool Osterwalder and Pigneur (2010). This analytical instrument was harnessed to meticulously dissect the nine fundamental facets that amalgamate to constitute a robust business model tailored specifically to the nuanced nature of dairy cooperatives. These nine pivotal elements include: 1) the delineation of customer segments, 2) the articulation of value propositions, 3) to the orchestration of channels, 4) the cultivation of customer relationships, 5) the configuration of revenue streams, 6) the allocation of key resources, 7) the activation of key activities, 8) the establishment of key partnerships, and 9) the sculpting of the cost structure. This comprehensive canvas emerged as a guiding light for the dairy cooperatives, fostering the development of innovative and holistic business models that resonate with the complex dynamics of the industry.

In its quest for sustainability, the study recognized the need for additional layers of depth. This led to the augmentation of the business model canvas, integrating two additional elements, 1) mission statement, and 2) impact and measurements as integral components. By embracing these dimensions, the canvas not only encapsulates the operational facets but also echoes the intrinsic values and aspirations of the dairy cooperatives, thereby rendering a holistic view. The cornerstone of this endeavor lay in data collection, an intricate process that delved into the perspectives and insights of diverse stakeholders. Through interviews with key actors within the dairy business ecosystem, including dairy cooperatives, dairy farmers, representatives from the milk industry, and local government entities, a rich tapestry of insights was woven. This comprehensive data collection approach unearthed multifaceted perspectives, enriching the study with a diverse range of viewpoints and considerations.

RESULTS

In the realm of sustainable dairy business models, the integration of health systems remains an underexplored frontier, both conceptually and in practical managerial applications. This study embarked on a thorough analysis of existing business model creation frameworks, culminating in the development of an invaluable tool designed to assist dairy cooperatives in scrutinizing and enhancing their business models. This innovative tool draws from the foundations of the Business Model Canvas (BMC), adapting and expanding its components to encompass the nuanced dimensions intrinsic to dairy farms and cooperative operations.

At the core of this endeavor lies the cooperative business model's overarching mission, meticulously designed to enhance the sustainability of the dairy business, foster advancements in health systems within dairy farms, elevate milk production and quality, amplify income streams for dairy cooperatives, and ultimately uplift the livelihoods of dairy farmers. To effectively gauge the impact of these business model modifications, a selection of impact parameters were deemed essential. These parameters encompassed the enhancement of health systems, the augmentation of milk quantity and quality, the amplification of revenue streams, and the elevation of overall livelihood standards. Crucially, these parameters paved the way for a comprehensive evaluation of the newly devised business model's effectiveness.

In pursuit of comprehensive evaluation, a set of measurements emerged as indispensable indicators of progress. These measurements include quantifiable parameters such as the value of specific milk quality attributes (including total plate count, somatic cell count, milk density, total solid content, and fat content), alongside metrics tracking the levels of sales and income achieved by the cooperatives. The integration of these measurable indicators facilitates a more nuanced and data-driven understanding of the impact of the novel business model.

Through the lens of the Business Model Canvas analysis, a value proposition-driven business model emerges as the cornerstone of sustainable dairy business development. This model is adept at fostering improved milk product quality, increased milk production volume, abundant fresh milk supply that meets quality standards, heightened milk accessibility, and an efficient cow health care system, all achieved at a reasonable cost. The delineation of customer segments reveals a bifurcation, with raw milk and product-oriented segments encompassing dairy processors and consumers, while the health services and supplies segment pertains to smallholder dairy farmers. To fortify customer relationships, partnership

contracts and dedicated personal assistance programs were identified as pivotal loyalty-building mechanisms. In terms of distribution channels, the model champions a multifaceted approach. This entails the sale of fresh milk and processed products through various channels, including direct selling, local stores, farmers' group channels, and strategically positioned milk collection points. These distribution channels collectively optimize reach and accessibility, bolstering the business model's impact. Figure 2 serves as an illustrative encapsulation of these dynamic interactions, painting a vivid picture of the intricate relationships that underpin the redefined cooperative business model's impact.

The practical execution of this business model hinges upon a series of key activities, including milk collection, processing, marketing, partnership establishment, quality assessment, and animal health monitoring. This intricate web of activities necessitates resource allocation, spanning capital investments (such as milk collection point facilities, milk tank vehicles, and production plants), acquisition of production equipment and materials, human resource allocation, and financial resource management. Crucially, the cooperative business model thrives through synergistic collaborations involving government bodies, suppliers, dairy farmers, and the National Dairy Cooperative Union (GKSI), all uniting with the shared goal of fostering sustainable dairy business practices.

The innovative sustainable business model adopted by dairy cooperatives heralds a departure from conventional practices, emphasizing a mission statement that encompasses the multifaceted improvement of the entire dairy ecosystem. This avant-garde approach is underpinned by a commitment to enhancing the sustainability of the dairy business on various fronts. The articulated mission includes dedicated efforts to improve the overall health systems within dairy farms, increase both milk production and quality, elevate the income of dairy cooperatives, and uplift the livelihoods of dairy farmers. This holistic mission sets a new standard for the dairy industry, positioning cooperatives as agents of positive change. Furthermore, the impact and measurement criteria of this innovative model are meticulously defined. The success of the model is gauged through tangible metrics such as the level of milk quality and the overall sales and income generated. This strategic focus on measurable outcomes ensures accountability and provides a clear roadmap for assessing the effectiveness of the sustainable business model.

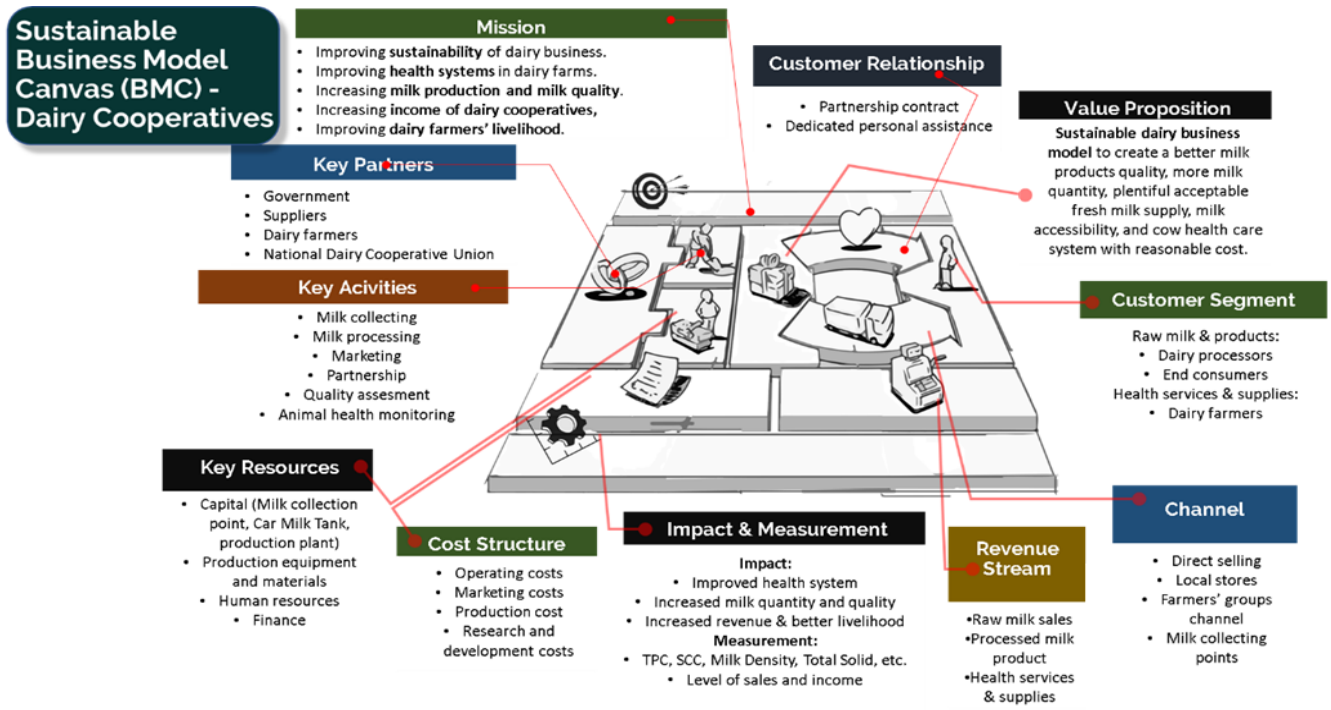

Figure 2. Sustainable Business Model Canvas (BMC) of innovative dairy cooperatives

In contrast, the conventional dairy business model tends to prioritize basic operational efficiency without a dedicated commitment to holistic sustainability. While it may achieve short-term goals related to milk production and sales, the conventional model often falls short in addressing broader issues such as the health and livelihoods of dairy farmers. The innovative model, on the other hand, recognizes the interconnectedness of these factors and actively works towards creating a more resilient and sustainable dairy ecosystem.

The core principles of the sustainable dairy business model aim to revolutionize the industry by creating superior milk products with enhanced quality, increasing overall milk quantity, ensuring a consistent and accessible supply of fresh milk, and implementing a comprehensive health care system for dairy cows all while maintaining reasonable costs. This forward-thinking approach not only aligns with the growing consumer demand for sustainable and ethically produced goods but also establishes a foundation for long-term resilience and success in the dairy industry.

The findings underscore the vital role of governmental collaboration with industries in the pursuit of robust dairy cooperatives. The study recommends that the government take the lead in enhancing the capacity of dairy cooperatives, simultaneously rolling out supportive policies and programs. This collaborative effort, underpinned by industry-government partnerships, is pivotal in realizing a sustainable business model that not only ensures the vibrancy of the dairy sector but also uplifts the livelihoods of dairy farmers, aligning with the objectives set forth by Nuryadi and Mulyono (2019).

Managerial Implications

The outcomes of this study found several pertinent managerial implications that can significantly impact the trajectory of sustainable dairy business models and their integration with health systems. Governments should proactively engage in collaborative initiatives by providing financial support, technological access, and capacity-building programs to invigorate dairy cooperatives. This partnership not only ensures the resilience of the industry but also fosters an environment conducive to innovation and sustainable practices. Managers within dairy cooperatives must engage in advocacy efforts to encourage governmental support and establish frameworks for long-term collaboration, recognizing the mutual benefits of such partnerships. Dairy cooperative managers should actively engage with policymakers to advocate for policies incentivizing health-centric training for farmers, promoting sustainable practices through incentives, and establishing supportive regulatory frameworks. This proactive involvement helps align business objectives with societal health goals, thereby fostering a more holistic and sustainable approach to dairy farming. Managers can leverage the study's findings to inform policymakers about the potential benefits of such policies, emphasizing the positive impact on both public health and the dairy industry's sustainability.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

In conclusion, this study sheds light on the potential of integrating health systems within sustainable dairy business models, an area that has received limited attention in both conceptual and practical domains. By delving into the dynamics of dairy cooperatives in West Java, Indonesia, we have highlighted the significance of recalibrating traditional business model frameworks to accommodate the unique intricacies of dairy farm operations and cooperative management. The developed approach, a tailored variation of the Business Model Canvas, showcases its efficacy in fostering innovative and holistic business strategies, especially in creating better milk product quality, more milk quantity, plentiful acceptable fresh milk supply, milk accessibility, and cow health care system with reasonable cost.

The identified cooperative business model, with its resolute focus on augmenting milk product quality, increasing production volume, and streamlining health systems, stands as a pivotal pillar in cultivating a sustainable dairy industry. The integration of mission and impact measurements imbues this model with a deeper sense of purpose, aligning the endeavors of dairy cooperatives with broader societal and environmental aspirations. However, the journey towards sustainable dairy business models necessitates concerted efforts. Our findings underscore the significance of collaborative partnerships between governmental bodies, industry stakeholders, suppliers, and the dairy cooperative union. This synergy is essential not only for refining business models but also for fostering an environment conducive to innovation, growth, and the realization of sustainability goals.

Recommendations

Several recommendations and managerial implications emerge that could enhance the trajectory of sustainable dairy business models and their integration with health systems based on business model canvas development and validation with relevant respondents and stakeholders:

1. Government-Industry Partnership: Governments should play a proactive role in facilitating the growth and development of dairy cooperatives. Collaborative initiatives that offer financial support, access to technology, and capacity-building programs can invigorate the industry, ensuring its resilience in the face of evolving challenges.
2. Policy Support: Governments should formulate policies that incentivize the integration of health systems within dairy business models. This could include promoting health-focused training programs for farmers, offering incentives for adopting sustainable practices, and creating a conducive regulatory framework.
3. Capacity Building: Dairy cooperatives must focus on enhancing their members' knowledge and skills in health management. Workshops, training sessions, and access to expert resources can contribute to a more informed approach toward health-related aspects within dairy farming.
4. Research and Innovation: Industry stakeholders, including cooperatives and academia, should collaborate to foster research that delves deeper into the interplay between health systems and dairy business models. Innovation hubs could be established to develop novel technologies and strategies that optimize cow health while bolstering business sustainability.
5. Monitoring and Impact Assessment: Regular assessment and monitoring of key indicators, such as milk quality parameters, sales, and income, are crucial to track the efficacy of the integrated business models. This data-driven approach can guide timely adjustments and enhancements.
6. Information Dissemination: Establishing platforms for knowledge sharing and exchange can facilitate the dissemination of best practices across dairy cooperatives. This could involve the creation of online resources, workshops, and peer-learning networks.

In essence, our study underscores that the integration of health systems into sustainable dairy business models is an avenue ripe with potential. With strategic collaborations, policy support, and a commitment to innovation, the dairy industry can not only flourish financially but also contribute to the broader goals of improved health, enhanced livelihoods, and environmental sustainability.

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REFERENCES

Andri KB, Shiratake Y. 2005. Empirical study of contract farming system conducted by dairy cooperatives in East Java, Indonesia. *Review of Agricultural Economics* 55: 73–84.

BSN. 2011. Indonesian National Standard for Fresh Milk Quality SNI 3141.1.

Devendra C. 2001. Smallholder dairy production systems in developing countries: characteristics, potential and opportunities for improvement - review. *Asian-Australasian Journal of Animal Sciences* 14(1): 104–113. https://doi.org/10.5713/ajas.2001.104

Fadillah A, van den Borne B, Poetri ON, Hogeveen H, Umberger W, Hetherington JB, Schukken YH. 2023. Smallholders' milk quality awareness in Indonesian dairy farms. *Journal of Dairy Science* 106(11): 7965–7973. https://doi.org/10.3168/jds.2023-23267

Fadillah A, van den Borne BHP, Poetri ON, Hogeveen H, Slijper T, Pisestyani H, Schukken YH. 2023. Evaluation of factors associated with

bulk milk somatic cell count and total plate count in Indonesian smallholder dairy farms. *Frontiers in Veterinary Science* doi: 10.3389/fvets.2023.1280264

Guntoro B, Widyobroto BP, Umami N, Indratiningsih SN, Pertiwiningrum A, Rochijan. 2016. Marketing and institutional characteristics of dairy industry in Indonesia. *International Journal of Agriculture and Environmental Research* 2:106–114.

Hetherington J, Umberger W, Akzar R, Granzin B, Ritchie Z, Daryanto A, Sahara, Erwidodo Purwati H, Priyanti A, Romjali E, Hanifah VW. 2023. *Final Report: Improving milk supply, competitiveness and livelihoods of smallholder dairy chains in Indonesia (IndoDairy)*. Canberra: ACIAR.

Jahroh S, Atmakusuma J, Harmini, Fadillah A. 2020. Comparative analysis of dairy farming management and business model between East Java and West Java, Indonesia. *Jurnal Manajemen & Agribisnis* 17:96–107. https://doi.org/10.17358/jma.17.1.96.

Moran J, Morey P. 2015. Strategies to increase the domestic production of raw milk in Indonesia and other South East Asian countries. *International Seminar on Tropical Animal Production (ISTAP)* 6: 1–11.

Nugraha DS. 2010. Extending the Concept of Value Chain Governance: An Institutional Perspective Comparative Case Studies from Dairy Value Chains in Indonesia [thesis]. Berlin: Humboldt-Universität zu Berlin.

Nuryadi RT, Mulyono NB. 2019. Proposed Business Model of Dairy Cooperative to Empower Dairy Supply Chain of Dairy Cooperative. *The Asian Journal of Technology Management* 12(3): 226-242. https://doi.org/10.12695/ajtm.2019.12.3.6

Osterwalder A, Pigneur Y. 2010. *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. New Jersey: Wiley.

Parikesit K, Takeuchi A, Tsunekawa OS, Abdoellah. 2005. Resource analysis of small-scale dairy production system in an Indonesian village a case study. *Agriculture, Ecosystems & Environment* 105(3): 541–554. https://doi.org/10.1016/j.agee.2004.07.013.

Secretariate General Ministry of Agriculture. 2016. *Outlook Susu Sektor Pertanian Sub Sektor Peternakan: Susu. Pusat Data dan Sistem Informasi Pertanian*. Sekretariat Jenderal Kementerian Pertanian. http://epublikasi.setjen.pertanian.go.id/epublikasi/outlook/2016/Peternakan/OUTLOOK%20SUSU%202016/files/assets/common/downloads/OUTLOOK%20SUSU%202016.pdf

Statistics Indonesia. 2022. Dairy Cattle Population in Indonesia from 2017 to 2021. https://www.bps.go.id/indicator/24/470/1/populasi-sapi-perah-menurut-provinsi.html.