Shaping the Future Trajectory of Dairy Processing Industries in Tanzania through Eco-Commercial Dairy Farms' Strategy

Ezekiel Kanire[1,]
Elibariki Msuya[2]
Roselyne Alphonce[3]

[1]ekanire@irdp.ac.tz
[2]msuyaee@sua.ac.tz
[3]roselyne@sua.ac.tz

[1, 2, 3] Department of Agricultural Economics and Agribusiness, Sokoine University of Agriculture, Tanzania
[1]Institute of Rural Development Planning – Lake Zone Centre, Mwanza, Tanzania

ABSTRACT

Following the challenges faced by smallholder dairy farmers in sustaining dairy processing industries' (DPIs) demand, this study sought to propose an operational model to meet DPIs' demand for milk and enhance the capacity utilisation of dairy processing industries in Tanzania. The study employed a sequential explanatory mixed design, where qualitative insights drawn from 23 dairy stakeholders were supported by bibliometric data from the Scopus database. Qualitative data obtained through interviews was analysed using content-thematic and SWOT analysis techniques. SWOT outputs were subjected to TOWS analysis, where eco-commercial dairy farms' strategy was prioritised using the urgency-importance approach. The prioritised strategy was further subjected to a business model canvas to provide a clear blueprint for the operationalization of the eco-commercial dairy farms in Tanzania. In the same vein, the study highlights how commercial dairy farms can co-work with smallholder dairy farmers, enabling them to overcome their limitations and access high-value markets as out-growers. This study contributes to the operationalization of commercial dairy farms in terms of both knowledge and practice. Furthermore, while the existing literature on commercial dairy farms primarily focuses on animal health and milk productivity, this study addresses the linkage gap in the literature between commercial dairy farms and dairy processing industries.

Keywords: Business Model Canvas, Commercial Dairy Farm, Dairy Processing Industries, Milk Productivity, SWOT Analysis

I. INTRODUCTION

Dairy processing industries (DPIs) play a significant role in the economic development of many developing countries, including Tanzania (Lunogelo et al., 2021; International Dairy Foods Association [IDFA], 2021; Jaiswal et al., 2018; Kanire et al., 2024a, 2024b; Mamo et al., 2021). Despite their importance, DPIs in Tanzania face a milk demand crisis that limits their potential growth (Kanire et al., 2024a, 2024b). Like many other Sub-Saharan countries such as Ethiopia, Zambia, Kenya, and Uganda, DPIs in Tanzania heavily rely on milk supplied by pastoralists and smallholder dairy farmers, who form the backbone of milk production in the country. Nonetheless, these small-scale milk producers encounter numerous challenges that prevent them from producing an adequate quantity of milk to support DPIs' operations (Blackmore et al., 2020; Kanire et al., 2024a, 2024c; Kilima, 2021).

Literature provides challenges such as breed, poor animal husbandry (i.e., livestock management), prevalence of pests and disease, high costs of production, and the effects of climate change (Kibet et al., 2023; Lunogelo et al., 2020; Vroegindewey et al., 2021). The compounding effects of climate change adversely impact milk production by lowering productivity with rising temperatures and reduced rainfall, hindering pasture and fodder crop growth (Notenbaert et al., 2020). Similarly, literature records low-yielding local cattle breeds and rain-fed grazing as among the challenges contributing to suboptimal milk production in the country. In addition to these challenges, the country's population increase subsequently heightens the demand for milk and milk products, while milk production is low.

According to the Tanzania Dairy Board (TDB), the country produces 3.6 billion litres of milk, which is almost 9 billion less than its potential demand of 12 billion litres per year. The mismatch or discrepancy in milk supply and demand subsequently intensified competition in Tanzania's two primary milk marketing channels. Whereas, the formal supply of milk in DPIs accounts for 3% of the milk produced in the country, while a large share (i.e., 97%) is supplied in the market through informal milk marketing channels (Kanire et al., 2024b; United Republic of Tanzania [URT] & Dalberg, 2019). The majority of smallholder dairy farmers prefer informal channels (Kanire et al., 2024a; URT & Dalberg, 2019).

1.1 Statement of the Problem

The persistent preference of smallholder dairy farmers for informal markets led to a decline in milk supply to DPIs from 10% in 2000 (Kurwijila et al., 2001; Katjiuongua & Nelgen, 2014) to 3% in 2020 (URT, 2021a). This has subsequently resulted in underutilization of DPIs' capacity. Current statistics show Tanzania has a total of 152 registered DPIs, with 9 of them non-operational. The remaining DPIs operate at only 19% of their total installed capacity (URT, 2024). Overall, the shortage of milk supply in DPIs significantly limits the dairy sector's potential contribution to food security, health, employment, and other economic benefits of processed milk and milk products in the country (Kanire et al., 2024b).

Following the need to resolve the milk demand crisis in dairy processing industries, several initiatives have been taken to support the milk value chain with the aim of boosting milk production; however, the growth rate of 0.2% per year is not promising to meet household and industrial demand. In conjunction with public and private initiatives, studies have attempted to propose strategies to resolve the milk demand crisis in the dairy processing industries. A study conducted by Kilima (2021) proposes the integration of smallholder dairy farmers into the formal milk market channel through upgrading and value chain champions. However, this study builds upon Kingu and Ndiege (2018), who argue on the capacity of cooperative unions to leverage between demand and supply and how cooperatives are relevant in reducing costs of production through economies of scale. Despite a few positive cases and the contribution of these studies, less attention is paid to the formation, management, and sustainability of the suggested models, which in most cases challenge the overall performance of subsistence smallholder dairy farmers in Tanzania (Notenbaert et al., 2020).

Understanding these challenges, this study proposes and operationalizes the establishment of eco-commercial dairy farms in Tanzania as a strategy to strengthen the dairy sector. Specifically, the study addresses the following research question: How can eco-commercial dairy farms be effectively established and operationalized in Tanzania to strengthen the dairy sector? Previous literature, including the Tanzanian government's five-year Livestock Masterplan (URT, 2017a) and a study by Bahta et al. (2021) on the analysis of the technical efficiency of developments towards commercialization, both recommend commercial dairy farming over traditional farming. However, this literature failed to provide a full practical framework for the implementation of the proposed strategy. Therefore, this study contributes to bridging this gap by developing a comprehensive business model canvas tailored to the establishment of commercial dairy farms, thereby offering a roadmap for operationalizing this strategy. In the same vein, the study contributes to SDG #2 by addressing zero hunger through increasing milk production; SDG #8 by promoting employment creation through vibrant DPIs; and SDGs 12 and 13, which promote responsible production and climate action through eco-friendly commercial dairy farms.

The rest of the sections of this paper outline the literature review, research methodology, findings, and discussion on the operationalization of dairy commercial farms before drawing conclusions and recommendations for this study.

1.2 Research Objective

This study proposes and operationalizes the establishment of eco-commercial dairy farms in Tanzania as a strategy to strengthen the dairy sector. Specifically, the study addresses the following research question: How can eco-commercial dairy farms be effectively established and operationalized in Tanzania to strengthen the dairy sector?

II. LITERATURE REVIEW

2.1 Strategic Framework and Decisions in the Dairy Sector's Literature

The performance of the dairy industry is affected by both internal and external business environments; therefore, the study employed a SWOT analysis framework. The framework is essential for the strategic decision-making process. The SWOT framework has been widely used in the dairy sector to identify areas for improvement and various strategic decisions. Studies employing SWOT analysis in the dairy sector include Almeida et al. (2021) that highlight the constraints and possibilities for increased value in the dairy sector in the Azores Islands. At the same time, Setianto et al. (2022) look into enhancing the welfare of farmers' through dairy agribusiness. This is achieved by adopting SWOT analysis to point out possibilities and drawbacks. Likewise, Rademaker et al. (2016) utilised SWOT analysis to offer insights concerning sustainable growth in the dairy sector in Kenya, stressing opportunities and impediments to growth. Further, Susanty et al. (2018) evaluated the Indonesian dairy supply chain, focusing on strategic planning hinged on SWOT outcomes.

Nonetheless, SWOT analysis has been embraced in different agriculture settings, as noted by Uztürk (2023), particularly in strategic analysis for boosting smart agriculture in Turkey. In the end, past research underpins the value of the SWOT analytical model for strategic thinking in this present research.

2.2 The Dairy Sector Bibliometric Analysis of SWOT Model

The SWOT analytical model for strategic thinking has attracted more focus in the dairy sector literature. A bibliometric analysis of 48 English papers in the Scopus database using the search string "Dairy AND SWOT" in March 2024 reveals an increasing trend in the use of the SWOT analytical framework in the dairy sector. Figures 1 and 2 exhibit the increasing importance of the SWOT framework and the growing application of SWOT analysis across the dairy sector, analysing both the internal and external environment of the dairy sector for strategic planning and improvement. Furthermore, figure 3 depicts countries and the number of articles where these studies were carried out. Moreover, these figures and trends reveal the application of the SWOT framework beyond geographical boundaries, showcasing its versatility in strategic evaluation. In particular, the framework helps to identify the dairy sector's strengths (core competencies), weaknesses (challenges), opportunities, and threats for strategic directions and sustainable production of milk and milk products in Tanzania (Phadermrod et al., 2019).

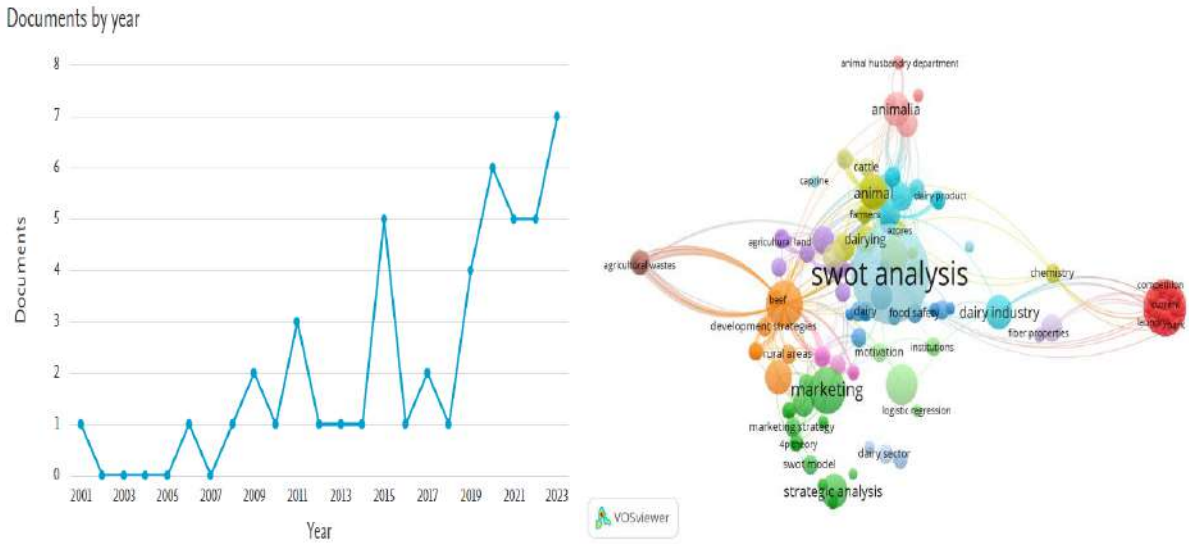

Figure 1

Trend of Literature on the Application of SWOT Analysis in Dairy Sector Published in High-Impact Journals Indexed in Scopus Database (2024), and the Network of Keywords Created Using VOSviewer, version 1.6.19 (2024).

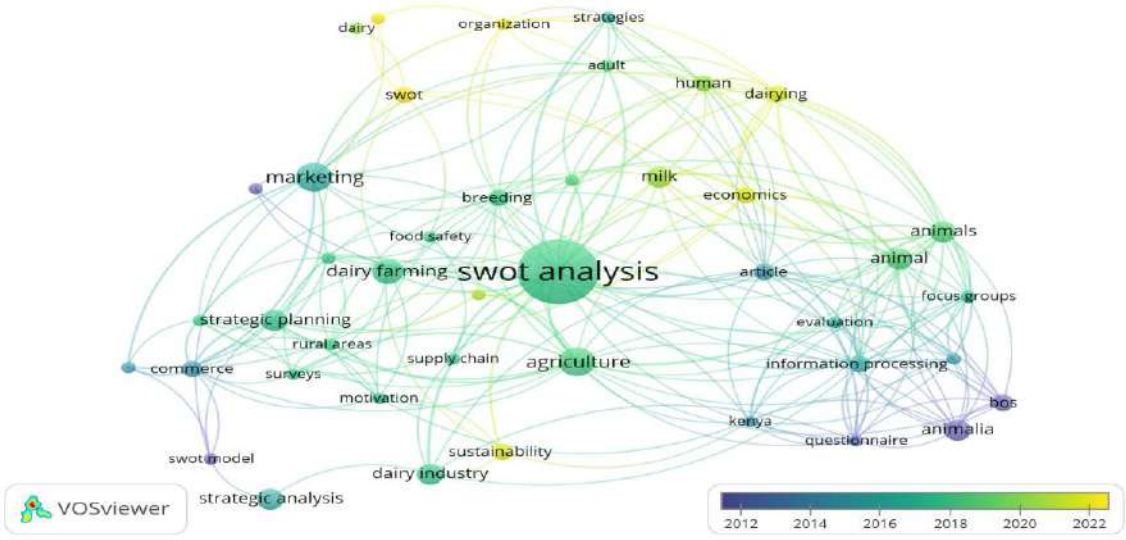

Figure 2

Areas Employed SWOT Framework Across the Dairy Sector Based on Minimum Number of Occurrences of two Keywords. Network of Keywords Created Using VOSviewer, version 1.6.19 (March, 2024)

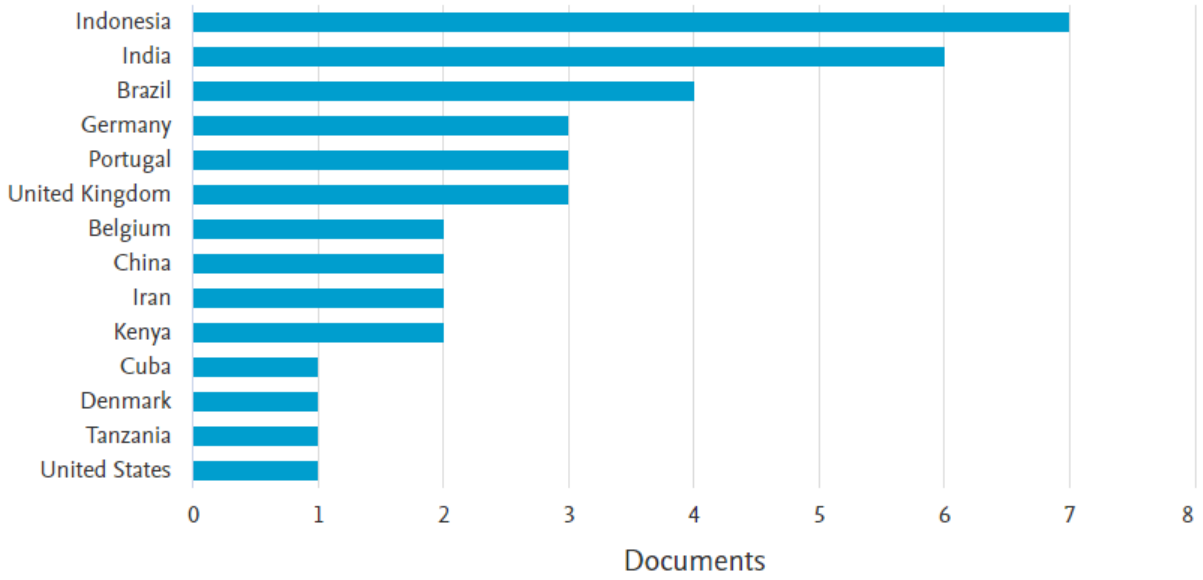

Figure 3
Articles in Dairy Sector that Employed SWOT Framework Per Country; Scopus, March 2024

2.3 Commercial Dairy Farms' Potential in Milk Production Over Smallholder Dairy Farmers

Commercial dairy farms play a crucial role in producing more milk yields compared to smallholder farmers. The farms exhibit numerous inherent advantages that contribute to their superiority in producing more milk over smallholder dairy farmers. The utilisation of modern technologies and equipment, such as automated milking systems and efficient feed management practices, enhances milk yield and productivity (Ivanyos et al., 2020). Additionally, leveraging economies of scale, commercial farms improve operational efficiency, enable substantial investments in specialised breeding programmes, pest and disease control, and precise nutritional management, which in turn helps to produce more milk and drive profitability within the sector (Birthal et al., 2017; Mamo et al., 2021; Mihret et al., 2017). The capability of commercial dairy farms to meet market demands establishes them as indispensable participants in the dairy industry, affording them a distinctive competitive advantage.

In addition to increasing milk yield, commercial dairy farms are also known for their commitment to standards and producing high-quality milk (Nyokabi et al., 2021). These farms possess the necessary resources and infrastructure to enforce quality control measures and standards, ensuring compliance with hygienic practices and meeting consumer expectations (Vyas et al., 2020). Commercial farms use modern milking equipment and maintain the quality of milk produced through compliance with rules and regulations (Henson & Humphrey, 2008; United Nations Economic Commission for Africa [ECA], 2020, Čapla et al., 2022). Unlike smallholder farmers, meeting quality standards is a challenge that hinders smallholder dairy farmers' access to high-value markets.

Furthermore, the literature consistently emphasises the crucial role of commercial dairy farms in driving milk production. A comprehensive review of scholarly articles indexed in the Scopus database (see Table 1) highlights the significant contributions of commercial dairy farms in increasing milk yield, improving milk quality, and surpassing smallholder dairy farms in various advantageous aspects.

Table 1
Scholarly Articles Indexed in Scopus Highlighting the Contributions of Commercial Dairy Farms in Milk Production

S/No	Document title	Authors	Source	Year	Citation
1	Increased Milk Yield and Reduced Enteric Methane Concentration on a **Commercial Dairy Farm** Associated with Dietary Inclusion of Sugarcane Extract (*Saccharum officinarum*)	Ahmed, A., Flavel, M., Mitchell, S., Desai, A., Jois, M.	Animals, 13(20), 3300	2023	1
2	Milk Composition and Production Efficiency within Feed-To-Yield Systems on **Commercial Dairy Farms** in Northern Ireland	Craig, A.-L., Gordon, A.W., Hamill, G., Ferris, C.P.	Animals, 12(14), 1771	2022	11

S/No	Document title	Authors	Source	Year	Citation
3	Comparison of feed evaluation models on predictions of milk protein yield on Québec **commercial dairy farms**	Binggeli, S., Lapierre, H., Lemosquet, S., Ouellet, D.R., Pellerin, D.	Journal of Dairy Science, 105(5), pp. 3997–4015	2022	4
4	Analysis of milk solids production and mid-lactation bodyweight to evaluate cow production efficiency on **commercial dairy farms**	Evers, S.H., McParland, S., Delaby, L., Pierce, K.M., Horan, B.	Livestock Science, 252, 104691	2021	4
5	Fertility and milk production on **commercial dairy farms** with customized lactation lengths	Burgers, E.E.A., Kok, A., Goselink, R.M.A., Kemp, B., van Knegsel, A.T.M.	Journal of Dairy Science, 104(1), pp. 443–458	2021	16
6	Associations between milking technology, herd size and milk production parameters on **commercial dairy cattle farms**	Ivanyos, D., Monostori, A., Németh, C., Fodor, I., Ózsvári, L.	Mljekarstvo, 70(2), pp. 103–111	2020	4
7	Effects of Calliandra and Sesbania on Daily Milk Production in Dairy Cows on **Commercial Smallholder Farms** in Kenya	Makau, D.N., Vanleeuwen, J.A., Gitau, G.K., Muraya, J., Wichtel, J.J.	Veterinary Medicine International, 2020, 3262370	2020	7
8	Effect of changes in milk yield and inter-calving period on profitability of **commercial dairy farm**	Arti, Sirohi, S., Oberoi, P.S.	Indian Journal of Animal Sciences, 89(12), pp. 1411–1412	2019	0
9	Association between left-displaced abomasum corrected with 2-step laparoscopic abomasopexy and milk production in a **commercial dairy farm** in Italy	Fiore, F., Musina, D., Cocco, R., Di Cerbo, A., Spissu, N.	Irish Veterinary Journal, 71(1), 20	2018	9
10	Calving traits, milk production, body condition, fertility, and survival of Holstein-Friesian and Norwegian Red dairy cattle on **commercial dairy farms** over 5 lactations	Ferris, C.P., Patterson, D.C., Gordon, F.J., Watson, S., Kilpatrick, D.J.	Journal of Dairy Science, 97(8), pp. 5206–5218	2014	18
11	Life cycle assessment of milk production from **commercial dairy farms**: The influence of management tactics	Yan, M.-J., Humphreys, J., Holden, N.M.	Journal of Dairy Science, 96(7), pp. 4112–4124	2013	45
12	The effects of increased milking frequency during early lactation on milk yield and milk composition on **commercial dairy farms**	Soberon, F., Ryan, C.M., Nydam, D.V., Galton, D.M., Overton, T.R.	Journal of Dairy Science, 94(9), pp. 4398–4405	2011	25
13	Seasonal variation in milk production and cheese yield from **commercial dairy farms** located in northern Victoria is associated with pasture and grazing management and supplementary feeding practices	Walker, G.P., Williams, R., Doyle, P.T., Dunshea, F.R.	Australian Journal of Experimental Agriculture, 47(5), pp. 509–524	2007	9
14	Clinical mastitis detection by on-line measurements of milk yield, electrical conductivity and milking duration in **commercial dairy farms**	Zecconi, A., Piccinini, R., Giovannini, G., Casirani, G., Panzeri, R.	Milchwissenschaft, 59(5-6), pp. 240–243	2004	12
15	Milk production performance and inter-relationship among traits of economic importance in buffaloes maintained at commercial dairy farms	Hamid, S.K., Farooq, M., Mian, M.A., Syed, M., Jamal, S.	Livestock Research for Rural Development, 15(10), pp. 58–68	2003	5
16	Papillomatous digital dermatitis on a **commercial dairy farm** in Mexicali, Mexico: Incidence and effect on reproduction and milk production	De Jesús Argáez-Rodríguez, F., Hird, D.W., Hernández De Anda, J., Read, D.H., Rodríguez-Lainz, A.	Preventive Veterinary Medicine, 32(3-4), pp. 275–286	1997	78

S/No	Document title	Authors	Source	Year	Citation
17	Milk Production of Dairy Cows Fed Ammonium and Calcium Salts of Volatile Fatty Acids on 43 **Commercial Dairy Farms**	Rogers, J.A., Clark, W.A., Ferraro, D.N., Dildey, D.D., Armentano, L.E.	Journal of Dairy Science, 72(1), pp. 270–283	1989	2

A further analysis of the articles presented in Table 1 and an examination of the associated keywords using VOS Viewer manifest that the majority of commercial dairy farms primarily focus on milk production (van Eck & Waltman, 2023). This emphasis is represented by the varying sizes of circles in VOS Viewer, where larger circles indicate greater emphasis (van Eck & Waltman, 2023). In the pursuit of enhancing milk production, the identified keywords reveal that studies have relied more on the production side of the milk value chain than the processing industries. The analysed studies specifically addressed aspects such as lactation, agricultural lands, milk yield, feeding practices, animal experimentation, dairy cattle, pregnancy, diseases like mastitis, diet composition, physical examination of animals, and hygiene (as seen in Figure 4). However, despite the considerable attention given to these areas of milk production, an apparent gap emerges in the existing literature. There is a lack of established linkages between dairy farms, milk production, and the subsequent dairy processing industries or plants, which this study sought to bridge.

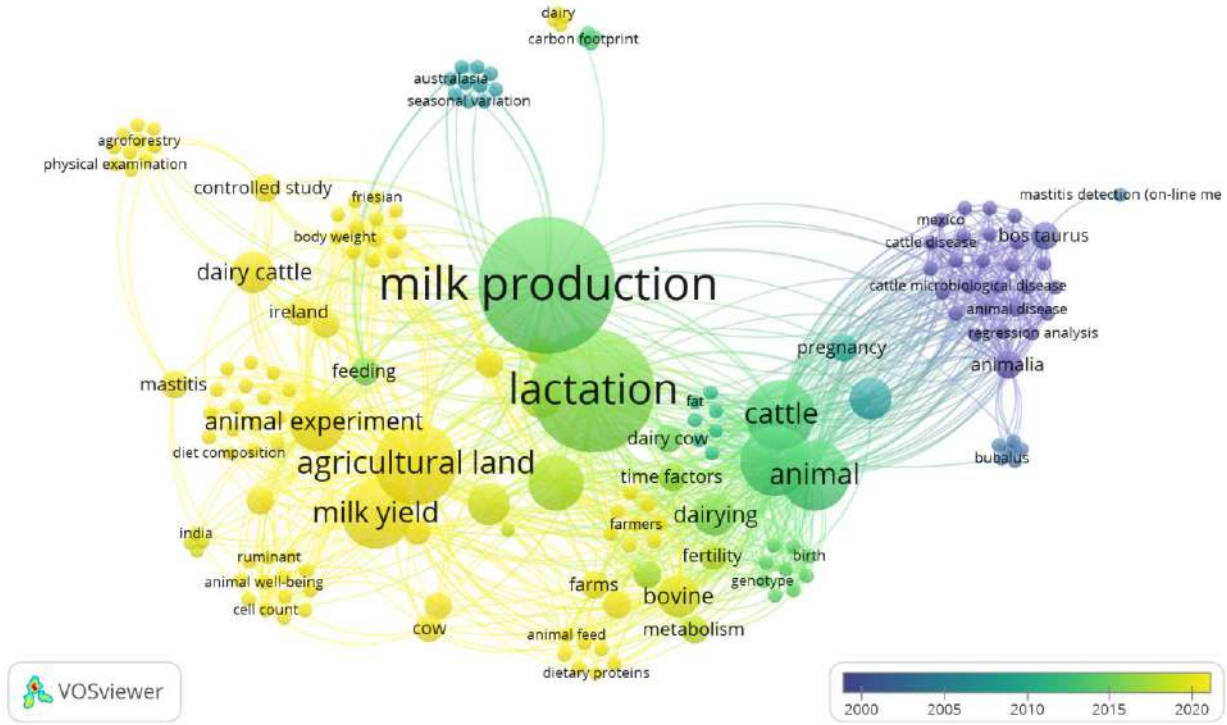

Figure 4

Trend of Literatures on Commercial Dairy Farms and their Primary Focus as Analysed from Articles Presented in Table 1. Created using VOSviewer, version 1.6.19 (March, 2024)

2.4 The Linkage between Commercial Dairy Farms and Dairy Processing Industries

The study employed a bibliometric analysis method to map the trend and linkages between commercial dairy farms and dairy processing industries or plants in the literature. Bibliometrics is a quantitative research method useful for mapping knowledge, trends, and relationships in the literature, featuring countries, contributing organisations, authors, and journals, and their impact (Yu et al., 2020). Based on this, a search of related literature indexed in the Scopus database was carried out, focusing on article titles, abstracts, and keywords (van Eck & Waltman, 2023; Yu et al., 2020). Using the search string "TITLE-ABS-KEY (commercial AND dairy AND farm AND processing AND industries OR plants OR milk OR supply OR linkage OR value OR chain OR relations OR integration) conducted in March, 2024. A total of 115 pieces of literature categorised into 85 articles, 12 conference papers, 8 reviews, 7 book chapters, 1 book, 1 erratum, and 1 short survey (see Figure 5) were found. The majority of these articles (i.e., 76, or 35.3%) focused on agricultural and biological sciences (see Figure 5). The analysis of this literature reveals the US as the most prominent country with the highest number of studies on commercial dairy farms, whereas only one study

exploring commercial dairy farm potentials was found in Tanzania (see Figure 5). Furthermore, the analysis of the keywords using VOS Viewer (van Eck & Waltman, 2023) revealed the fact that commercial dairy farms have gained remarkable visibility in the literature (Burgers et al., 2021; Craig et al., 2022; Evers et al., 2021). However, the trend of studies on commercial dairy farms is mainly focusing on animal health and science, while little attention is paid to the linkage between dairy farms and processing industries (see Figure 7). Whereas, this study provides updated literature on the current state of the art in commercial dairy farms' linkage to dairy processing industries. Overall, this literature review provides substantial evidence and empirical findings that underscore the central importance of commercial dairy farms in meeting the growing global demand for milk.

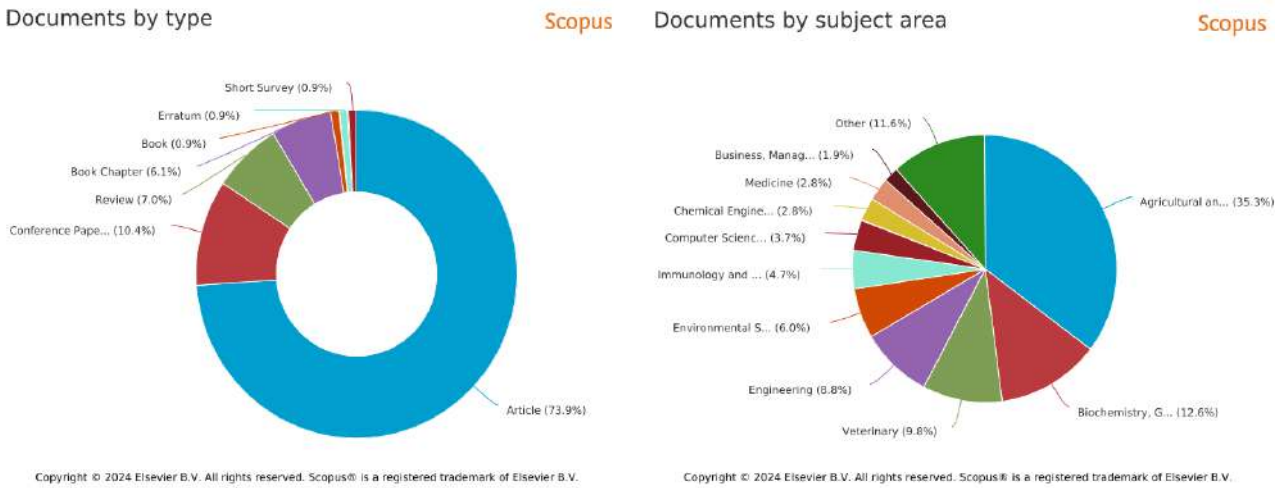

Figure 5

Type of Literature, Categories and Subject Areas Covered in the Analysed Literature Based on Scopus, March 2024.

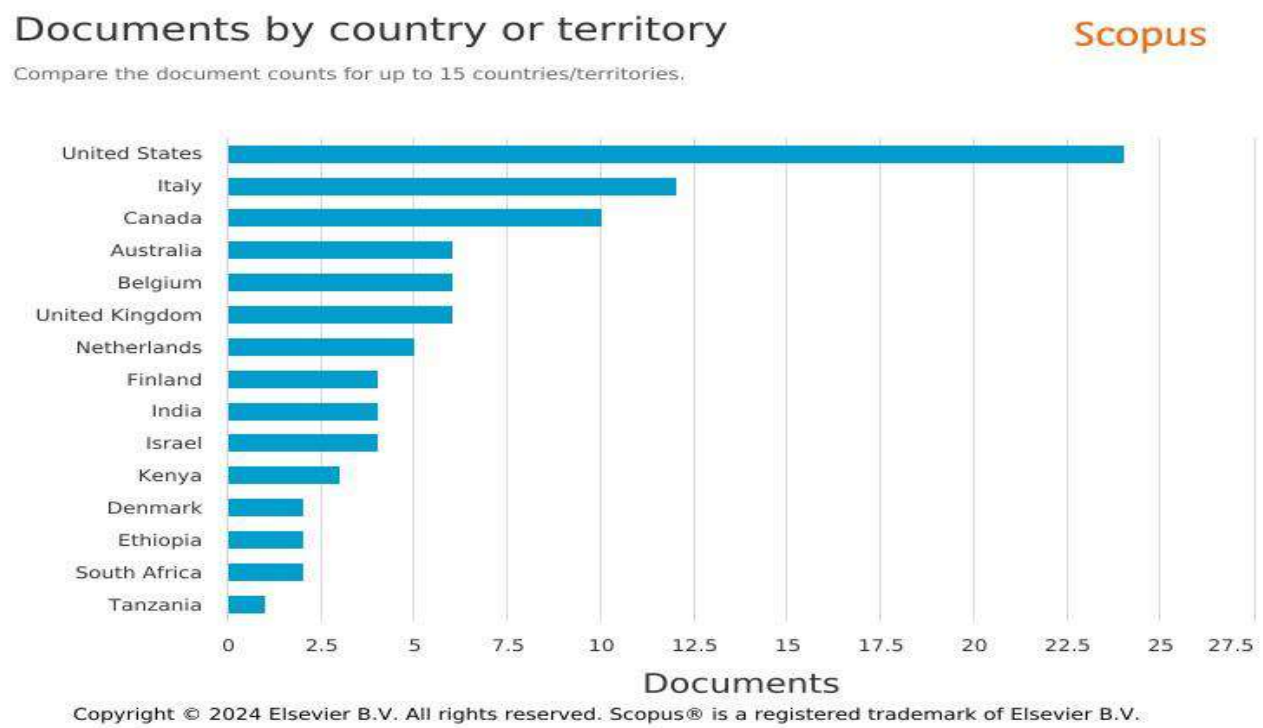

Figure 6

Documents on Commercial Dairy Farms by Countries as Indexed in Scopus Database, March 2024

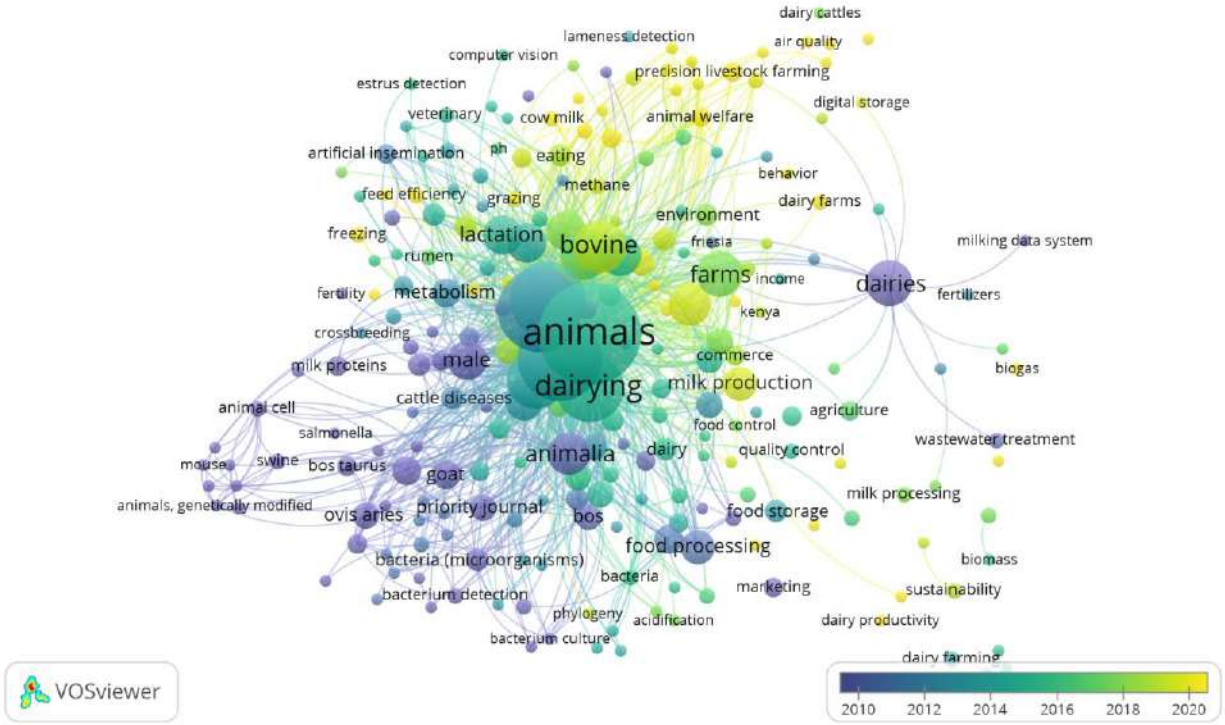

Figure 7

Trend of Studies on Commercial Dairy Farms Based on 115 Identified Articles Indexed in Scopus. Network of Keywords Created Using VOSviewer, version 1.6.19 (March, 2024)

III. METHODOLOGY

3.1 Study Design, Area and Participants

The study employed a sequential explanatory mixed design, which combines qualitative and quantitative methods (Creswell, 2009), where qualitative insights are supported by quantitative analysis such as bibliometric analysis. The design allows for a comprehensive understanding of the phenomenon through the integration of qualitative findings with quantitative evidence (Koskey et al., 2023). It provides a more robust and nuanced interpretation of the phenomenon under investigation (Sahaf & Fazili, 2024).

In the course of this study, the researchers conducted a phenomenological qualitative study (Bush et al., 2019) to learn from the lived experiences of the study participants, exploring the capability of the dairy sector to meet milk demand for dairy processing industries in Tanzania. The qualitative phase involved a purposive sampling of five (5) dairy farms based in the milk shed regions of Tanga and Iringa and 23 experienced dairy experts based in Tanga, Iringa, Dodoma, Arusha, and Morogoro. Participants involved a diverse range of stakeholders, such as dairy farmers and farm owners, farm managers, milk collection centres' managers, chief executive officers of large dairy processing industries, dairy cooperative union leaders, regional livestock officers, and experts from research centres, the dairy board, and the ministry of livestock and fisheries.

Semi-structured interviews with participants based on the predefined criteria related to SWOT analysis were employed to gather qualitative data. Detailed notes were taken during the interviews, while some observed features were captured using a phone camera with participants' consent. Most interviews lasted for a duration of 2 hours. Content analysis was used to directly point out the dairy sector's strengths, weaknesses, opportunities, and threats. On the other hand, thematic analysis was used to identify the underlying themes and patterns of the transcribed interviews, where coding, categorization, and interpretation of data were employed to uncover strengths, weaknesses, opportunities, and threats within the dairy sector, as presented in Table 2.

The quantitative phase involved bibliometric analysis of published articles indexed in the Scopus database. The quantitative findings based on bibliometric analysis supported the qualitative findings to provide a broader context for the qualitative results (Oraee et al., 2017).

3.2 Analytical frameworks

3.1.1 Situational Analysis of the Dairy Sector Using SWOT and the Associated Analytical Tools

While SWOT analysis can offer valuable insights of the internal and external environment of the dairy sector, yet combining SWOT with other frameworks can provide more benefits to holistically analyse the sector. Bitoun et al. (2023) suggest combining SWOT and PESTEL for a more comprehensive approach providing insights into political, legal, and environmental factors affecting sustainable practices in the dairy industry. Additional external environment analytical frameworks such as Porter's Five Forces can help assess the competitive landscape of the dairy industry (Lawrence & Mintert, 2011). By considering factors like supplier power, buyer power, competitive rivalry, threat of substitutes, and threat of new entrants, organizations in the dairy sector, provides deeper insights into market dynamics.

Regarding strategic analysis of the dairy sector, value chain analytical (VCA) model offers explicit evaluation of the actions and procedures involved in the internal settings of the dairy sector. VCA starts from the upstream players (e.g. production) to downstream players (for example distribution side) (Abdel-fattah & Hiary, 2023). The model points out value-adding work and possible contexts for betterment. Through VCA, businesses in the dairy sector can boost operational efficiency and overall industry performance. Alongside VCA, the 3Cs model (Company, Customers, and Competitors) helps in analyzing a business's both internal and external environment (Hamilton et al., 2020). Gaining insight into the company's capacities, needs of customers, and competitive setting is necessary for establishing effective tactics. Further, the 4Ps of the marketing mix (Product, Price, Place, and Promotion) guides dairy companies in optimizing their marketing strategies to meet customer demands and achieve a competitive advantage (Pishbahar et al., 2019). Therefore, integrating other frameworks such as Porter's five forces, the 3Cs, 4Ps of marketing mix and, the value chain analysis in SWOT, enables a comprehensive assessment of both internal capabilities and external market dynamics, facilitating informed decision-making and sustainable growth in the dairy industry (see figure 8).

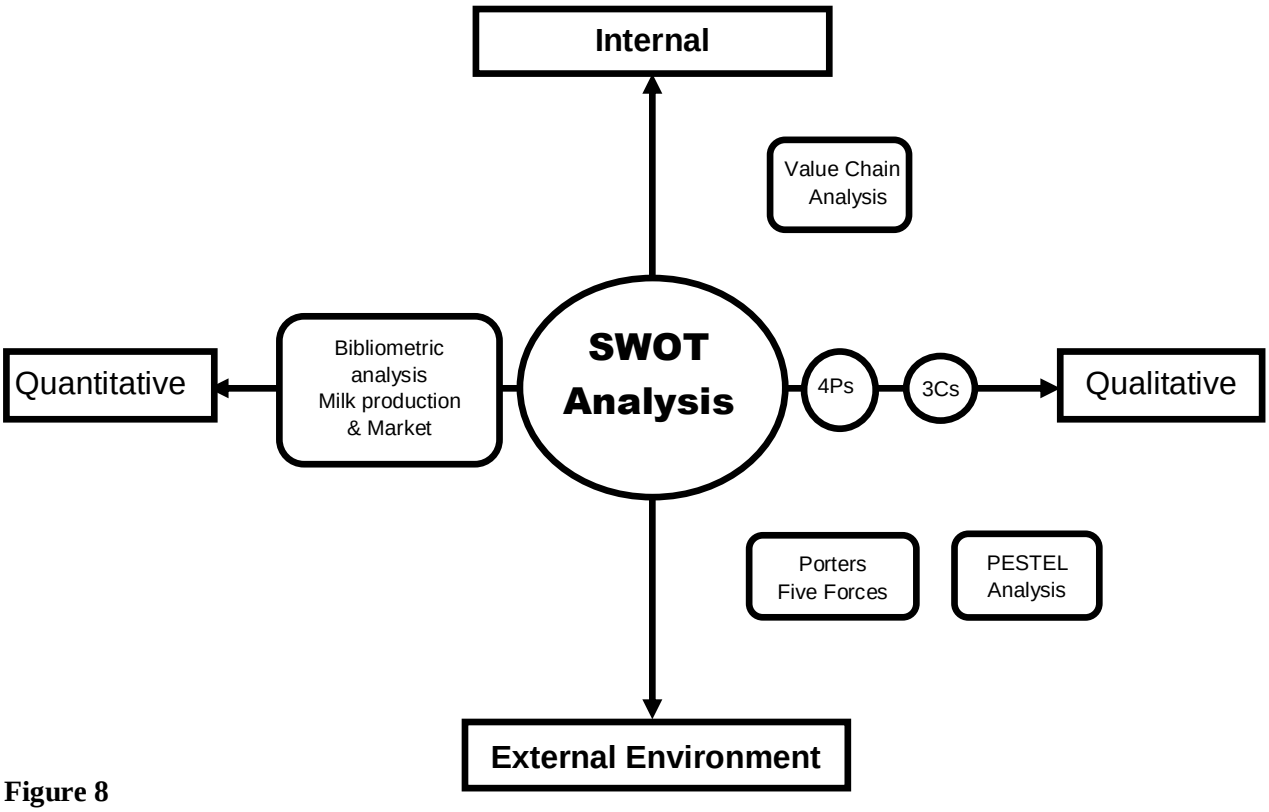

Figure 8

Analytical Frameworks Employed in SWOT Analysis of the Dairy Sector Business Environment Focusing on Milk Production. Authors' Conceptualization with Adaption from KAIZEN-BDSP Training (2024)

Table 2

SWOT Analysis of the Dairy Sector in Tanzania Focusing on Milk Production

STRENGHS	WEAKNESSES
Growing demand for milk and milk products Increasing number of dairy farms that support dairy processing industries by supplying milk in DPPs.	Productivity is significantly low Underutilized facilities such as Dairy processing plants, Livestock Multiplication Units, research and training units, land

Availability of government and private owned land that can be utilized for fodder production Availability of innovations and technologies to support fodder and feed production Tanzania is ranked second in cattle population in Africa, with a high number of animals, predominantly local breeds. Presence of Artificial insemination centre for breed improvement Extensive experience and strong cultural background in livestock and milk production among smallholder livestock keepers in Tanzania Smallholder livestock keepers desire to link up with high value markets	for growing pasture/hay Scarcity of fodder and feed, both in terms of quality and quantity, poses a significant constraint to improving yield. Seasonality of milk production and supply especially in traditional herds heavily relies on rainfall Milk collection systems remain unorganized due to scattered nature of dairy farmers and lack of milk collection, handling and transportation infrastructures Presence of huge informal markets Lack of dairy technologists in Tanzanian labour market Few dairy processing plants with long shelf life technology to cater for seasonality of milk supply Very few graduating dairy farmers despite several supports given to smallholder dairy farmers Low adoption of Artificial Insemination technology to increase high yielding cattle breeds Low utilization of available resources for irrigation technology to enhance pasture Inadequate financial support for running livestock multiplication centres to ensure adequate parent stocks and assurance for in-calf heifers to enhance productivity Centralized decision making process for Livestock Livestock multiplication Units operate as service entities instead of business units to pace up with the growing demand for in-calf heifers Low investment in dairy sector Unwillingness of traditional livestock farmers to adopt new technologies and commercial farming system
OPPORTUNITIES	**THREATS**
High demand for feed presents opportunities for fodder and feed business Growing demand for livestock and dairy products particularly in urban areas Availability of government policies and regulations that support investment in dairy sector Availability of technologies and innovations to increase milk quality and productivity Dairy cows presents opportunities for income generation and food security for smallholder farmers Availability of trained human resources in the labour market Availability of free technological applications for the preparation of animal feed using local available raw materials Availability of livestock training and research centres	Climate change effects on pasture Continued fragmentation of producers in milk collection and marketing is a challenge Increased informalities in milk marketing channels Imports of competitively priced high-quality dairy products present a threat to domestic market Shift in demand towards quality imported processed milk and milk products due to market convergence effect and the unavailability of locally processed alternatives such as milk powder for babies Loyalty towards imported brands due to regular consumption of imported milk and milk products. Campaigns against animal products may lead to a rise in plant-sourced milk substitute, such as Soy milk, as a preferred choice for vegetarians and vegans

3.1.2 TOWS analysis

Following the completion of the SWOT analysis, the study employed TOWS Matrix/analysis to develop strategies that capitalize on strengths and opportunities while addressing weaknesses and threats (Weihrich, 1982). TOWS matrix serves as a valuable tool for organizations and industries to systematically evaluate their internal capabilities and external environment, enabling them to develop effective strategies that align with their goals and objectives (Dandage, 2019; Yamagishi et al., 2021). Dandage, (2019)highlights the TOWS framework as a strategic model, emphasizing its role in identifying key success factors and strategic directions and decision making processes. In this regard, TOWS matrix was developed to leverage the output of SWOT analysis in formulation of strategies or identify strategic priorities, and develop plans to foster growth, sustainability, and competitiveness in the dairy industry. Strategic findings for enhancing the dairy sector' productivity (i.e., TOWS' Outputs)

3.2 Strengths-Opportunities (SO) Strategies (Maxi – Maxi strategies)

According to Weihrich, (1982), the dairy sector can take advantages of maximizing its strengths and opportunities available to increase the capacity utilization of the processing industries and unlock the dairy sector

potentials. Thus, the study aligned the sector's strengths with the identified opportunities, and the following strategies were proposed;

3.2.1 Develop and Promote Eco-Friendly Commercial Dairy Farms.

Given the presence of the available dairy farms and smallholder dairy farmers, the dairy sector in Tanzania can capitalize on the growing demand for milk and milk products. This can be achieved through emphasis on the transition of the available dairy farms into competitive eco-friendly business or commercial oriented farms to meet the existing demand (Burgers et al., 2021; Evers et al., 2021; Mamo et al., 2021). Transformation of the existing farm business operations can be achieved through utilization of available land for fodder production, changing of strategic thinking of the farms management and orientations to enhance productivity. Furthermore, promotion of eco-friendly commercial dairy farms can be achieved through targeted marketing campaigns, certifications, and partnerships with financial institutions and other stakeholders including investors (URT, 2017a).

3.2.2 Enhance Fodder Farming and Promote Innovations and Technological Adoption

Public and private sectors can promote and support the identification of private and public underutilized lands for fodder farming (Habiyaremye et al., 2021; Omore et al., 2015; URT, 2017a). As an illustration, Livestock Multiplication Units (LMUs) can be availed support to maximize their under - utilized land through undertaking irrigation systems and updated agricultural techniques to optimize fodder production. This can be utilized to support livestock within the LMUs and the extra can be delivered to other dairy keepers, producing extra income and promote the local dairy sector. Sustainable and consistent nutritious feed supply for livestock is necessary for fostering both growth and dairy industry sustainability.

Likewise, leveraging on technological availability and innovations to boost productivity, quality of milk and efficiency according to Jebessa et al. (2023), Oparaocha (2016) and Thomas et al. (2023) can be attained through urging dairy farms and farmers to embrace up-dated farming techniques e.g. automated milking systems, accurate feeding, feed preparation methodologies or software systems e.g. Rumen 8, irrigation techniques, Artificial insemination (AI) procedures like sexed-semen adoption, and data-enhanced decision-making instruments, to optimize their strengths and realize increased yields.

3.2.3 Bolster Collaborations and Partnerships with Research and Training Departments

This can be attained through partnership between dairy keepers with research and training agencies to establish and share best practices, perform research on sustainable dairy generation, and avail technical assistance to farmers (URT, 2021b; Kanire et al., 2024a). This is geared to boost knowledge base of the industry, enhance production methods, and foster innovation.

3.3 Strengths-Threats (ST) Strategies (Maxi – Min Strategies)

According to Weihrich, (1982), Maxi -Min tactics aim at utilizing strengths to decrease the effect of external threats. Taking advantage of this, the aforementioned strategies were hinted;

3.3.1 Bolster Mechanisms for Disease Control and Veterinary Services

The incidence of animal diseases risk can be combated through availing resources in programs linked to disease control, enhancing veterinary services accessibility, and campaigning for vaccination and biosecurity measures (Fagnani et al., 2021; URT, 2017a; Vroegindewey et al., 2021). Likewise, forming linkages between farmers and research available, training institutions for livestock and veterinary laboratories and centers for investigation is vital for controlling diseases (Omore et al., 2015; Notenbaert et al., 2020; Fagnani et al., 2021; Girma & Kuma, 2022). This is helpful in safeguarding dairy cattle's health and productivity, guaranteeing a sustainable industry.

3.3.2 Boost Milk Collection Systems Organization

Dangers of unstructured milk gathering systems and promoting in formalities in channels of milk marketing can be curbed through enforcing mechanisms to streamline procedures of milk collection and formalization (Sutter et al., 2017). This entails developing centers for milk collection, campaign for dairy cooperatives and advise farmers to form dairy cooperative unions, fostering transportation network, and availing training to farmers on required milk handling and storage methods (Feyissa et al., 2023; Notenbaert et al., 2020; Omore et al., 2015). At the same time, farmers who are organized should be connected to markets of high-value milk to attract more farmers to be involved in the system (Omore et al., 2015; Sutter et al., 2017; URT, 2017a).

3.3.3 Advance Tactics for Climate Resilience

The sector associated with dairy can boost efficient and effective utilization of locally available climate resilience tactics and advance innovative procedures to minimize the impact of climate change on dairy production capacity (Bastidas-Orrego et al., 2023; Feyissa et al., 2023; Notenbaert et al., 2020). These encompass promotion and adoption of climate smart farming technologies and practices such as Rumen 8 for preparation of animal feed to meet cattle dietary requirements, promoting agroforestry for shade and carbon sequestration, diversifying forage crops, implementing efficient water management techniques, practicing rotational grazing, and accessing climate information to enhance adoptive capacity (Notenbaert et al., 2020; Feyissa et al., 2023).

3.4 Weaknesses-Opportunities (WO) Strategies (Min – Max Strategies)

WO Strategies aim at overcoming weaknesses through taking advantages of available opportunities (Weihrich, 1982). Using the identified weaknesses, the study matched them with the identified opportunities and the following strategies were proposed;

3.4.1 Improve Productivity through Technological Interventions and Good Animal Husbandry Practices

Investing in good animal husbandry and technologies that optimize feed production, improve breeding practices, and enhance milk production can help to address the issue of low productivity (URT & Dalberg, 2019; URT, 2017b, 2021b; Vyas et al., 2020). This can be achieved through promoting the use of artificial insemination particularly sexed semen, provision of training on modern farming techniques, and facilitate access to improved genetics and high-quality feed (URT, 2017b, 2021b; Vyas et al., 2020).

3.4.2 Strengthening of Government-Owned Dairy Entities to Enhance Milk Supply

There is a need to strengthen government-owned dairy farms, Livestock multiplication units (LMUs), and the National Artificial Insemination Center (NAIC) as competitive business entities (URT, 2017; URT & Dalberg, 2019). The ministry of livestock and fisheries can empower these entities by decentralizing decision-making and grant semi-autonomy status to these entities to operate as business entities while maintaining accountability to the ministry. This strategy leverages inherent strengths of these entities, addressing existing inefficiencies including financial challenges, optimize operations, make timely decisions, and fostering responsiveness to market demands (Porter, 1990; Susanty et al., 2017; URT, 2021b). Similar to other government entities, this semi-autonomous mandate empowers them to cater to market needs efficiently and effectively.

3.4.3 Establish Collaborations with the Private Sector.

Fostering partnerships and collaborations with private sector through engaging private companies and investors in infrastructure development, technological advancements, and market expansion (Omore et al., 2015; URT, 2017a; van der Lee et al., 2020) can help to overcome the lack of private sector support and address weaknesses and unlock growth opportunities.

3.5 Weaknesses-Threats (WT) Strategies (Min – Min Strategies)

Mini – Mini strategies are the most defensive strategies, aimed at minimizing weaknesses and avoiding threats (Weihrich, 1982). These strategies involve identification of vulnerabilities and external challenges, with the aim of avoiding failures by developing plans to mitigate risks (i.e., address failures) (Weihrich, 1982; Dandage, 2019; Yamagishi et al., 2021).

3.5.1 Diversify Product Offerings and Improve Processing Capabilities

The threat of consumers' demand shift towards imported processed milk can be countered through enhancing the quality and variety of locally produced dairy products (URT, 2017; ECA, 2020; Feyissa et al., 2023). The dairy sector can invest in modern processing technologies, improve packaging and labeling, and conduct consumer education campaigns to emphasize the benefits and uniqueness of Tanzanian dairy products (URT, 2021b). Also, the sector can make good use of milk school programs to position locally processed milk brands.

3.5.2 Facilitate Access to Credit and Inputs

In addressing the issue of limited access to credit and inputs, there is a need of working with financial institutions and government agencies to develop tailored financial products and support programs for dairy farmers (United Nations Economic and Social Council [ECOSOC], 2015; Okello et al., 2021). Additionally, partnerships with suppliers and the establishment of feed production cooperatives can help to promote access to quality inputs for feed production (Ola & Menapace, 2020; Kibona & Yuejie, 2021).

3.6 Prioritizing Strategies – Critical Factor of Success

The output of the TOWS analysis (i.e., the proposed strategies) particularly the Maxi – Maxi strategic options were further prioritized to obtain a critical strategy of success as they are considered as ideal strategies capitalizing on maximizing both strengths and opportunities (Rahul et al,. 2018; Weihrich, 1982; Yamagishi et al., 2021). For this reason, the study capitalized on the Maxi-Maxi strategies to enhance adequate milk production for dairy processing industries. Furthermore, based on the urgency need and importance for addressing the milk shortage in Dairy processing industries, the establishment of commercial dairy farms was prioritized with the aid of Eisenhower matrix approach (Wang et al., 2023). This technique entails tasks segmentation hinged on their urgency and value. Through this methodology, the environment-friendly dairy commercial farms tactic was determined and discovered as a high-priority activity because of its essential function in handling the urgent requirement for enhanced production of milk to counter shortage of milk in industries for processing dairy products. The chosen tactic was additionally subjected in Business Model Canvas (BMC) for feasibility and attainment of the intended strategy as depicted below in table 3. In the words of Pasaribu et al. (2023) & Saad et al. (2023) Business Model Canvas demonstrates a one page business model for feasibility and business idea operationalization.

IV. FINDINGS & DISCUSSIONS

4.1 Commercial Dairy Farms' Operationalization Tactic through Business Model Canvas.

This Model describes is a strategic management instrument that offers a visual representation of a business structure, detailing core elements e.g. client segments, value propositions, networks, streams of revenue, cost framework, main activities, core resources and primary partners (Pasaribu et al., 2023; Saad et al., 2023). BMC is largely adopted for designing, enforcing, and assessing business frameworks in different industries and settings (Wang et al (2023). In addition, BMC stresses the benefits of attractiveness, sustainability, viability and operationalization of a business structure or tactic (Pasaribu *et al.*, 2023). The model has attracted prominence in the literature, as evidenced by its occurrences in various articles as shown by the bibliometric map of keywords (see the bibliometric figure 9). The bibliometric map presented in figure 9 is based on 1,326 documents indexed in Scopus database, searched in March 2024 through a search string "TITLE-ABS-KEY (business AND model AND canvas)". The magnitude of occurrences of the BMC in the scholarly articles showcases the model's versatility in addressing challenges related to social and commercial objectives, achieving marketing, operational and financial sustainability of business models or strategies.

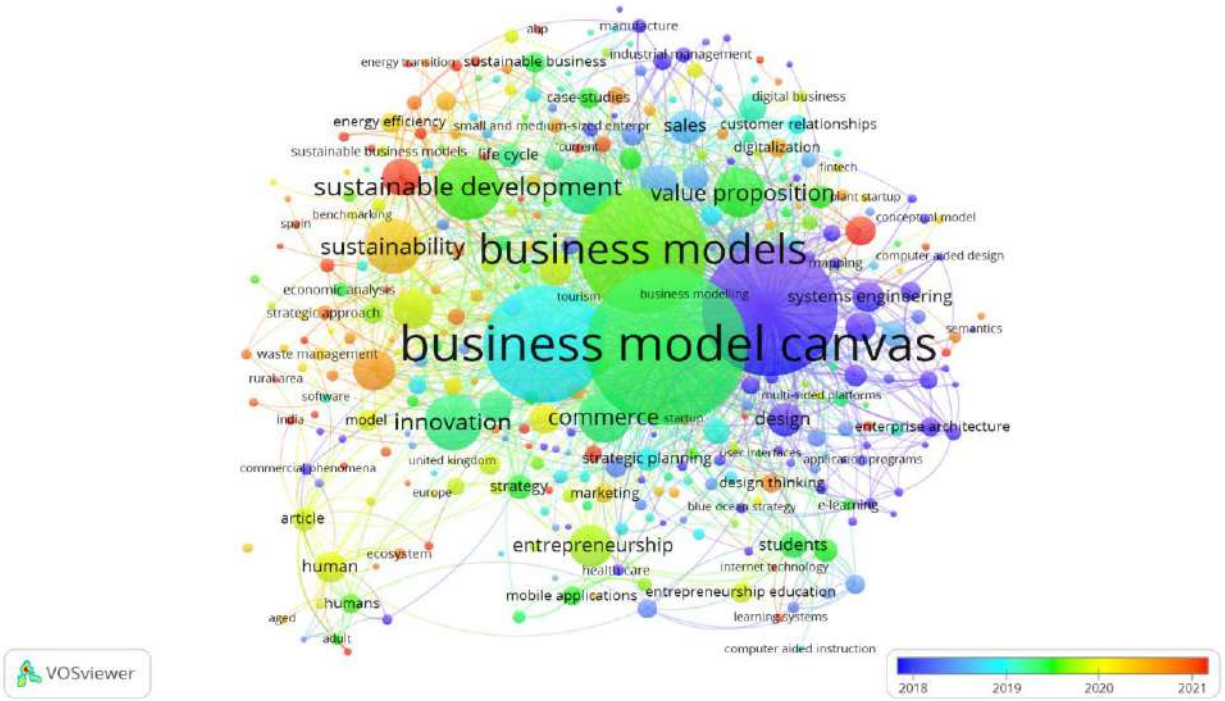

Figure 9

Occurrences of Business Model Canvas in Scholarly Communities/Articles Network of Keywords Created Using VOSviewer, version 1.6.19 (March, 2024)

Table 3

Proposed Business Model Canvas for Commercial Dairy farms in Tanzania to Enhance Sustainable Milk Supply in Dairy Processing Plants

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value Propositions</th><th>Customer Relationships</th><th>Customer Segments</th></tr>
<tr><td rowspan="3">• Suppliers of feed, equipment, and veterinary services
• Dairy processors and distributors
• Financial institutions for loans and credit
• Training and livestock research institutes
• Smallholder dairy farmers</td><td>• Dairy herd management and breeding
• Feed procurement and nutrition management
• Milk production and quality control
• Marketing and sales of dairy products
• Management of diversified activities such as Agri-tourism, and Meat business</td><td rowspan="3">• High-quality milk and dairy products
• Reliable supply of milk to meet market demand
• Competitive pricing and consistent product quality
• Sustainable and ethical farming practices</td><td>• Building trust through consistent product quality and reliability.
• Providing excellent customer service and support
• Engaging with customers through educational and exhibition events or farm tours</td><td rowspan="3">• Dairy processors
• Direct consumers (wholesalers/individuals, households – For diversified products)
• Agri-tourists</td></tr>
<tr><th>Key Resources</th><th>Channels</th></tr>
<tr><td>• Land for grazing and fodder production
• Dairy cattle and breeding stock
• Modern facilities for milking, feeding, and housing
• Skilled labour (farm managers, herders, veterinarians)</td><td>• Distribution through dairy processors, wholesalers, and retailers
• Direct sales at farm stands or farmers' markets
• Online sales through e-commerce platforms</td></tr>
<tr><th colspan="3">Cost Structure</th><th colspan="2">Revenue Streams</th></tr>
<tr><td colspan="3">• Feed and forage costs
• Labour expenses
• Veterinary care and animal health products
• Equipment maintenance and depreciation
• Utilities and operational overhead
• Purchase of milk from smallholders due to available facilities</td><td colspan="2">• Sales of raw milk to processors or wholesalers
• Sales of diversified products/services
• Direct sales to consumers through retail or online channels</td></tr>
</table>

Key Metrics:

- Milk production volume and quality
- Cost per unit of milk produced
- Revenue and profit margins
- Customer satisfaction and retention
- Return on investment (ROI) for capital expenditure

4.2 Operationalization of the Commercial Dairy Farms

The Business Model Canvas (BMC) is valuable approach for operationalization of the commercial dairy farms as it provides a structured framework to analyze and align key aspects such as partnerships, activities, resources, value propositions, customers, distribution channels, and revenue and cost streams (Pasaribu et al., 2023). Utilizing the BMC, commercial dairy farms can strategically assess and prioritize their operations, ensuring effective integration of key partners or collaborators such as input suppliers, while sustainably producing milk and maintaining customer relationships (Saad et al., 2023) (see Table 3). According to Pasaribu et al. (2023), the nine quadrants of the BMC can further be subdivided into three key business management aspects, namely marketing, financial and operation management of the commercial dairy farms as follows;

4.3 Marketing Management of the Commercial Dairy Farms

4.3.1 Customer Segments

The proposed Business Model Canvas (BMC) for commercial dairy farms identifies two key customer segments, namely dairy processors and agri-tourists. At the beginning, the farms are expected to target on meeting the demand for dairy processing industries, however, as time goes on, the farm can diversify their products when need arise (Christiaensen et al., 2020; Feyissa et al., 2023). Also, the establishment of a dairy farm attracts several visitors; this is another opportunity for Agri-tourism and serves as income generating service (Holland & Khanal, 2022; Nichols, 2021). Through targeting diverse customer segments, dairy farms can diversify their revenue streams and ensure a reliable and consistent supply to DPIs.

4.3.2 Value Propositions

The value propositions answers the question on "what makes the proposed commercial dairy farms better than present dairy farms?"(Saad et al., 2023). The intended competitive edge for commercial dairy farms' or value propositions encompass availing milk of high-quality, offering a consistent milk supply to fulfill market demand, availing competitive pricing and reliable product quality, and boosting sustainable and ethical farming procedures (Porter, 1990). These value propositions focus on differentiating the dairy farms from their rivals and consider the particular targeted client segments requirements.

4.3.3 Customer Relationships

In order to establish strong customer connections, commercial dairy farms ought to concentrate on forming trust through reliable quality product, availing superior service to clients and support. This is in addition to involving customers through educational and exhibition forums or farm tours (Quoquab et al., 2019; Sahaf & Fazili, 2024). Likewise, farms should develop databases for customers and propose to update them on their products and services (Dash et al., 2016; Hussain, 2020). Strategies on customer relationship can greatly assist dairy farms to retain loyalty, enhance innovations, products and services co-creation, boost image of their brand, and increase comprehension of the customers' requirements apart from their database.

4.3.4 Channels

Channels help in answering queries on how the intended commercial dairy farms disseminate their value propositions to the target clients. The proposed BMC illustrates a number of distribution networks for the commercial dairy farms. Some of these entail direct marketing e-mails, printing media, social platforms e.g. Radio, TV, WhatsApp, X, Instagram and Facebook (Agholor et al., 2023). A number of past research such as Roche et al. (2020) asset the value of communication options and embracing of social media among dairy producers in Canada. Similarly, Linné, (2016) proposes how dairy investors and consumers can connect and share through social media. However, channels between farms dealing with commercial dairy and processors entail trucks for milk distribution (Kuhn et al., 2018). Utilizing these channels and networks, the dairy farms can connect with a broader range of clients and guarantee the effective milk delivery and dairy products.

4.4 Operations Management of the Commercial Dairy Farms

4.4.1 Key Activities

The key activities of the commercial dairy farms that would deliver the value proposition encompass dairy herd management and breeding (Mihret et al., 2017; Notenbaert et al., 2020), fodder farming or feed procurement and nutrition management (Notenbaert et al., 2020; Vyas et al., 2020), milk production and quality control (Grace et al., 2020; Habiyaremye et al., 2021; Čapla et al., 2022), marketing and sales of dairy products (Balirwa & Waholi, 2019; Vroegindewey et al., 2021), and the management of diversified activities, such as agri-tourism and meat business (i.e., for curried animals) (Feyissa et al., 2023; Tarekegn & Shitaye, 2022). Concentrating on these key activities, the dairy farms can maximize their modus operandi, boost productivity and foster the business's overall productivity

4.4.2 Key Resources

The core resources needed to implement successively the commercial dairy farms encompass grazing land and generation of fodder, dairy cattle and stock for breeding, updated milking facilities, feeding, and housing, and expert labour e.g. managers of farms, herders, and vets (Birthal et al., 2017; Burgers et al., 2021; Ivanyos et al., 2020; Mihret et al., 2017). Ascertaining availability and effective control of these core resources is paramount for the dairy farms to satisfy their targets in production and quality.

4.4.3 Key Partnerships

The value of forming key partnerships with different stakeholders is depicted by the Business Model Canvas (Pasaribu et al., 2023; Saad et al., 2023). In order to operationalize the commercial dairy farms, main partners include feed suppliers, equipment, and vet services (Habiyaremye et al., 2021). Others are dairy processors and distributors, financial organizations like commercial banks to avail loans and credit (Omore et al., 2015). Similarly, Artificial insemination providers like the National Artificial Insemination Centre (NAIC – Arusha), training and livestock research agencies e.g. Sokoine University of Agriculture (SUA), Livestock Training Institutes (LITI), Livestock Multiplication Centres (LMUs) for instance Mabuki (Mwanza) and Sao Hill (Mafinga, Iringa) including smallholder dairy farmers (URT, 2017a). These partnerships can help the commercial dairy farms access essential inputs, secure financing, leverage expertise, and foster collaboration within the dairy value chain to ensure sustainable milk supply in Dairy processing industries.

4.5 Financial Management of the Commercial Dairy Farms

4.5.1 Cost Structure

The key cost drivers for the commercial dairy farms, particularly "where the revenue is majorly spent" include feed and forage costs, labour expenses, veterinary care and animal health products, equipment maintenance and depreciation, utilities and operational overhead (Mohd Suhaimi et al., 2017; URT & Dalberg, 2019). Furthermore, the availability of milk cooling tanks and storage facilities, the farms can opt to aggregate milk from smallholder dairy farmers. Therefore, this can help to reduce smallholder dairy farmers' transaction costs related to market access, at the same time practice fosters and promote mutual relationship between dairy farms and the smallholder around the farms. On the whole, meticulous control and maximization of these cost factors is necessary for the dairy farms to preserve profitability and efficiency in operations.

4.5.2 Revenue Streams

This section addresses the query, "How do commercial dairy farms generate revenue or profit?" The framework identifies three main revenue channels for commercial dairy farms namely, raw milk sales to processors or wholesalers, value-added products or services like agri-tourism, and direct sales to clients via retail or web networks. By diversifying revenue streams, dairy farms can reduce risks, respond to market fluctuations, and seize emerging opportunities in the dairy sector. The proposed Business Model Canvas (BMC) provides a structure for evaluating the feasibility and viability of Tanzania's commercial dairy farms to enhance sustainable milk production and ensure a steady supply to processing plants. This will be achieved through aligning marketing, operational, and financial management variables, thereby improving the overall performance, sustainability, and resilience of Tanzania's dairy industry.

The BMC also conceptualizes how commercial dairy farms can achieve strategic goals of boosting milk production for dairy processing plants and integrating smallholder dairy farmers into the supply chain (Kilima, 2021). Despite their challenges, smallholder dairy farmers are key stakeholders in the milk value chain (Duguma, 2022; Kanire et al., 2024b). The proposed model enables commercial dairy farms to serve as hubs for extension services and markets for smallholder dairy farmers, aggregating milk for dairy processing plants (DDPs). This approach links smallholder farmers to high-value markets, fostering mutual relationships and enhancing milk production. Commercial dairy farms can horizontally integrate smallholder dairy farmers into their business, providing standards and support to boost milk production. This collaborative model aligns with the Tanzania Livestock Master Plan (URT, 2017a), which advocates linking smallholder farmers to high-value markets.

While the study demonstrates the feasibility of implementing commercial dairy farms in Tanzania using the BMC, we recommend pilot studies due to the complexity and context-specific nature of the dairy sector (Christian, 2019). Pilot studies can refine and validate the strategies and collaborative models to ensure their effectiveness in the Tanzanian context. Additionally, literature asserts that increasing herd size and milk production necessitates supplying milk through formal channels, as informal markets may not handle large quantities (Birthal et al., 2017; Ivanyos et al., 2020; Jitmun et al., 2020; Vroegindewey et al., 2021). However, large herd size alone does not guarantee sales in formal markets, as market forces also play a role. For instance, a large dairy farm in Tanga producing 1,200 liters of milk per day switched to the informal market due to low prices and payment delays in the formal system. Therefore, pilot studies and established agreements between producers and processing industries are essential for the successful operation of commercial dairy farms.

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

The study explored strategic options to address the milk demand crisis and capacity underutilization challenges faced by dairy processing plants in Tanzania. Among the eleven strategic options identified, the study prioritized the development of commercial dairy farming as a solution to the milk supply shortage. The study highlights the weaknesses of the previously proposed commercial farming by addressing how commercial farms can be operationalized through a business model canvas approach. Furthermore, the study revealed the potential benefits of a collaborative approach involving commercial dairy farms, smallholder dairy farmers, and the dairy processing plants. Overall, the study views commercial dairy farms as potential vehicles towards capacity utilization of the DPIs and a vibrant dairy sector.

5.2 Recommendations

Prioritize the development of commercial dairy farming: Based on the study's findings, the development of commercial dairy farming should be a key strategic priority to resolve the milk demand crisis and capacity underutilization challenges faced by dairy processing plants in Tanzania. Fostering the growth of commercial dairy operations can help bridge the gap between supply and demand, ensuring a stable and sufficient milk supply for processing plants.

Foster collaboration among stakeholders: The study highlighted the potential benefits of a collaborative approach involving commercial dairy farms, smallholder dairy farmers, and the dairy processing plants. Policymakers and industry stakeholders should actively promote and facilitate such collaborative models to enhance the sustainability and productivity of the dairy sector. By leveraging the strengths and resources of each stakeholder group, a synergistic ecosystem can be created, leading to improved efficiency, increased milk production, and better market access.

Provide support for the transition to commercial dairy farming: Recognizing the potential of commercial dairy farming, policymakers and development partners should consider implementing targeted support programs, such as access to finance, technical assistance, and incentives, to encourage the transition towards commercial dairy farming. These supportive measures can help address the financial, technological, and capacity-building challenges faced by farmers seeking to adopt commercial dairy farming practices.

Address the broader systemic challenges: While the study focused on the strategic options within the dairy sector, it is essential to also consider and address the broader systemic challenges, such as infrastructure, regulatory frameworks, and market dynamics, which may hinder the development and growth of the dairy industry in Tanzania. A holistic approach that tackles these overarching issues is crucial for creating an enabling environment that fosters the sustainable growth of the dairy sector.

Conduct further research and pilot studies: Given the complexity and context-specific nature of the dairy sector, additional research and pilot studies may be necessary to refine and validate the strategies and collaborative models identified in this study, ensuring their suitability and effectiveness in the Tanzanian context. Continuous research efforts and real-world testing can provide valuable insights, allowing for iterative improvements and adaptations to the proposed solutions.

REFERENCES

Abdel-fattah, A., & Hiary, M. Al. (2023). A participatory multicriteria decision analysis of the adaptive capacity-building needs of Jordan ' s agribusiness actors discloses the indirect needs downstream the value chain as " post-requisites" to the direct upstream needs. *Frontiers in Sustainable Development*. https://doi.org/10.3389/fsufs.2022.1026432

Agholor, A. I., Ogujiuba, K., & Shongwe, I. . (2023). Determinants of small farmers access to agricultural markets in South Africa. *Agricultural Science and Technology*, *15*(1), 80–87. https://doi.org/10.15547/ast.2023.01.010

Almeida, A. M. De, Alvarenga, P., & Fangueiro, D. (2021). The dairy sector in the Azores Islands : possibilities and main constraints towards increased added value. *Tropical Animal Health and Production*, *53*(40). https://doi.org/https://doi.org/10.1007/s11250-020-02442-z

Balirwa, E. K., & Waholi, E. (2019). Analysis of Market Participation Behavior Among Smallholder Dairy Farmers in Uganda. *Journal of Agricultural Science*, *11*(3), 109. https://doi.org/10.5539/jas.v11n3p109

Bastidas-Orrego, L. M., Jaramillo, N., Castillo-Grisales, J. A., & Ceballos, Y. F. (2023). A systematic review of the evaluation of agricultural policies: Using prisma. *Heliyon*, *9*(10), e20292.

Birthal, P. S., Chand, R., Joshi, P. K., Saxena, R., Rajkhowa, P., Khan, M. T., Khan, M. A., & Chaudhary, K. R. (2017). Formal versus informal: Efficiency, inclusiveness and financing of dairy value chains in Indian

Punjab. *Journal of Rural Studies*, *54*, 288–303. https://doi.org/10.1016/j.jrurstud.2017.06.009

Bitoun, R. E., David, G., & Devillers, R. (2023). Strategic use of ecosystem services and co-benefits for Sustainable Development Goals. *Sustainable Development*, *October 2022*, 1296–1310. https://doi.org/10.1002/sd.2448

Blackmore, E., Guarín, A., Alonso, S., Grace, D., & Vorley, B. (2020, October). *Informal milk markets in Kenya, Tanzania, and Assam (India): An overview of their status, policy context and opportunities for policy innovation to improve health and safety*. International Institute for Environment and Development; International Livestock Research Institute; Natural Resources Institute, University of Greenwich.

Burgers, E. E. A., Kok, A., Hogeveen, H., & Kemp, B. (2021). Fertility and milk production on commercial dairy farms with customized lactation lengths. *Journal of Dairy Science*, *104*(1), 443–458. https://doi.org/10.3168/jds.2019-17947

Bush, E. J., Singh, R. L., & Kooienga, S. (2019). Lived Experiences of a Community: Merging Interpretive Phenomenology and Community-Based Participatory Research. *International Journal of Qualitative Methods*, *18*, 1–12. https://doi.org/10.1177/1609406919875891

Čapla, J., Zajác, P., Ševcová, K., Čurlej, J., & Fikselová, M. (2022). Milk and diary products – summary of European legislation, hygiene manuals, ISO standards and Codex Alimentarius standards. *Potravinarstvo Slovak Journal of Food Sciences*, *16*, 431–462. https://doi.org/10.5219/1744

Christiaensen, L., Rutledge, Z., & Taylor, J. E. (2020). Viewpoint : The future of work in agri-food. *Food Policy*, *March*. https://doi.org/10.1016/j.foodpol.2020.101963

Christian M. D. (2019). Triage. *Critical care clinics*, *35*(4), 575–589. https://doi.org/10.1016/j.ccc.2019.06.009

Craig, A., Gordon, A. W., Hamill, G., & Ferris, C. P. (2022). *Milk Composition and Production Efficiency within Feed-To-Yield Systems on Commercial Dairy Farms in Northern Ireland*. *Dmi*, 1–19.

Creswell, J. W. (2009). Creswell's appreciation of arabian architecture. In *SAGE* (3rd ed., Vol. 3). https://doi.org/10.1163/22118993-90000268

Dandage, R. V. (2019). Strategy development using TOWS matrix for international project risk management based on prioritization of risk categories. *International Journal of Managing Projects in Business*, *12*(4), 1003–1029. https://doi.org/10.1108/IJMPB-07-2018-0128

Dandage, R. V., Mantha, S. S., & Rane, S. B. (2019). Strategy development using TOWS matrix for international project risk management based on prioritization of risk categories. *International Journal of Managing Projects in Business*, *12*(4), 1003-1029. https://doi.org/10.1108/IJMPB-07-2018-0128

Dash, P., Pattnaik, S., & Rath, B. (2016). Knowledge Discovery in Databases (KDD) as Tools for Developing Customer Relationship Management as External Uncertain Environment : A Case Study with Reference to State Bank of India. *Indian Journal of Science and Technology*, *9*(4). https://doi.org/10.17485/ijst/2016/v9i4/82902

Duguma, B. (2022). Heliyon Farmers ' perceptions of major challenges to smallholder dairy farming in selected towns of Jimma Zone , Oromia Regional State , Ethiopia : possible in fl uences , impacts , coping strategies and support required. *Heliyon*, *8*(November 2021), e09581. https://doi.org/10.1016/j.heliyon.2022.e09581

ECOSOC. (2015). United nations economic commission for Africa. *2015 United Nations Economic and Social Council*, 1–5.

Evers, S. H., Mcparland, S., Delaby, L., Pierce, K. M., & Horan, B. (2021). Analysis of milk solids production and mid-lactation bodyweight to evaluate cow production efficiency on commercial dairy farms. *Livestock Science*, *252*(March), 104691. https://doi.org/10.1016/j.livsci.2021.104691

Fagnani, R., Nero, L. A., & Rosolem, C. P. (2021). Why knowledge is the best way to reduce the risks associated with raw milk and raw milk products. *The Journal of Dairy Research*, *88*(2), 238–243. https://doi.org/10.1017/S002202992100039X

Feyissa, A. A., Senbeta, F., Tolera, A., & Guta, D. D. (2023). Unlocking the potential of smallholder dairy farm: Evidence from the central highland of Ethiopia. *Journal of Agriculture and Food Research*, *11*(2), 100467. https://doi.org/10.1016/j.jafr.2022.100467

Girma, Y., & Kuma, B. (2022). A meta analysis on the effect of agricultural extension on farmers' market participation in Ethiopia. In *Journal of Agriculture and Food Research* (Vol. 7). Elsevier B.V. https://doi.org/10.1016/j.jafr.2021.100253

Grace, D., Wu, F., & Havelaar, A. H. (2020). MILK Symposium review: Foodborne diseases from milk and milk products in developing countries—Review of causes and health and economic implications. *Journal of Dairy Science*, *103*(11), 9715-9729. https://doi.org/10.3168/jds.2020-18323

Habiyaremye, N., Ouma, E. A., Mtimet, N., & Obare, G. A. (2021). A Review of the Evolution of Dairy Policies and Regulations in Rwanda and Its Implications on Inputs and Services Delivery. In *Frontiers in Veterinary Science* (Vol. 8). Frontiers Media S.A. https://doi.org/10.3389/fvets.2021.611298

Hamilton, B. J. R., Ramanujam, R., Tee, S., & Underdown, M. (2020). Business Competitiveness: Building and Applying the 3Cs and the Strategic Change Matrix across COVID-19. *Global Journal of Science Frontier Research: I Interdisciplinary*, *20*(5), 19-46.

Henson, S., & Humphrey, J. (2010). Understanding the complexities of private standards in global agri-food chains as they impact developing countries. *The journal of development studies*, *46*(9), 1628–1646. https://doi.org/10.1080/00220381003706494

Holland, R., & Khanal, A. R. (2022). Agritourism as an Alternative On-Farm Enterprise for Small U . S . Farms : Examining Factors Influencing the Agritourism Decisions of Small Farms. *Sustainability*, *14*. https://doi.org/https:// doi.org/10.3390/su14074055

Hussain, T. (2020). Improving Customer Relationship Management (CRM) through Database Systems and Internet Marketing - An Analysis of Online Customers of Bangladesh. *International Journal of Innovation, Creativity and Change*, *12*(5), 394-410.

IDFA. (2021). 2021 Economic Impact Study of the Dairy Products Industry Summary Results : In *International Dairy Foods Association* (Issue May).

Ivanyos, D., Monostori, A., Németh, C., Fodor, I., & Ózsvári, L. (2020). Associations between milking technology, herd size and milk production parameters on commercial dairy cattle farms. *Mljekarstvo*, *70*(2), 103-111. https://doi.org/10.15567/mljekarstvo.2020.0204

Jaiswal, P., Chandravanshi, H., & Netam, A. (2018). Contribution of dairy farming in employment and household nutrition in India. *International Journal of Avian & Wildlife Biology*, *3*(1), 78–79. https://doi.org/10.15406/ijawb.2018.03.00059

Jebessa, G. M., Fikadu, B., Chalchisa, T., Tadese, A., Berhanu, A., Hailu, D., & Seid, A. (2023). Impacts of crossbreed dairy cow adoption on women dietary diversity in southwestern Ethiopia. *Journal of Agriculture and Food Research*, *12*, 100544. https://doi.org/10.1016/j.jafr.2023.100544

Jitmun, T., Kuwornu, J. K. M., Datta, A., & Kumar Anal, A. (2020). Factors influencing membership of dairy cooperatives: Evidence from dairy farmers in Thailand. *Journal of Co-Operative Organization and Management*, *8*(1), 100109. https://doi.org/10.1016/j.jcom.2020.100109

Kanire, E., Msuya, E., & Alphonce, R. (2024a). Drivers of dairy farmers ' engagement in informal milk markets : Policy implications for developing countries. *Journal of Agriculture and Food Research*, *16*(March), 101128. https://doi.org/10.1016/j.jafr.2024.101128

Kanire, E., Msuya, E., & Alphonce, R. (2024b). Impact of capacity underutilization of milk processing plants on employment multipliers. *Sustainable Technology and Entrepreneurship*, *3*(2), 100059. https://doi.org/10.1016/j.stae.2023.100059

Kanire, E., Msuya, E., & Alphonce, R. (2024c). Drivers of dairy farmers' engagement in informal milk markets: Policy implications for developing countries. *Journal of Agriculture and Food Research*. Elsevier B.V. https://doi.org/10.1016/j.jafr.2024.101128

Katjiuongua, H., & Nelgen, S. (2014). *Tanzania smallholder dairy value chain development: Situation analysis and trends*. ILRI Project Report. https://www.ilri.org/knowledge/publications/tanzania-smallholder-dairy-value-chain-development-situation-analysis-and

Kibet, R. K., Job, K. L., & Edith, W. G. (2023). Factors influencing choice of milk market outlets among smallholder dairy farmers in Kuresoi north sub-county, Kenya. *African Journal of Agricultural Research*, *19*(2), 189–195. https://doi.org/10.5897/ajar2020.15069

Kibona, C. A., & Yuejie, Z. (2021). Factors that influence market participation among traditional beef cattle farmers in the Meatu District of Simiyu Region, Tanzania. *PLoS ONE*, *16*(4 April), 1–14. https://doi.org/10.1371/journal.pone.0248576

Kilima, F. T. (2021). *Integrating Smallholder Dairy Farmers into Formal Milk Markets in Tanzania: Key Lessons and Policy Implications*. *20*(1), 72–81.

Kingu, D., & Ndiege, B. (2018). Empowering small scale dairy farmers through the co-operatives model. *Journal of Co-Operative and Business Studies (JCBS)*, *1*(1), 1–11.

Koskey, K. L. K., May, T. A., Fan, Y. "Kate," Bright, D., Stone, G., Matney, G., & Bostic, J. D. (2023). Flip it: An exploratory (versus explanatory) sequential mixed methods design using Delphi and differential item functioning to evaluate item bias. *Methods in Psychology*, *8*(March), 100117. https://doi.org/10.1016/j.metip.2023.100117

Kuhn, E., Meunier-goddik, L., & Waite-cusic, J. G. (2018). Effect of leaving milk trucks empty and idle for 6 h between raw milk loads. *Journal of Dairy Science*, *101*(2), 1767–1776. https://doi.org/10.3168/jds.2017-13387

Kurwijila, Lusato R, D. R. and W. T. (2001). Smallholder dairy production and marketing: Opportunities and

constraints. *Proceedings of a South–South Workshop Held at National Dairy Development Board (NDDB) Anand, India, 13–16 March 2001*, *March*, 414–430.

Lawrence, J. D., & Mintert, J. R. (2011). Fundamental forces affecting livestock producers. *Choices: The Magazine of Food, Farm, and Resource Issues*, *26*(1), 1-6.

Linné, T. (2016). Cows on Facebook and Instagram : Interspecies Intimacy in the Social Media Spaces of the Swedish Dairy Industry. *Television & New Media*, *1*(15), 1–15. https://doi.org/10.1177/1527476416653811

Lunogelo, H. B., Songora, M. F., & Lasway, J. (2021, November). *Innovation and inclusive industrialisation in agroprocessing: The Tanzanian dairy value chain* (Working paper v1). Innovation and Inclusive Industrialisation in Agro-Processing project (IIAP). Funded by the Global Challenges Research Fund (ES/S0001352/1).

Lunogelo, H., Makene, F., & Gray, H. (2020). Dairy Processing In Tanzania Prospects for SME inclusion. *Innovation & Inclusion in Agro-Processing*, *April*, 1–8. www.iiap.info

Mamo, T., Haji, J., Bekele, A., Teklewold, T., Berg, S., Moore, H. L., & Hodge, C. (2021). Determinants of milk marketing channel selection by urban and peri-urban commercial dairy producers in Ethiopia. *Ethiopian Journal of Agricultural Sciences*, *31*(3), 69–100.

Mihret, T., Mitku, Fentahun, & Guadu, T. (2017). Dairy Farming and its Economic Importance in Ethiopia: A Review. *World Journal of Dairy & Food Sciences*, *12*(1), 42-51. https://doi.org/10.5829/idosi.wjdfs.2017.42.51

Mohd Suhaimi, N. A., de Mey, Y., & Oude Lansink, A. (2017). A transaction cost analysis of Malaysian dairy farmers' marketing channel selection. In *2017 International Congress* (pp. 1-11). European Association of Agricultural Economists. https://doi.org/10.22004/ag.econ.261436

Nichols, M. C. (2021). Agritourism and Kidding Season: A Large Outbreak of Human Shiga Toxin-Producing Escherichia coli O157 (STEC O157) Infections Linked to a Goat Dairy Farm - Connecticut. *Frontiers in Sustainable Development*, *8*(November), 1–9. https://doi.org/10.3389/fvets.2021.744055

Notenbaert, A., Groot, J. C. J., Herrero, M., Birnholz, C., Paul, B. K., Pfeifer, C., Fraval, S., Lannerstad, M., McFadzean, J. N., Dungait, J. A. J., Morris, J., Ran, Y., Barron, J., & Tittonell, P. (2020). Towards environmentally sound intensification pathways for dairy development in the Tanga region of Tanzania. *Regional Environmental Change*, *20*(4), Article number 138. https://doi.org/10.1007/s10113-020-01723-5

Nyokabi, S. N., de Boer, I. J. M., Luning, P. A., Korir, L., Lindahl, J., Bett, B., & Oosting, S. J. (2021). Milk quality along dairy farming systems and associated value chains in Kenya: An analysis of composition, contamination and adulteration. *Food Control*, *119*(July 2020), 107482. https://doi.org/10.1016/j.foodcont.2020.107482

Okello, D., Owuor, G., Larochelle, C., Gathungu, E., & Mshenga, P. (2021). Determinants of utilization of agricultural technologies among smallholder dairy farmers in Kenya. *Journal of Agriculture and Food Research*, *6*, 100213. https://doi.org/10.1016/j.jafr.2021.100213

Ola, O., & Menapace, L. (2020). Revisiting constraints to smallholder participation in high-value markets: A best-worst scaling approach. *Agricultural Economics (United Kingdom)*, *51*(4), 595–608. https://doi.org/10.1111/agec.12574

Omore, A. O., Bwana, G., & Ballantyne, P. G. (2015). *Transforming smallholder dairy value chains in Tanzania through innovation and market linkages* (ILRI Policy Brief 19). International Livestock Research Institute (ILRI). Nairobi, Kenya. http://hdl.handle.net/10568/68870

Oparaocha, G. O. (2016). Towards building internal social network architecture that drives innovation: A social exchange theory perspective. *Journal of Knowledge Management*, *20*(3), 534-556. https://doi.org/10.1108/JKM-06-2015-0212

Oraee, M., Hosseini, M. R., & Papadonikolaki, E. (2017). ScienceDirect Collaboration in BIM-based construction networks: A bibliometric-qualitative literature review. *JPMA*, *35*(7), 1288–1301. https://doi.org/10.1016/j.ijproman.2017.07.001

Pasaribu, R. D., Shalsabila, D., & Djatmiko, T. (2023). Revamping business strategy using Business Model Canvas (BMC), SWOT analysis, and TOWS matrix. *Heritage and Sustainable Development*, *5*(1), 1–18. https://doi.org/https://doi.org/10.37868/hsd.v5i1.125

Phadermrod, B., Crowder, R. M., & Wills, G. B. (2019). Importance-Performance Analysis based SWOT analysis. *International Journal of Information Management*, *44*, 194–203. https://doi.org/10.1016/j.ijinfomgt.2016.03.009

Pishbahar, E., Ferdowsi, R., & Hayati, B. (2019). *Assessing the Relationship Between Marketing Mix and Customer Satisfaction : Evidence from Iranian Dairy Companies*. Springer Singapore. https://doi.org/10.1007/978-981-13-6283-5

Porter, M. E. (1990). *The Competitive Advantage of Nations*. The Free Press, New York.

Quoquab, F., Mohamed Sadom, N. Z., & Mohammad, J. (2020). Driving customer loyalty in the Malaysian fast food industry: The role of halal logo, trust, and perceived reputation. *Journal of Islamic Marketing*, *11*(6), 1367-1387. https://doi.org/10.1108/JIMA-01-2019-0010

Rademaker, C. J., Bebe, B. O., van der Lee, J., Kilelu, C., & Tonui, C. (2016). *Sustainable growth of the Kenyan dairy sector: A quick scan of robustness, reliability and resilience* (Report 3R Kenya/WLR 979). Wageningen Livestock Research. https://doi.org/10.18174/391018

Roche, S. M., Renaud, D. L., Genore, R., Bauman, C. A., Croyle, S., Barkema, H. W., Dubuc, J., Keefe, G. P., & Kelton, D. F. (2020). Communication preferences and social media engagement among Canadian dairy producers. *Journal of Dairy Science*, *103*(12), 12128–12139. https://doi.org/10.3168/jds.2020-19039

Saad, A. M., Dulaimi, M., & Zulu, S. L. (2023). Broader use of the Modern Methods of Construction (MMC) in the UK public sector : A Business Model Canvas (BMC) perspective. *Journal of Open Innovation: Technology, Market, and Complexity*, *9*(2), 100035. https://doi.org/10.1016/j.joitmc.2023.100035

Sahaf, T. M., & Fazili, D. A. I. (2024). Does customer-based destination brand equity help customers forgive firm service failure in a tourist ecosystem? An investigation through explanatory sequential mixed-method design. *Journal of Destination Marketing and Management*, *31*(February), 100866. https://doi.org/10.1016/j.jdmm.2024.100866

Setianto, N. A., Mastuti, S., Djatmiko, O. E., Setiana, L., Purwaningsih, H., & Nur, Y. (2022). Dairy Agribusiness to Improve Farmers' Welfare in Kabupaten Banyumas. *Animal Production*, *24*(3), 178-184. https://doi.org/10.20884/1.jap.2022.24.3.25

Susanty, A., Bakhtiar, A., Jie, F., & Muthi, M. (2017). The empirical model of trust, loyalty, and business performance of the dairy milk supply chain: A comparative study. *British Food Journal*, *119*(12), 2765-2787. https://doi.org/10.1108/BFJ-10-2016-0462

Susanty, A., Bakhtiar, A., Puspitasari, N. B., & Mustika, D. (2018). Performance analysis and strategic planning of dairy supply chain in Indonesia. *International Journal of Productivity and Performance Management*, *67*(9), 1435–1462. https://doi.org/10.1108/IJPPM-10-2017-0250

Sutter, C., Webb, J., Kistruck, G., Ketchen, D. J., & Ireland, R. D. (2017). Transitioning entrepreneurs from informal to formal markets. *Journal of Business Venturing*, *32*(4), 420–442. https://doi.org/10.1016/j.jbusvent.2017.03.002

Tarekegn, K., & Shitaye, Y. (2022). Determinants of Market Participation among Dairy Producers in Southwestern Ethiopia. *Research on World Agricultural Economy*, *3*(1), 16–23. https://doi.org/10.36956/rwae.v3i1.486

Thomas, R. J., O'Hare, G., & Coyle, D. (2023). Understanding technology acceptance in smart agriculture: A systematic review of empirical research in crop production. *Technological Forecasting and Social Change*, *189*(C). https://doi.org/10.1016/j.techfore.2023.122374

United Nations Economic Commission for Africa. (2020, October). *Harmonization of standards across Africa is vital to the realization of trade and industrialization potential of the AfCFTA*. Addis Ababa: United Nations Economic Commission for Africa. UN. ECA. https://hdl.handle.net/10855/44423

URT & Dalberg. (2019). *Sector Analysis: Price, Cost, Revenue, Profitability and Human capital chains in Tanzania's Dairy Sector*. https://www.mifugouvuvi.go.tz/uploads/publications/sw1592794301-Tanzania%20%20Diary%20Sector%20Analysis%20-%20Dalberg.pdf

URT. (2017a). *Tanzania Livestock Master Plan (2017/2018 - 2021/2022).* United Republic of Tanzania, Ministry of Livestock and Fisheries, 126. https://www.mifugouvuvi.go.tz/uploads/projects/1553601793-TANZANIA LIVESTOCK MASTER PLAN.pdf

URT. (2017b). Tanzania Livestock Sector Analysis (2016/2017-2031/2032). United Republic of Tanzania, Ministry of Livestock and Fisheries. https://www.mifugouvuvi.go.tz/uploads/projects/1553602287-LIVESTOCK%20SECTOR%20ANALYSIS.pdf

URT. (2021a). *National Census of Agriculture*. Ministry of Agriculture, United Republic of Tanzania.

URT. (2021b). *National Five Year Development Plan 2021/22-2025/26: Realising Competitiveness and Industrialisation for Human Development*. United Republic of Tanzania, Ministry of Finance and Planning, June, 321.

URT. (2024). *Ministry of Livestock and Fisheries, 2023/2024 Budget speech*. Ministry of Livestock and Fisheries, United Republic of Tanzania

Uztürk, D. (2023). Strategic Analysis for Advancing Smart Agriculture with the Analytic SWOT / PESTLE Framework : A Case for Turkey. *MDPI Agriculture*, *13*(12), 2275. https://doi.org/10.3390/agriculture13122275

van der Lee, J., Oosting, S., Klerkx, L., Opinya, F., & Bebe, B. O. (2020). Effects of proximity to markets on dairy farming intensity and market participation in Kenya and Ethiopia. *Agricultural Systems*, *184*.

https://doi.org/10.1016/j.agsy.2020.102891

van Eck, N. J., & Waltman, L. (2023). *VOSviewer Manual version 1-6-19*. Leiden: Univeristeit Leiden, January, 54. http://www.vosviewer.com/documentation/Manual_VOSviewer_1.6.1.pdf

Vroegindewey, R., Richardson, R. B., & Thériault, V. (2021). Key factors for increasing farmer participation in markets: Evidence from the malian dairy sector. *Revue d'Elevage et de Medecine Veterinaire Des Pays Tropicaux(France)*, *74*(2), 93–103. https://doi.org/10.19182/remvt.36331

Vyas, D., Nelson, C. D., Bromfield, J. J., Liyanamana, P., Krause, M., & Dahl, G. E. (2020). MILK Symposium review: Identifying constraints, opportunities, and best practices for improving milk production in market-oriented dairy farms in Sri Lanka*. *Journal of Dairy Science*, *103*(11), 9774–9790. https://doi.org/10.3168/jds.2020-18305

Wang, D., Dai, R., Luo, Z., & Wang, Y. (2023). Urgency , Feasibility , Synergy , and Typology : A Framework for Identifying Priority of Urban Green Infrastructure Intervention in Sustainable Urban Renewal. *Sustainability*, *15*, 10–12.

Weihrich, H. (1982). The TOWS Matrix Situational Analysis. *Long Range Planning*, *15*(2), 54–66. https://doi.org/https://doi.org/10.1016/0024-6301(82)90120-0

Yamagishi, K., Sañosa, A. R., de Ocampo, M., & Ocampo, L. (2021). Strategic marketing initiatives for small co-operative enterprises generated from SWOT-TOWS analysis and evaluated with PROMETHEE-GAIA. *Journal of Co-operative Organization and Management*, *9*(2), 100149. https://doi.org/10.1016/j.jcom.2021.100149

Yang, X., Zhao, K., Tao, X., & Shiu, E. (2019). Developing and validating a theory-based model of crowdfunding investment intention—Perspectives from social exchange theory and customer value perspective. *Sustainability*, *11*(9), 2525. https://doi.org/10.3390/su11092525

Yu, Y., Li, Y., Zhang, Z., Gu, Z., Zhong, H., Zha, Q., Yang, L., Zhu, C., & Chen, E. (2020). A bibliometric analysis using VOSviewer of publications on COVID-19. *Annals of Translational Medicine*, *8*(13), 816–816. https://doi.org/10.21037/atm-20-4235