

In simplest terms, blockchain is a method of storing data in such a way that it is difficult or impossible to alter, hack, or cheat it. A blockchain is a digital log of transactions that is duplicated and distributed across the blockchain's complete network of computer systems. While majority of Blockchain development and launches have been focused on financial systems such as Cryptocurrency and Financial Security, the implications of blockchain on food systems is an avenue awaiting to be explored radically.

The potential of blockchain to keep ownership records and resist tampering can be utilized to address pressing concerns in the present food system, such as food fraud, safety recalls, supply chain inefficiency, food traceability and more. From the vantage point of advantages of blockchain, the following features are ripe for innovation and subsequent innovation operationalization in the Food Value Chain.

- 1. Food production:** Blockchain technologies can be used to consolidate information on the quality of the agri inputs for food production. Inputs such as seed, fertilizers, animal feed and environmental conditions can be converted into a ledger that can be linked to logistics and distribution channels. The blockchain enablement could enhance transparency in public private partnership models through provision of non-corruptible records from production to consumption. As a substantial portion of food fraud happens at the farming stage itself, blockchain solutions can be utilized with proper validation and can prevent illegal and unethical production and distribution that undermines sustainability and community food security especially in agri-dependent economies.
- 2. Food logistics:** As the world moves deeper into hyperconnected food value chains, logistics play an important role in ensuring timely, adequate, and quality food supply. The pandemic and subsequent supply chain disruptions have highlighted the role that logistics play in getting food on our plates. Blockchain technologies can be utilized by producers and consumers alike to enable increasingly transparent and predictable end-to-end surveillance of supply chains. Producers, regulatory agencies, and distributors can digitize physical stocks and create a decentralized and un-corruptible record of transactions, thereby making it feasible to track stock keeping units—starting from production to delivery or consumption use by end users. This increased supply chain transparency provides enhanced visibility to both businesses and consumers. Furthermore, Blockchain adoption can drive increased supply chain transparency to help reduce fraud for high value or high perishability products. It could assist enterprises in understanding how raw materials and finished products are passed through each subcontractor and reduce losses arising due to counterfeit and illicit trading in the value chain thereby increasing confidence in end users.
- 3. Food consumption:** Food traceability has been at the core of global food safety dialogues with inherent focus on organic and sustainable food sourcing. Due to the constantly extending supply chain of major food groups and notably that of perishable food, the industry as a whole is extremely susceptible to human lapses in judgement and due to the inherent nature of food as basic sustenance, non-strategic ideation and implementation ultimately affects human lives. This is evident with the periodic and repeated incidences of food borne disease outbreaks and mass malnutrition alongside increased obesity. At the core, these challenges are essentially due to lack of transparency more than lack of intent. Blockchain enabled transparency can enable governments as well as consumers to make informed decisions to make better product choices and can allow consumers to reward producers who employ good food producing practices. This majorly includes small and

medium scale farmers and fishermen who are the most accessible source of food producers for majority of the global population. This transparency can also enable better value realization and value addition for organic products which depend on traceability for value acceptance by consumers.

While the above avenues are the core apparent targets for blockchain acceptance, further adaptation and applications are feasible with a customized audit of the product and value chain to identify potential implementation and innovation avenues. Areas such as customer centric product sourcing, omnichannel consumption areas and ethically responsible supply chains can be core areas of blockchain implementation.

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