Solar-instant milk chilling: Pathway for sustainable growth of a Safe and Quality-Driven Kenya's Dairy Industry

Policy Brief

April 2026

Gregory Sikumba, Catherine Kilelu, Joyce Kinyanjui, Patience M. Ochieng

Design, Layout and Formatting: Peter Ongalo

Co-funded by the European Union

Implemented by giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

1. Executive Summary

The sector contributes about 4% of GDP and supports roughly 1.8 million smallholder households, yet 20–30% of marketed milk is lost to spoilage and post-harvest losses linked to inadequate cold chain infrastructure. An estimated 80–85% of marketed milk bypasses cooling and moves through informal channels.Most small-scale dairy farmers are off-grid, and where grid power exists, it is costly and unreliable. Cooperatives that rely on diesel backup face high operating costs that erode margins.

Solar-powered cooling is technically viable and increasingly cost-effective. However, adoption remains limited: a 20–30 kWp solar PV system for a cooperative-scale bulk cooler costs US$80,000–200,000, far beyond the self-financing capacity of typical smallholder cooperatives. Kenya has no systematic national subsidies, duty waivers, or public guarantee facilities specifically targeting dairy energy investments, and commercial bank lending is constrained by risk aversion and a lack of tailored products.

Thus, dairy cold chain gap in Kenya is not primarily a technical problem but a governance and investment problem. The core challenge is a persistent gap between policy intent and implementation, reflected in fragmented regulation, energy policies that do not prioritise dairy cooling, high upfront capital costs without dedicated finance instruments, and limited technical capacity to install and operate solar cold chain systems. Closing this gap requires an integrated package of reforms that align regulation, finance, energy infrastructure and skills development.

Policy recommendations

Strengthen and align policy integration and regulation

Update Kenya Dairy Board (KDB) licensing regulations to establish explicit cold chain standards (arrival temperature, storage temperature, total viable count at dispatch) as a schedule to the Dairy Industry Regulations. Integrate dairy cold chain into national electrification plans and the National Cooling Action Plan, prioritising cooperative cooling centres as anchor loads in rural electrification planning.

Invest, incentivise and enable solar cooling infrastructure adoption

Capitalise dairy cold chain investment through blend finance instruments including grant-based first-loss capital from development partners and governments, concessional debt, and results-based financing tied to verified improvements in temperature control and microbial quality.

Offer tax incentives to stimulate market uptake

Remove import duties and VAT on dairy cooling equipment and solar systems (plate heat exchangers, bulk milk coolers, icebank systems, solar panels, batteries, inverters). Mandate solar hybrid energy cooling systems for all new government or donor-financed dairy cooling centres.

Build capacity and link it to finance

Reform TVET curricula to incorporate solar refrigeration and cold chain systems. Combine hands-on technician training with field-level performance assessment, serving as both skills development and evidence tools for financiers to de-risk lending.

Embed inclusion in financing design

Mandate inclusion targets in blended finance and bank loan products for solar cooling, ensuring tiered, lower-entry loan products and simplified application requirements for women-led cooperatives and youth entrepreneurs, in line with commitments from commercial lenders and blended finance pathways.

Expected impact

Implementing these reforms would reduce milk losses and processor rejections, raise smallholder incomes, improve consumer food safety, unlock value-added dairy products and export markets, and support Kenya's climate and energy transition goals. With effective solar cold chain management and governance, Kenya's dairy sector is well positioned to become a leading dairy economy in East Africa.

Citation: Sikumba, G; Kilelu, C; Kinyanjui, J; Ochieng, P.M (2026) Solar-instant chilling: Pathway for sustainable growth of Kenya's Dairy Industry. Policy Brief. ACTS and Happy Cow Ltd.

2. Introduction

Kenya's dairy industry is one of the most significant in sub-Saharan Africa. The sector contributes about 4 percent to national GDP and provides primary income for an estimated 1.8 million smallholder farm households, most of whom keep between one and five dairy cattle (Kenya Ministry of Agriculture, 2024). Smallholders account for more than 70 percent of marketed milk production, making the efficiency, safety, and inclusivity of the dairy value chain a national priority for rural poverty reduction, nutrition, and food security. This industry growth is notable through increased milk production over the years as shown in figure 1 below.

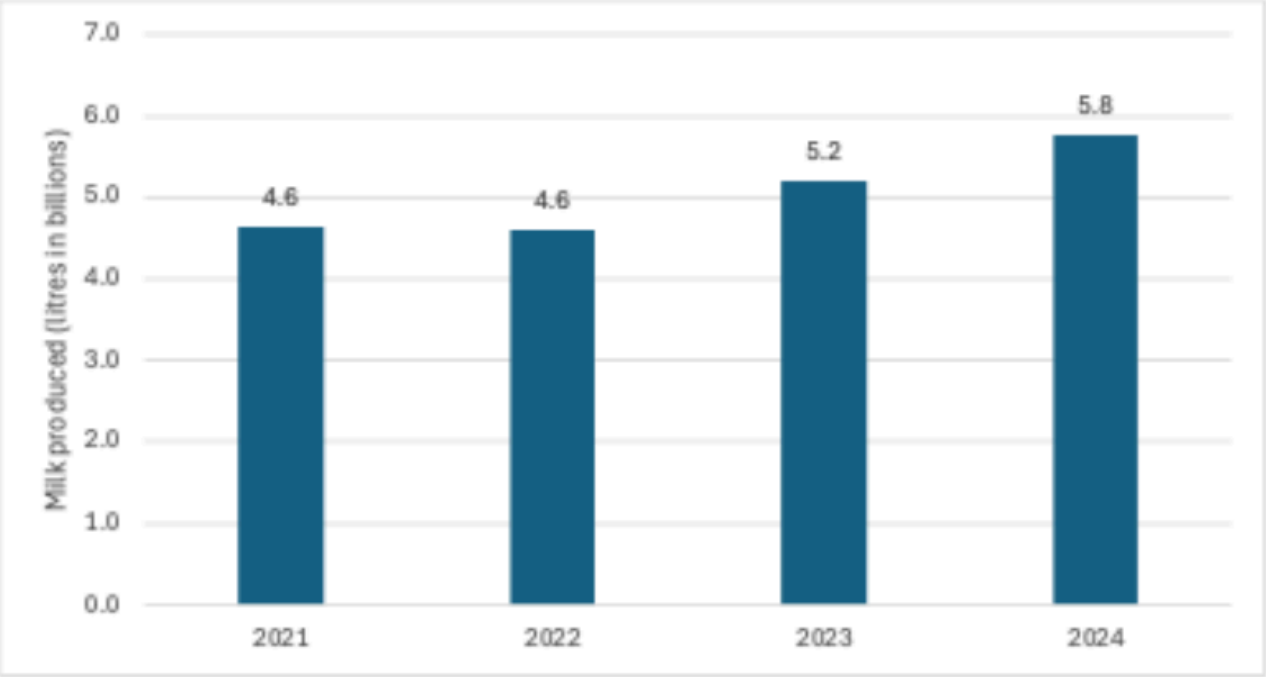

Figure 1: Trends in annual milk production (KNBS, 2025)

Furthermore, dairy processing is increasing in volumes as noted in figure 2 below with about 15-20% of total milk produced (KNBS, 2025). Parallel to the formal system, a large and economically significant informal sector operates. An estimated 80% to 85% of milk in Kenya is distributed and marketed through informal channels.

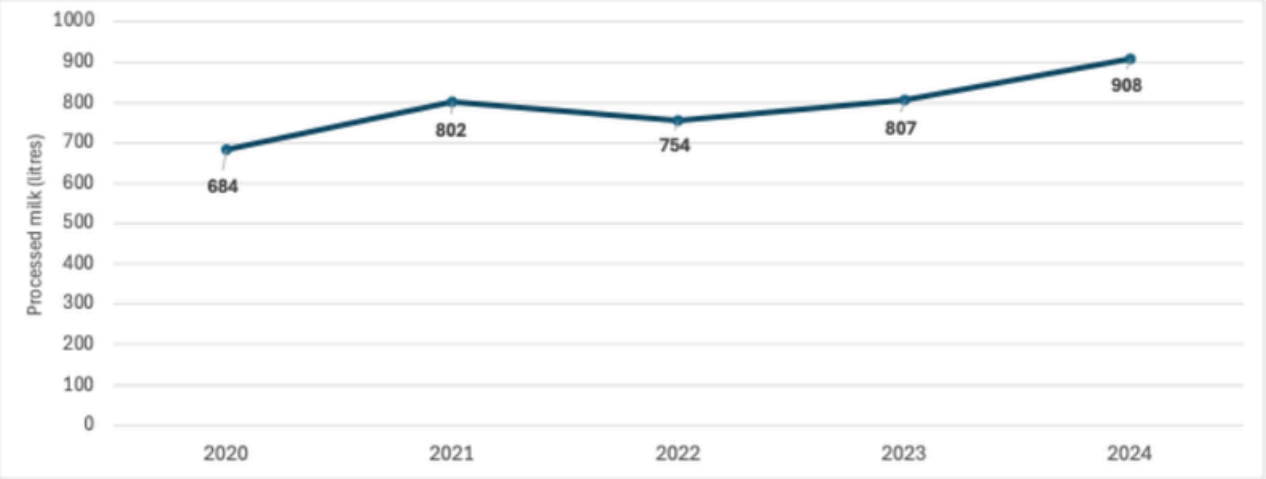

Figure 2: Trends of annual processed milk (KNBS, 2025)

As the trends show, dairy product consumption is increasing, in line with projected per capita consumption that is expected to double by 2030. The expansion of dairy product processing is driven by rising demand for a wider range of value-added dairy products, fueled by urbanization, rising incomes, and shifting dietary preferences (Erdaw, 2023; Heady et al., 2024).

An estimated 80% to 85% of all marketed milk bypasses any form of cooling infrastructure altogether and is traded through informal channels without consistent temperature control (Blackmore et al., 2022). Even within the formal sector, access to chilling facilities is uneven. Well-capitalized cooperatives and processor-linked bulking centres are more likely to maintain functional cold chains, while smaller cooperatives and independent centres often struggle to meet the capital and operational costs required for cooling equipment. As a result, rural smallholders, particularly women and youth, are structurally excluded from quality-compliant and formal chilled supply systems.

Seasonal fluctuations further intensify these challenges. Milk production peaks during the long and short rainy seasons, from March to May and October to December, when supply can exceed available chilling capacity. In contrast, production declines sharply during dry periods, reducing volumes to levels that make the operation of cooling equipment less economically viable. This leads to a cold chain that is inherently unstable, with performance varying with weather patterns, investment levels, and energy reliability, rather than functioning as a consistent system capable of maintaining milk quality through to processing

However, there are quality and safety concerns in the industry linked to high microbial contamination traced in products. This has also been a barrier to regional markets. A notable factor in milk quality and safety is access to cooling infrastructure within the dairy supply chain. About 20% of marketed milk, sourced primarily from small-scale farmers, is lost due to ineffective cold chain, especially from farm-to-cooling centres. Current chiller technology deployed in many cooperatives is not designed for instant chilling, inadvertently contributing to the multiplication of total bacterial count in milk. An estimated 80% to 85% of all marketed milk bypasses any form of cooling infrastructure altogether

Kenya's dairy supply chain is a multi-layered system linking producers to consumers. Smallholder farmers typically milk twice a day (morning and evening) and transport milk by foot, bicycle, or motorcycle to village collection points or cooperative bulking and cooling centres. At these centres, milk is tested, rapidly chilled, and stored in bulk tanks before being transported in chilled tankers or insulated vehicles to around 35 major processing firms (CGIAR, 2019; UoN, 2021).

Key data point: An estimated 20–30% of marketed milk in Kenya is lost to spoilage and post-harvest losses linked to inadequate cold chain infrastructure (Kenya Ministry of Agriculture, 2024; Sun Connect, 2019).

In 2023, 290 million litres of milk were lost before leaving the farm gate due to inadequate on-farm cooling (Shell Foundation, 2024).

The most fundamental driver of cold chain failure in Kenya is the limited well-functioning cooling infrastructure at the farm and collection-centre level for most smallholder producers. This is characterized by limited access to cooling technology, coupled with poorly performing and expensive-to-operate cooling technology because of high energy costs (Wilkes, et al 2018). Milk is highly perishable, leaving the cow at approximately 35 degrees Celsius and, under typical ambient conditions of 25 to 30 degrees Celsius, allowing bacteria to multiply Rapidly, within 60 to 90 minutes. Without timely and rapid cooling to around 4 degrees Celsius, milk quality deteriorates quickly. Recent studies show high total bacterial counts in raw milk, a key driver being the holding temperature and the length of time milk is stored before testing and processing, which if not managed under optimal chilled temperatures, stimulates bacterial growth. (Ndungu et al, 2016). Key parameters include total plate count (TPC) (maximum thresholds of 30,000 cfu/ml for Grade I pasteurized milk and 2,000,000 cfu/ml for Grade III raw milk), coliform count, butterfat content (minimum of 3.25%), and checks for adulteration (CGIAR, 2019).

Poor-quality milk is a key source of losses, which can occur through spoilage or buyer rejection, and it also poses a safety risk. Integrating solar energy for productive use in the dairy sector is an important avenue for innovation in quality, energy-efficient cooling technology that can address the milk quality and safety challenge. The Kenya Dairy Sustainability Road Map (KDB, 2024) notes the industry's need to invest. It identifies expanding access to cooling as a key strategy for achieving sustainable industry growth characterized by quality, safe milk. Investment in solar cooling at the bulking stage is particularly important given the scale of smallholder milk producers who cannot invest in costly farm-level cooling technology. Relatedly, the national action cooling reiterates the lack of an efficient and affordable cold chain in our food sectors, including dairy, which makes it difficult to assure markets and consumers of the quality and safely of milk. (Ministry of Environment, Climate Change and Forestry, 2020)

This policy brief examines the structural, regulatory, and institutional dimensions needed to expand access to solar-powered cooling in Kenya's dairy sector, especially at bulking centres where the opportunity is most strategic. It highlights areas for policy coherence and makes recommendations that can set the pathway for scaling best-fit cooling technology to sustainably drive quality, safe industry development.

3.Dairy Cold Chain Overview and Opportunity for Solar- Linked Innovation

3.1 Status of dairy cooling infrastructure

Kenya's smallholder-dominated dairy cold chain operates across four key stages: on-farm cooling, bulking collection and chilling centres, refrigerated transport, processing firms and whole and retail markets. However, as noted in the National Cooling Action Plan (Ministry of Energy, Climate Change and Forestry, 2023), cold chain coverage for milk remains underdeveloped, as in other agricultural sectors. Post-harvest milk losses attributable to spoilage, microbial contamination, and cold chain failure are estimated at 20 to 30 percent of total marketed milk production (Kenya Ministry of Agriculture, 2024; Sun Connect, 2019). In 2023, an estimated 290 million litres of milk were lost before reaching the market, making the farm gate the most significant point of loss in the value chain (Shell Foundation, 2024).

Another critical point of the chain is anchored in approximately 597 to 600 licensed cooperative cooling centres and satellite units, which are intended to play a significant role in reducing milk temperatures from ambient levels to a safe storage range of 4 to 7 degrees Celsius and ensuring the chilling is maintained until milk is then transported to processing firms (Wilkes, van Dijk and Odhong', 2018). It is estimated that 7.3 percent of all produced milk is lost through spoilage, poor handling, and limited cold chain beyond the farm (Kang'ethe et al., 2020; MoALFI, 2019).

Fresh milk contains few microorganisms that rapidly increase in warm temperatures. Kenyan Standard KS1552:2016 stipulates that milk delivered to a collection centre should arrive within two hours of milking and must be cooled to 10 degrees Celsius or lower; and to *4°C within three to four hours after milking.* (CGIAR, 2019). In practice, these requirements are frequently not met. In less densely populated dairy regions, transport distances of 50 to over 100 kilometres are common, and milk from remote farms often remains in transit for more than three hours before reaching any form of chilling infrastructure. Additionally, research has noted increased microbial growth in milk sampled from chillers in cooperatives, attributed to poor cooling efficiency (Mogotu et al., 2022).

The cooling infrastructure gap exists at multiple levels and is compounded by affordability barriers and limited access to finance. At the farm level, even a basic on-farm milk cooler costs around US$5,000 to US$10,000 for a small unit, which far exceeds the financial capacity of a smallholder with one to three cows.

At the cooperative level, the installation cost of a functional bulk cooling tank ranges from US$15,000 to US$50,000, depending on capacity, with ongoing electricity costs that can absorb a significant share of cooperative revenue. High operations and maintenance costs mean that many cooperative bulking centres operate without functional cooling equipment (UoN, 2021). Even where cooling tanks exist, power outages, compressor breakdowns, and insufficient volumes to justify cooling can leave milk at ambient or suboptimal temperatures for extended periods. The cooling challenge is amplified at the point of transportation, as most milk is transported with limited or no cooling.

3.2 Integrating solar in the Dairy cold chain

Effective milk cooling is an inherently energy-intensive activity, and energy access is a critical binding constraint for dairy cold chain development in Kenya. Approximately 85 percent of Kenya's 850,000 small-scale dairy farmers are not connected to the national electricity grid Grid electricity, where available, is costly and unreliable: frequent outages, documented at 4 to 12 days per month in some dairy counties, force cooperative cooling centres to rely on diesel generators that substantially increase operating costs and reduce investment returns. (GCCA, 2018; Foster et al., 2015).

Investment in solar cooling technology is expanding as an option to address the high energy costs of conventional technology. The transition to solar chilling technology could reduce the energy cost of cooling milk. Moreover, integrating solar energy more broadly, especially in collection centres for lighting and other needs, makes a strong case for investment.

However, the sector's high capital investment costs for solar cooling technology, coupled with information asymmetry about the performance of such investments, is stifling adoption.

Notable private-sector-led models, e.g., Techwin, Baridi, Savanna Circuit are already deploying solar milk cooling units in smallholder co-operatives to enable the transition from grid-dependent to solar-powered chilling, reporting near elimination of spoilage during outages and reduced electricity costs. Other efforts include NGOs such as SNV's Power for Food project, which applies a market–system approach to link solar technology suppliers and financiers with co-operatives, and the KCIC-DREEM hub-and-spoke model, which has already supported solarization of dairy value chains through concessional financing coupled with technical assistance. Thus, the evidence shows strong value propositions for solar cooling investment technology, linked to declining costs of solar panels and battery storage, which were cited as making solar milk chillers increasingly viable for cooperatives previously priced out of the market.

Nonetheless, several structural and institutional conditions perpetuate cold chain failure and need attention to enable adoption of solar cold chain technology as a way to address the noted challenges. These are related to several systemic, policy and regulatory issues highlighted below:

4. Policy Issues and Implications On Cold Chain Gap

First, regulatory fragmentation: the overlapping mandates of the KDB, county public health officers, KEBS, and county livestock departments create a system in which no single authority is accountable for outcomes in cold chain gaps.

4.1 Financing Barriers to Effective Cooling and Cold Chain Investment

The capital cost of cooling technology compounds energy-access barriers. A solar photovoltaic system adequate for a cooperative-scale bulk cooler of around 20 to 30 kWp system costs between US$80,000 and US$200,000 at current market prices in Kenya, depending on battery storage requirements (Wilkes, van Dijk and Odhong', 2018; Sun Connect, 2019). This is far beyond the self-financing capacity of a typical smallholder cooperative, and commercial bank lending for energy efficiency investments in the dairy sector remains constrained by risk aversion and limited financial product development.

No systematic national subsidies exist for cooling technology, no duty waivers apply to cold chain equipment, and no public guarantee facility specifically targets dairy energy investments (Sun Connect, 2019).

The absence of supportive energy policy and financing instruments means that the capital cost barrier reproduces itself across generations of cooperative investment cycles. Cooperatives that cannot afford solar-hybrid systems remain dependent on unreliable grid electricity and expensive diesel backup, making their cold chain economics unviable in the long run. This energy-cost trap directly translates into milk spoilage, processor rejection, and smallholder farmer income loss, representing policy failure with quantifiable economic and nutritional consequences.

Financing barriers to effective cooling and cold-chain investment can be reduced by redesigning risk-sharing, loan structures, and repayment mechanisms to match the cash-flow realities of dairy cooperatives and smallholders. Evidence from Kenya and comparable agri-finance contexts shows that blended finance works best when risk is tiered (i.e., not shared evenly), loan products are seasonally aligned, and processors are leveraged as credible off-takers and repayment agents (Agyekumhene et al., 2026). Examples of revolving funds demonstrate the potential of blended financing instruments. Revolving funds such as the KCIC DREEM financing model were highlighted as a model for improving access to agri-solar financing for cooperatives and individual entrepreneurs, including youth and women.

Key data point: 85% of Kenya's 850,000 small-scale dairy farmers are off-grid, excluding them from grid-powered milk cooling (GCCA, 2018).
Energy and water costs amount to approximately KSh 2 per litre of milk procured - significant relative to an average farm gate price of KSh 30 per litre (Wilkes et al., 2018).
No systematic national subsidies, duty waivers, or concessional finance instruments currently exist for dairy cooling equipment (Sun Connect, 2019).

4.2 Regulatory Gaps

Kenya's dairy sector operates under a layered regulatory framework anchored by the Dairy Industry Act (CAP 366), the Public Health Act (CAP 242), and the Kenya Bureau of Standards. The Dairy Industry Regulations (2021) require storage, transportation, and handling to meet hygiene standards, and that all traders and bulking centre operators hold valid Kenya Dairy Board (KDB) licences. The East African Community (EAC) and KEBS standard KS1552:2016 establish specific requirements for hygienic milk handling, transport, and storage (CGIAR, 2019). These regulatory frameworks overlap and are poorly coordinated in implementation. The governance landscape is further complicated by the devolution of inspection and enforcement functions to county governments.

In addition to fragmented regulations and overlapping approvals, uncertain equipment standards and weak enforcement increase the cost and time required to install milk coolers, particularly solar-powered systems in remote collection centres. Thus a mix of regulatory requirements and implementation gaps has created practical barriers.

4.3 Policy Disconnect

Promoting solar cooling in the dairy sector speaks to several policy ambitions that are currently disconnected. One relates to Energy. National energy policies do not currently identify dairy cold chain development as a focus area. Renewable energy deployment and electricity tariff design do not integrate milk cooling needs. Wilkes, van Dijk, and Odhong' (2018) found that energy-efficiency investments in Kenya's 32 dairy processing plants could deliver payback periods of 3 months to under 3 years with existing technology yet remained unrealized due to risk aversion and the absence of appropriate finance.

For cooperative-scale cooling, the lack of concessional credit, duty waivers, and technical support prevents cost-effective transition to solar-hybrid systems that would improve both reliability and economics. The National Action Cooling Plan, driven by the Ministry of Environment, acknowledges the milk cold chain as important for promoting milk quality and safety but does not provide clear strategic interventions to promote the integration of sustainable cold chains in the sector. The analysis of the milk cold chain is not well elaborated in the cooling plan, inadvertently contributing to the gap.

A further gap exists at county level: county governments are often best positioned to identify priority and competent cooperatives and coordinate local rollout of solar cooling but lack dedicated funding streams to do so. Nyandarua County Livestock Department reported growing farmer demand for solar chilling solutions being routed through county offices, with no conditional-grant mechanism from national government available to co-finance these investments.

4.4 Skills and Capacity

A policy gap exists in the disconnect between the need for skilled cold chain personnel and the limited systemic investment in technical and vocational training in Kenya. A shortage of qualified technicians, operators, and engineers constrains effective cold chain deployment in the sector. This is especially evident in the solarization of the dairy cold chain. Policies have largely failed to promote cold chain engineering as critical infrastructure that requires dedicated public funding for vocational training, leaving the private sector to shoulder the burden of skills development alone. This is linked to limited investment inhuman capital development within national policies designed to address energy insecurity.

5. Implications

5.1 Economic Losses for Smallholder Farmers

Cold chain failure leads directly and immediately to income losses for smallholder dairy farmers, who are among the most economically vulnerable participants in the value chain. When processors reject milk because of high bacterial counts or failure to meet organoleptic standards, farmers receive no payment for that delivery, meaning they absorb the full costs of production, labour, and transport as a loss. At an average procurement price of KSh 30 per litre and rejection rates of 15% to 20% in poorly managed supply chains, a smallholder farmer delivering 50 litres per day can lose between KSh 225 and KSh 300 daily, translating to approximately KSh 82,000 to KSh 109,000 annually, a substantial share of household income.

Beyond direct rejection losses, inadequate cold chain systems erode farmer incomes through three additional pathways. These include lower prices processors pay for substandard milk that is still accepted at a discount, the financial costs and legal risks of using chemical preservatives such as formalin and hydrogen peroxide as substitutes for proper cooling, and exclusion from higher-value markets. Collectively, these dynamics reinforce a value chain structure in which the economic burden of cold chain failure falls disproportionately on the poorest and most marginalised actors.

6.2 Food Safety and Public Health Risks

The public health implications of a non-functional cold chain are severe and well-documented. Across multiple counties in Kenya, studies report that between 80% and 96% of informal raw milk samples exceed permissible bacterial limits, indicating a systemic breakdown in food safety controls with wide-reaching implications for consumers. Milk-borne diseases such as brucellosis, tuberculosis, salmonellosis, and cryptosporidiosis are estimated to contribute disease burden of about 53,000 DALYs annually in Kenya (Ndambi et al, 2023).

6.4 Missed Value Addition Opportunities

A cold-chain-compliant dairy sector in Kenya would unlock significant value addition opportunities that are currently constrained.

Access to export markets, including the European Union, Gulf Cooperation Council countries, and regional East African Community markets, depends on HACCP-compliant cold chains, documented quality assurance systems, and adherence to international microbiological standards. At present, Kenya's dairy sector is unable to consistently meet these requirements at scale, limiting its competitiveness and leaving substantial export earnings unrealised.

Within the domestic market, value-added dairy products such as cheese, yoghurt, UHT milk, butter, and infant formula offer considerably higher returns, often fetching prices three to five times greater than raw milk. These products are increasingly in demand in urban centres. However, their production depends on a stable supply of high-quality raw milk, which is difficult to guarantee with inadequate cooling and inconsistent handling practices.

The cold chain gap is thus not only a technical or food safety problem: it is a structural barrier to the sector's contribution to national economic transformation, and its resolution would generate multiplier effects in employment, gender equity, and rural income that extend well beyond the dairy sector itself.

6. Recommendations

The following recommendations are directed at national government institutions (Ministry of Agriculture and Livestock Development, Kenya Dairy Board, Energy and Petroleum Regulatory Authority), county governments, development partners, and private sector actors. They are sequenced by institutional lead and each carries a measurable policy target to enable accountability.

6.1 Regulatory Enforcement: Strengthen, Simplify, and Align

The fragmented regulatory framework governing the dairy cold chain needs to be streamlined to ensure clear accountability and simplified compliance pathways that are accessible to informal and small-scale actors, rather than serving primarily the formal sector minority.

Update KDB Licensing Regulations to Establish Explicit Cold Chain Standards
Gazette minimum cooling requirements (arrival temp, storage temp, TVC at dispatch) as a schedule to the Dairy Industry Regulations. Require temperature logging as a licence renewal condition from 2027.

6.2 Energy and Infrastructure Support: Invest, Incentivise, and Enable

The capital and energy cost barriers that exclude most smallholder cooperatives from functional cold chain infrastructure can only be resolved through targeted public investment and policy instruments that change the economics of cooling at cooperative scale.

R5. Establish a Dairy Cold Chain Investment Fund (blended finance)
Capitalise a dedicated fund (target: KSh 5 billion over 5 years) combining grant first-loss capital from development partners and GoK, concessional debt from the Agricultural Finance Corporation (AFC), and results-based payments tied to verified TVC and temperature
R6. Remove Import Duties and VAT on Dairy Cooling Equipment and Solar Systems
Issue a fiscal directive exempting plate heat exchangers, bulk milk coolers, icebank systems, solar panels, battery storage, and inverters intended for dairy cooling from import duties and VAT.
R7. Mandate Solar-Hybrid Energy Systems for Publicly-Funded and Donor-Financed Cooling Infrastructure
All new government or donor-financed dairy cooling centres in areas with >4 grid outage days/month must specify solar-hybrid systems with battery storage. Prohibit procurement of high-GWP refrigerants (>1000) in all public investments.
R8. Integrate Dairy Cold Chain into the National Electrification and NCAP Implementation Plans
Direct EPRA and the Rural Electrification and Renewable Energy Corporation (REREC) to prioritise dairy cooperative cooling centres as anchor loads in rural electrification planning. Make sure that the dairy cold chain is included in NCAP annual progress report

6.3 Capacity Building

Delivering a sustainable cold chain in the sector requires adequate personnel who can design, install, and operate the systems. The opportunity presented by solar cold chain technology calls for more effort toward enhanced capacity building

Proposal of a concrete delivery mechanism to close the capacity building gap: 'field-based living classroom' such as Solio Settlement Farmers' Cooperative site under the DREEM programme, that combines hands-on technician training with visible field performance data. These sites double as evidence-based tools for financiers to de-risk lending, linking capacity building directly to the financing agenda.

The capital and energy cost barriers that exclude most smallholder cooperatives from functional cold chain infrastructure can only be resolved through targeted public investment and policy instruments that change the economics of cooling at cooperative scale.

R9. Reform TVET Curricula to Incorporate Cold Chain Management and Solar-Dairy Systems
Integrate refrigeration, cold chain operations, and solar energy systems into National Diploma and Certificate programmes at TVET institutions in key dairy counties (Nakuru, Kiambu, Murang'a, Nyandarua).

8. Conclusion

Kenya's dairy cold chain remains a gap in driving sustainable sector growth. Twenty to 30 percent of marketed milk is lost to spoilage and microbial contamination; 80 to 85 percent of all milk is sold through informal channels without systematic temperature management; up to 96 percent of informal raw milk samples in some counties exceed safe bacterial count limits; and an estimated 53,000 DALYs of foodborne disease are attributable to poor milk annually. These are not incidental statistics, but measurable outcomes of a system in which the infrastructure, regulatory enforcement, energy access, and institutional capacity required to maintain milk quality have not been developed or implemented coherently and sustainably.

The cold chain crisis in Kenya is not rooted in gaps in policy and regulatory coherence. The core challenge lies in a persistent gap between policy intent and implementation, reflected in limited governance capacity, inadequate investment, and insufficient technical and institutional readiness among smallholder cooperatives, market actors, and county governments.

Bridging this gap requires moving beyond an approach that focuses mainly on compliance enforcement in the formal sector, without matching investments in infrastructure, energy access, and capacity building. An integrated agenda is needed that addresses regulation, finance, energy systems, skills development, and gender inclusion simultaneously. This means having the national cooling action plan speak to the Kenya Dairy Sector Sustainability Road, for example. The recommendations in this brief provide a structured, evidence-based pathway for such reforms. Achieving this will require sustained political commitment, targeted public investment, and effective coordination among the Kenya Dairy Board, county governments, EPRA, AFC, and development partners.

The potential gains are substantial and well supported by evidence, including improved farmer incomes, enhanced consumer food safety, strengthened sector competitiveness, and better alignment with climate and energy transition goals. Kenya’s dairy sector already has a strong production base, an established institutional framework, and increasing private sector engagement. With effective cold chain governance, it is well positioned to become a leading dairy economy in East Africa. However, without action, current inefficiencies will persist, resulting in continued losses, preventable public health risks, and the exclusion of smallholder farmers whose livelihoods depend on a functional and equitable dairy system.

9. References

Agyekumhene, C.; Mbai, J.; Ires, I.; Jacobs-Mata, I.; Tilahun, S. 2026. Co-designing blended finance mechanisms for farmer-led irrigation in Kenya. Report of the Multi-stakeholder Workshop on Co-designing Blended Finance Mechanisms for Farmer-Led Irrigation in Kenya, Nairobi, Kenya, 4 November 2025. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Scaling for Impact Program. 20p.

Blackmore, E., Guarin, A., Vorley, W., Alonso, S. and Grace, D. (2022). Kenya's informal milk markets and the regulation–reality gap. Food Policy, 107. https://pmc.ncbi.nlm.nih.gov/articles/PMC9313611/

CGIAR. (2019). Regulatory Compliance in the Kenyan Dairy Sector. CGIAR Research Programme on Agriculture for Nutrition and Health. https://cgspace.cgiar.org/bitstreams/799a75f7-fd1c-4078-a4d6-3e1106525fc0/download

Food and Nutrition Journal. (2015). Physicochemical and Microbiological Post-Harvest Losses of Camel Milk. http://www.foodandnutritionjournal.org/

Foster, V., Bedrosyan, D. and Ansley, J. (2015). Small-Scale Dairy Farmer Access to Electricity in Kenya. World Bank Energy Sector Working Paper.

GCCA (Global Cold Chain Alliance). (2018). Kenya Cold Chain Assessment Final Report.
Kang'ethe, E.K. and Lang'a, K.A. (2009). Aflatoxin B1 and M1 contamination of animal feeds and milk from urban centres in Kenya. African Health Sciences, 9(4), pp.218–226.

Kang'ethe, E.K., Grace, D. and Randolph, T.F. (2020). Dairy food safety in Kenya: challenges and opportunities. East African Agricultural and Forestry Journal, 86(1), pp.1–15.

Kenya Ministry of Agriculture, Livestock and Fisheries (2024). Post-Harvest Management Strategy on Food Loss and Waste Reduction. https://kilimo.go.ke/wp-content/uploads/2024/10/KENYA-POST-HARVEST-MANAGEMENT-ON-FOOD-LOSS-AND-WASTE-REDUCTION-STRATEGY.pdf

Mogotu, M. W., Abong, G. O., Mburu, J., & Ndambi, O. A. (2022). Assessment of hygiene practices and microbial safety of milk supplied by smallholder farmers to processors in selected counties in Kenya. Tropical Animal Health and Production, 54(4), 220.

Ndambi, O. A., Kilelu, C., van Knippenberg, C., & van der Lee, J. (2023). Estimating public and private costs and benefits of implementing a milk quality assurance system in Kenya: a case study. NJAS: Impact in Agricultural and Life Sciences, 95(1), 2194258.

Ndungu, T. W., Muliro, P. S., Omwamba, M., Oosterwijk, G., & Jansen, A. (2016). Quality control of raw milk in the smallholder collection and bulking enterprises in Nakuru and Nyandarua Counties, Kenya. African Journal of Food Science, 10(5), 70-78.

Shell Foundation (2024). Testing the Feasibility of Solar Cooling for Kenyan Dairy Farmers: Learning Report. Shell Foundation, London. https://shellfoundation.org/learning-report/testing-the-feasibility-of-solar-cooling-for-kenyan-dairy-farmers-2/

Sun Connect. (2019). Assessment of the Cold Chain Market in Kenya. https://sun-connect.org/wpcont/uploads/Assessment-of-the-Cold-Chain-Market-in-Kenya.pdf

Wilkes, A., van Dijk, S. and Odhong', C. (2018). The Potential for Reduced Consumption of High-Emission Energy in Kenya's Dairy Sector. CCAFS Info Note, CGIAR. https://cgspace.cgiar.org/bitstreams/54decf0c-ac3c-464a-a6f0-381508543669/download

Contact Us

African Centre for Technology Studies

Email: info@acts-net.org

Website: www.acts-net.org

2nd Floor, Konza Technopolis Complex

P.O. Box 45917 - 00100

Nairobi- Mombasa Road,

Konza, Kenya.

Instagram | X/Twitter: @ACTSNET

Facebook | LinkedIn: African Centre for Technology Studies (ACTS)