Blockchain technology for food supply chain traceability and authentication

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**Abstract.**

Currently, companies adopt traceability systems scarcely shared among the players of the supply chain, uneven in terms of technology and tracked data structure. Generally, they are almost entirely aimed at complying the basic requirements of food safety regulations. Nowadays customers have access to product information through different channels that are largely deployed also in multi- or omni- channel marketing strategies (websites, mail, app, social media). Data analytics and Artificial Intelligence can then highly enhance marketing strategies. Furthermore, there is a high demand of proof of authenticity systems able to certify high-value food credential attributes. Thus, in this paper a blockchain-based system is proposed to manage and certify traceability information and, therefore, the authenticity of food products. Blockchain is a distributed ledger shared among a peer-to-peer network that allows to securely record transactions. Blockchain features of transparency, security, decentralization and data immutability make it a valid technology to share information between the numerous actors of agri-food supply chains.

In the context of the PININ project, the traceability of dairy and meat supply chains has been considered. A decentralized application (DApp) has been developed for the registration of the collected traceability data in a consortium blockchain, where a limited number of actors with shared responsibility can submit transactions and access data. The DApp also allows the publication of recorded data in a regional blockchain to render them publicly available. A mobile application, has been developed to connect the physical products with their digital twins. By means of a QR code printed on labels, blockchain certified data are then available to food supply chain public and private stakeholders.

An electronic collar equipped with GPS and Bluetooth systems has been also developed to georeferencing cattle in mountain pastures. The acquired data, recorded in the blockchain, allow competent authorities to securely verify the position of the animals for the correct disbursement of European funds to farmers, thus preventing frauds.