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Inclusive of Traceability in Dairy Supply Chain

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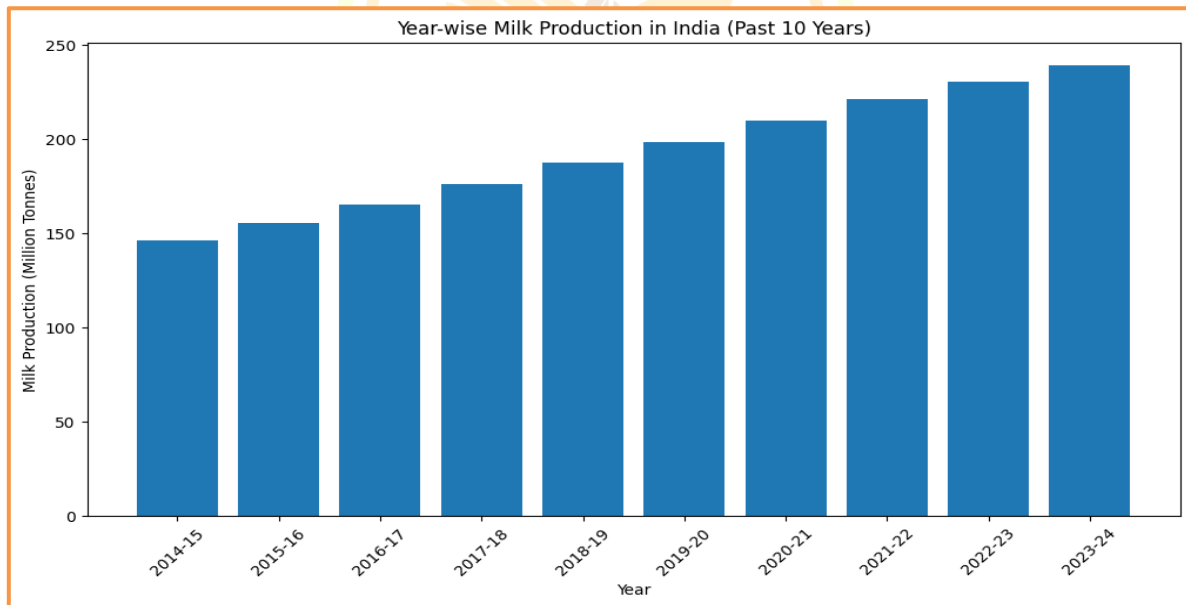
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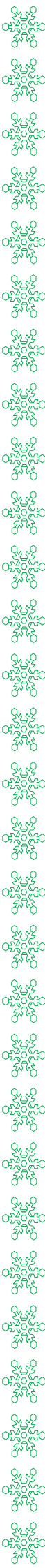
The dairy industry in India is the largest globally, accounting for 23% of global milk production. The industry contributes 5% to the national economy and directly supports more than 8 crore farmers. India's dairy industry has grown significantly over the past 10 years, supported by various initiatives taken by the government. The nation's milk production increased at a CAGR of 6.2 per cent from 146.31 million tonnes (MT) in 2014-15 to 209.96 MT in 2020-21. The livestock and dairying industry in the country has been particularly promising, as it constitutes the backbone of the country's rural economy and employs nearly 200 million Indians.

Key Words: Compound annual growth rate, Traceability, supply chain, Internet of Things (IOT)



The major production area of dairy products in India is Uttar Pradesh, Maharashtra, Himachal Pradesh, Madhya Pradesh, Punjab, Rajasthan and Tamil Nadu. Competition in the Indian dairy industry has always been robust. Amul, Mother Dairy, Orissa State Cooperative Milk Producers Federation, Dudhsagar Dairy, Aavin, and Kwality Limited are some of the major players in the dairy industry in India.

Human consumption of foods every day relies on the belief that the products are manufactured, processed, transported and stored in accordance with the quality standards and safety regulations. However, statistics show that every year around six hundred million



people in the world are affected by diseases for consuming contaminated food products and more than forty thousand lives are lost annually because of the same reason⁽¹⁾

The ability to track and trace products is fundamental to sound supply chain management. Traceability affects supply chain efficiency, product safety and security, managing deep tier risks, on-time delivery performance, troubleshooting customer issues, controlling costs, and regulatory compliance. Now, another set of demands can be added to this list: government and consumer pressure to meet sustainability goals. Most industries—but especially consumer-facing ones such as food—are experiencing this pressure, and key to their responses is effective supply chain traceability. However, while these demands are increasing and are extremely dynamic, traceability technology is confusing and, in a number of respects, behind the curve. Innovative solutions are being developed, but companies often struggle to justify investments in the technology. Companies need to change the way they evaluate supply chain traceability to make the right investments, and to mitigate the risks of missing their sustainability goals and suffering reputational damage in the event of a supply chain failure.

Inclusive of Traceability in Dairy supply chain

The concept of traceability within the dairy supply chain is integral to the modern agricultural paradigm, crucially supporting food safety and quality management systems. Traceability pertains to the systematic ability to track and document the production, movement, and history of dairy products from their source—be it a dairy farm or grazing field—through the stages of processing and distribution until they are delivered to the consumer. This comprehensive tracking is essential for verifying the provenance of dairy commodities, managing recalls efficiently, and ultimately ensuring the integrity of the product.

Furthermore, as dairy products transition from farm to plate, every transaction and transformation, ranging from feeding and milking of animals, storage and transportation of raw milk, pasteurization, and packaging, to the final sale, must be clearly recorded and accessible. Advanced technologies such as RFID tagging, GPS tracking, and blockchain ledger systems are increasingly employed to offer real-time monitoring and immutable records.

Establishing such traceability frameworks sets a stage that not only elevates consumer trust but also enables producers and regulatory bodies to swiftly react to and contain any issues related to foodborne illnesses, thereby securing the health of the end consumer and the longevity of the dairy industry.

Dairy Farm:

To commence traceability, the process begins by capturing the milkman's name. Recording the details of milk collection enhances efficiency and aids in demand forecasting. Every lot collected is quantified and assigned a unique number, facilitating precise inventory management and batch tracking. Both the timestamp and location of each lot are documented to ensure accountability. These records will be reinforced with visual documentation—photographs and videos—providing a verifiable account of the milk's origin. Furthermore, technologically advanced methods are utilized to capture data on raw ingredients even in remote locations with limited network connectivity.

Collection/Transportation:

To ensure the integrity of our produce from catch to delivery, each catch is meticulously recorded with the date, time, and corroborating visual evidence—photos and videos. The catch's live geographic location is instantly shared. Upon arrival, each batch undergoes stringent quality control checks to confirm its quality. The produce is then packaged as per client requirements, catering to processors, manufacturers, or distributors.

QR codes are applied for enhanced traceability and lot history. Shipments are labeled with the processor organization's identity and monitored with real-time tracking to confirm successful delivery. Throughout transit, IoT technology is employed to continuously record temperature and humidity, preserving the quality of the shipment. Instant app notifications

alert us to any unexpected stops, while detailed analytics provide insights into any shrinkage or theft during the product's journey.

Packaging/Processing:

All goods received are promptly logged, with shrinkage closely monitored and the entire journey of product transformation meticulously documented from the raw state to finished goods. New food batches are produced and facilitate traceability by assigning system-generated QR codes to designate quantities to specific lots, which are also clearly labeled for efficient tracking.

Every product's shelf life is recorded, inventory is diligently managed by location, and we enable real-time tracking of shipment locations until the point of delivery. Utilizing IOT sensors, transit conditions, such as temperature and humidity, are continuously measured, ensuring product quality and maintaining vigilance with in-app alerts that notify us of any transit stoppages or incidents of shrinkage or pilferage.

Distribution/Retailer:

Upon the reception of goods, it is crucial to meticulously record the arrival and evaluate for any potential shrinkage, while simultaneously accessing the wealth of product details and logistics data, such as shipment specifics, and tracking the transportation vehicles involved. The emphasis on maintaining product integrity is non-negotiable; this is achieved through diligent contamination checks, assigning separate lots tailored to each order, and preparing the packaging accordingly for retailer shipment.

Warehouse operations are amplified with cutting-edge technology; real-time monitoring of shipments is now standard, coupled with precise management of inventory that varies by location, ensuring deliveries are on track every step of the way. The integration of Internet of Things (IOT) sensors provides another layer of oversight, offering temperature and humidity monitoring during transit. These capabilities empower businesses with proactive in-app notifications for any interruptions and access to thorough reports on shrinkage or theft, ensuring a transparent and secure supply chain from start to finish.

Consumers:

In retail stores, each item's QR code serves as a gateway to its provenance. A quick scan allows customers to view a comprehensive product journey, including information about its source and shelf life, right at their fingertips. Beyond mere tracking, the platform extends to interactions such as tipping the milkman for their delivery service directly through the system. Customers can also actively participate by rating the ingredients, thus providing valuable feedback. This level of transparent communication available on the journey detail page not only enlightens consumers but also cultivates a deeper level of trust with the product owner, ushering in a new era of informed purchasing.

Cornell brand using QR code Customers had a choice: purchasing milk with printed best-by dates or buying containers with QR codes, which, when scanned by a smart phone, would display the best-by date.

“During two-month study, over 60% of customers purchased the milk with the QR code, showing a considerable interest in using this new technology,” Lau said. “This revealed that the use of QR codes on food products can be an innovative way to address the larger issue of food waste.”



Plate 1: Cornell Dairy using QR for tracing

Government Plan

Prime Minister Narendra Modi, approved the continuation of the Animal Husbandry Infrastructure Development Fund (IDF) with an outlay of Rs 29,610.25 cr for the next three years, until 2025-26. The schemes aims to incentivize investments in dairy processing, product diversification, animal feed plants, breed multiplication farms, waste management and veterinary vaccination⁽¹⁾

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