Blockchain Revolution in India and its Applicability in the Indian Dairy Sector

Pritam Roy[1], Bikram Barman[2], Sayak Saha[3], and Bhaskar Ghosh[2]

Introduction

Blockchain technology is a decentralized digital ledger that is used to record transactions on multiple computers in a secure and transparent manner. Each block in the chain contains a set of transactions that are verified and encrypted by a network of participants, called nodes. Once a block is added to the chain, it cannot be altered or deleted, providing a tamper-resistant and immutable record of all transactions. Blockchain technology has the potential to revolutionize a wide range of industries, from finance and healthcare to supply chain management and voting systems. The current paradigm for storing and managing data involves centralized systems where a single entity controls the data and its access. These centralized systems can be vulnerable to hacking, fraud, and data breaches, leading to a lack of trust and transparency in the system. Blockchain technology, on the other hand, operates on a decentralized system where data is distributed across a network of computers (nodes) rather than being controlled by a single entity. Each block in the blockchain contains a timestamp and a link to the previous block, creating a secure and transparent system where every transaction can be tracked and verified by anyone on the network.

India's stand on Blockchain technology:

India has shown a keen interest in exploring the potential of blockchain technology. Many state governments in India have initiated blockchain-based projects in different areas such as land records management, healthcare, supply chain management, and education. For instance, the Telangana state government has launched a blockchain-based solution for land records management to ensure transparency and efficiency in land transactions. Similarly, the Andhra Pradesh state government has initiated the E-Pragati project that aims to provide a unified platform for the delivery of citizen services.

India's regulatory bodies such as the Securities and Exchange Board of India (SEBI) and the Telecom Regulatory Authority

Pritam Roy[1], Bikram Barman[2], Sayak Saha[3], and Bhaskar Ghosh[2]
[1]National Dairy Research Institute, Karnal, Haryana
[2]Indian Agricultural Research Institute, New Delhi
[3]RPCAU, Bihar

of India (TRAI) have also been exploring the use of blockchain technology. SEBI has been exploring the use of blockchain for streamlining the KYC process, while TRAI has been exploring the use of blockchain for preventing unsolicited telemarketing calls.

The Tea Board of India has also started exploring blockchain technology to ensure transparency in the tea supply chain. The Tea Board has collaborated with tech firms to develop a blockchain-based platform that enables tracking of the tea supply chain from production to consumption.

Many private companies in India have also been exploring the use of blockchain technology. For instance, ICICI Bank, India's second-largest private bank, has implemented a blockchain-based platform for domestic and international trade finance transactions. Similarly, Tata Consultancy Services (TCS), one of India's leading IT services companies, has developed a blockchain-based solution for supply chain management.

Blockchain possibilities in Indian Dairy sector:

The Indian dairy sector is one of the largest in the world, contributing significantly to the country's economy. It is also a significant source of livelihood for millions of farmers, particularly in rural areas. India is the largest producer of milk globally, with an estimated annual production of over 221 million metric tons. Despite the sector's growth, it faces several challenges, such as milk quality issues, supply chain inefficiencies, and payment delays. Blockchain technology can address these challenges and create new opportunities for the sector. There are mainly three key areas where blockchain technology can be used in Indian dairy sector , they are as follows :

Milk production and supply:

Blockchain can be used to create a tamper-proof record of milk production and supply chain. Farmers can record the milk production data on the blockchain, and this data can be traced by the stakeholders in the supply chain, including the dairy cooperatives, processors, and retailers. This can help in ensuring the quality and safety of the milk and can also help in reducing fraud and adulteration.

Animal feed supply chain:

Blockchain can be used to create transparency in the animal feed supply chain. The farmers can record the purchase and use of animal feed on the blockchain, and this data can be traced by the stakeholders in the supply chain, including the feed manufacturers, suppliers, and farmers. This can help in ensuring the quality of the animal feed and can also help in reducing the use of low-quality feed.

Animal production:

Blockchain can be used to create a digital identity for the animals, which can be used to track the animal's health, vaccination, and breeding history. This can help in ensuring the quality and safety of the dairy products and can also help in reducing the risk of diseases and infections. The stakeholders in the supply chain, including the farmers, veterinary doctors, and dairy cooperatives, can access this data on the blockchain.

Challenges in adoption of Blockchain technology in livestock sector

Infrastructure: Upgrading the existing IT infrastructure of the dairy sector to support blockchain implementation requires significant investment in hardware, software, and network capabilities. Ensuring reliable internet connectivity in rural areas, where many dairy farms are located, is crucial for seamless data transmission and participation in the blockchain network.

Data Standardization: Achieving data standardization across diverse stakeholders in the dairy supply chain is a complex task. Harmonizing data formats, definitions, and protocols among farmers, cooperatives, processors, and other actors is necessary to ensure accurate and interoperable data exchange on the blockchain.

Adoption and Collaboration: Convincing all participants in the dairy sector, including small-scale farmers and traditional cooperatives, to adopt blockchain technology and actively participate in the network can be challenging. Overcoming resistance to change, building trust among stakeholders, and promoting the benefits of blockchain, such as improved transparency and traceability, are critical for successful adoption.

Cost and Scalability: Implementing blockchain technology involves significant upfront costs, such as infrastructure setup, network maintenance, and ongoing system upgrades. Ensuring the scalability of the blockchain network to handle the high volume of transactions in the Indian dairy sector, while keeping costs manageable for all participants, requires careful planning and resource allocation.

Regulatory Framework: Developing a comprehensive regulatory framework that addresses legal and compliance aspects specific to blockchain technology is essential. This includes data privacy, intellectual property rights, smart contract enforcement, and dispute resolution mechanisms. Balancing the need for regulation to protect stakeholders' interests while fostering innovation and flexibility is a challenge that requires close collaboration between government and industry.

Skill Development: Building a skilled workforce with expertise in blockchain

technology is crucial for successful implementation. Providing training programs and educational resources to farmers, cooperatives, and industry professionals can help bridge the skill gap and empower stakeholders to effectively use blockchain in their daily operations.

Conclusions:

Blockchain technology has the potential to revolutionize the Indian dairy sector by increasing transparency, efficiency, and trust among stakeholders. With the use of blockchain-based systems, farmers can have better control over their production and supply chain, and consumers can have access to verifiable information about the milk they consume. Over time, supply chains have grown more complex, leading to challenges in terms of traceability, responsiveness, and trust. These obstacles have hindered the creation of more efficient supply chain networks. Blockchain technology has the potential to alleviate these challenges, thereby unlocking value and new opportunities. Despite its potential, however, there have been only a limited number of large-scale blockchain implementations. There is an opportunity for India's youth and industry to lead a revolutionary movement, leveraging artificial intelligence, and blockchain to deliver trusted value to end-consumers in both domestic and global markets.