



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



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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

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Abbreviations and acronyms

FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
IIED	International Institute for Environment and Development
ILO	International Labour Organization
ILRI	International Livestock Research Institute
INR	India rupees
JCMC	Joint Coordination and Monitoring Committee
MoALF	Ministry of Agriculture, Livestock and Fisheries
NDDB	National Dairy Development Board
SDP	Smallholder Dairy Project
SFL	Sustainable Food Lab
TFDA	Tanzania Food and Drugs Authority
USD	United States dollars

Executive summary

This paper reviews the status and policy contexts of informal milk markets in Kenya, Tanzania and Assam (India) to better understand the opportunities for a policy innovation based on training and certification to overcome market access barriers for sellers of informal milk by improving the health and safety practices of informal milk traders, thereby addressing policymakers' concerns. It is based on an extensive review of available literature and a small number of expert interviews and contributions.

Informal economic activities have been defined as those that operate outside the formal reach of the law or where the law is not applied or enforced, or where the law discourages compliance because it is inappropriate, burdensome or imposes excessive costs (White and Aylward 2016). However, as in other types of informal markets, informality in milk markets is not a black-and-white phenomenon. Small-scale milk businesses operate at different points along a spectrum of informality, with those selling raw milk without any of the required licences at the more informal end of the spectrum and those selling only packed and industrially pasteurized/ultra-heat treated milk with all necessary licences at the formal end. Other measures of formality/informality include the type of labour, relations with suppliers or access to finance and credit (White and Aylward 2016).

Milk production in the three countries is predominantly informal and small-scale. Dominant farming systems in Kenya, Tanzania and Assam are smallholder-led sedentary farms and pastoralists. Large volumes of milk are produced in all three countries and significant volumes are consumed on farm. The informal sector usually pays more to producers than the formal sector and pays in cash on collection—a key attraction.

Industrial milk processing in all three countries is largely under-developed. In Kenya, the market is highly consolidated¹, with Brookside Dairy Limited and New Kenya Cooperative Creameries Limited processing 75% of all milk, and there is some market concentration in Tanzania. Obtaining sufficient volumes of milk is a key constraint to growth of the industrialized processing sector in all three countries. Smaller and micro-scale processors are emerging in Assam and Kenya in response to the government push for pasteurization. The informal sector dominates dairy marketing and trade. Mobile vendors, shops/kiosks and milk bars dominate retailing in Kenya and Tanzania, and mobile/street vendors in Assam. The geography and size of all three countries and poor infrastructure make marketing challenging. A lack of cold chain facilities means the milk must pass through a short chain to reach the consumer to maintain its quality.

Low-income consumers dominate consumption of informal milk (chiefly raw and/or boiled, or informally pasteurized, or in the case of India, solid milk-based products such as sweets, ghee and paneer). Rates of consumption among low-income consumers are still lower than the recommended rates of per capita consumption. Price, quantities available to purchase, perceptions of freshness and fat content, convenience and accessibility drive the preference for raw milk. Health hazards are associated with milk consumption. But, due to prevalent boiling practices in all three countries (with the exception of African pastoralist communities), many of these hazards do not translate to actual risks.

Informal milk production and trade contribute significantly to employment and livelihoods of poor people, as well as nutrition. In terms of price per unit of protein, milk typically represents better value than other domestic animal products.

¹. The dairy market is considered to be consolidated if it is dominated by 1–5 major players. See <https://mordorintelligence.com/industry-reports/dairy-products-market>

However, legitimate health and safety concerns exist for milk since it is highly perishable and can contain disease-causing parasites, bacteria, antibiotic residues and aflatoxins. Some of these cannot be eliminated by any form of heat treatment (including pasteurization) and are determined at the production node of the chain (for example, antibiotic residues and aflatoxins).

Informality poses significant challenges to policymaking. Our review has shown that current policy approaches are poorly equipped to address the persistent reality of informal dairy markets. Informal trade of milk and dairy products in Kenya, Tanzania and Assam shows no signs of abating, and yet policy offers either unrealistic, and unachievable, standards to force a move towards formalization in the form of pasteurization, or neglect. Neither of these options offers a path to dealing constructively with a sector that offers livelihoods and nutrition for millions, but that also suffers from public health issues. Inappropriate policies may in fact increase the cost of milk to the disadvantage of consumers and may, paradoxically, decrease milk safety.

Training and certification schemes offer a glimpse of a possible policy alternative that reconciles the needs of governments for better oversight of the informal sector, of vendors for freedom of harassment and better livelihoods, and of consumers for affordability, taste and, if well implemented and grounded on positive incentives, safety. These schemes were implemented in all three countries with varying degrees of success in terms of impact, scale and sustainability. In Kenya and Tanzania, the initial promise shown by the schemes has not translated into long-term sustainability or scaling. In Assam, as of 2015, the scheme was still ongoing but some challenges in recruiting and retaining participants had been reported. Evidence on the impact of the scheme in the respective countries shows some improvements for businesses in terms of skills and quality control, but the evidence is mixed with regard to health and safety practices and income for vendors.

Our review suggests that training and certification schemes can provide win-win situations when they align the interests of different stakeholders, but that co-funding is often needed. A number of challenges and constraints explain the inability of the schemes to be scaled and sustained, including unstable policy environments (changing attitude of government to informal players); absence of policy or wider social drivers; and a weak relationship between knowledge and practice. While knowledge and capacities were improved, these did not always or necessarily translate into changes in practice.

I Introduction

The informal economy dominates the production, trade and consumption of food and other commodities in many developing countries (Skinner and Haysom 2016), and it is likely to remain significant as a source of livelihoods and food in at least the medium term. Policymakers should acknowledge this centrality and develop approaches to harness the positive aspects of informal economies and minimise the negatives, in order to avoid adverse impacts on development.

This document discusses a novel policy approach to informality—‘inclusive formalization’—that has been applied with varying degrees of success to the milk markets of Kenya, Tanzania and the Indian state of Assam, three countries with economically important and largely informal dairy sectors². This paper is part of an effort to understand why previous inclusive policy approaches to the informal sector gave varied outcomes, and what has prevented these schemes from being expanded and sustained over time. The ultimate aim is to influence the design of these kinds of ‘light-touch’ policy approaches going forward, by ensuring that they are grounded in evidence and reality. The focus of this research is milk, predominantly raw milk, as justified later, and the use of raw milk as inputs to yoghurt in informal markets etc., rather than the whole sector including formally processed dairy products.

This paper reviews the literature about informality in milk markets in Kenya, Tanzania and Assam (India), their policy frameworks and the emergence of more inclusive approaches that have been used in attempts to upgrade the health, safety and business skills of informal milk traders. This analysis will offer some initial insights on why and how more inclusive policy approaches to formalize the informal sector succeed or fail, to inform a subsequent phase of in-depth primary research exploring the same issues.

I.1 The scale of the informal economy

More than half the workforce in developing countries is employed in the informal economy (IIED 2016). According to the International Labour Organization (ILO), the informal economy accounts for 50–75% of all non-agricultural employment in developing countries (White and Aylward 2016). In addition, the Food and Agriculture Organization of the United Nations (FAO) estimates that 500 million out of the total of 570 million farms that exist in the world belong to smallholders (Lowder et al. 2014), who typically operate informally. Informality is therefore the normal economic activity in most developing countries. It is particularly important as a source of livelihoods for the poor, and for vulnerable people such as women and youth; of all women employed in sub-Saharan Africa, for example, 90% are in informal employment when agriculture is included (ILO 2018). For the majority of smallholder farmers in developing countries, the most accessible markets are informal markets; they trade upwards of 80–90% of the agricultural goods in most developing countries and are particularly important for trading all products produced by smallholder farmers, including the high-volume, lower-value grain and pulse crops, as well as the higher-value fruits, vegetables and meat products (Ferris et al. 2014).

Informal markets are also central in facilitating access to markets for consumption (Kabwe et al. 2018). In sub-Saharan Africa, for example, most of the increase in demand over the past 50–60 years has been met by domestic production. Much

² This study is part of the *MoreMilk: Making the most of milk* project, a five-year project funded by the Bill & Melinda Gates Foundation, the CGIAR Research Program on Agriculture for Nutrition and Health, and the United Kingdom government and implemented by the International Livestock Research Institute (ILRI) and the International Institute for Environment and Development (IIED).

of the success of domestic production has been in linking rural food surplus production zones with major deficit urban consumption centres, predominantly through informal trade (Vorley and Lançon 2016). Supply chains to serve internal (mainly urban) markets have been growing and have become fundamental to national food security in sub-Saharan Africa (Reardon et al. 2014a in Vorley and Lançon 2016).

The informal economy makes a significant contribution to the gross domestic product (GDP) of many developing countries. Charmes (2012) estimates that the informal economy contributes, on average, almost 64% to GDP across sub-Saharan Africa. In Kenya, for example, the informal economy contributed one-third of GDP in 2015 and has been growing since 2005 (Medina and Schneider 2018). In Tanzania, the informal economy was estimated in 2015 to have contributed 39% to GDP, and in India, the unorganized (i.e. informal) sector contributed 57% of the net domestic product (Kulshreshtha 2011), though both Tanzania and India have seen a slight shrinking of the informal economy since 2004 (Medina and Schneider 2018). Researchers predict that as sub-Saharan Africa's urban transition continues, so too will the burgeoning informal economy continue to exist (Fraser et al. 2014).

Box 1: Defining the informal economy

There has been a substantial shift in the way the informal economy has been understood since the term 'informal sector' was first used by Keith Hart in 1971 and a year later by the ILO (White and Aylward 2016). The term 'informal economy' includes both workers in the informal sector and informal workers outside of the informal sector (i.e. workers in the formal economy who lack the protections typically associated with formal employment, like contracts or sick pay), and is therefore broader in scope than the informal sector (ILO undated).

Conceptualizations of the term are arguably more nuanced and holistic now, with recognition that the informal economy refers to all economic activities that are not covered, or are insufficiently covered, by formal arrangements, either in law or in practice. Informal economic activities operate completely or partially outside the formal reach of the law or where the law is (or some laws are) not applied or enforced, or where the law discourages compliance because it is inappropriate, burdensome or imposes excessive costs (White and Aylward 2016). While there can be some overlaps between informality and illegality (for example, a small minority of people purposefully avoiding registration or taxation), generally speaking, illegality and informality are not synonymous and those dealing with illegal goods and services are not part of the informal economy and not captured in related statistics (IIED 2016).

The informal sector has multiple dimensions and there is no single indicator which can categorize enterprises as either formal or informal (White and Aylward 2016). It is more appropriate and accurate to conceive of informality as a continuum or a spectrum along which varying degrees of informality can be found, between an enterprise operating completely outside a country's laws and regulations to one that complies with all laws and regulations (DCED in White and Aylward 2016).

1.2 The centrality of the informal economy in food provision to the poor

Despite the growth of modern retail, informal food markets dominate the provision of food and drink to poor consumers in low- and middle-income countries. In a review of 23 studies on street food primarily from African cities, Steyn et al. (2013) found that daily energy intake from street foods—ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers—in adults ranged from 13–50% of energy and in children from 13–40% of energy. Although the amounts differed from place to place, even at the lowest values of the percentage of energy intake range, energy from street foods made a significant contribution to diets. In addition, many of the reviewed studies reported that street foods contributed significantly to the daily intake of protein, often at 50% of the recommended daily allowance. Animal-source foods, like dairy, are particularly important sources of protein (Dror and Allen 2011), and milk provision in many

developing countries typically happens in informal markets (FAO [undated]). In India, retail is dominated by traditional outlets, which are largely part of the 'unorganized' or informal sector. Traditional retailers, which include 'kirana' (small stores) and street vendors, account for about 90% of the sales in the country and employ about 40 million people, roughly half of whom are involved in food retail (Kumar et al. 2008). Despite recent growth, supermarkets control less than 10% of the market (<http://www.ibef.org>), much lower than had been expected due to the slow growth of the Indian middle class.

A number of factors are responsible for driving the popularity of informal food markets. Firstly, these markets are better able to provide food that meets socio-cultural expectations. In Kenya for example, the perception is that milk is safest when fresh/unprocessed and it cannot be trusted if it is treated in a way that allows it to have a longer shelf life, as is the case with pasteurization or ultra-heat treatment. Secondly, informal markets typically sell products at lower prices than formal markets or in smaller quantities that better suit the purchasing power of low-income consumers. Thirdly, informal traders often pay higher prices to the farmer than the formal sector (as is the case in milk in Kenya, Tanzania and Assam) (Blackmore et al. 2015; Robinson and Yoshida 2016). Low-income, urban households in sub-Saharan Africa depend on informal traders more specifically (including street vendors) to achieve food security (Carrillo-Rodriguez and Reed 2018). This is attributed to informal retailers' spatial accessibility, low price and appropriate quantity, and the fact that they may offer consumers access to credit. Having food and other products available in small and variable quantities is particularly important for the poor, since cash and purchasing power are limited and many people may be paid by the day and lack adequate storage facilities to keep greater volumes of food for any notable length of time.

Despite their popularity, informal markets are often associated with sale of low-quality food products. Robinson and Yoshida (2016) argue that the low prices mentioned above, a key benefit for consumers who shop in informal markets, in part reflect informal businesses' low fixed costs and their avoidance of business regulations, tax responsibilities and manufacturing standards. Intuitively, this could also mean limited resources are invested in product quality and safety, although this is not necessarily the case, as discussed in later sections.

The paper is structured as follows. In Section 2, we describe the methodology used to conduct this research. In Section 3, we describe the informal dairy value chains in Kenya, Tanzania and Assam, from production to consumption. In Section 4, we use this information to assess the performance of the informal dairy sector in terms of livelihoods, nutrition and health outcomes. In Section 5, we outline policy approaches in the dairy sectors in Kenya, Tanzania and Assam, focusing specifically on the implications for the informal milk sector. In Section 6, we describe the experience to date and impacts of interventions based on training and certification as a more inclusive policy approach in our three focus countries. Finally, in Section 7, we conclude by outlining the implications of our study for scaling and sustaining innovative policy approaches.

2. Methodology

This study was conducted as a review of published literature, complemented with interviews and communication with key informants in the three target countries.

Literature was identified using Google and Google Scholar, recommendations from key in-country experts and the CGSpace online repository (<https://cgspace.cgiar.org>). Literature included academic journals, grey literature and policy documents. A snowball approach was used to identify additional sources of literature, whereby the reference list of a paper or the citations in the paper were used to identify additional sources.

Web searches were also used to identify up-to-date market information from news sources or industry bodies/sector regulators (e.g. Kenya Dairy Board), and to understand the role of key sector stakeholders via their own websites.

Published literature was particularly scant for Assam (India) and Tanzania, whereas the literature was more extensive for Kenya. Particularly for those two countries, we relied on key insights from interviews and written communication with in-country ILRI staff to fill major gaps in the data and information where those gaps were considered central to the analysis.


The literature was summarized according to the key themes that form the basis of the structure of this paper: the key characteristics of the milk sector and milk value chains (formal and informal) in each country/state; their contribution to livelihoods and nutrition, and their health and safety status; relevant policies governing each of the dairy sectors (with a particular focus on milk); and how the inclusive policy innovations were designed and implemented in each context, with what impact and with what enablers or constraints to scaling and sustaining them.


3. Informality in the value chain for milk and dairy in Kenya, Tanzania and Assam

In developing countries, the informal market for milk and dairy is generally characterized by the predominance of traditional processing, products and retail practices, and the limited access to infrastructure including water, electricity, sanitation, cold chain and refrigeration. Dairy products typically escape effective health and safety regulation, and operators are not licensed and/or registered, do not pay taxes and receive little support from the public sector (Grace 2015). Informal milk has traditionally been synonymous with raw milk—milk that has not been pasteurized, homogenized or heat treated in any way—which is typically produced by smallholders and marketed through small-scale channels (Grace et al. 2007). Indeed, many governments in developing countries conceive of the informal sector as that concerning the trade of raw, unpasteurized milk (although in certain areas, milk may be sold boiled or even pasteurized through small-scale informal pasteurization units, as is increasingly the case in Kenya). Raw milk accounts for up to 80% of milk sold in Kenya, 90–95% in Tanzania and over 95% in Assam, where it is typically consumed in the form of traditionally processed products.

As in other types of informal markets, informality in milk markets is not a black-and-white phenomenon. Small-scale milk businesses operate at different points along a spectrum of informality, with those selling milk without any of the required licences at the more informal end of the spectrum and those selling only packed and industrially pasteurized/ultra-heat treated milk with all necessary licences at the formal end (Figure 1). Other measures of informality/formality include the type of labour, relations with suppliers and access to finance and credit (White and Aylward 2016). From the perspective of understanding the opportunities for policy innovations to improve health and safety, the focus of this paper is those supply chain players who may lack the knowledge and/or capacity to make the necessary investments in producing, trading or selling safe milk and whose livelihoods could be improved from doing so.

Figure 1: Informality/formality spectrum in milk trade.



			
Size	Relatively small-scale: trading or producing small volumes of milk; using smaller transportation vehicles (for example, bicycles or motorcycles); having smaller premises or mobile vending arrangements etc.	Small- or medium-sized: trading or producing moderate volumes of milk; using medium-scale transportation vehicles (vans); having medium-sized premises etc.	Relatively large: trading or producing larger volumes of milk; using larger transportation vehicles (for example, lorries); having larger premises etc.
Labour	Mostly family, unpaid labour; no contracts or contributions to social security	A mix of family and paid labour; no written contracts or contribution to social security, but relationships maybe longer term	Mostly non-family, paid labour. Written employment contracts and contribution to social security

Relationships with suppliers/buyers	Verbal agreements, trust-based relationships. Cash transactions.	Verbal agreements, trust-based relationships, although these may be long term.	Based on legally enforceable contracts. Long-term relationships more likely with buyers than producers.
Access to credit/finance	Limited access to banking, credit and finance. Credit provided by suppliers or kin	Some access to credit, including through microfinance, peer lending or small loans	Good access to credit via formal financial institutions
Taxes	Pay little or no taxes (either fall under threshold or avoid)	May pay some taxes if exceeding certain income threshold	Full compliance with all taxes
Licensing/registration	No licensing and/or registration	May have some licences or be registered	Comply with all licensing and registration requirements
Compliance with regulations	May comply with some, often locally enforced regulations	May comply with more regulations but typically do not meet food safety standards	Comply with most regulations. More likely to be inspected and to meet food safety standards
Type of milk/processing	Raw (no processing)	'Back-street' processing, not fully adhering to all sanitary regulations or proper processes	Highly technical pasteurization/ultra-heat treatment

Source: Authors

In what follows, we describe the milk value chain in the three countries, from production through processing, marketing and consumption. Several differences exist between informal and formal value chains in dairy in the three focus countries, with parts of the value chain being entirely discrete depending on whether the chain handles raw milk or pasteurized milk. For example, the trading nodes of the respective value chains are typically entirely separate, and raw milk clearly skips the processing node altogether. However, there are also parts of the chain, such as production (and, to a much smaller extent, consumption), which overlap.

3.1 Production

Milk production in the three countries is predominantly informal; production is typically small scale, organized around family labour and lacking contractual relationships with buyers or service providers.

Dominant farming systems are smallholder-led, sedentary farms and pastoralists

In Kenya, 80% of milk is estimated to be produced by smallholders, with 20% of dairy farmers being medium to large scale. In Kenya, there are estimated to be 1–1.8 million smallholders producing milk (MoALF undated a; SDP in Muriuki 2011). In Tanzania, approximately 70% of marketed milk is estimated to come from smallholders. Small-scale producers account for about 70% of India's production and dairy farming employs some 20 million people (Kumar et al. 2013).

There is a mix of farming systems in Kenya and Tanzania, though the majority of these (small-scale) systems are low input–low output (i.e. have minimal external inputs or farm investments). The two most common systems are pastoralist systems (most prevalent in Tanzania), which involve the movement of livestock in search of grazing and water, and sedentary systems, which are the typical smallholder farms found in much of eastern and sub-Saharan Africa (0.2–5 hectares) involving mixed farming and the use of dairy cattle. Production in Assam, specifically, is overwhelmingly by small-scale rural households, of which more than 80% keep cattle (Kumar and Staal 2010).

Large volumes of milk are produced, though significant volumes are consumed on farm

Kenya produced 4.11 billion litres of cow's milk in 2016 (FAOSTAT 2018), much of which was consumed on farm/at home and the rest was marketed (in 2011, approximately 45% was consumed on farm/at home and the rest was marketed [Muriuki 2011]). Tanzania produced 1.42 billion litres of cow's milk in 2016 (FAOSTAT 2018), with 90% of it consumed on

farm/at home or by neighbours (Njombe et al. 2012) and only the remaining 10% making it to market. India is by far the largest milk producer in the world, producing about 150 million tonnes (approximately 150 billion litres) per year, of which about half is cow's milk and half is buffalo milk (FAOSTAT 2018). Nearly half of the milk produced in India is consumed by the household in which it is produced and is not marketed (Landes et al. 2017). The state of Assam produced 861,000 tonnes of milk (NDDDB 2019), accounting for just 0.5% of the total national production. Only about 17% of this production is marketed, with the rest being consumed at the farm (ILRI 2007).

Cash is king, and the informal sector usually pays more to producers than the formal sector

Dairy-generated income is available daily and the prevailing market systems offer cash payment (Baker et al. 2013), particularly the informal sector. This can be advantageous for poor producers, who typically have urgent cash needs to pay for food, schooling and healthcare. In Kenya, sellers in the informal sector usually give a higher price and make more timely payments to producers than processors in the formal sector, making the informal sector the preferred buyer for farmers (Grace 2015). Similarly, in Tanzania, milk producers supplying the informal value chain receive almost twice the price than they receive when supplying the formal chain, although formal chains can provide more stable prices because of contractual arrangements (Twine 2016). In addition, due to inefficiencies and high transaction costs in the existing formal value chain for fresh milk, the producers' share of the consumer price for pasteurized milk is relatively low (25–32%) in Tanzania (Mchau et al. 2009 in Katjuongua and Nelgen 2014), suggesting that the formal chain is not meeting its potential for more equitable value distribution and capture in Tanzania. The same appears to be true in Assam, where the producers' share of the consumer price is 78–82% when the milk is sold to informal channels versus 68% when it is sold to cooperatives, which are formal (Kumar et al. 2010).

In Kenya, farmers tend to prefer the collection times (as well as prices) offered by informal agents to those offered by the formal sector; in addition, there are lower barriers to entry (such as the need for cooling facilities) (Hambloch et al. 2014). This is likely to also be true for Tanzania and Assam, India.

Trading agreements are typically short term and informal

In Kenya, Tanzania and Assam, transactions between producers and processors in the formal sector mainly take the form of informal verbal agreements and simple contracts. Where contracts do exist, these are noted to be relatively ineffective, with regular sales diversions happening, especially during the dry season when other buyers will offer higher prices or more favourable payment terms. While there is interdependence among milk producers, traders and processors, the current relations and transactions are short term and characterized by limited vertical coordination (ILRI 2007; Katjuongua and Nelgen 2014). In the informal sector, agreements between producers and intermediaries/transporters or traders are typically verbal and short term with no written contracts.

Dairy farms face a number of production challenges

Farmers in all three countries face a number of production challenges: their reliance on rain for grazing, which can lead to significant fluctuations in supply (Kenya and Tanzania), particularly in the dry season and in light of significant drought in recent years; diseased cattle (with very low rates of vaccination); and an overall shortage of cattle (Njombe et al. 2011), particularly more productive cattle (Katjuongua and Nelgen 2014). In Assam, where cattle are used mainly for draught, and dairying is a supplemental activity, low productivity is a particularly acute problem. Yields in Assam are lower than in any other region in India, mainly due to slow adoption of cross-breeding and limited use of concentrate feed (ILRI 2007). Access to sufficient quantities of high-quality feed (at affordable prices) and other inputs is also a challenge (Katjuongua and Nelgen 2014).

3.2 Industrial processing

Industrial milk processing is largely underdeveloped

Processing levels for dairy are low in all three countries, relative to the total amount of milk produced and marketed in the country. In Tanzania, it is estimated that 41 million litres of cow milk are processed annually, which constitutes approximately 3% of all the milk produced (1.42 billion litres) (Baregu 2017). In Kenya, 648 million litres of milk were processed in 2018, which constitutes approximately 16% of all the milk produced (4.11 billion litres) (Daily Nation 2019). In India, 15% of marketed milk is formally processed (approximately 11.25 billion litres), but much more is traditionally processed, i.e. via small-scale and family-based processors to produce traditional products such as butter, ghee, paneer and curd (Landes et al. 2017).

In Kenya, there are about 54 registered milk processors, of which 34 are operational (in 2019). Combined, they handle about 1.5 million litres per day, despite having a capacity of 3 million litres, leaving 50% of capacity unused (MoALF undated a). In Tanzania, the current national milk processing capacity is 700,000 litres a day, but it is estimated that only 40% of this capacity is used, in part due to insufficient supply (Food Business Africa 2018). According to Njombe et al. (2011), milk processing in the country is mainly undertaken by small- and medium-scale plants, of which there are 50 to 60 in Tanzania (Kurwijila et al. 2012; Katjuongua and Nelgen 2014). The processing capacity of these plants ranges from 500 to 50,000 litres per day (Katjuongua and Nelgen 2014; Nell et al. 2014).

In Assam, only a small percentage of the produced milk is industrially processed (i.e. pasteurized). In 2015, only about 2% of the milk produced in the state (22 million tonnes out of the 843 million tonnes produced) was processed (Kakaty and Das 2017). The nine processing plants in the state operate on average at around 40% of full capacity, and several of the 15 chilling plants in the state are not functional or operate at only a fraction, sometimes 5% or less, of their capacity (Sirohi et al. 2009). In sum, despite considerable installed capacity, the infrastructure in Assam is largely under-utilized and plants have substantial operational losses and are only kept afloat with government support (Sirohi et al. 2009).

Obtaining sufficient volumes of milk is a key constraint to growth of the industrialized processing sector

In all three countries, a bottleneck in supply of high-quality milk is seen as one of the main challenges for industrial processing (ILRI 2007). For example, in the first half of 2012 in Kenya, some processors experienced a milk intake drop of up to 50% (Research Solutions Africa 2013), attributed to significant supply fluctuations due to changes in rainfall patterns and therefore grazing availability. The formal sector typically loses out in periods of short supply, since the informal sector pays higher prices and offers better payment terms to producers than the formal sector. In Tanzania, for example, producers can wait for up to 16–17 days for payment from the collection centres owned by processors (Katjuongua and Nelgen 2014), while payment by intermediaries or traders in the informal sector will be made on the same day.

Market concentration in the industrialized processing sector is typically high

Within the processing segment of the value chain, there are high levels of market concentration in both Kenya and Tanzania. In Kenya, two processors—Brookside Dairy Limited (majority owned by the Kenyatta family, of which President Uhuru Kenyatta is a key member [Forbes 2015]) and New Kenya Cooperative Creameries Limited (a parastatal)—process 75% of all milk, while in Tanzania, two processors, Tanga Fresh and ASAS Dairy, account for one-third of all processed milk (Baregu 2017). Industrial dairy processing in India is largely state driven. Despite recent attempts at liberalization, government-supported cooperatives are the biggest owners and users of processing facilities (Sharma and Gulati 2003).

3.3 Marketing and trade

The informal sector dominates dairy marketing and trade

Dairy marketing and trade in Kenya, Tanzania and Assam are dominated by the informal sector. This means that the key linkages in the chain, traders who link producers to the market, and retailers who deliver dairy products to the end consumer, are informal.

For milk that is not sold directly (i.e. at the farm gate) to consumers, informal traders play an important role in getting milk to market. The proportion of milk being marketed is increasing, at least in Kenya (MoALF undated b; Baiya and Kithinji 2010), meaning an ever growing role for certain value chain players. These actors include intermediaries, transporters and retailers/vendors. In informal markets, producers may sell directly to vendors or retailers (as is most common in Assam), or to intermediaries and transporters (as is relatively common in urban or peri-urban areas where milk is in high demand in Kenya and Tanzania). Intermediaries may use animal-drawn carts, bicycles, motorcycles and small pickup trucks. In Kenya, the margins made by intermediaries for the transportation of raw milk from dairy farms to the informal and formal markets have been noted to be high (MoALF undated a), though they provide an important service which may justify that margin; as mentioned above, milk transportation is challenging due to poor infrastructure. Producers who sell to the formal dairy industry deliver the milk directly to aggregators or collection centres, some of which may be linked to cooperatives.

A variety of retailer or vendor types exists in the market, though small shops dominate the informal market

Milk retailing is carried out by a variety of actors with different degrees of informality, although in the three countries studied, informality is dominant. On the more informal side of the spectrum are mobile vendors, or 'pushcart vendors' as they are known in India. Mobile vendors are typically individuals who are self-employed, do not operate from a fixed premise and trade in the early morning and early evening to capture customers on their way to and from work. In the case of Kenya, they also operate during these hours to escape detection by the authorities/regulators, such as the Kenya Dairy Board, who will not license mobile vendors on the grounds of health and safety; they argue that the lack of fixed premises compromises milk quality. Mobile vendors typically source milk directly from producers.

Other retail outlets (with varying degrees of informality) include milk bars, shops and kiosks, and milk vending machines. Milk bars are specialist outlets, common in Kenya, which typically sell raw milk from fixed premises. Shops and kiosks, or kirana in India, sell different types of consumer items, including processed and unprocessed milk (Muriuki 2011). Automated milk-vending machines have been gaining popularity in Kenya, especially in Nairobi. Although these are supposed to sell pasteurized milk only, some sell raw milk, prompting a clamp down by regulators. These fixed-premise retail outlets, like small shops and kiosks, and even vending machines will have business owners who may from time to time employ someone to stay on the premises and sell on their behalf.

At the more formal end of the spectrum are supermarkets, which sell exclusively pasteurized milk and typically adhere to high standards of food safety and cleanliness. Supermarket penetration is relatively low in the three countries of study. Kenya has the highest number of supermarkets among countries in sub-Saharan Africa except for South Africa, but supermarkets have only about 18% of the market share (Oxford Business Group undated). Most Kenyans prefer to buy meat and dairy from small butcheries, shops or kiosks ('dukas') (Grace et al. 2007). In India, supermarkets have less than 10% of the market share (<http://www.ibef.org>) and this proportion is likely to be much lower in Assam (ILRI 2007). In all countries, supermarkets tend to cater to wealthier consumers (Baker et al. 2016).

Challenges in marketing and trade are similar across Kenya and Tanzania

The nature of marketing and trade, and the challenges faced, are broadly similar across Kenya and Tanzania. These are high costs in transporting milk, relative to other successful dairy producing countries, chiefly due to poor roads and high (and

increasing) fuel costs. Poor roads also contribute to spillage and delays in milk deliveries which result in further waste or reductions in milk quality. A significant challenge to maintaining quality and safety of milk in Kenya, Tanzania and Assam is the absence of a cold chain, especially in the informal sector, due to its high costs and infrastructure requirements. Informal milk markets depend on quick turnover and very rarely involve chilling the milk, except when long delivery times are involved that would cause the milk to spoil (Jaffee et al. 2011).

3.4 Consumption

Dairy consumption rates: low but growing

Milk and dairy consumption in the three countries of study is low relative to international standards and recommendations, but consumption is growing. In Kenya, each person consumes, on average, somewhere between 50 and 110 litres of milk per year (MoALF undated a; Bosire et al. 2017), which is four times the average in sub-Saharan Africa (SDP 2004a), but still lower than the recommended per capita consumption of 220 litres per annum (Muriuki 2011). In Tanzania, average rates of consumption were estimated to be 23.5 litres per person per annum (FAO in Baker et al. 2016), compared to the recommended per capita consumption of 220 litres per annum (Muriuki 2011). In Assam, household survey data found average liquid milk consumption to be 44 and 37 litres per person per year in urban and rural areas, respectively, well below the national average of 90 litres per person per year (ILRI 2007).

In Kenya, annual per capita consumption levels are expected to increase to 220 litres by 2030 due to better incomes and better marketing (MoALF undated a). Demand for milk and dairy products is predicted to surpass supply, with growing demand from urban markets in particular (Feed the Future 2011 in Orregård 2013). Baker et al. (2016) attribute low levels of consumption in Tanzania to low income levels, and predict that consumption of animal-source foods (meat and milk) will increase slightly as income levels continue to grow (which corresponds with the rapid economic growth experienced in Tanzania) to 26 litres per person per annum by 2030. In India, demand for dairy products has been rising at an estimated 4% per year for the last 15 years or so, in line with rising incomes (Landes et al. 2017).

Patterns of consumption vary according to geography and wealth within a country, as well as livelihoods (for example, whether your livelihood includes keeping cattle). In Tanzania, milk is consumed mainly by pastoralist and agro-pastoralist communities, where up to 100 litres can be consumed per person per year (Njombe et al. 2011). In Kenya, however, the total amount consumed by milk-producing households has decreased while the amount of marketed milk has increased; urban annual per capita milk consumption (125 litres per person per year) is higher than the national average (MoALF 2013). In both countries, there is a significant difference in average rates of consumption between wealthier and poorer urban consumers. In Tanzania, wealthier people consume 39 litres per person per year, while the poor consume just under 5 litres per person per year (Nell et al. 2014). In Kenya, high-income groups consume about 45% of the milk sold in urban areas, leaving 55% to middle- and low-income groups, who constitute far higher population numbers (MoALF 2013).

In India, milk consumption shows similar differences between rural and urban populations, as well as the poor and the better-off. Household expenditure surveys show that the share of income spent on dairy products increases as incomes rise, in both urban and rural areas (Landes et al. 2017). A household survey in Assam in 2007 showed that urban consumers spend twice as much money on dairy products than rural consumers, and they tend to buy more processed products such as ghee, paneer and sweets. With increasing incomes, it is likely that demand for these processed products will increase in both urban and rural areas (ILRI 2007).

Factors explaining a preference for raw milk include prices, convenience and taste

As Staal et al. (2008) argue, the dominance of informal markets is typically not the result of a lack of investment in formal market channels, or non-enforcement of milk standards, but rather the continued demand for the products and services they offer: 'In many cases, investment in formal dairy processing facilities, both in the private and public sectors, have failed leading to underutilized capacity surviving on subsidies or abandoned milk processing plants and cooling facilities.' (Staal et al. 2008).

Factors explaining the high demand for raw milk in our countries of focus include:

1. **Price and payment terms:** Unpasteurized milk is 20–50% cheaper for consumers in Kenya than pasteurized milk; it faces lower costs in production and supply (SDP 2004a). In addition, the informal sector usually gives a higher price to producers in both Kenya and Tanzania than the formal sector, making it the preferred buyer for farmers (Grace 2015), as well as making more timely payments to producers than processors in the formal sector.
2. **Convenience and accessibility:** Raw milk is sold in variable quantities in Kenya and Tanzania, meaning greater access for some households with limited purchasing power. Raw milk is often more accessible to purchase (particularly in rural areas), via mobile milk vendors, milk bars etc. At times, consumers are also able to obtain additional services from vendors when purchasing milk, for example, credit, which they would not be able to obtain from the formal sector.
3. **Taste:** The taste and buttermilk content of raw milk are preferred. During industrial processing, some of the milk fat is removed. In Kenya, raw milk is described by people as ‘creamier’ than pasteurized milk, and consumers like to see the creamy top which exists in unhomogenized milk. Consumers in Assam showed a strong preference for ‘high fat content, fresh smell, and milk from local breeds’ which are attributes commonly associated with raw rather than pasteurized milk (ILRI 2007).
4. **Perceptions around health and safety:** Regarding health and safety, despite government concerns, Kenyan consumers generally perceive boiling to be sufficient to reduce health hazards (discussed in further detail below) (SDP 2004a). Similar behaviours are reported in Assam, India, where consumers ‘recognized the potential health risks associated with drinking raw milk as evidenced by the high proportion (88%) of respondents in urban and rural areas who said that they boiled milk before consuming it’ (Lapar et al. 2010). In Tanzania, Kilango et al. (2012) argue that the practice of boiling raw milk before consumption is ‘very common’ (although not among pastoralist communities). In Kenya, there is also a perception that raw milk is fresher than pasteurized milk and therefore does not require the addition of preservatives. Household surveys show that, in Assam, however, many consumers distrust the quality and safety of the milk available from informal vendors (ILRI 2007).

Table 1 summarizes the key characteristics of informal dairy value chains in Kenya, Tanzania and Assam.

Table 1: Key characteristics of informal dairy value chains in Kenya, Tanzania and Assam

Production	<ul style="list-style-type: none"> • All smallholders or pastoralists (some organized into and/or selling to cooperatives). • Large volumes of milk consumed on farm (by households or calves, or by neighbours), though the percentage of milk making it to markets in Kenya and Tanzania is increasing.
Processing	<ul style="list-style-type: none"> • Some small-scale, ‘cottage industry’ processing (unregulated, untaxed), particularly in Assam (and growing in Kenya in response to government push for pasteurization).
Marketing/ trade	<ul style="list-style-type: none"> • Very active role for intermediaries/transporters in linking producers to markets, particularly in Kenya. • The geography, size of all countries and poor infrastructure make marketing challenging. • Lack of cold chain facilities, which means the milk must pass through a short chain to reach the consumer to maintain its quality.
Retail/vending	<ul style="list-style-type: none"> • Mobile vendors, shops/kiosks and milk bars dominate retailing in Kenya and Tanzania, and mobile/street vendors in Assam. • Low levels of licensing. • Untaxed, and generally unregulated (with some instances of harassment, for example, in Kenya, by the Kenya Dairy Board or police).
Consumption	<ul style="list-style-type: none"> • Low-income consumers dominate consumption in the informal sector (chiefly raw or informally pasteurized milk or, in the case of India, solid milk-based products such as sweets, ghee and paneer). • Rates of consumption among low-income consumers are still lower than the recommended rates of per capita consumption. • Price, quantities available to purchase, perceptions of freshness and fat content, and convenience drive the preference for raw milk. • Health hazards are associated with milk consumption. However, due to prevalent boiling practices many of these hazards do not translate to actual risks.

4. Assessing the performance of the informal dairy sector

In order to understand the appropriateness and effectiveness of government approaches to regulating the informal sector, it is necessary to understand how the informal sector performs in relation to a number of important criteria (particularly, livelihoods and contribution to poverty alleviation, health, nutrition and food safety) and to what extent these criteria are borne in mind when designing regulations. This builds on the information outlined above regarding the market characteristics of the milk value chains in each of our focus countries.

Milk production and trade contribute to employment and livelihoods of poor people

Trade in raw milk is a particularly important source of income and livelihoods. In Kenya, for example, it is estimated that mobile milk trade (i.e. milk sold through mobile vendors) provides 20 full-time jobs per 1000 litres of milk handled daily (SDP 2004b). Milk bars, specialist outlets selling milk from fixed premises, offer 14 jobs per 1000 litres of milk handled daily and employ large numbers of women. In comparison, the formal processing sector employs an average of 12.5 full-time jobs per 1000 litres of milk handled daily (SDP 2004b). Even if formal jobs are more stable, wage rates between formal and informal dairy are broadly similar (SDP 2004b). In the processing sector in Kenya, 13 jobs are generated for every 1000 litres of milk handled, or a total of about 15,000 jobs (Muriuki 2011). The informal sector generates 18 employment opportunities for every 1000 litres of milk handled, or a total of 40,000 jobs (this excludes the production end, which is described below). In Tanzania, profit margins for milk vendors and retailers (who are usually sole proprietors) are significantly higher than the country's per capita income (Omore et al. 2009).

A study of informal dairy traders in Assam, both of raw milk and of processed products (Kumar and Staal 2010), found that trade is dominated by very small traders (30% handle 8–30 litres per day) and that almost all of them are men. This study found that returns to labour are substantially higher in traditional milk processing than in raw milk trade; while processing has higher costs, it also produces more income. While no legal barriers exist to process milk, involvement in processing is influenced by age, education and capital availability. Importantly, milk traders are very efficient at generating surplus and operate at decreasing returns to scale, suggesting that 'informal trading and processing are an economically viable proposition' (Kumar and Staal 2010, p. 224). A further study (Kumar et al. 2010) suggested that small traders earned an average profit of 88 India rupees (INR) per day, 'which was probably higher than the prevailing wage rate in the state of Assam' (Kumar et al. 2010, p. 752).

Production of milk is also significant as a source of livelihood for smallholder farmers, many of whom are poor and disadvantaged. For example, in Kenya, the average dairy farm size is 2.6 hectares and supports six people; a quarter of these households are female headed (Grace et al. 2007). In Kenya, at the farm level, dairy activities are estimated to generate, for every 1000 litres of milk produced daily, about 23 full-time jobs for the self-employed, 50 permanent full-time jobs for employees and three full-time casual labour jobs, making a total of 76 direct farm jobs per 1000 litres of daily production, or a total of about 841,000 full-time jobs (585,000 for full-time hired workers and 256,000 for self-employed/farm owners) (Muriuki 2011). In Tanzania, most rural households own livestock and are involved in agricultural activities;

60% of these households on average derive 22% of their income from livestock activities. Women's participation in livestock activities tends to be oriented towards the selling of milk (Katjiuongua and Nelgen 2014). In India, milk production is overwhelmingly done by smallholders and landless peasants, and it provides a key source of livelihoods and income for half of the farm households in the country (BIRTHAL et al. 2017).

The benefits of smallholder dairying are not limited to farmers and there are important and far-reaching multiplier effects. Market linkages include input suppliers (fertilizers, seeds, animal feed, semen), construction (sheds, fences, dairies), equipment maintenance services, contract services (ploughing, vaccination, health, credit), security, extension and management services (and all the other roles involved in trade and marketing). Each of these chains have, in turn, their own suppliers. In Kenya, for example, informally marketed raw milk provides income for 350,000 intermediaries along the milk value chain, representing about 12% of the national agricultural workforce (Grace et al. 2007, p. 153).

Informal milk markets contribute to the nutrition of poor consumers

Milk is an important source of energy, protein and micronutrients (including vitamin A, vitamin B12, riboflavin, calcium and phosphorus) (Grace et al. 2007). Studies have shown benefits from milk consumption in terms of growth (height and weight, increased muscle mass), an improved immune system and a positive effect on micronutrient status (increased haemoglobin, ferritin and B12, and reduced vitamin A and zinc deficiency) (Grace et al. 2018). In terms of price per unit of protein, milk typically represents better value than other domestic animal products (Grace et al. 2007). Consumption of dairy products has been positively and significantly related to all measures of nutritional outcomes among low-income households in Tanzania (Kidoido and Korir 2015), and these data are likely to hold true for Kenya and Assam, also.

The lower-than-recommended levels of per capita milk consumption in Kenya, Tanzania and India have been attributed to low incomes, suggesting that informal markets will likely remain a crucial point of access for milk, particularly for lower income groups (Johnson et al. 2015). Informal markets offer accessible, desirable products in the right volumes and at the right price.

Legitimate health and safety concerns exist, but some can be effectively managed

Raw milk is highly perishable and is particularly susceptible to microbial growth and survival, and thereby is a good vehicle of foodborne pathogens, especially in warm climates where refrigeration is lacking. Hoffmann et al. (2017) identify a number of disease-causing pathogens in dairy, including parasites (*Cryptosporidium*) and bacteria (*Brucella*, *Campylobacter*; non-typhoidal *Salmonella* and Shiga-toxin producing *E. coli*). In addition to microbial contamination, residues from antimicrobial drugs used in veterinary treatment have also been found in milk. However, these pose little direct risk to human health. More serious are bacterial toxins that can cause health problems in humans; because they cannot be eliminated by any form of heat treatment (including boiling), they can pose a significant health risk for milk consumers.

Aflatoxins (from mycotoxin-producing fungi which contaminate food and feeds before, during and after harvest) are also a significant health risk for milk consumers as they can be liable for carcinogenicity, chronic toxicity, acute toxicity, immunotoxicity and genotoxicity, and are found in both raw and pasteurized milk, since no form of processing can remove aflatoxins from the food chain. A study by Senerwa et al. (2016) shows that aflatoxin contamination is common in dairy feeds and milk in Kenya and concentrations may be high. Kagera et al. (2019) found extremely high levels of aflatoxin contamination in milk sampled from smallholders in Kasarani sub-county in Nairobi. Virtually all samples were contaminated with a cancer-causing type of aflatoxin, and two-thirds of these samples contained aflatoxins at levels that exceeded the European Union legal limit. However, more recent studies found the risk to human health from aflatoxins in milk was negligible (Ahlberg et al. 2018).

One of the greatest sources of microbial contamination in milk is argued to be from milk handling equipment (Orregård 2013). In Kenya, for example, many informal milk vendors lack refrigeration facilities for milk or are challenged by numerous power cuts if they do own refrigerators, and still use plastic containers for storing and transporting milk because of the high costs of purchasing aluminium containers. This can mean the fundamental quality and safety of products is sub-

standard. Producers may not wash milking containers properly between milking different cows (or between morning and evening milking), may mix morning and evening milk without cooling milk, or may not observe antibiotic withdrawal periods before milking. Another potential source of contamination comes from adulteration. Omoro et al. (2005) found that 5% and 10% of samples from consumer households and market agents, respectively, were adulterated with contaminated water, though this was lower than the common public perception. In Assam, however, milk adulterated with water was not associated with higher levels of contamination, indicating that the water used for adulteration was probably of good quality (ILRI 2007).

The actual extent of health problems associated with contaminated milk is, however, unclear. In Tanzania, Kilango et al. (2012) estimate that every day, 953 people purchased (raw or boiled raw) milk from kiosks in peri-urban Temeke (a municipality in the capital Dar es Salaam), and among them, 217 people were likely to purchase contaminated milk. In Assam, while adulteration is a common concern for consumers and constitutes fraud, the health risks associated with adulteration are unknown (Lapar et al. 2014). Ndambi et al. (2018) estimate that in Kenya, milk-related infectious diseases currently cause an annual loss of 53,000 healthy life years, also referred to as disability-adjusted life years (Devleeschauwer et al. 2014). This translates to 850 full lives a year. A risk assessment of acquiring Shiga toxicogenic *Escherichia coli* infection from informally marketed unpasteurized milk in urban East Africa concluded that two to three symptomatic Shiga toxicogenic *E. coli* infections could be expected for every 10,000 unpasteurized milk portions consumed (Grace et al. 2008).

In addition to the risks to health, milk spoilage can lead to financial losses (Abdulai and Birachi 2009). Vendors may be shut down by authorities due to safety issues leading to losses of income. Alternatively, people may be affected as consumers through illnesses associated with contaminated/unsafe milk, leading to a loss in ability to work, and/or having to discard the milk they have purchased leading to wasted household expenditure.

Some research suggests that microbial contamination and other health risks are not exclusive to informal dairy markets. Research carried out by SDP (2004c) in Kenya found that the bacterial quality of both raw and processed milk (i.e. milk being sold in the formal sector) was often quite low compared to national standards. Omoro et al. (2005) found that most samples from short market chains and rural households in Kenya met the quality specifications for raw milk, but samples from long market chains and urban households did not. Similarly, over 60% of processed milk samples did not meet the specifications for pasteurized milk. Other studies found *Bacillus cereus* and *Staphylococcus aureus* present in formally processed milk, despite pasteurization (Macharia 2016). Therefore, whether raw or pasteurized and packaged, most milk samples traded in markets did not meet their respective quality and safety standards. In Assam, most milk (both raw and pasteurized) did not meet standards. A higher proportion of raw milk samples had acceptable total bacterial counts than ultra-heat treated or pasteurized milk samples (ILRI 2007).

Consumers mitigate some of the risks discussed above by boiling raw milk before consumption. This is done by virtually all urban consumers in Kenya, Tanzania and Assam so the risk of infection from bacterial health hazards is estimated to be low for these consumers. While boiling made milk generally safer by killing most pathogens, it still carried the risk of consumer exposure to pathogenic bacteria from possible recontamination due to unhygienic handling subsequent to boiling (Kilango et al. 2012). Boiling also does not remove the risk of aflatoxins, bacterial toxins or antibiotic residues, so improved handling and storage throughout the chain and through improved production practices at farm level are critical needs.

Improved milk safety could decrease rates of spoilage leading to increases in consumption (and possibly even reductions in prices), maximizing the nutritional benefits of milk consumption or ensuring a more equitable distribution of milk consumption within the household. It would also reduce the burden of foodborne disease attributable to milk and the economic costs associated with disease.

5. The policy context for informal dairy in Kenya, Tanzania and Assam

The following section presents the current policy frameworks in place in Kenya, Tanzania and Assam, particularly those that are relevant to informal market actors, in order to understand the need for and relevance and emergence of alternative approaches to formalization.

Informality poses significant challenges to development policymaking (Benson et al. 2017), in part due to its under-explored and under-researched nature but also its association with negative outcomes. Informality is considered to undermine the performance — in social welfare, tax revenue, human and environmental health, investment climate, competitiveness and governance — of important parts of the economy (Kabwe et al. 2018). In the case of informal trade in raw milk, policymakers' concerns revolve around food safety issues, as well as what is regarded as 'unfair competition' by the formal sector.

The relationship between informal actors and governments is typically tense, fraught with conflicts and misunderstanding. As Brown and McGranahan (2016) argue, 'local authorities are inclined to view informal vendors and producers as illicit or even 'illegal', to the extent that their processes and arrangements do not conform to regulatory frameworks, and may interfere with the formal economy' (p. 99). On the other hand, informal vendors and producers are likely to perceive of local authorities as a hindrance rather than a help, particularly because of the lack of respect with which they are typically treated and the high levels of harassment and fines they face. A large void therefore emerges between economic reality in many developing countries and within informal sectors, and regulatory systems.

5.1 Kenya's dairy policy framework: past to present

Liberalization saw the strengthening of the informal sector

In the early 20th century, commercial dairying was introduced to Kenya by British colonials. After independence in 1963, most dairy cattle were transferred to the indigenous people, marking the beginning of smallholder domination of the dairy industry (Muriuki 2011). During the 1990s, the dairy industry in Kenya was gradually liberalized, leading to a withdrawal of the state from price-setting, marketing and service delivery. Liberalization, and mismanagement, saw the collapse of the state-owned Kenya Cooperative Creameries, and a lack of consideration for the transition process for publicly delivered services (MoALF undated a).

The gap was filled quickly by several private processors (42 in 1999) operating in the formal sector and a high number of new small-scale intermediaries such as brokers, agents, milk bars and itinerant traders working predominantly in the informal sector. The collapse of Kenya Cooperative Creameries left approximately 100,000 farmers with millions of Kenya shillings owing to them for unpaid milk which naturally reduced trust in formal markets and left farmers with no option other than to sell to the informal market. The withdrawal of state marketing agencies from the milk sector saw a decline in government-provided services to the industry (MoALF 2013) and left producers to coordinate both production and market-side activities themselves. Producers then incurred the costs of searching for alternative market outlets, and the related costs of screening, and monitoring contractual arrangements with individuals and firms (Abdulai and Birachi 2009). Informal marketing agents offered a solution for producers to a number of these marketing challenges.

The Dairy Development Policy was first formulated in 1993 to guide the industry through the liberalization process initiated the previous year. The policy was updated in 1997 and revised, after wide stakeholder consultation, in 2000, when it was accompanied by a draft dairy bill, which is yet to be enacted. The process has been slowed by changes at ministry level (SDP 2004d).

2000s: Tensions between the informal and formal sector as government struggles to regulate

The Kenya Dairy Board struggled to control the proliferation of traders and vendors. According to Grace et al. (2007), the private dairy companies regarded the untaxed, unregulated and unlicensed informal sector as unfair competition. The Kenya Dairy Processors Association and a packaging manufacturer launched a campaign in 2003, dubbed the 'Safe Milk Campaign', claiming that the consumption of raw milk was dangerous because of milk adulteration by informal milk traders. Informal milk traders were portrayed as criminals who added potentially dangerous substances to preserve raw milk or increase milk volumes in order to boost their profits. The informal milk sector was portrayed as illegal, and milk traders (especially milk transporters and mobile retailers) constantly faced harassment from rent-seeking officials (Leksmono et al. 2006; Baiya and Kithinji 2010).

2004: New progressive approaches to policymaking emerge

In response to the 'Safe Milk Campaign', a new evidence base was developed by a number of non-governmental organizations in Kenya, led by the Smallholder Dairy Project (SDP), on the levels of safety and hygiene in the informal sector versus the formal sector. The intention was to facilitate a more constructive engagement with the Kenya Dairy Board around the potential for more inclusive and constructive policy change. Indeed, there appeared to be a shift in attitudes towards the informal sector (traced back to around September 2004), with a shift in attitude of regulators, a reduction in harassment by Kenya Dairy Board officials of small-scale milk vendors and an increase in licensing of small-scale milk vendors (Leksmono et al. 2006). Field-level regulators switched from purely policing and inspection (checking for licences) to checking that vendors met milk hygiene and testing requirements and offering advice on how to meet these conditions (Kaitibie et al. 2010).

In September 2004, subsidiary legislation (Legal Notices 101, 102 and 103) was gazetted, streamlining the licence application process and making it clear what type of licences were available for which type of producer in the sector, some of which were compatible with small-scale informal operations. This allowed the Kenya Dairy Board to develop procedures for small-scale milk vendors to operate legally. The Kenya Dairy Board officials used the impetus provided by the issuance of these regulations to engage and institute training, certification and licensing requirements for small-scale milk vendors (Kaitibie et al. 2010) (see Section 5).

Positive attitudes to the informal sector were reflected in a new dairy policy, presented for stakeholder consultation in April 2006. According to Leksmono et al. (2006), the proposed policy explicitly recognized the role of small-scale milk vendors and included measures to facilitate the formalization of the informal milk trade. Many of the measures appeared to be 'inclusive' in the sense that they sought to upgrade the performance of traders in relation to milk handling, and incentivize this upgrading, rather than simply seeking to criminalize and eliminate those traders. In addition, the Kenya Dairy Board appeared to be regulating the sector as if the informal sector had been legalized. Nevertheless, as of 2009, there did not appear to be any changes to regulation of the dairy sector (Kaitibie et al. 2009), with the Kenyan dairy policy document and bill having been in a parliamentary process for more than a decade.

Beyond 2009: formalization becomes a key policy objective

The positive attitude of Kenya Dairy Board officials to informal traders appears to have waned, without appropriate legal change to support and sustain it, as demonstrated by a variety of dairy plans and proposed policies which emphasize

formalization. It is unclear the reason for the change in attitudes, but it is important to acknowledge the vested interests that exist in the dairy sector linking to the highest levels of government (Forbes 2015).

The government's emphasis on formalization is evidenced by a number of national policies and plans, including the Big Four Agenda which has four priority areas: food security, affordable housing, manufacturing and universal health coverage (Government of Kenya undated). Increasing production of pasteurized milk is intended to contribute to the delivery of the food security and manufacturing parts of the agenda.

The 'new' Dairy Master Plan was completed and launched in 2012 to guide the development of the industry for the next 20 years to realize Kenya's Vision 2030. A master plan is a strategic policy document that indicates the general framework for planning the development of a sector, sub-sector or a region, giving direction for positive changes, interventions, policies, programs and projects (MoALF undated a). The plan describes a move to all milk being pasteurized: 'transformation of this informal milk marketing system to formal processing systems is a development objective in the Dairy Master Plan 2010–2030 and Vision 2030 as a strategy to meeting the growing urban demand while creating jobs, incomes and public revenues.' (MoALF undated a, p. 11). The plan aims to increase the percentage of milk marketed through formal channels and shift to formal, 'modern' agriculture. The plan also mentions the use of training and certification schemes to enhance milk quality and efficiency of value chains.

The Dairy Development Policy of 2013 recognizes that a major proportion of milk is marketed in the informal sector, representing an appreciable employment opportunity, but raises concerns over its public health implications and states that formalization of the small enterprise sub-sector in the dairy sector will be pursued. Measures include development and adoption of low-cost technology for small-scale dairy investors; investment in training programs on safe milk handling; linkages with dairy industry stakeholders to improve the standards of milk processing in the informal sector; instituting public awareness campaigns on the dangers of drinking unprocessed whole milk and giving informal milk traders incentives for milk handling; and setting up of a milk dealer certification system (MoALF 2013). Other notable points include milk producers and transporters to use aluminium cans, a push for processors to establish quality-sensitive pricing mechanisms (which has not yet happened, other than through a few donor-supported pilot projects or by small premium processors) and enhanced testing.

There are a number of licences that intermediaries and vendors must obtain in Kenya to operate within the confines of the law. In Kenya, for example, all actors who process, manufacture, prepare or treat milk for sale, and distributors (who buy for resale) must obtain a licence from the Kenya Dairy Board. Licensees pay a fee and a cess on the volumes of milk that they process or market. In addition to Kenya Dairy Board licences, vendors must obtain licences from the Public Health Office and medical permits. These licences verify the safety of premises and food handling and the health of personnel working on the premises. A county-level business permit ('annual single business permit'), the cost of which varies depending on the county, is also required. An additional Kenya Bureau of Standards licence is required if the business engages in value addition. Transporters of milk also have to obtain an additional licence (milk movement permit) from the Kenya Dairy Board to operate as distributors. Licensing requirements are therefore numerous, as are the costs involved, both direct and indirect (for example, time and effort taken to apply and efforts needed to meet the standards required for some licences). This may in part explain why, relative to the formal sector and relative to the volumes of milk intake, licensing levels are low among traders, intermediaries and producers (Muriuki 2011).

The Food, Drugs and Chemical Substances Act 2013 (Cap 254, Part XI on Milk Products) specifies the required standards of whole milk and pasteurized milk. The standards specified for whole, raw milk are exceedingly brief, without any reference to coliform counts. This implies an assumption that pasteurization will take place (as only then does it refer to coliform counts). It also specifies a number of requirements for premises selling, preparing, packaging, storing or displaying food for sale, for example, the need for a food hygiene licence.

The Public Health Act 2012 is perhaps the most widely used regulation in governing the informal sector. The most relevant excerpt from the Act which is used by key government regulators to support the argument that trade in raw milk is illegal centres on the safety of milk for the public: 'Certain milk not to be sold. No dairyman, and no purveyor of milk, shall sell or prepare, expose, deposit, convey, deliver or mix with any other milk, or permit to be prepared, exposed,

deposited, conveyed or delivered or mixed with any other milk for sale, milk — (a) which has been or is likely to have been contaminated or exposed to any infection or is in a condition likely or liable to prove unwholesome or injurious or dangerous to the health of man' (Public Health Act, Kenya, Cap 242, Section 134, p. 203). The Kenya Dairy Board's control over licensing and its role as regulator of the sector means that in practice, trade in raw milk is de facto illegal, despite the fact that the Act does not mention a specific requirement of pasteurization.

The most recently proposed Dairy Industry Regulations of 2020 signal a strong intention by the relevant authorities to make the sale and consumption of raw or boiled milk explicitly illegal, with few concrete plans for measures to allow for, or facilitate, value chain players to gradually move towards meeting the regulations. The text in the later drafts of the regulations is arguably less explicit about this ban than in earlier drafts, however. An earlier draft included a reference to 'prohibition of sale of raw milk' and has likely been softened due to public outcry. The latest (as of May 2020) drafts of the regulations state that (under Part II, Safety of Dairy Produce) (1) a person shall not trade in, sell or otherwise offer for sale any dairy produce which is not compliant with the relevant Kenya standard; (2) a person shall, for the purpose of destroying or deactivating microorganisms in any dairy produce, only process or manipulate the produce through (a) pasteurization; (b) aseptic processing; (c) retort-sterilization and (d) refrigeration after pasteurization. The proposed regulations specify further that 'a milk bar shall ensure that the product meets the set safety and quality standards by only selling pasteurized dairy produce.' Dukas (small shops) or mobile vendors are glaringly absent from the regulations, despite these constituting a significant majority of retail outlets that trade in milk in Nairobi (and likely other counties). The regulations state that any person who violates any of the provisions of this part shall be liable, on conviction, to a fine of 10,000 Kenya shillings (approximately 100 United States dollars [USD]) and/or custodial sentences for non-compliance.

In general, Kenya's approach to governing the informal market has been inconsistent. At times the government has appeared to willingly turn a blind eye to informal trade or has simply lacked the institutional capacity to enforce regulations (such as a lack of financial capacity to obtain the equipment needed to make regular checks of milk being sold in the market). At other times it has engaged in more progressive policy approaches (see later section on training and certification scheme) in the informal sector, as a result of new evidence (produced by non-government organizations) and changing government priorities. However, there are suggestions that the Kenya Dairy Board is now narrowing its remit and focus somewhat, with a greater focus on upholding safety and quality standards of milk, ensuring compliance and enforcement of standards and moving away from training of milk vendors. This 'tougher' approach is demonstrated by the Kenya Dairy Board shutting down automated milk-vending machines on the grounds of safety concerns. This is an important context to bear in mind when considering the potential for scaling and sustaining more inclusive approaches to formalization, such as the training and certification approach which showed potential for success several years ago.

5.2 Tanzania's dairy policy framework: past to present

1970s to 1990s: From state control to liberalization

Dairy farming in Tanzania emerged from a few settlers who started in the highlands around Arusha and Iringa in the period between the First and Second World Wars (Nell et al. 2014). From 1967, Tanzania adopted the Policy of Socialism and Self Reliance, which involved the establishment of parastatal companies for the livestock sector to increase production and catalyse development. The first dairy development plan was designed in the early 1970s (when the dairy sub-sector was recognized as one of the government's priorities) and implemented through a World Bank credit for the development of large-scale parastatal dairy farms, large-scale dairy plants and communal dairy units in the villages (World Bank 1985).

From 1982, the emphasis switched to smallholder dairy development supported by donors (Kurwijila and Boki 2003), prompted by the underperformance of parastatal dairy enterprises (due to management problems), and because smallholder systems proved to be more efficient and offer greater potential for reducing poverty. This coincided with economic reforms which included government withdrawal from performing production, marketing and processing and the liberalization of markets.

In the period 1985–95, most of the parastatal companies were privatized and the policy of a fixed milk price was abandoned. As a result of government reforms, many individuals and agencies joined the industry as milk producers, processors, marketing agents and facilitating agencies performing various functions such as promotion of improved dairy breeds, milk processing and marketing but in the absence of proper regulation. Similarly, to Kenya, this is when the informal sector was able to flourish. The government enacted a Dairy Industry Act No. 8 of 2004 (Njombe et al. 2011). Up to 1990, almost all processing capacity was in the hands of the Tanzania Dairy Limited, one of the parastatal companies of the government-owned Livestock Development Authority. These were privatized in the 1990s and in response, new processors (local and foreign) seized an opportunity to set up small- to medium-sized processing facilities. Many of these were unable to operate profitably due to low milk prices for farmers, increases of milk sales on the informal market and the decline in milk powder donations and commercial imports for reconstitution of milk on which quite a few factories depended (Alexopoulou 2011). As a result, many closed. This trend continued and, by 2009, the processing industry had shrunk by more than 80% (RLDC 2009 in Alexopoulou 2011).

2000s: Emergence of the Tanzania Dairy Board and emphasis on increasing productivity of smallholder farmers

The Tanzania Dairy Board was established in 2005 (under the Dairy Industry Act No. 8 of 2004) as a response to a need to regulate and coordinate the development of the dairy industry; however, a vacuum in the coordination and regulation of the dairy industry remained (ILRI and GAIN unpublished manuscript).

Tanzanian dairy policy is embedded within the National Livestock Policy of 2006. This policy has maintained an emphasis on smallholder farmers, partly because of the considerable potential of smallholder dairying to reduce poverty (Ministry of Livestock and Fisheries Development in Twine and Katjiuongua 2015). It seeks to improve the welfare of milk producers, consumers and other agents in the supply chain. The National Livestock Policy is implemented through several strategies and initiatives, including the Tanzanian Livestock Modernization Initiative of 2010, the Livestock Sector Development Program of 2011 and the Agricultural Development Strategy of 2017. The Agricultural Development Strategy was launched in October 2017 and is now in its second phase; it is the overarching strategy for national livestock policies. Notably, these policies emphasize the need to improve the genetic potential of the dairy herd; strengthen technical support services and promote use of appropriate technologies; promote investments in production, processing and marketing; and promote dairy organizations and strengthen the Tanzania Dairy Board (Nell et al. 2014).

Present: Emphasis on formalization through pasteurization, though trade in raw milk is legal and the government's approach is one of pragmatism

In general, the government appears to recognize the potential of the dairy sector to improve the living standards of people and contribute towards reduction of poverty through improved nutrition, arising from consumption of milk and incomes raised from sale of milk and milk products (Njombe et al. 2011). Its priorities appear to be an expansion of milk processing capacity and increasing the range of dairy products produced in Tanzania, reduction in importation of ultra-heat treated milk and dairy products, substantial reduction in the annual import bill spent on such products and boosting of local production (Ministry of Livestock and Fisheries in Njombe et al. 2011). Formalization is also a priority, which we can assume is linked to the expansion of processing capacity, though this is not stated explicitly. The Ministry of Livestock and Fisheries talks of strengthening stakeholder organizations through registration and formalization of informal dairy stakeholders; information, education and communication campaigns; and training and skills enhancement (Ministry of Livestock and Fisheries in Njombe et al. 2011).

The Tanzania Livestock Master Plan of 2017 (Michael et al. 2018), which bears no regulatory weight but involves the consensus of key institutions and experts in the sector, prioritizes two areas relevant to the dairy sector: (1) research capacities on breed improvement, feed, health, marketing and value chain and dairy extension services and (2) marketing and processing to support the construction of ultra-heat treated and powder milk processing plants; establishment of dairy

cooperatives in high-potential areas through provision of training; establishment of milk collection/chilling centres and strengthening capacity of the dairy board milk quality and safety control laboratory.

Most relevant to the informal sector is the plan's promotion of the production and consumption of processed milk and dairy products, the introduction of quality-based standards and pricing to encourage increases in the supply of high-quality milk, strengthening of the enforcement of quality standards for milk and milk products and, most notably, the formalization of milk trade through the training and licensing of milk traders (see Section 6.2. which describes the intervention). Hence, while the policy and investment environment may seek to encourage the production of processed milk (in direct competition with the informal sector), it does not seek to eradicate the informal sector directly, seeking instead to inclusively formalize the informal sector through training and certification (Mbwambo et al. 2017).

The sale of raw milk is legal in Tanzania, though a number of registration and licensing requirements and safety standards exist. For example, the Tanzania Food, Drugs and Cosmetics Act 2003 (Cap 219) prohibits the sale of any milk from a cow that has had tuberculosis or is recovering from tuberculosis, mastitis or any other zoonotic disease (TFDA 2003, p. 38). Section 10 of the Dairy Industry Regulations states that 'no person shall sell or distribute to the public any milk for human consumption unless such milk has been pasteurized, sterilized or subjected to such treatment to render it safe for human consumption'. It is unclear whether the government considers boiling to be a treatment which would render milk safe for human consumption (and there is no evidence to suggest the government is interpreting this policy in a way that allows for criminalization of informal milk traders) but if not, the regulations are likely to be aspirational in light of the low levels of processing within the country.

To operate within the confines of the law, milk producers, collectors, traders, transporters, processors, and traders must register with the Tanzania Dairy Board to obtain a registration certificate (which is valid for five years upon payment of the registration fee and subsequent payment of an annual retention fee of 10% of the registration fee). The conditions attached to registration differ according to the value chain actor, but traders must possess suitable milk handling equipment, adhere to hygienic milk handling and possess basic platform milk testing facilities (Dairy Industry Act 2004 and Dairy Industry Regulations 2007).

Before milk vendors can be registered with the Tanzania Dairy Board, they must undergo a medical examination. In addition to registration with the board, vendors must obtain other licences to operate. For example, transporters must obtain a milk transport permit from the Ministry of Livestock and Fisheries Development, the Ministry of Health and local government authorities (Charles Urassa, personal communication). Additionally, small-scale dairy traders must obtain a general trading licence issued by the local government (D. Mlay, personal communication).

In addition, the regulations specify that in order to operate legally (and obtain their registration certificates), dairy premises dealing with raw milk need to be kept away from environmentally polluted areas or industrial activities that could pollute milk; be of suitable design, layout and construction to facilitate easy maintenance and sanitary milk production; have sufficient space for placement and storage of sanitary operations; have adequate areas to ensure no contamination with undesirable microorganisms; have adequate lighting and have adequate ventilation.

To support enforcement of the Act and regulations above, the Tanzania Dairy Board (under the Duties and Powers of Inspectors and Analysts Regulations of 2007 and under the Dairy Industry Act of 2004) is able to appoint inspectors and analysts. Inspectors carry out functions and exercise powers as directed by the Tanzania Dairy Board (in brief, these are as follows: enter dairy premises without notice; require the owner of the facility or premises to observe and maintain established standards of the dairy premises; suspend their operations if not compliant; seize milk unfit for human consumption; detain vehicles carrying unsafe milk; close premises and begin legal proceedings). Meanwhile, an analyst shall take samples of milk for testing, test the milk and provide results to the registrar. In reality, enforcement is limited. Challenges include a lack of capacity within government (officials lack proper training and there are insufficient government employees to carry out the relevant duties), the sheer size of the market and the geography of the country. The Tanzania Dairy Board also lacks capacity to carry out training or capacity building measures as intended. Draconian measures against the informal sector have not yet materialized. In comparison to Kenya, penalties for traders trading in raw milk without

the requisite licences are not as severe. However, formal sector players are calling for a review of policy to encourage the government to be stricter on informal milk vendors.

5.3 Assam: Operation Flood and emphasis on the cooperatives

While informal markets account for the overwhelming majority of milk trade in India, the focus of government policy has been largely to promote and support dairy cooperatives, which are part of the 'organized' (i.e. formal) dairy sector. Rural development is a crucial political issue for the government; the emphasis on cooperatives is seen as an essential part of providing market access for millions of small-scale producers to enable their subsistence. Because the sector is dominated by small-scale producers, the main aim of dairy policy for the last half-century has been to increase productivity through breeding and improved feeding (Landes et al. 2017). Even with significant moves towards liberalization and increased government support, the commercial dairy industry plays a relatively small role in the sector.

The core of India's dairy policy post independence was the so-called Operation Flood. In the 1960s, India was a net importer of milk, despite having the world's largest cattle herd. Making the country self-sufficient was seen as a national priority, both in terms of food self-sufficiency and of rural development. To meet this critical goal of import substitution, the National Dairy Development Board (NDDB) replicated on a national scale a model that had been successful in the state of Gujarat. This so-called Anand Model was based on the collection of milk from tens of thousands of village-level producers through cooperatives, aggregating supply into district-level unions which also did processing (Babcock Institute 2006). The three-tiered system (village—district—state) provided not only the physical infrastructure for milk collection and processing, but complementary programs in cattle breeding and feeding, as well as farmers' capacity building, thus providing better integration of production, processing and marketing (Gautam et al. 2010). Applied in three stages from 1970 to 1996, Operation Flood successfully turned India from a net importer to a net exporter of milk. Milk production rose from about 20 million tonnes in 1970 to nearly 80 million tonnes in the early 2000s (Gautam et al. 2010).

After Operation Flood, dairy policy has been formulated by the Perspective Plan (1996–2010) and the National Dairy Plan (2011–19). In the Perspective Plan, the NDDB focused on further strengthening cooperatives by supporting business development, production, quality control and capacity building and improving information flows (Landes et al. 2017). The current National Dairy Plan has three components: (1) increasing productivity through scientific breeding and nutrition, (2) strengthening village-based milk production systems and (3) project management and learning (NDDB 2011). The bulk of the funding has gone to the first component, particularly to increase the proportion of the herd that is genetically improved and to increase the production and use of fodder. The National Dairy Plan does not explicitly consider informal dairy trade; instead, through the third component, it aims to expand and strengthen dairy cooperatives so that they retain at least half of the market share of the organized (formal) sector (NDDB 2011). The current policy focuses on the main milk-producing states, not including Assam.

The last few years have seen a more deliberate attempt at market liberalization, including greater openness to the introduction of industrial processors and supermarkets. But policy has generally tended to protect cooperatives via licensing systems such as the Milk and Milk Products Order (Sharma and Gulati 2003). The order of 1992, which was quite restrictive, aimed to protect the cooperatives by requiring new private milk processors to develop their own milksheds (Birtal et al. 2017). A 2002 revision of the order was more flexible, lifting the zonal restrictions on milk procurement and allowing for the construction of new private processing plants (Sharma and Gulati 2003). According to Gautam et al. (2010), the policy focus on cooperatives presents a paradox: while the cooperative model has been by all measures successful in integrating small-scale producers to markets, it still requires heavy support from the state, and it has plateaued at about 20% of the total market share for dairy in India.

The health and safety standards for milk production, processing and commercialization are governed by the Food Safety and Standards Act 2006 and implemented by the Food Safety and Standards Authority of India. In 2011, the authority issued notifications regulating specific aspects such as food business licensing and registration, packaging and labelling, prohibitions

and restrictions on sale, and food standards and additives. A 2017 notification from the authority further updated the rules on prohibitions and standards. All of these regulations have a bearing on informal dairy trade, though they distinguish between 'petty food manufacturers', which make up most of the informal sector (processors, retailers or street vendors with annual turnover below INR 12 million [approximately USD 16,000] and, in the case of dairy, who procure or handle up to 500 litres of milk per day) and larger businesses. For example, smaller food businesses are exempt from licensing, though they do need to be registered with local authorities by submitting a simple application form (which can be done online) and paying a fee of INR 100 (approximately USD 1.4). Petty businesses must adhere to basic sanitary and hygienic requirements, including cleanliness and access to water, and are subject to inspection.

The trade of raw milk is not restricted in India, but there are restrictions on adding water to milk (a common concern expressed by consumers, as noted above), as well as specifications for the minimum milk and fat content of cream and other traditional dairy products such as ghee.

5.4 Summary: Government attitudes to the informal sector are variable, as are plans for formalization

Despite the relatively similar milk markets in all three countries, the policy approaches taken have varied significantly. There are varying degrees of emphasis on formalization across the three countries, and differing pathways to achieve it.

Kenya's approach to the informal sector has been very variable in recent years (ranging from ignore, to harass, to tolerate, and to control). However, the inability of vendors selling raw milk to obtain licences from the Kenya Dairy Board shows a de facto ban on trade in raw milk is in place, since operating without licences is illegal and opens up opportunities for harassment of vendors by authorities, confiscation of milk and containers, arrest, bribes and loss of business. While the government appears, in theory, via a number of other policy documents and plans, to be supportive of more inclusive approaches to formalization, such as training and certification, there is a simultaneous push for all milk traded to be pasteurized and encouraging supply of milk to the industrial processed sector, and a greater focus on enforcing standards related to milk safety. Indeed, the more recently proposed Dairy Industry Regulations of 2020 show a very strong position against the trade in raw milk. How, and whether, these policy positions translate to either future constraints or enablers of more inclusive policy approaches remains to be seen.

Tanzania's government approach to the informal sector has been largely to tolerate it (partly in recognition of its dominance and significance as a voter base) with a longer term view to formalize, though questions remain over capacity to deliver on this plan for formalization. Plans for formalization appear to be inclusive, with an emphasis on training and certification, but significant investments are required to meet those plans.

India's policy approach has been largely tolerant of, if oblivious to, the informal dairy sector, what Alonso et al. (2016) call 'benign neglect'. Even though the informal sector is by far the largest one, the focus of policy has been on promoting dairy cooperatives in the 'organized' (formal) sector and restricting the entrance of private, commercial dairy. Several rules and regulations, including on safety standards and business licensing, apply to informal milk traders, but these are rather accepting of the presence of small-scale trade. Whereas raw milk trading is not restricted, on paper, all milk and dairy vendors must comply with certain quality and safety standards, and it seems unlikely that they all do.

6. Training and certification: an innovation for more inclusive policy towards the informal dairy sector

The previous section shows that government policies regarding the informal dairy sector in Kenya, Tanzania and Assam range from deliberate confrontation/control, to neglect, to toleration. None of the policies described above appears to create a positive, constructive approach to a sector that employs and provides a key source of nutrition for many of the poorest people.

This section describes a different type of policy approach to the informal dairy sector: one that recognizes its importance, but that is also conscious of the potential hazards of poor milk safety. The three cases below describe attempts to adapt policymaking to the reality on the ground, and thus increase the likelihood of compliance on the part of vendors.

The interventions presented here have two common features: a training component, whereby traders improve their knowledge and skills to handle milk safely, and a certification component, which accredits them as being compliant with basic food safety regulations. Access to training and certification for dairy actors operating in the informal dairy value chain was enabled by a program, funded partially by donors, and recognized by government authorities. Participation in the scheme appears to have helped: improve safety standards in some cases; give participants legitimacy in the face of regulators and; in the case of Kenya, reduce harassment and conflict between the state and the vendors. In what follows, we describe the interventions in our three focus countries.

6.1 Kenya

The training and certification scheme in Kenya emerged from the SDP which was initiated in 1997 as a collaboration of the Ministry of Livestock and Fisheries Development, the Kenya Agricultural Research Institute and the International Livestock Research Institute with funding from the United Kingdom Department for International Development. The project was an integrated research and development initiative aimed at supporting the sustainable development of Kenya's smallholder dairy sub-sector. It ended in 2005 (Leksmono et al. 2006).

After a minor revision of Kenya's dairy policy in 2004 and a more progressive attitude to the informal sector, attributed to the research and advocacy work of the SDP, the Kenya Dairy Board offered small-scale milk vendors a facilitated route to licensing through its training and certification scheme. The Kenya Dairy Board worked with SITE, a local nongovernmental organization, to launch the scheme at a number of pilot sites in 2006 with support from the United Kingdom Department for International Development. A set of training materials and guidelines was developed and tested in three milk producing areas. In each area, up to 20 small-scale milk vendors were encouraged to form groups licensed by the Kenya Dairy Board, who along with Ministry of Health officers were also involved in the training. The SDP also developed a simple technology for milk transport, namely non-spilling, hygienic and easy-clean milk containers at affordable prices.

The training and certification scheme aimed for registration and formalization of informal businesses, alongside upgrading of traders' milk handling practices. Accredited business development service providers offered training in hygienic milk handling, quality control and entrepreneurship. The training was to be paid for by the traders themselves in order to be sustainable. The training was designed to be short to avoid loss of earnings and realistic in terms of the practices vendors are actually able to change. The training provided guidance on how improvements in handling and hygiene can grow traders' businesses and reduce financial losses. Financial incentives existed for training providers and traders to engage; trainees gained a certificate that facilitated access to a Kenya Dairy Board licence so they could operate legally. Trainers were paid for the services they offered, and were accredited by the Kenya Dairy Board, offering them a competitive advantage relative to other service providers in the country (Blackmore et al. 2015). Support to launch the project was provided by donors and the scheme was to be rolled out by the Kenya Dairy Board using business development service providers and financed by traders themselves.

Decisions to train informal sector actors are based on the assumptions that (1) many workers are well intentioned but ill-informed and will change some of their behaviours if given information and instruction, (2) some of the behaviours promoted will also have other obvious benefits (such as less food spoilage), which can encourage adoption and (3) new institutions such as branding or licensing will act as an incentive for behaviour change (Grace 2015).

Evidence on the impact of training on the safety of milk among all value chain players is mixed; some studies show improvements in milk safety by vendors as a result of training in milk handling (and support for use of different containers) and quality control (for example, testing milk before purchase). For example, Omore et al. (2005) found—during a pilot study in Murang'a, Nakuru and Thika districts to test the potential gains that could be achieved through training and certification of informal milk traders—that the proportion of unacceptable milk samples reduced significantly after training, particularly for those traders who used plastic containers previously. This led the researchers to conclude that 'training of informal sector milk traders combined with the use of more hygienic metal containers will significantly reduce the health risks associated with raw milk of poor bacteriological quality, and in so doing, provide consumers with a higher degree of product quality assurance' (Omore et al. 2005, pp. 36–37). Small-scale milk vendors also saw increased demand from consumers when using new containers (SDP 2004c). Traders' businesses were found to be more profitable (SDP 2004c) and there was an increase in the number of small-scale milk vendors under licence. Traders who participated in the training were satisfied with the scheme, and untrained trainers also demonstrated demand for participation in the scheme.

Respondents said that the benefits of participating in the scheme included reduced wastage/spoilage, improved incomes, better business, lower transaction costs and higher quality milk. Traders were better able to judge the quality of milk from suppliers, leading to less wastage and spoilage, and they reported improved incomes from commercializing value-added products such as yoghurt. Transaction costs were also reduced by now operating legally (Blackmore et al. 2015). Recent research conducted in Eldoret and Kisumu in Kenya confirm all these findings (Alonso et al. 2018). Traders were less likely to be harassed by authorities after participating in the scheme and therefore were less likely to feel the need to pay bribes to extract themselves from a potential arrest situation. Nearly all licensed small-scale milk vendors who had been in operation before the policy change reported a change in the behaviour of regulators towards them since licensing, noting that they were now allowed to operate as long as they complied significantly with all the requirements (Kaitibie et al. 2010).

However, Alonso et al. (2018) did not find any differences in the quality of milk between trained and untrained traders in their survey of dairy vendors in Kenya conducted two years after the training. This may have been due to the small sample size used in their survey, making it difficult to detect differences between the two groups. Or it may suggest that effects of the training on milk quality are hard to sustain over time, given that trainings had been completed at least two years before the survey. Given that the quality of the delivery of the training was not formally monitored, it is also not possible to exclude that differences in the quality of delivery may explain the different impacts of milk quality observed between studies.

Impact analysis (published in 2010) of the policy change in favour of licensing of informal milk traders that preceded this scheme showed significant benefits to the economy amounting to USD230 million for Kenyan milk producers, vendors and consumers over the preceding 10 years (USD33 million per year). Reduced vendor margins were found as a result of the policy change in Nairobi (prices for raw milk decreased because of increased supply to the market; licensed small-scale

milk vendors were able to operate freely in an environment with high demand for raw milk). However, because market quantities increased (and small-scale milk vendors derive profits from quick, relatively high-volume turnovers), welfare gains were made by small-scale milk vendors despite lower margins (Kaitibie et al. 2009 in Cheronon et al. 2012).

As of mid-2010, the scheme had enrolled over 400 business development service providers across the country, nearly 200 of whom were inducted and accredited in collaboration with the East Africa Dairy Development project in Central and Rift Valley regions (Kaitibie et al. 2009 in Cheronon et al. 2012).

However, the reach and uptake of the scheme has been less than optimal, due chiefly to challenges around supply and accessibility of training and cost (Blackmore et al. 2015). In some cases, there has been a significant lag between training and licensing. For example, in a 2007 survey carried out by Kaitibie et al. (2010) in SDP pilot areas, approximately 85% of the respondents reported that they had been trained on milk handling and quality control methods but only half of them reported applying for and receiving operating licences immediately following training, implying a lag between training and licensing.

Indeed, recent evidence suggests that the training and certification scheme has ceased to operate due to a breakdown of the link between training, certification and licensing which was a key incentive for traders to engage in the scheme. The certificate is no longer required for vendors to obtain a licence (a decision made by the Kenya Dairy Board without justification or prior consultation with previous project partners, but possibly due to greater scope to make money from licensing without certification). Without this incentive, demand for training from Kenya Dairy Board-accredited business development service providers decreased. The changing policy context, with a de facto ban on raw milk trade now in place, has placed all licences out of the reach of informal traders regardless of whether vendors have training certificates or not.

6.2 Tanzania

The *More Milk in Tanzania* project, funded by Irish Aid (July 2013 to June 2015), was built on earlier efforts in 2006 by the Tanzania Dairy Board and a local nongovernmental organization, Austroproject Association, to train and certify traders in Dar es Salaam and Mwanza. The project involved the piloting of a training, certification and marketing scheme by the Tanzania Dairy Board (in partnership with ILRI) in 30 villages and four districts in Morogoro and Tanga (Mlay 2015). It involved training of 15 business development service providers selected through a competitive tender process, training of government dairy inspectors and training of 69 to 100 traders (Johnson et al. 2015; Mlay 2015) (no accurate counts of the number of traders involved in the pilot phase have been obtained). Traders were meant to pay for most of the training themselves.

Experts suggest that based on initial pilots, the scheme could be successfully scaled up and out. However, impacts have not yet been measured and a number of challenges have been identified. For example, the business development service providers have not been persuasive enough in their attempts to recruit milk traders for training. In addition, enforcement of the Dairy Industry Act is weak; there are too few inspectors and training to build the necessary skills among them is lacking, so this reduces the incentives for traders to engage in training. Training has been slow to take off, contributing to unaffordable fees because of loss in economies of scale. Informal traders have not been adequately sensitized on the importance of training in improving the profits of their businesses (Mlay 2015). More recently (mid-2018), the training ground to a halt due to the termination of payment of cess fees which helped to fund the scheme.

6.3 Assam

In Assam, informal milk vendors are not subject to harassment or persecution, as the laws are rather tolerant of informal milk trading and enforcement is weak. The motivation for the training and certification program was a desire by the state government, particularly the Directorate for Dairy Development, to improve hygiene standards in milk production and trade. Starting in 2009, in partnership with ILRI, a program was established to develop training material and provide practical skills to dairy traders. The aim was to improve the quality and safety of the products offered by informal vendors,

especially in light of greater competition from other actors (ILRI 2014). The program was rolled out in the district of Kamrup with 221 traders, and with a further 476 producers in 2013. Training was free and open to all volunteers, but it required a time commitment of five days for participants (Lindahl et al. 2018).

Since the responsibility of ensuring milk quality and safety and regulating milk trade falls under different government agencies, a Joint Coordination and Monitoring Committee (JCMC) was established by the Dairy Development Department and ILRI, bringing together other relevant government actors to improve coordination and collective action. As part of this process, a monitoring system was established at two levels: (1) peer monitoring by trained vendors and producers and (2) project monitoring by representatives of the JCMC to increase adoption of good practices taught in the training. For peer monitoring, a Hygienic Milk Monitoring Committee was established among the trained traders and producers in each area to monitor the extent to which better practices were being implemented (Lapar et al. 2014). The successful adopters were issued a training certificate exclusively under the banner of the JCMC. Training and monitoring of the program continued into 2014 and 2015, although there have been some challenges in recruiting and retaining participants, as well as funding constraints (ILRI 2014). A follow-up program, funded in part by the World Bank, has been in development since 2016 and aims to extend the coverage to other districts in Assam and include other value chain actors such as processors and sweet-makers.

An assessment of the effects of the training, monitoring and certification scheme in Assam carried out in 2014 found that training and certification of milk value chain actors on milk hygiene and quality led to improved milk handling practices by milk vendors and producers, as well as increased incidence of reported customer satisfaction with milk quality (Lapar et al. 2014). Further evaluations have shown that knowledge among farmers of hazards in milk, and how these could be transmitted, can be improved through training (Lindahl et al. 2018). Cows from trained farmers were found to have lower incidence of clinical mastitis (Melin 2015). Trained farmers generally had a better knowledge about hazards in milk and how diseases could be transmitted than non-trained farmers, and trained farmers were more aware than non-trained farmers of the harmful effects of aflatoxins to humans. However, this did not necessarily translate to improved outcomes. Milk from cows belonging to trained farmers had higher aflatoxin levels than milk from cows owned by untrained farmers, which the researchers attributed to a higher reliance on composite feeds among trained farmers compared to their untrained counterparts. However, training did see a difference in terms of milk production (trained farmers saw a 9.5% increase in milk production after the training, whereas untrained farmers saw a 6% decrease), implying that improved knowledge and awareness can lead to different practices but the pathways of change are not always clear or guaranteed, and incentives are important. The assessment of the training, monitoring and certification scheme in Assam suggests that 'a training intervention can have a medium-term impact, while the issue of food safety is more complex and cannot be assumed to automatically follow from even successful training' (Lindahl et al. 2018, p. 9).

7. Conclusions and implications for scale and sustainability

Our review has shown that current policy approaches are poorly equipped to address the persistent reality of informal dairy markets. Informal trade of milk and dairy products in Kenya, Tanzania and Assam shows no signs of abating, and yet policy offers either unrealistic (and unachievable) standards or neglect. Neither of these options offers a path to dealing constructively with a sector that offers livelihoods and nutrition for millions, but that also suffers from public health issues. Inappropriate policies may in fact increase the cost of milk to the disadvantage of consumers and may, paradoxically, decrease milk safety (Grace et al. 2007).

Training and certification schemes such as the ones described for Kenya, Tanzania and Assam offer a glimpse of a possible policy alternative that reconciles the needs of governments for better oversight, of vendors for better livelihoods and freedom from harassment, and of consumers for affordability and taste and, if well implemented, is grounded on positive incentives, with attention to safety and sustainability. Training and certification schemes bring policy much closer to the reality of the people who work in and benefit from informal markets. In theory, such schemes could deliver improvements in safety and business revenues, with multiplier effects for the rest of the economy. Training and certification could also improve government oversight, as it would bring more traders under regulatory control. Research suggests that legality increases investments by informal business owners by increasing their perceptions of financial security (Grace et al. 2007). Governments could also benefit from improved revenue by having more licensed traders (Baiya and Kithinji 2010), and politicians could gain politically from supporting informal workers and their customers.

Our review of the evidence shows some of the promises of training and certification schemes, but highlights some of their challenges. Lacking systematic evaluations of the experiences in Kenya, Tanzania and Assam, the information we reviewed shows some improvements for businesses in terms of skills and quality control, but the evidence is mixed with regard to health and safety practices and income for vendors. Moreover, the schemes that we reviewed, particularly in Kenya and Tanzania, appear to have waned after some time, suggesting difficulties to move from pilots to interventions at scale. A more in-depth assessment of why these training and certification schemes struggle to scale and be sustained, and suggestions on how to improve them, is the object of a forthcoming study based on new empirical research. Here, we outline the opportunities and constraints for scaling and sustaining these schemes based on the evidence from the reviewed literature.

Opportunities and enablers

Win-wins and joint efforts. Our review suggests that training and certification schemes can provide win-win situations when they align the interests of different stakeholders. The case of Kenya shows that when the approach of policymakers towards informal dairy was more positive, better outcomes were delivered for vendors and the economy was improved more widely. Furthermore, vendors felt more legitimate in the face of the government by attending the training courses. The case of Assam, where vendors and government established a joint committee to oversee progress in the scheme, suggests that the policy approach need not be a zero-sum game (i.e. when one party's gain is another's loss) and that joining forces is possible.

Co-funding. From the point of view of vendors, investing time and money in training and certification is costly, and the perceived returns (as we discuss below) may not make this investment worthwhile. When the perceived and realized benefits by vendors of participating in certification schemes were high, they were willing to pay for it, but as these benefits seemed to decrease so too did their participation in the schemes. Where the private sector is unable or unwilling to provide training for vendors, co-funding from government and other sources is a crucial means to engage cost-sensitive traders. The case of Tanzania shows this clearly, as training and certification ended once the funds from the cess fees stopped supporting the scheme. Funding sources can be sustainable if obtained from sector-specific taxes, licensing fees etc. that are reinvested into the sector to improve performance (for example, milk safety and quality) (see Molenaar et al. [2015]). This can allow a scheme such as training and certification to be independent of sporadic corporate social responsibility and donor funding (SFL 2015). In other cases, such as India, the government is willing to invest in vocational training.

Challenges and constraints

Unstable policy environment. Our review suggests that there is a gradient of tolerance towards informal dairy, with Kenya currently at the more repressive end of the spectrum and Assam at the most tolerant, with Tanzania somewhere in between, leaning towards tolerance. Kenyan policy towards informal dairy has shifted significantly from periods of engaging constructively with the informal dairy sector to a clear bias towards pasteurized milk within a relatively short period, though with acceptance of the emergence of smaller-scale pasteurizers as a possible compromise. The political window of opportunity within which the original training and certification scheme was conceived seems to have passed during its implementation, creating uncertainty and removal of crucial government support in the form of licensing of those raw milk traders who had engaged in training and obtained the certificate, and not harassing licensed vendors. In Kenya, large private processors, often with political connections, have an interest in the government maintaining a hard-line approach towards informal vendors, as they see them as direct competition. Pressure from these processors could represent one of the greatest threats to the scheme's sustainability and long-term success.

Absence of policy or wider social drivers. We found no evidence of a major scandal or public health crisis derived from informal trade of milk in the three countries. The real health and safety issues that we describe in Section 4 are slowly simmering in the background rather than creating news headlines and are thus unlikely to galvanize public opinion around the issue. Consumers are, on the whole, broadly satisfied with what is on offer. Similarly, the issue of informal milk trade does not appear to be high enough on the policy agenda, particularly in Tanzania and Assam, so there is no strong urge for policymakers to act and to create the right incentives for vendors and other value chain players to engage in genuine efforts to upgrade health and safety practices. While donor support for these programs is strong, the rather weak demand for change from consumers and decision makers appears to be an important constraint to further investment in training and certification schemes.

Weak relationship between knowledge and practice. The evidence of the performance of training and certification schemes suggests that, while knowledge and capacities were improved, these do not always or necessarily translate into changes in practice by milk traders. The implementation of training and certification schemes in Kenya, Tanzania and Assam provides mixed support for the assumption that knowledge through training will result in observable changes in behaviour. For example, the assessment of the scheme in Assam found that trained farmers had better knowledge about milk-borne health hazards and how to prevent them, but this did not result in improved outcomes in terms of aflatoxin content in milk. However, the training did not cover aflatoxins and gave no information on how to reduce aflatoxin content. At the same time, the training emphasized higher use of concentrate feed to increase productivity and cattle consuming concentrate feed are associated with higher levels of aflatoxins in milk. Fortunately, this poses negligible risk to human health. At the same time, training appeared to have a noticeable effect on productivity. In sum, the pathways through which improved knowledge results in behaviour change are not straightforward, and addressing other contextual factors is important.

Poor balance between sticks and carrots. Our review suggests that the drivers vendors face for investing time and money in training and certification may not be sufficiently strong. This is particularly true in India and Tanzania, where there are no penalties ('sticks') for selling milk informally and thus there is less of a need for vendors to engage. The breakdown of the

link between certification and licensing by authorities in Kenya (which would have led to improved legitimacy of vendors and reduced harassment by authorities and therefore reduced business costs) is likely to have significantly weakened the incentives for traders to engage in the scheme. In addition, the link between training, certification and marketing may not be sufficiently valuable for traders. In Tanzania and Kenya, it is unclear whether the market will deliver any benefits to trained traders in terms of preferential purchases. Will consumers perceive the certified milk to be of a higher quality and therefore higher value and pay a premium for it? This is a key determinant of the sustainability of the scheme. Without the right incentive structure in place to support the scheme (both carrots and sticks), it is unlikely to be either scaled or sustained.

8. References

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