Opportunities and challenges for blockchain in the agri-food industry

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Outline

- Why is blockchain relevant for food chains?
- What are the features and applications?
- What is the way forward?

Disclaimer: this presentation uses the terms blockchain and distributed ledger technologies (DLTs) interchangeably. However, note that all blockchains are DLTs and are only one specific implementation of DLTs.

Why is blockchain relevant for food and agriculture?

1. Food chains lack efficiency, traceability and transparency.

For example:

- Insufficient traceability and transparency in food chains
  - Often no auditable production history for food safety, sustainability information and occupational health
- Trade is complex, time-consuming and expensive
  - Legacy customs and trade finance can be characterized by paper documents, manual-labour, rising costs, asymmetric information and increased risk.

2. Challenges for trade and food chains are data problems

- Verifiable data is the basis for certificates, product quality, food safety, financing, etc.

What are the features?

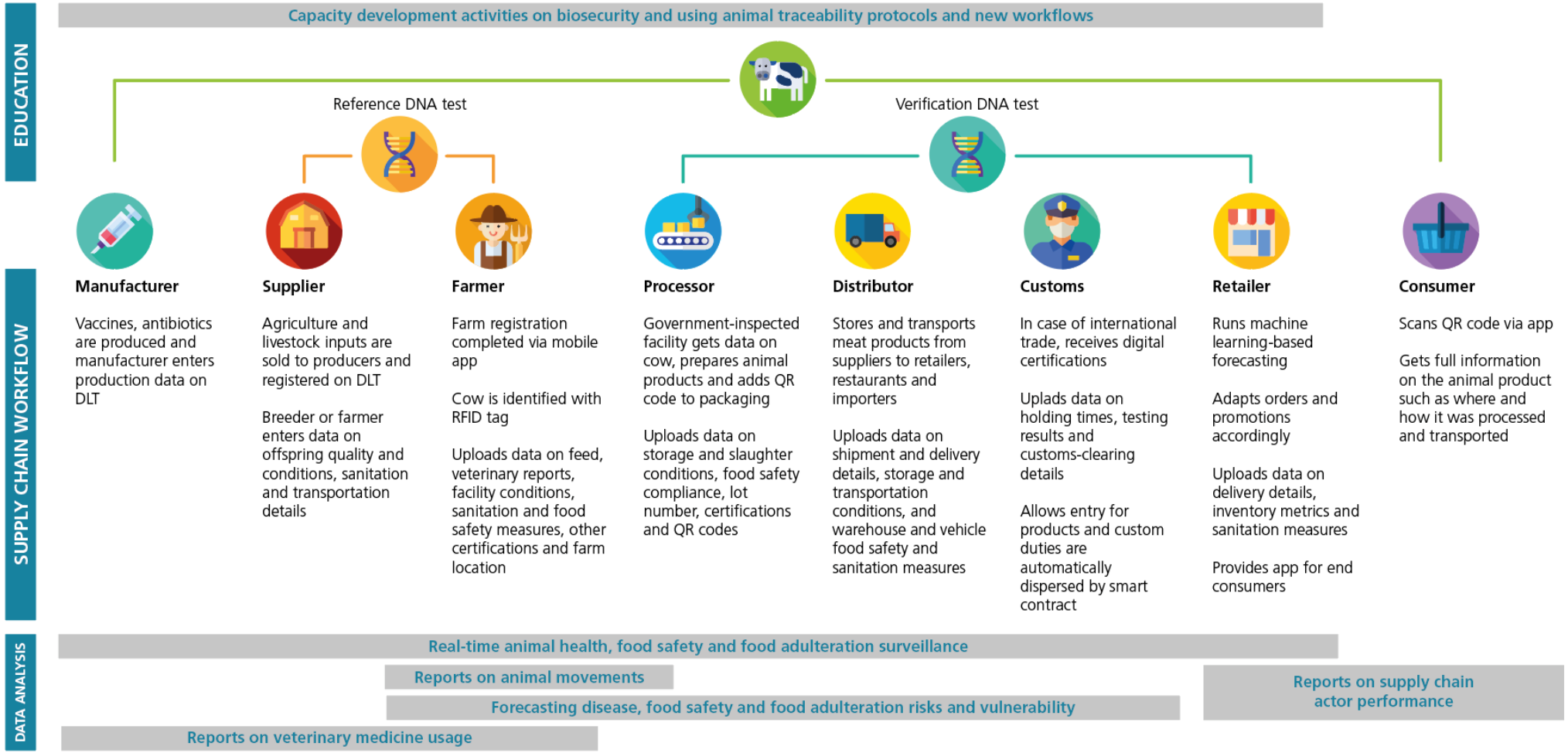
New solutions…?

- DLTs have unique features…
  - Shared database with immutable and secure data entries
  - Brings greater ***transparency, traceability, efficiency, accountability and trust*** to the exchange of value and information.
- Smart contracts
  - Auto-execute contracts when pre-defined conditions are met

What are the applications of DLTs in agriculture?

- Supply chain management
- Food safety
- Trade finance
- Agricultural financial services
- Market information
- Land registries
- International agreements related to agriculture

1. Enhanced traceability and higher quality transactions



Source: Tripoli & Schmidhuber (2020)

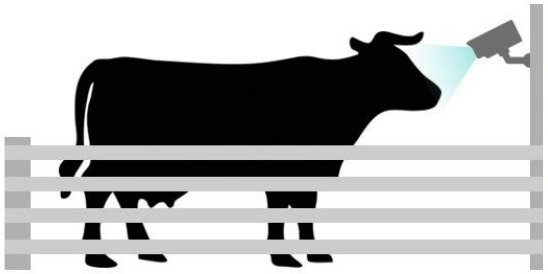
Product-process links for enhanced traceability

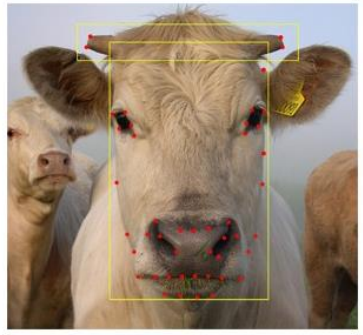
QR codes

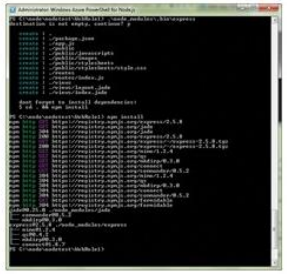
Crypto-anchors

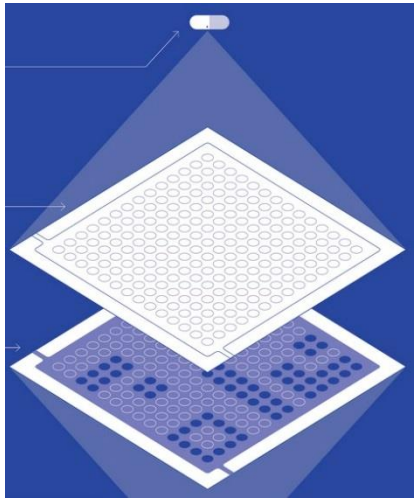
RFID chips

Facial recognition









Audible production history

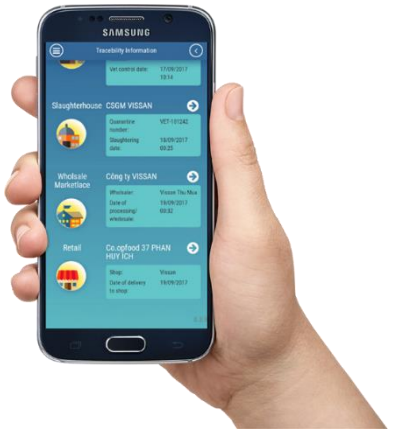
- Enhanced traceability and detailed product data on provenance, attributes and authenticity
  - Plant genetics, production techniques and inputs, SPS measures, processing conditions, transport data, sustainability data and certifications.

↳Improves monitoring and compliance with SPS and sustainability standards

↳Faster response to disease outbreaks and contaminated food products

↳Combat food fraud

↳Reduce friction at the border for international trade



2. Disintermediates transactions in ag supply chains

- DLTs and smart contracts provide similar outcomes for trade finance and agricultural financial services (payment services, agricultural insurance, credit and derivatives)

Problems in legacy systems

- Paper intensive
- Manual labour
- High costs
- Fraud
- Asymmetric information
- High risk
- Long payment terms

DLT benefits for financial services

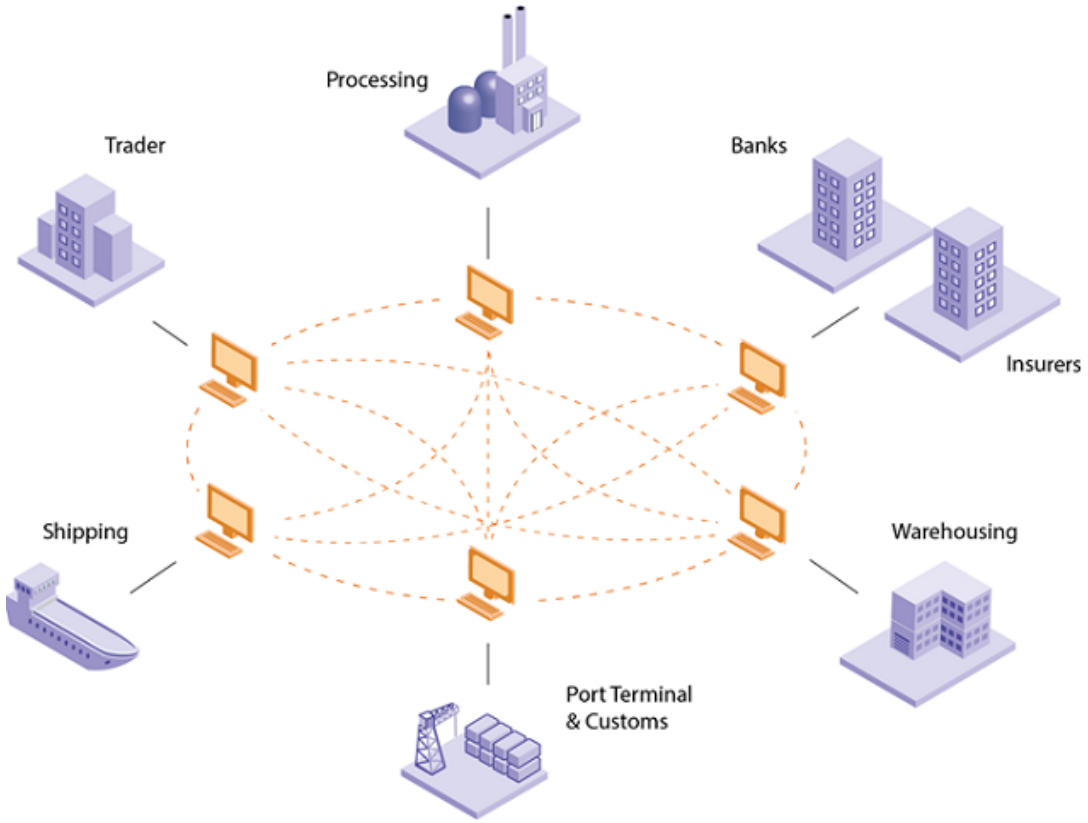
- Increased efficiency
- Greater access for smallholders and MSMEs
- Better facilitates trade with less friction

DLT solutions

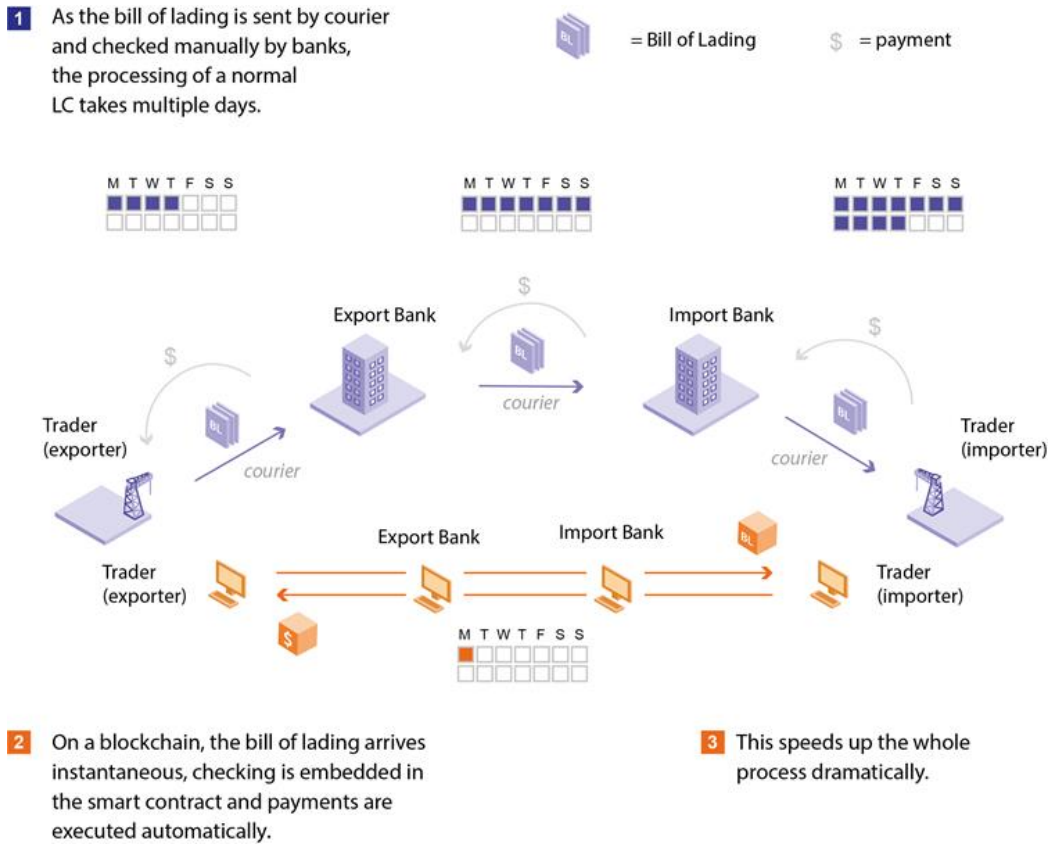
- Digitalization of economic activity, contracts, and payments
- Auto-executes contracts
- Lowers transaction costs
- Reduces risk for sellers and banks
- Real-time payments

More efficient trade finance

Single ledger for all trade documentation



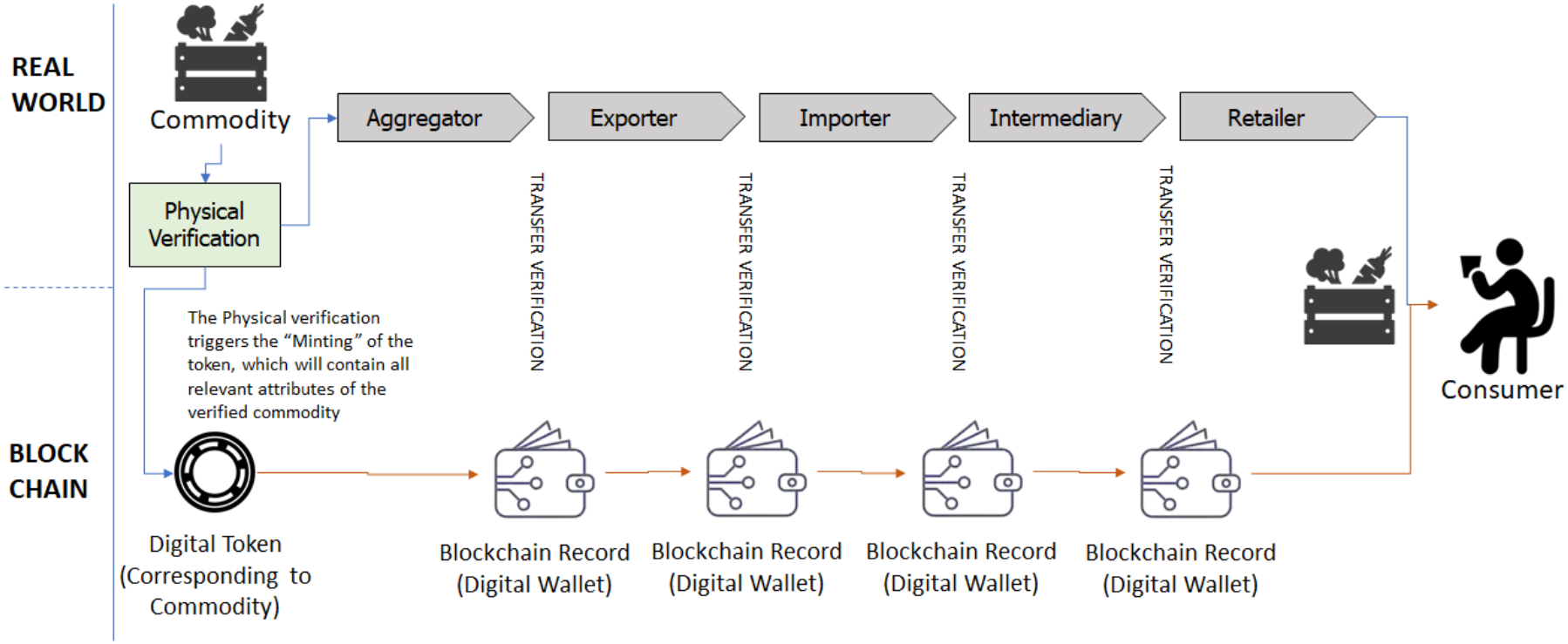
Instantaneous documentation flows



Source (figures): Rabobank. 2018. The impact of blockchain on trade finance.

Tokenized assets

- Tokenization enables unique business models for remunerating farmers and consumers to create sustainable and responsible supply chains.



3. Building a digital identity

- By recording digital and physical assets on the DLT, users build a digital identity to access financial services and find new market opportunities.

  - Digital assets, or data, recorded from activity in agricultural supply chains can:
    - Enhance market information and market transparency
    - Provide supply chain actors with detailed records on their operations
  - Physical assets can be used as collateral to access financial services
    - DLTs provide a secure, fast and immutable method to register land titles

What is the way forward?

From potential…

- From 2018-2022, the global blockchain market in the agriculture sector is projected to grow at a CAGR of 56%.*

To adoption…

1. Improve knowledgebase of public and private sector on the application of DLTs for food and agriculture
2. Address the numerous technical, regulatory, institutional, infrastructure and capacity development related challenges for widespread adoption
3. Create an enabling environment that promotes DLT adoption and ensures the productivity gains generated by DLTs are shared by all market participants, including smallholder farmers, processors and MSMEs.

Achieved by…

- Promoting international cooperation through public-private sector partnerships
  - Contributing to technical dialogue on research and development with private sector
  - Providing policy guidance on the use of DLTs in supply chains
  - Developing appropriate regulations and standards (regulatory sandbox) with private sector
  - Outreach to raise awareness, and improve digital infrastructure and skills (pilot projects in agricultural supply chains)

*Source: Technavio. 2018. Global Blockchain Technology Market in the Agriculture Sector 2018-2022. **Bain and Company. 2018. Wolf in Sheep's Clothing: Disruption Ahead for Transaction Banking.

THANK YOU

For more information see the following publications

Food and Agriculture Organization of the United Nations

TRADE POLICY BRIEFS

TRADE & AGRICULTURE INNOVATION

NO. 33

HOW CAN BLOCKCHAIN'S GENERAL ARCHITECTURE ENHANCE TRADE FACILITATION IN AGRICULTURAL SUPPLY CHAINS?

SUMMARY

- Distributed ledger technologies (DLTs) and smart contracts can enhance trade facilitation by bringing greater transparency, accountability, efficiency and traceability to the exchange of value and information in agricultural supply chains.
- These technologies have the potential to simplify transactions along agricultural supply chains, by facilitating access to trade finance, improving the transparency of transactions, and strengthening the compliance with trade agreements.
- Enhanced trade facilitation through DLTs can help achieve broader policy goals, such as food security and rural development, and be a catalyst to meet the Sustainable Development Goals (SDGs).

Introduction

Authors: Mischa Tripoli & Josef Schmidhuber

Organising transactions in agricultural supply chains often amounts to managing complex, expensive, and time-consuming processes. Transactions are intermediated by institutions, which rely on manual labour and paper-heavy settlement processes. For example, documenting transactions alone costs seven percent of the value of traded goods, according to the Global Alliance for Trade Facilitation. Not only are traditional transactions expensive, they are also slow. For example, the payment terms for Australia's grain sector range from two to five weeks, posing counterparty credit risk to producers (Fintech Australia 2016). Other challenges for trade facilitation include the lack of transparency and the limited traceability of products.

The World Trade Organization's (WTO) Trade Facilitation Agreement sets out to reduce costs, increase transparency, avoid delays and reduce uncertainty in trade. Blockchain and other DLTs[1], combined with smart contracts[2] can make a major contribution towards these goals. They can speed up transactions, lower costs and make trade finance more efficient. They enhance food safety, make transactions transparent and traceable and thus strengthen the compliance with international trade agreements (Tripoli & Schmidhuber, 2018).

Enhanced trade facilitation in agricultural supply chains with DLTs

Enhanced traceability and higher quality transactions

DLTs offer a platform that records, tracks, monitors and transacts physical and digital assets in agricultural supply chains. The technology can integrate and manage each process and transaction throughout the agricultural supply chain in real time. Each transaction processed on a DLT carries process details and specific product attributes, which are added by supply chain actors and Internet of Things (IoT) devices and sensors, such as agricultural and livestock production practices, transportation and storage conditions, export-related certifications, sustainability information and certifications and other technical details. Every transaction can be traced by the cryptographic fingerprint in the DLT, while the movement of the physical product along the supply chain can be traced by an immutable link that connects the product to the DLT (process) to ensure the product's authenticity. There are number of ways to ensure these product-process links such as QR codes, RFID chips, facial recognition for livestock, and crypto-anchors[3].

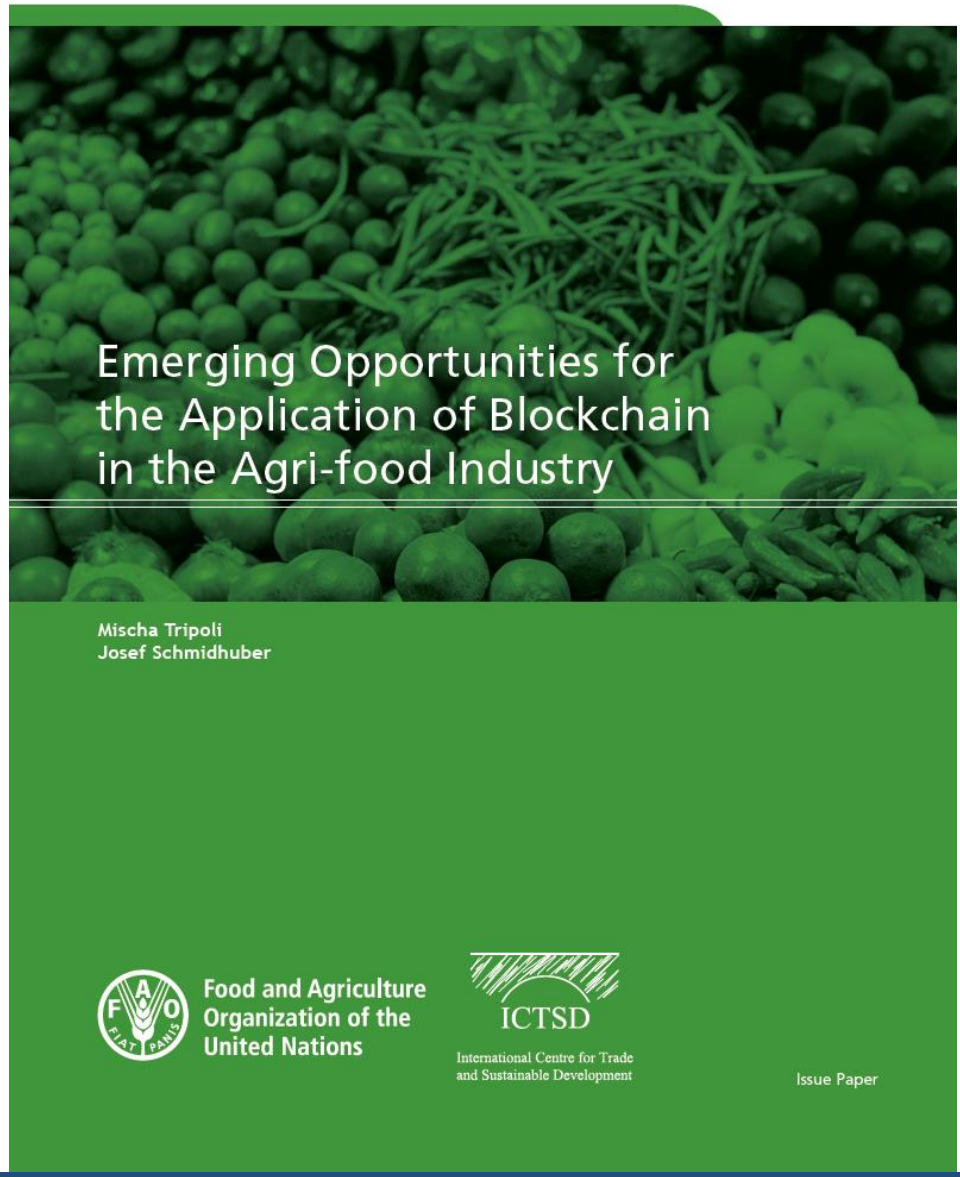
The ability of DLTs to trace a product's provenance, carry detailed attributes in each transaction and ensure its authenticity provides vast improvements in traceability and transparency. Regulatory control is easier with DLT as the product can be traced along the supply chain, which will allow for legal accountability, detecting fraudulent behaviour or noncompliance. The enhanced traceability improves

1 For the purpose of this brief, the terms blockchain and distributed ledger technologies (DLTs) are interchangeable, but note that blockchain is actually one type of DLT.

2 Smart contracts are computer programmes that automatically execute when predefined conditions are met.

3 Crypto-anchors are tamperproof digital fingerprints that are embedded into products in the form of edible ink using optical code or tiny computers, and linked to the DLT to prove a product's authenticity (BMZ 2018).

TRADE & AGRICULTURE INNOVATION



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Emerging Opportunities for the Application of Blockchain in the Agri-food Industry

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Issue Paper