Background

Recent economic surveys in Kenya show a steady growth in sales of processed milk and dairy products, owing to increased demand (KNBS, 2016). Coupled with this increase are innovative businesses that have emerged to deliver affordable pasteurized milk to consumers through dispensing machines, popularly known as ‘milk ATMs’. An ATM is an automated facility that dispenses chilled, pasteurized, ready-to-drink milk that is sold unpackaged. The ATM offers several advantages. For the business, they eliminate packaging and processing which lower retail prices, and automated business transactions ease monitoring of sales turnover. Consumers expect ATM milk to enhance hygiene and offer affordable milk of any desired volume.

ATMs are now widespread and are located in various strategic outlets: retail shops, farms, cooperatives, supermarkets and milk bars (Kosgey et al., 2018). As part of the growing Kenyan dairy industry, the ATM enterprises are expanding, even as safety of fluid milk remains a highly debated issue of public concern. Operating an ATM requires reliable power and a clean water supply to ensure milk quality is not compromised. Regulations require that the ATM is cleaned once every 24 hours to assure high quality of milk and to minimize loss from spoilage (KDB, 2015).

As an emerging innovation, nevertheless, information about the ATM as a retailing enterprise and their value offer for quality milk is scanty. This brief summarises findings of a recent market and consumer study that assessed the quality of milk sold through ATMs and other milk retailing practices, to understand the business proposition of this enterprise. The study also assessed consumer perceptions of risks of ATM milk compared with packaged and raw milk.

The study was carried out in four towns—Nairobi, Nakuru, Eldoret and Kisumu—but during the consumer survey, Kisumu was replaced with Kakamega. These towns represent a high concentration of the growing milk demand in Kenya.

Findings and Implications for the Sector

Milk ATMs as an enterprise

Different types of milk ATM models are in the market; these are imported from China, Italy and The Netherlands. They vary in capacity and price, ranging from KES 150,000 to 700,000 (USD 1,500–7,000). Their average annual operational costs, based on information collected from sampled operators, amount to KES 123,200 (USD 1,232). Almost 60% of these operational costs are spent on servicing the ATM equipment (Figure 1).

![Figure 1: Cost categories of operating a milk ATM business in Kenya](image)

Key messages

- Milk vending machines (“ATMs”) are a growing retail business innovation that seek to offer competitive price and safety advantages to consumers of pasteurized milk
- As a business, sales margins per litre of milk are up to USD 0.1 (KES 10) positive, but operational costs are high
- The general consumer perception is that milk sold at ATMs is safer than raw milk and is as safe as packaged milk
- Field observations show that milk sold at ATMs is largely non-compliant with national, regional and international standards for milk quality and safety
- Severe limitations exist in surveillance and quality control of ATMs and intentional non-compliant behaviour that exposes consumers to serious health risks.

Policy recommendations

- The Kenya Dairy Industry Regulations 2017 should include a framework for regulating the practices of milk ATM vendors to ensure compliance.
- Scale up the implementation of stipulated action towards non-compliant traders through periodic safety control management training for ATM operators linked to trade licensing and permits.
- Establish and strengthen public-private partnerships to support the development of standards for local milk dispenser models.
Annual turnover from daily sales of between 200 and 1500 litres averages between USD 3,650 and 54,750, depending on volumes of milk sold and on the selling location. ATM milk is sold at about half the price (KES 60–70, USD 0.60–0.70) of packaged pasteurized fluid milk per litre (KES 120, USD 1.2). This pricing offers consumers an economic incentive to purchase ATM milk. Overall, sales margins per litre of milk are up to USD 0.1 (KES 10) positive, thus, for operators with large sales volumes the ATM business is lucrative, hence the reason it has attracted many entrepreneurs. However, some business operators might skip servicing the equipment because of its high costs, which may compromise the quality of milk.

**Comparing ATM milk quality with other retail practices**

The study assessed the quality of milk sampled from different retail options: ATM (n=39), packaged milk (n=32), and raw milk sold from plastic containers (n=29). How do ATMs compare on milk density, solids not fat (SNF), total viable counts (TVC), total coliform counts (TCC) and aflatoxin? (See Figure 2).

![Milk reception at a cooperative platform](image)

Regulations require that milk sold in ATMs be pasteurized. Milk samples analysed showed that some ATMs dispensed raw milk. The study did not assess the prevalence of this practice, but the sale of raw milk in ATMs should concern consumers and regulators. This breach of regulations is a health risk to consumers who buy ready-to-drink milk and do not boil it as they do with milk obtained directly from the farms.

Milk density between the three retail practices was comparable and meets the national standards (1.026–1.032 g/mL), but not the East African standards (1.028–1.036 g/mL). All retail practices had lower levels of SNF than stipulated in national and international standards: packaged milk had more non-compliant samples (56.3 percent) than ATM milk (43.6 percent) or raw milk (41.4 percent). Low SNF levels can be attributed to many factors such as the dominance of dairy crossbreeds, inadequate feeding, prevalence of mastitis infections and adulteration, all of which may lower milk density (Rademaker et al., 2017; Ndungu et al., 2016; Kashongwe et al., 2017).

The proportion of milk samples with microbial counts exceeding the standards for raw milk (<log10 6cfu/mL) and pasteurized milk (<log10 4.47 cfu/mL) was fewer in ATM milk (20.5 to 25.6 percent) than in raw milk (58.6 to 69.0 percent). However, ATM and packaged milk were not distinctly different in non-compliance with the standards for microbial load. This provides the evidence that the risk of microbial contamination remains high even in ATM and packaged milk.

ATM milk contained unsafe levels of aflatoxin, exceeding the international safe standard limits (<50 ppt). ATM milk exceeded the maximum safe limits for aflatoxin content by 2.4 times and packaged milk by 2.8 times. Aflatoxin content above the specified international standards is less prevalent in ATMs (50 percent) and in raw milk (36.4 percent) than in packaged milk (77.8 percent).

The widespread aflatoxin contamination in ATM and packaged milk should concern all actors in the dairy value chain, including regulators, entrepreneurs as well as consumers. It also negatively affects the export market potential.

The use of hydrogen peroxide is more prevalent in ATM milk (8 percent) and packaged milk (6 percent) than in raw milk (3 percent). This is an intentional breach of compliance as the use of hydrogen peroxide as a preservative is prohibited in Kenya and internationally.

![Figure 2: Proportion (%) of milk samples that exceed the national and international standards in the three retail options](image)

**Consumer Perceptions of Milk Quality**

What are consumers’ perceptions of milk sold in ATMs compared with other retail options?

Most consumers perceive ATM milk as safer and of better quality than raw milk (Figure 3). Almost 61 percent of consumers’ associate raw milk sold in plastics with a high risk of adulteration, while fewer (14.2–15.8 percent) consider that ATM milk is adulterated.
Fewer consumers perceive milk sold in ATMs and packaged as likely to be adulterated or exposed to bacterial contamination, while more consumers think that packaged milk is more likely to contain preservatives than ATM milk. In addition, fewer consumers perceive the risk of antibiotic presence lower in ATM milk compared with raw milk in plastic containers but higher than in packaged milk (Figure 3).

![Milk ATM entrepreneur](image)

More consumers think that packaged milk is more likely to contain preservatives than ATM milk.

**Figure 3.** Consumer perceptions of milk quality retailed in ATMs, packaged or plastic containers.

**Which Way Forward?**

The growing milk ATMs retail innovation offers good business opportunities and is attracting consumers because of the competitively priced milk they offer. While consumers perceive raw milk in plastic containers as less safe than pasteurized ATM and packaged milk, this study established that ATM milk is not safer than raw and packaged milk.

The slightly higher levels of hydrogen peroxide in ATM and packaged milk show non-compliance by processors and vendors, exposing consumers to health risks. This reveals a gap in enforcing standards. Specifically, the presence of raw milk in ATMs violates the Consumer Protection Act of 2012 that, in line with the constitution, grants consumers access to safe, quality food. The Act outlines penalties for businesses that knowingly sell sub-standard goods, should be enforced.

Under the Kenya Dairy Industry Regulations, 2017, which stakeholders are currently reviewing, the national regulator should include a framework for regulating the practices of milk ATM vendors, to ensure compliance. Due to the high noncompliance of ATMs in milk bacterial load standards, consumers should be advised to boil the milk before consuming it. However, this will likely reduce their confidence in ATM milk as a ready-to-drink product.

The high cost of maintaining milk ATMs potentially results in vendors not adhering to the servicing schedule to increase their profit margins, compromising the quality and safety of traded milk. This further validates the importance of having a strong surveillance system to monitor the operations of milk ATM businesses.

The exponential growth in milk retailing through ATMs is indicative of its potential to expand the country’s level of milk processing. While this expansion could reduce the challenges of the dominant raw milk market, a controlled approach to expanding ATM retailing is needed to guarantee consumers that the milk is pasteurised as expected. This would not only secure the value proposition of this growing business venture by emphasising the quality of their product but also protect consumers from exposure to health hazards and risks associated with poor quality and unsafe milk.
Works cited


3R Kenya Project

The 3R Kenya (Resilient, Robust, Reliable. — From Aid to Trade) project is a learning initiative supported under the Agriculture and Food and Nutrition Security (FNS) program of the Embassy of the Kingdom of the Netherlands. 3R Kenya seeks to generate evidence and lessons from FNS and other related programmes that support competitive, market-led models in spurring agricultural development. It focuses on the aquaculture, dairy and horticulture sectors. 3R Kenya is executed at a time when Dutch government’s bilateral relations in Kenya are transitioning from a focus on Aid to Trade to enhance the development of agri-food sectors. Through evidence generation and stakeholder dialogue, 3R seeks to contribute to an understanding of effective conditions for sustainable inclusive trade for transforming resilient, robust and reliable agri-food sectors.

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The brief is a summary of a more comprehensive research report available at http://www.3r-kenya.org/

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