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Milk quality and safety in the informal sector in Assam, India: governance, perceptions, and practices

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ABSTRACT: This paper explores how the safety of milk and dairy products is understood and managed within the informal dairy sector of Guwahati, the largest city in Assam, north-east India. The article contributes to a growing body of literature that questions negative assumptions about food safety in informal markets, and seeks to understand how access to safe and healthy food for all is, or can be, achieved in these markets. The study combines a literature review of the informal dairy sector in Assam and India with a field survey and key informant interviews. A survey of 113 producers, intermediaries, retailers, traditional processors and consumers, provides insights into how people think about the safety of milk, and the everyday practices they employ to mitigate food safety risks when trading and consuming dairy products. Our findings suggest that, in the absence of formal guarantees of quality and safety, consumers’ cultural practices and producers’ and traders’ knowledge likely reduce the risks of consuming raw milk. Despite the informal dairy sector receiving little direct government support in India, we found that at the state level, there has been some cooperation between government officials, small-scale producers and informal traders. We conclude that the absence of adverse relations between these groups, together with proactive attempts at collaboration, could inform other Indian states’ approaches to food safety governance, and are a positive foundation for future improvements to food safety in Assam’s dairy sector.

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Keywords: food safety; milk; dairy; informal sector; traditional markets; India; Assam

1. Introduction
India’s food system has undergone significant transformation in the last three decades. Urbanisation and rising incomes have contributed to major dietary changes, with per capita demand for staple grains decreasing and the consumption of animal-derived products—especially milk—and processed foods increasing (Pingali et al., 2019; Shetty, 2002; Tak et al., 2019). The structure of production, processing, trade, and retail has also changed significantly. The development of value chains in agriculture has promoted diversification and expanded the production of higher-value crops (Birthal et al., 2012). At the same time there has been a consolidation of processing and the emergence of modern retail, including the expansion of supermarkets and
their supply chains, all of which have been associated with economic liberalisation (Pingali et al., 2019; Reardon & Timmer, 2014).

This rapid modernisation of the Indian food system has brought new challenges and approaches to food safety. The growth in demand for perishable products such as fruits and vegetables, as well as the increased length and complexity of value chains, can increase the risk of food-borne disease and pesticide residues in food (Grace, 2015; Unnevehr, 2022). It has also been argued that, as incomes rise, consumers become more aware of food safety issues, and visual inspections of cleanliness are gradually replaced by more standardized guarantees (Ortega & Tschirley, 2017). In India, the increased attention to food safety has been driven both by the country’s greater participation in global markets, as well as by the demands of an increasingly wealthy and educated population (Umali-Deininger & Sur, 2007). The country’s policy framework has been updated in recent years to strengthen regulatory standards, institutions and enforcement, and the private sector has also invested in improving traceability across the supply chain, especially for exports (Dandage et al., 2017; Shukla et al., 2014). However, deploying and enforcing safety standards in the country’s largely informal (or “unorganised”) food sector is challenging.

India’s dairy sector—by far the world’s largest in terms of the number of cattle and volume of milk produced—illustrates the limits of this modernising trend in the country’s agri-food system and associated food safety approaches (FAO, 2021). Since the 1990s, demand for milk has grown steadily, at a rate of about 4% annually, while consumption of processed milk products has grown even faster; USDA estimates show around 60% of milk in India is processed into products like ghee, butter and curd (Landes et al., 2017). Increased consumption has been matched with overall rises in production, but productivity remains low, owing to the predominance of small-scale production, the limited use of specialized feed and the small share of genetically high-yielding cattle (Birthal et al., 2017; Kumar et al., 2013). Only about half of the milk produced is traded (the rest is consumed by producing households), and most of this (about 40% of overall production) circulates through traditional channels (Landes et al., 2017). These channels include millions of wholesalers, traditional processors and sweet-makers, liquid milk retailers and chaiwallahs (tea vendors) who make up the “unorganised” sector: small-scale economic activity that relies on family or casual labour, may not maintain regular accounts or comply with all relevant laws, and is largely unregulated (Second National Commission on Labour, 2002; Upadhyay & Ranjan, 2007). The formal milk sector, i.e. that involving pasteurisation and industrial processing, is comprised of state-sponsored cooperatives and private companies. Although the share of milk commercialised by the formal sector is small (about 15% of total production), modern processing capacity is increasing, and is expected to rise along with demand (Landes et al., 2017).

The rise in production and consumption of milk, and the fact that it is overwhelmingly traded and consumed in unpasteurised form, through informal channels, has prompted questions about its quality and safety. Because of its perishability, milk can be a source of pathogenic bacteria, including Salmonella spp., Brucella spp., Staphylococcus aureus and Escherichia coli; chemical hazards, such as aflatoxins, which are associated with impaired growth and liver disease; and pesticide residues (Chambers, 2005; Hoque & Mondal, 2019; Mekuria et al., 2020; Sushma, 2019). Several studies have shown that milk often does not conform with national safety standards due to adulteration with water, bacteriological contamination, and zoonotic disease (Landes et al., 2017; Lingathurai & Vellathurai, 2013; Smits & Kadri, 2005). Aflatoxin residues in milk were first measured by the FSSAI in 2018, and were found to be more prevalent in processed than raw milk (FSSAI, 2018).

In this paper we present findings from a study of the informal dairy sector in the Indian state of Assam, in order to examine how food safety is perceived, managed, and governed in an unevenly transforming food system. Assam is one of India’s poorest states; the dairy sector here is one of the country’s least industrialised, and commerce is still dominated by trade in raw milk through informal channels. However, as in other parts of India, urbanisation is increasing, demand patterns are changing, and government actors are shifting their approaches to governing food safety.
Drawing on empirical research in and around Guwahati, the state’s capital and largest city, we show how, in the absence of formal mechanisms and infrastructure, informal guarantees of quality and safety operate in these markets to reduce food risks and prevent illness. By providing insights into perceptions, practices and policies related to milk quality and safety in the informal sector, we aim to contribute to broader understandings of food safety governance in traditional markets, which could shape future interventions, policy and regulations related to food safety in such settings.

In section 2, we give a brief overview of the dairy sector in Assam and India, including relevant policies and past interventions. Following this we outline the study’s methodology and present the results, focusing in particular on food safety and quality practices, and the challenges facing the informal dairy sector of Assam. In section 4, we discuss the results and situate our study in the context of wider debates on food safety governance and informal markets in the global South. The final section provides a brief summary and some concluding thoughts, as well as recommendations for policy and future interventions.

2. Background

Nearly 90% of Assam’s 31 million inhabitants live in rural areas, with over half of the total workforce employed in agriculture (Kakaty & Das, 2017). In Assam, cattle are used mainly for draught, and dairying is a supplemental activity; unlike other dairying states, cows rather than buffalos predominate. The state has the lowest milk productivity in India, estimated at 1.3 kg/day/animal in 2010–11 (including cattle and buffalo)—about one third of the national average in the same period (DAHD, 2021; ILRI, 2007; Kumar et al., 2013). Dairy farming is an important source of livelihoods, especially for women, even if gender inequalities exist with regard to land tenure and wages (Goswami, 2013; Sarma & Payeng, 2012).

As in many other parts of India, only a small proportion of the milk produced goes to market. Just over two thirds of marketed milk is sold to consumers “at the farmgate”, while a third is sold to informal traders (ILRI, 2007). Only a very small fraction—as little as 0.05% of marketed milk—goes to the cooperative (formal) sector, compared to roughly 7.5% nationally (ILRI, 2007; Kakaty & Das, 2017; Landes et al., 2017). Of the milk going through traders, roughly half is sold raw directly to consumers; the rest is sold to small shops and retailers (ILRI, 2007). Like production, milk consumption in Assam (roughly 27 litres per person per year) is lower than the national average (Kakaty & Das, 2017). Previous studies in India and Assam have found that consumers prefer raw liquid milk over other forms (Landes et al., 2017; Lapar et al., 2010). However, over half of urban households also buy powdered milk usually or occasionally (Lapar et al., 2010). Pasteurized milk consumption is negligible.

Food safety is a concern in the Assamese dairy sector, especially as access to clean water, electricity and refrigeration is very limited across the supply chain (Lapar et al., 2010). Concerns with milk safety in the informal sector mainly relate to purported adulteration. A 2006 study of informal dairy outlets in Assam found that most samples had been adulterated with water, and almost half of the farmers and intermediaries in the study said that they add water to milk (Grace et al., 2010). All raw milk samples in the study had an acceptable total plate count (total level of all bacteria) at the point of consumption, although half of the samples exceeded the national limit for coliform counts (which indicates contamination by human or animal faeces). Importantly, the findings showed that pasteurised milk sometimes had higher levels of bacteria than unpasteurised milk. A more recent study of the bacteriological quality of raw milk in Guwahati found that the standard plate counts and coliform counts in all 200 samples were above legal standards (Kakati et al., 2021). However, it is worth noting that the risks associated with bacterial contamination are largely eliminated through boiling.

2.1. The dairy sector policy landscape in India and Assam

India’s official policy is to promote dairy cooperatives, which are considered part of the formal sector, and to support increasing productivity, mainly through crossbreeding and improved feeding (Landes et al., 2017). This focus is largely explained by the dominance of small-scale producers.
Dairy has historically been seen as a rural development opportunity, and cooperatives a means of providing market access to millions of small-scale farmers (Babcock Institute, 2006). The core of India’s post-independence dairy plan was “Operation Flood”, a programme that led to thousands of village-level producers being organised into cooperatives, which in turn were connected to urban markets through district-level cooperative unions (Babcock Institute, 2006). Productivity was also a key aim of the programme, and between 1970 and 1996, India went from being a net importer to a net exporter of milk.

The Department of Animal Husbandry and Dairying (DAHD), and the National Dairy Development Board (NDDB) are responsible for shaping India-wide policies relevant to the dairy sector, including on livestock. Phase 1 of the National Dairy Plan (NDP) (2011-2019) aimed to increase productivity and strengthen village-based procurement systems through scientific breeding, increased production and use of fodder; another goal was for cooperatives to retain half of the market share of the organised sector (NDDB, 2011). The NDP did not explicitly contemplate informal dairy trade, but the World Bank-funded National Dairy Support Project (NSP), part of the implementation plan for the NDP, framed the dominance of informality in the dairy market as an obstacle to increasing farmers’ profits (The World Bank, 2020).

Despite its significance for milk trade in the country, national dairy policy has been at best tolerant of, and often oblivious to, the informal dairy sector. The informal trade of raw milk and dairy is not restricted or criminalised, and laws and regulations are relatively accepting of it. However, the government’s proactive and explicit support of the cooperative sector may increasingly come at the expense of the informal dairy market and those who derive their livelihoods from it. As we set out below, competition from the government-backed cooperative sector is viewed as a major challenge for informal actors.

In the state of Assam, by contrast, authorities have adopted a more collaborative approach towards quality and safety in the informal dairy sector. The Directorate of Dairy Development (DDD), which deals with the organised procurement, processing and marketing of milk, dairy infrastructure and hygiene inspections in Assam, has claimed that it will consider “means to improve the existing traditional milk markets” (DDD, “Schemes and Projects”, 2019). Assam would appear to be unique among other states for having a policy approach which is supportive of the informal sector.

### 2.2. Increasing collaboration through a training and certification intervention

Since 2009 the DDD has worked with the International Livestock Research Institute (ILRI) on a training programme for informal dairy traders, which aimed to improve the safety of dairy products in Assam. Producers who took part in the training were found to have increased production, better hygiene practices and fewer cases of mastitis, although the impact of the training on food safety hazards targeted in the training was not evaluated (Lindahl et al., 2018).

As part of the training programme, a Joint Coordination and Monitoring Committee (JCMC) was established, bringing together state government actors, producer associations and representatives of informal dairy traders. The JCMC worked collaboratively on an implementation plan for the DDD’s initiatives to address quality and safety in the informal dairy sector. This trust-building exercise was seen by key informants as crucial to the successes—on productivity, hygiene and mastitis—of the programme. The light-touch, peer-to-peer approach to monitoring, which aimed to maintain compliance at a low cost beyond the end of the intervention, likely also contributed to sustained positive outcomes.

### 3. Methodology

Our study combined quantitative and qualitative survey methods with a literature review. The latter aimed to understand the state of play in India’s—and Assam’s—informal dairy sector and identify key knowledge gaps. This informed the design of a field survey, which aimed to create
a detailed picture of the structure and dynamics of the informal dairy market in Guwahati, as well as of perceptions and practices related to food safety among supply chain actors, including consumers. Finally, we conducted qualitative key informant interviews with stakeholders from government, the private and non-profit sectors. Interviews aimed to capture perceptions of the informal market's performance and produce insights into the workings of dairy policy and regulation in Assam.

The survey was conducted over two weeks in February 2020, in three urban and peri-urban localities of Guwahati where there is a high concentration of dairy farmers and milk traders: Jorabat in the south-east of the city, Maligaon in the west, and Narengi in the east. The 113 respondents comprised 13 producers, 19 intermediaries, 29 vendors, 10 processors and 41 consumers. A combination of purposive and snowball sampling was used to identify market actors from a range of backgrounds across the three locations. The sample is not meant to be statistically representative of the population, but rather aimed to illustrate the range of different opinions and perspectives within the sector. Business owners were asked to respond to the survey, rather than employees. Partly as a result of this, all of the producers and traders we spoke to were men. While women play a significant role in milk production, their participation in milk trading and processing is limited. We obtained permission from street vendors who had completed the survey to recruit their customers, who spoke to research assistants while making their purchases. We mainly spoke to consumers buying raw milk and paneer, rather than sweets or other products. Around a quarter of the consumers we spoke to were women (n = 11). Finally, we interviewed seven key informants from government and regulatory bodies, the private and non-profit sectors. Interviews were conducted in December 2019 and in February 2020. Informed verbal consent was obtained from all respondents. All survey data were anonymised, and key informants were assured that their names and affiliations would not be used in the reporting of results.

The survey was uploaded onto tablets using an open-access software package, CSPro (Census and Survey Processing System). The survey (comprising both closed and open-ended questions) was in English, but the research team voiced the questions to respondents in Assamese. Responses to open-ended questions were recorded in English. The survey data were then extracted from CSPro, coded and analysed in Microsoft Excel. Interviews were transcribed and coded thematically.

4. Results

4.1. Regulation, compliance and enforcement
Raw milk trading is not restricted in India, but according to the Food Safety and Standards Act, small-scale dairy traders must comply with certain quality and safety standards, and are subject to inspection. Processors, retailers or street vendors with an annual turnover below 12 million Indian Rupees (approximately 16,000 US Dollars) and, in the case of dairy, that procure or handle up to 500 litres of milk per day, are designated “petty food manufacturers”. They do not require a licence, but must register with the relevant local authority (e.g., Guwahati Municipal Corporation) and pay a fee (which varies between locations). Safety and quality standards are set at the national level by the Food Safety and Standards Authority of India (FSSAI), which is represented in each state by a Commissionerate of Food and Drugs Administration. The 2011 Food Safety and Standards (Prohibition and Restriction of Sales) Regulation prohibits the sale of milk to which water has been added, and there are also specifications about the minimum fat content for some dairy products such as ghee.

Rules and regulations appear to play a limited role in guaranteeing the safety and quality of milk in the informal dairy sector in Guwahati. Findings from our survey showed mixed awareness of, and compliance with, regulations. All surveyed processors and intermediaries, and most (n = 25) vendors had a municipal trading license. However, even though registration with FSSAI had become mandatory a few years prior for all food traders and processors, only two respondents (one vendor and one processor) were registered. Few respondents had clarity about the
requirements needed to get a registration, beyond having to pay a fee. Actors’ perceptions of the consequences of non-compliance do not straightforwardly explain low compliance either. Some vendors (n = 8) and intermediaries (n = 4) thought there were no consequences to not having the necessary licenses. But a higher proportion of vendors (n = 12), intermediaries (n = 7), and over half of processors (n = 6) thought they would have to pay a fine (we did not ask about actual experience of receiving fines).

Regulations also appear to be weakly enforced. Institutional challenges such as limited capacity and inadequate resources were seen by interviewees to impact on the ability of the DDD and FSSAI to undertake planned initiatives around safety. Some informants also thought that the remit and responsibilities of different institutions were unclear, and that this was an obstacle to improving food safety in Assam.

On balance, authorities have neither a strongly positive nor negative view of the informal dairy sector (source: key informant interviews). Likewise, among supply chain actors, the majority of surveyed intermediaries (n = 15), vendors (n = 26) and processors (n = 8) thought that the government has a neutral view of informal dairy actors (producers were not asked). On the other hand, one key informant from the DDD saw their agency as embodying a constructive or even supportive, rather than punitive, role towards the informal sector. Whether deliberately supportive or more passively “hands off”, Assam’s regulatory approach lacks the adversarial approach observed in other traditional markets, both in India and around the world. The collaboration between the DDD and ILRI appears to have contributed significantly towards this shift in approach. We expand on the idea of policy and regulatory “neglect” in the Discussion section.

4.2. Informal guarantees of safety and quality in the supply chain
In Guwahati’s informal dairy markets, most actors are knowledgeable about what to do—and what not to do—to try to preserve the quality of raw milk and ensure it is safe to consume, though there is variation between actors. Supply chain actors predominantly understood safety to be tied to both the taste of raw milk, and its consistency, with the latter linked to concerns around adulteration (Table 1). The consistency of milk is used by traders as a proxy for quality and safety, and is either judged by eye or using a lactometer, which measures milk density and can be used to detect whether other substances have been added.

We found that lactometers are predominantly used by intermediaries (18 out of 20 surveyed), followed by vendors (20 out of 29). The majority of producers (n = 9) we spoke to do not test their milk before selling it, but half said that their buyers conduct lactometer tests, echoing responses from intermediaries. Only three of the 10 surveyed processors we spoke to use lactometers. Five processors said that they measure safety and quality through the production of chenna (cottage cheese) or khoa (milk solids); however, this is after the point of purchasing raw milk.

Farmers, intermediaries, vendors, and processors report taking steps to manage the quality and safety of milk as it moves through the supply chain (Table 2). When asked about specific safety-related practices, almost all actors reported cleaning milk containers regularly. Handwashing was common among vendors and processors, but was mentioned by only half the producers and 65% of intermediaries. The rapid sale of fresh milk was a key practice cited by all producers, intermediaries and vendors (not relevant for processors).

In addition to these shared practices, actors in different parts of the supply chain also undertake different measures specific to their role. For example, proper treatment of cattle, and cleaning milking areas, were mentioned by nine out of the 12 farmers we surveyed. Ensuring that nothing is added to the milk was particularly important for intermediaries (11 out of 20). Not mixing morning and evening milk was also a key measure mentioned by a quarter of intermediaries, and one producer.
Table 1. Different supply chain actors’ perceptions of the meaning of fresh milk*

| Perception                     | Producers (n = 13) | Intermediaries (n = 20) | Vendors (n = 29) | Processors (n = 10) | Total |
|--------------------------------|--------------------|------------------------|------------------|---------------------|-------|
| Fresh taste                    | 7                  | 16                     | 7                | 5                   | 35    |
| Fresh smell                    | 2                  | 3                      | 2                | 0                   | 7     |
| Normal colour                  | 2                  | 1                      | 0                | 0                   | 3     |
| Consistency (by sight)         | 2                  | 1                      | 11               | 6                   | 20    |
| Consistency (other testing)    | 6                  | 5                      | 0                | 1                   | 12    |
| Cattle health                  | 0                  | 1                      | 1                | 0                   | 2     |
| Nothing has been added         | 0                  | 8                      | 0                | 1                   | 9     |
| Tested by lactometer           | 0                  | 0                      | 14               | 2                   | 16    |
| Hygiene procedures followed    | 0                  | 0                      | 1                | 0                   | 1     |
| Other                          | 0                  | 1                      | 1                | 1                   | 3     |

* The N values represent the number of respondents in each category of actor, rather than the total number of responses given per category of actor. Individual respondents may have given more than one answer.
| Practice Used | Producers (n = 13) | Intermediaries (n = 20) | Vendors (n = 29) | Processors (n = 10) | Total |
|---------------|-------------------|------------------------|-----------------|-------------------|-------|
| Cleaning milk containers regularly | 11 | 18 | 28 | 8 | 65 |
| Selling milk quickly | 13 | 20 | 29 | n/a | 62 |
| Hand washing | 7 | 13 | 23 | 8 | 51 |
| Keeping premises/milking area clean | 9 | n/a | 26 | 5 | 30 |

The N values represent the number of respondents in each category of actor, rather than the total number of responses given per category of actor. Individual respondents may have given more than one answer.
Despite the lack of refrigeration and reliance on visual cues, reports of spoilage are uncommon. When asked how much of their milk is spoiled each week, roughly half of all producers, vendors and processors claimed to have no milk spoiled, while the other half claimed between 1–10% of milk spoiled. Around three quarters (n = 15) of intermediaries selected 1–10%.

Loyalty and trust appear to play a key role in relationships between traders, although for many respondents, the quality of a supplier’s milk takes precedence. Vendors were least likely to change their supplier, with 70% never changing who they bought from. Half of processors and a third of intermediaries never change their supplier. Among those who do change suppliers, the main reason cited was the quality of the milk. This was closely aligned with the most common explanation for buying from a particular supplier: 70% of intermediaries, 50% of processors and 40% of vendors said that quality was the most important factor.

Concerns about the quality and safety of milk, and practices to ensure them, are also common at the consumer end of the supply chain. Over 90% of consumers we spoke to said that the safety of milk was “very important” when choosing a vendor or retailer. Consumers’ interpretations of the meaning of “safe milk” aligned closely with those of supply chain actors above. The two most common interpretations were that safe milk should taste fresh (16 out of 41 respondents) and that it should not have anything added to it (n = 15). Just under a third of respondents thought that milk was safe when it had been boiled (n = 12).

The taste of unpasteurised milk, followed by its perceived nutritional benefits, are the main reasons given by consumers for preferring this type of milk over other options. Around 15% of consumers we spoke to also cited safety as an important factor when deciding what type of milk to buy. Only 16 out of 41 consumers answered the question on how much they paid for pasteurised milk, suggesting that the majority of respondents only purchase raw milk. Only two respondents answered the same question about powdered milk.

Milk is commonly used by consumers in chai or coffee (only one respondent did not use it in this way), which typically involves boiling raw milk with tea leaves or coffee. A third of respondents also reported drinking boiled milk. Just over a third of consumers said that children under 5 years old drink the most milk in their household; around a quarter (n = 10) said that it was parents or heads of households, followed by a fifth who said it was children aged 6–11 years. Out of 41 respondents, nine said that they do not boil raw milk before drinking it; seven out of those nine respondents said that parents or the heads of households drank the most milk in their home, suggesting that milk purchased raw is generally boiled before children drink it.

Surveyed consumers rely on a mixture of visual cues and prior experience to decide who to buy from, and to determine whether or not a vendor is selling safe milk. Trust in the safety of

Table 3. Most important factors considered by consumers in Guwahati when deciding where to buy milk (n = 41)

| Factor                                      | Count |
|---------------------------------------------|-------|
| Trust in safety of vendor’s milk or absence of problems | 24    |
| Cleanliness                                 | 7     |
| Health and safety certificates/licenses      | 3     |
| Relationship with vendor                    | 2     |
| Convenience (distance)                      | 2     |
| Friendliness of staff                       | 1     |
| Price                                       | 1     |
| Other                                       | 1     |
a particular vendor and/or the absence of prior problems were by far the most important factors for consumers when deciding where to buy milk, as demonstrated in Table 3 below. All but two surveyed consumers always shop from the same vendor; trust was given as one of the main explanations for this. Most consumers (n = 21) determine the safety of milk at the point of purchase by looking at it, rather than smelling or tasting it. None of the consumers we spoke to found it challenging to decide whether a vendor is selling safe milk.

Consumers also engage in personal risk management. As already noted, almost 80% of those we spoke to boil raw milk before drinking it. Although our survey did not probe to what extent these behaviours are explicitly aimed at reducing the risk of illness, the above finding that a third of consumers equated safe milk with boiled milk suggests that for many this is a safety-related practice, as well as a cultural one.

Among surveyed consumers, there were no reports of illness associated with consuming raw milk. To some extent this low result may be explained by a certain degree of “survivor bias” in our sample, and potentially the fact that consumers were responding to the survey questions out loud, within earshot of the people they purchase milk from.

### 4.3. Challenges and solutions for actors in the informal dairy market

Many of the key challenges that supply chain actors face are not directly related to milk safety and quality, but instead reflect broader operational constraints. One of the most frequently cited challenges was finding labour: almost half of producers and 40% of processors said that they struggle to hire enough workers. Intermediaries and vendors feel most impacted by the growth of the formal sector and cooperatives: 70% of intermediaries and over half of vendors said that competition from the formal sector was the biggest difficulty they faced in running their business.

For producers, the main challenges relate to input prices and government support. A third of surveyed producers said that their main challenge was a lack of government support, and a fifth said that it was the high price of cattle feed. In addition, a key informant with ties to a producers’ association noted that the price of feed is volatile, and essentially controlled by the private sector. Unsurprisingly then, just under a third (n = 5) of surveyed producers thought that a reduction in the price of feed would help them solve this problem, and around 20% (n = 3) thought that the government should subsidise cattle feed.

When it came to support for improving milk safety and quality, most actors thought the government could help them (see, Table 4), though the strength of opinion varied across the supply chain.

Most respondents do not think they themselves need support to improve milk quality and safety. When asked whether training or finances (specifically to invest in equipment) could help them to improve the quality and safety of milk, roughly half the surveyed intermediaries and vendors, and most processors (n = 8) selected training. However, when prompted separately about whether they personally needed more training in health and safety, only one processor and around a third of vendors (n = 7) replied affirmatively (vendors were equally divided). This suggests that some respondents perceived training to be useful generally, but not everyone thought that they personally needed it.

Those responsible for governance and regulation differ in their diagnosis of the informal sector’s problems, compared to supply chain actors. Three local government actors we interviewed perceived adulteration to be a key challenge affecting the informal market. For one informant, adulteration by intermediaries explains how the latter manage to pay producers more than cooperatives, even when the price of production rises. This view is supported by evidence from previous studies (Grace et al., 2010). Similarly, the fact that the price of production was rising at the time of the survey was seen by another informant as an incentive for intermediaries to...
Table 4: Different supply chain actors’ opinions about who could best help them improve milk safety and quality in Assam

| Actor          | Producers (n = 9) | Intermediaries (n = 17) | Vendors (n = 25) | Processors (n = 10) | Total |
|----------------|------------------|-------------------------|------------------|--------------------|-------|
| Government     | 0                | 1                       | 6                | 1                  | 12    |
| Private sector | 1                | 0                       | 6                | 1                  | 8     |
| NGOs           | 0                | 1                       | 2                | 1                  | 4     |
| Other          | 1                | 1                       | 0                | 0                  | 2     |

*The N values represent the number of respondents in each category of actor, rather than the total number of responses given per category of actor. Individual respondents may have given more than one answer.*

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adulterate milk, in order to maintain the same consumer price without reducing their margins. On the other hand, the same informant did not think that this compromised its safety for consumers, given that most people boil milk before drinking it.

Most key informants we spoke to perceive the informal supply chain to have lower standards of hygiene, safety and quality—although informants differed in their ideas about which actors were unhygienic, and in what ways. For example, an informant linked to a government body thought that traders do not clean their milk containers properly, while a veterinary doctor linked to the local government thought farmers could improve their general hygiene in order to ensure the safety of raw milk.

5. Discussion

Awareness of the global health burden of food-borne disease has grown significantly over the past decade, including in India, which was estimated to have 100 million cases of food-borne disease in 2011 (Grace et al., 2019; Kristkova et al., 2017; WHO (Ed.), 2015). Given the dominance of informal markets for food provisioning in emerging economies, they are likely a key source of disease (Grace, 2015). However, the presence of hazards does not necessarily translate into risks to human health (Lindahl et al., 2018; Roesel & Grace, 2015).

The findings from our study contribute to a growing body of literature questioning assumptions about the safety of food sold in traditional markets. The informal food sector is often depicted as “dangerous” in mainstream media and policy; but such representations are usually neither fair nor accurate. Studies have shown that foods sourced through formal channels—which are often perceived to be more hygienic and desirable—may be no safer than those from traditional markets (Roesel & Grace, 2015). For example, Agarwal et al. (2012) found coliform bacteria, E. coli, and S. aureus in samples of both informally marketed raw milk and pasteurised milk collected in Punjab (Agarwal et al., 2012). The often outsized focus on food safety also obscures the positive contributions that traditional markets make to food and nutrition security, livelihoods and public life (Roesel & Grace, 2015).

5.1. Managing food safety risk: perceptions and practices

In settings where there are no official or third-party guarantees of food safety, consumers often evaluate the safety of a food vendor based on what they can see—including individual retailers, their premises, and the food itself. For example, Rheinländer et al. (2008) found that the “neatness” of street vendors and their premises in Kumasi, Ghana were central to consumer strategies for managing food risk. The same study also showed how aesthetic appearance had in turn become central to traders’ and health authorities’ normative perceptions of food safety, too. As a result, vendors took care to wear clean uniforms, but handwashing was found to be inadequate, and rarely enforced. In Guwahati, we found that personal cleanliness of vendors and their premises were likewise among the main criteria used by citizens to determine the safety of a retailer. However, while many traders reported keeping their premises clean, they attached greater importance to hygiene practices not necessarily visible to consumers, such as cleaning milk containers regularly and washing hands.

Trust is a key ingredient in citizens’ perceptions and management of food risks. In informal markets, consumer trust in the person selling the food is particularly important, and strongly linked to trust in the food product itself (Blackmore et al., 2021; GAIN, 2020; Klein, 2013). In Guwahati, trust in specific retailers was a key strategy for evaluating food safety; the fact that most respondents claimed to always shop from the same vendor reinforced this. Trust and loyalty may be just as important for traders as they are for consumers; in Guwahati’s dairy market, many reported never changing their supplier—although when they did, it was due to quality issues.

Freshness, consistency, and the absence of added substances were the main attributes which respondents associated with safe milk. The fact that freshness was important to respondents suggests that most have a basic understanding of the perishability of raw milk and related safety risks. All respondents who sold milk (producers, intermediaries and vendors) said they did so
quickly to preserve quality and safety, suggesting a close tie between individuals’ perceived meanings of safety and the practices they employ to ensure it.

Although we did not conduct laboratory analyses as part of our study, reports of both low spoilage rates and low incidences of illness suggest that quality and safety in the informal dairy market are of a high enough standard to keep consumers coming back—and to keep traders in business. On the other hand, Klein (2013) has argued that consumers’ continued patronage of informal food markets in Kunming, China, should not necessarily be interpreted as a “sign of confidence in the food supply or in the state’s ability to regulate it”. Particularly for poor and urban consumers who are reliant on purchased food, there may be few alternatives (Klein, 2013). Moreover, as noted above, it is possible that our sampling method for consumers led to a certain degree of “survival bias” in the data. By surveying people at the point of purchase, we likely failed to capture the views of consumers who no longer buy raw milk from informal traders—or from particular traders—as a result of negative experiences or illness.

5.2. Governing food safety risk: from benign neglect to cooperation and engagement

Concerns over public health, food hygiene and safety often go hand-in-hand with the politics and governance of urban space. Narratives of informal food markets as a blight on urban spaces and “a threat to society” have been used by policymakers and health authorities to justify the harassment, relocation and eviction of petty food traders (te Lintelo, 2009; Roesel & Grace, 2015). For example, Lincoln (2014) argues that the scapegoating of female food vendors following a cholera outbreak in Vietnam in 2007 served as a cover for political failings, and a justification for increased state power. The closure of traditional markets around the world in response to the Covid-19 outbreak is another salient example (Allison et al., 2021; Gulati, 2021).

The state’s marginalisation of the informal sector often intersects with private sector interests. In India, the privileging of the formal food sector has been linked to economic liberalisation, the rise of the middle classes and a desire to transform major cities into “world class” destinations (Anjaria, 2006; te Lintelo, 2009). For example, te Lintelo (2009) has demonstrated how a 2007 ban on cooking street food in Delhi, ostensibly due to food hygiene concerns, was actually part of a regulatory approach by the state which favoured retail spaces situated on privately owned land. Crucially, such “adversarial approaches” to governance have been shown to be counterproductive to improving food safety (Grace et al., 2019; Patel et al., 2014; Roesel & Grace, 2015).

In contrast, a growing body of evidence is exploring governance contexts characterised by “benign neglect”, which may range from active “covert cooperation” between traders and authorities, to a more passive lack of institutional capacity to enforce rules (Dai et al., 2019; Resnick et al., 2019). In Calabar and Minna, Nigeria, Resnick et al. (2019) argue that authorities’ neglect has led to an enabling environment that has allowed the sector to thrive. Similarly, we did not find harassment of informal dairy traders to be common in Guwahati. Most thought that the government had a neutral view of their sector, and that this manifested in a lack of state support, or at most, in the government discouraging consumers from drinking raw milk. In fact, competition from the formal sector was perceived as a far greater challenge, particularly by intermediaries and vendors, who linked this to declining consumer demand in recent years.

Guwahati’s smaller size and affluence relative to India’s megacities, and the limited importance of Assam within national dairy policy, could go some way towards explaining the city’s less stringent regulatory environment. This would be consistent with findings from Minna and Calabar, which are secondary cities, where authorities have turned a blind eye to the informal sector, and limited institutional resources and capacities undermine accountability for food safety (Resnick et al., 2019). A lack of capacity to enforce laws may create “a culture of non-compliance” while rendering laws “irrelevant” (Harriss-White, 2010). Our findings from Guwahati support this idea: a number of key informants saw the limited resources of the DDD and FSSAI, as well as a lack of clarity around the remit of different government departments, as key obstacles to improving the safety and quality of
the informal dairy sector in Assam. Indeed, a small but not insignificant number of respondents thought that there would be no consequences to not having the proper licenses.

Neglect can be a two-sided coin. On one hand, it allows the informal sector to survive. As Upadhyay and Ranjan (2007) note, the Indian government’s “laissez-faire approach” has allowed the informal dairy sector to grow in response to rising demand for milk, benefiting both poor farmers and consumers. But neglect can also lead to “service delivery gaps”, which impact on both food safety and on traders’ ability to make a living (Resnick et al., 2019). In Guwahati, producers were most vocal about limited state support. Many wanted the government to subsidise cattle feed, which is increasingly expensive. Intermediaries and vendors, too, feel the squeeze, and key informants linked this to concerns that traders are pushed to adulterate milk in response to rising production costs. A laissez-faire approach to the informal dairy sector therefore has the potential to threaten food safety, even if not to the same extent as overtly aggressive policies. Moreover, the absence of hostility between food safety authorities and informal food actors does leave space for engagement between the two—which can develop into positive and successful collaboration. This was demonstrated in Assam through the creation of the JCMC and active interventions to build trust between state government actors and representatives of informal dairy traders.

6. Conclusion

Local government actors and regulatory authorities in Guwahati are largely accepting of the presence of informal dairy trade in the city. Although the key informants in our study held a range of views of the sector—from tolerating to supporting it—no one appeared to think that it would, or should, disappear any time soon. This contrasts with studies in other emerging economies, as well as other Indian states, which found that informal food traders (including milk traders) routinely suffer intimidation, harassment, and government bans (Blackmore et al., 2021; Patel et al., 2014).

Our study also explored how producers, traders, consumers and key stakeholders understand and act on issues around quality and safety in Guwahati’s informal dairy markets. We found that in the absence of strictly enforced standards and regulations, food safety risks are mitigated to some extent by traders’ knowledge about hygiene and safety practices. The dominance of cultural practices of consumption, such as fermenting, using milk to make sweets and boiling milk with chai, also undoubtedly help to reduce the risk of illness among consumers. However, it is important to note that not all food safety risks can be eliminated by boiling milk, such as those from aflatoxins and antibiotic residues, which may have serious long-term health effects.

Concerns about adulteration of milk in the informal market were equal to, if not greater than those about hygiene, particularly among consumers and some government actors, who perceived the problem to be widespread. This finding was consistent with previous studies, and may stem from cultural perceptions of safety, including concerns around chemical contaminants and limited understanding of germs, as well as a more general distrust of actors in the informal food sector. Interestingly, despite the perception among authorities that adulteration is widespread, this has not led to increased regulation or repression of the informal sector.

The laissez-faire approach to dealing with the informal sector in Assam is likely explained by a number of factors. Firstly, authorities know that consumers reduce the risk of foodborne illness by boiling milk. Secondly, there is a perception that insufficient resources are being channelled to relevant government departments in Assam, and there is ambiguity around the remit of different institutions related to the dairy sector. Thirdly, Guwahati’s relatively small size compared to other cities in India, and the fact that it is not in one of the states targeted by national dairy policy, may also help explain why authorities are more accommodating of the city’s informal dairy sector.

Set against its more active promotion of the formal sector, the state government’s largely passive approach to the informal dairy sector may be interpreted as a form of “benign neglect” (Alonso et al., 2016; Resnick et al., 2019). This has positive, but also potentially negative impacts on the safety and
quality of informally traded raw milk. Traders in the informal sector do not fear being harassed by authorities, and the absence of conflict between traders and authorities has likely made it easier to collaborate to improve quality and safety. On the other hand, traders feel increasingly squeezed by competition from the cooperative sector. Despite acceptance of the informal market, the bulk of government support continues to go to cooperatives and pasteurisation. One key informant noted that rising production costs could push intermediaries to adulterate milk—suggesting that the government’s continued neglect of the informal sector could ultimately be detrimental for milk safety. Engaging with informal sector actors about adulteration will therefore be essential to effectively tackle the issue—whether perceived or real—in future interventions. Furthermore, our study suggests that future research into governance settings characterised by this kind of complacency would benefit from asking for whom neglect is ultimately “benign”, and why.

Finally, our study highlights the need for innovative policy and governance approaches to dealing with the informal food sector. The realistic and accepting approach of authorities to the informal dairy sector in Assam has allowed for some positive engagement between government and supply chain actors, for example, through the creation of the JCMC. Setting up a multi-stakeholder committee which included representatives from the informal dairy sector appears to have built trust and improved communication between actors who might not have otherwise engaged with one another. This type of positive engagement between informal sector actors and state-level authorities could set an example for other Indian state governments, and is a positive foundation on which to work towards improved milk quality and safety in future.

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