Enhancing trust in the food system with block chain technology
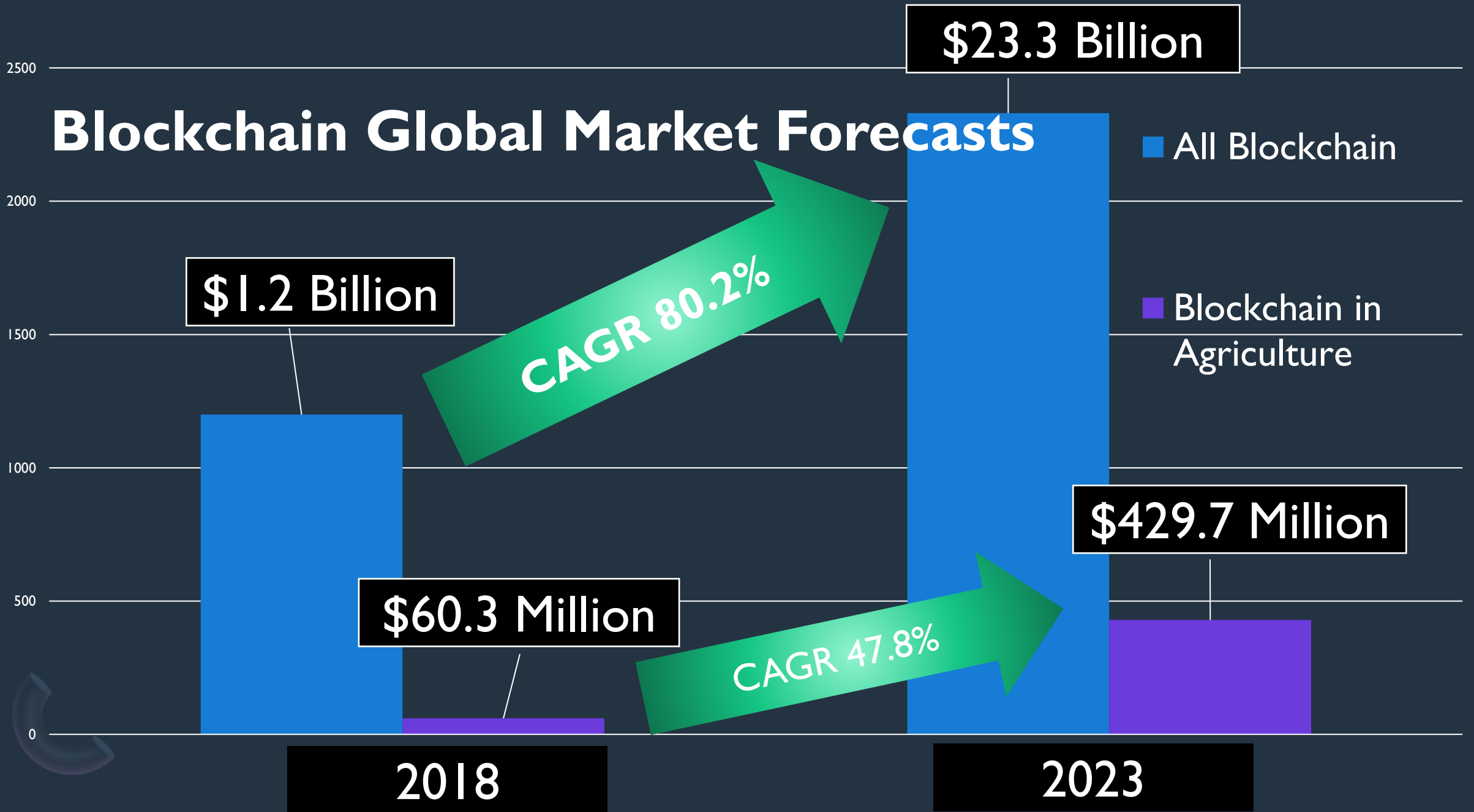
Strengths and vulnerabilities

Digital Transformation of the Agricultural Value Chain – Opportunities, Challenges and the Role of Science 2 – 3 December 2020, Berlin (Germany)
Sustainable digital transformation of the agricultural value chain
Thursday 3rd December 2020
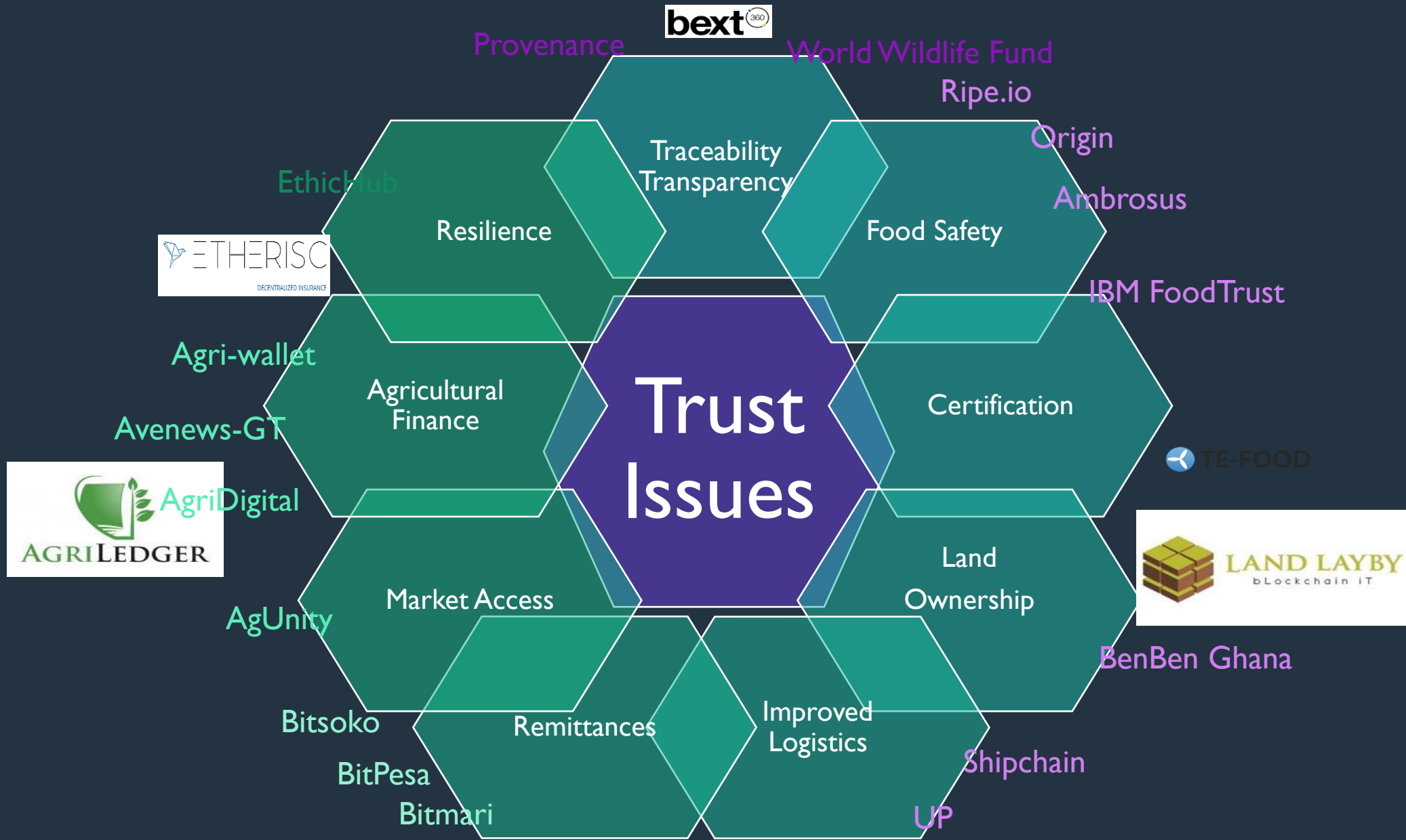
Chris Addison

CommUniq.org

Just one agritech blockchain company

- 6,000 + business customers

- 400,000+ operations per day

- 150 M people served

Agriculture & food security

Strengths and vulnerabilities of blockchain

Strengths	Vulnerabilities
Trust system-Immutability	Entry cost
Transparency	Private networks
Decentralisation	Awareness/Access to skills
Virtual organisation	Resources/policy
Smart contracts	Openness of algorithms
ID control	Ownership
Consumer information	Communication
Certification	Standards/Interoperability
Consumer Confidence	Long term security & technology change

Who is the consumer?

- Agricultural product consumer

- Farmer

- Government

- Agribusiness

Consumer crisis of confidence in food systems

Food safety → Environment → Climate change → Equity → Labour
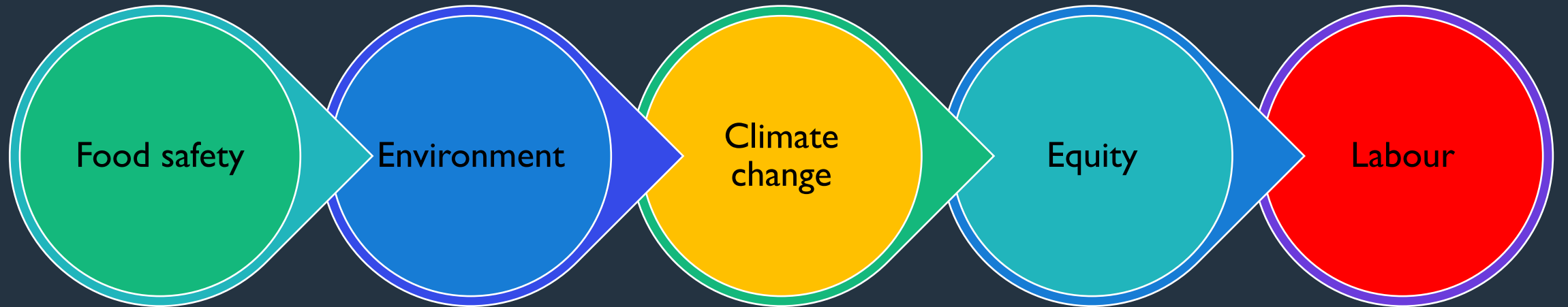
The Horse lasagne scandal

- *Which?* report 6 in 10 consumers changed their shopping habits.

- 30% of consumers were buying less processed meat.

- 24% were choosing vegetarian ready meals instead of meat ones.

- Consumer trust fell by a dramatic 24%.

- Lack of trust in cheaper processed supermarket meals linked to a rise in organic sales.

- Soil Association reported that organic sales increased by 8.4% in one month consumers were choosing to buy organic as a sign of integrity and quality.

https://www.highspeedtraining.co.uk/hub/horsemeat-scandal-facts-and-effects/

Digital trust and agriculture

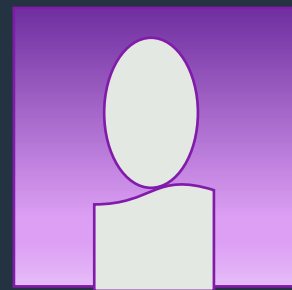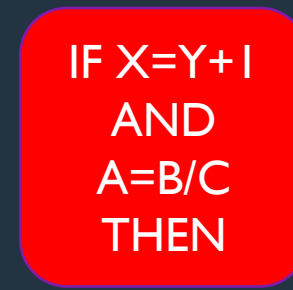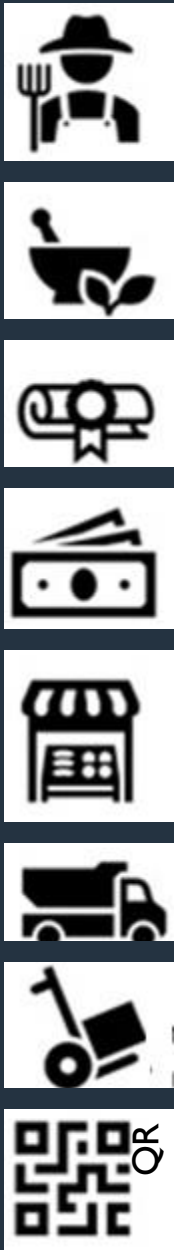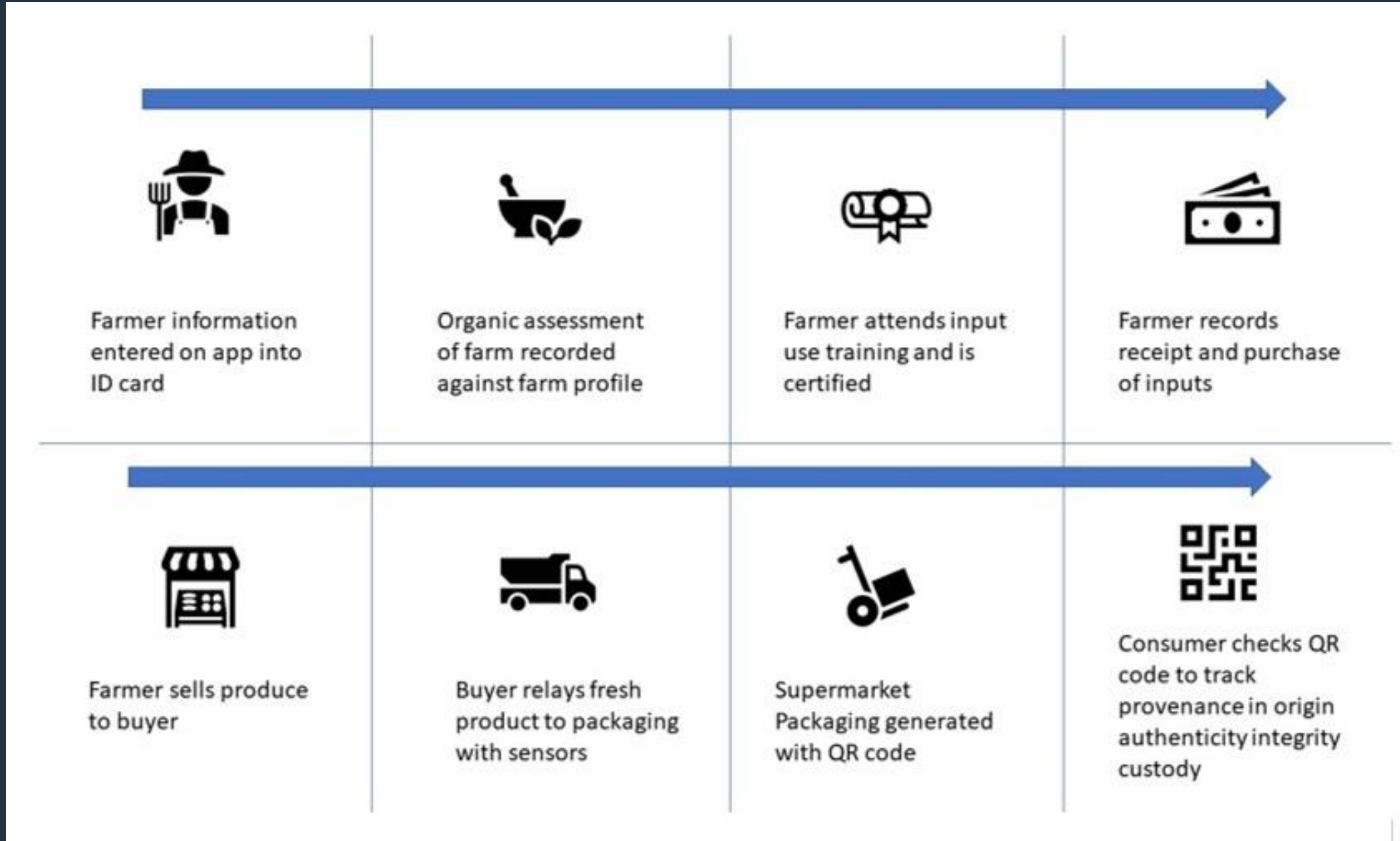| Steps in value chain	Cold chain/ Environment	Product tracking	ID management	Smart contract	Consumer/ Certification
Timestamp	IoT/Sensors	QR code	ID technology	Algorithm	Application

Consumer sovereignty

- First, blockchain technology does not inherently solve all trust issues when it comes to real-world interactions between human beings: the trust-free fallacy.

- Second, the role and importance of platforms as the broker and curator must not be neglected, but often is: the disintermediation fallacy.

- Third, unlike tech enthusiasts, main street consumers do not put much weight on the underlying technology: the consumer will fallacy.

Hawlitschek, Florian & Notheisen, Benedikt & Teubner, Timm. (2020). A 2020 perspective on "The limits of trust-free systems: A literature review on blockchain technology and trust in the sharing economy". Electronic Commerce Research and Applications. 40. 100935. 10.1016/j.elerap.2020.100935.

On the farmers watch

Trace – Proof on the blockchain

Farmer information entered on app into ID card → **Organic assessment of farm recorded against farm profile** → **Farmer attends input use training and is certified** → **Farmer records receipt and purchase of inputs**

Farmer sells produce to buyer → **Buyer relays fresh product to packaging with sensors** → **Supermarket Packaging generated with QR code** → **Consumer checks QR code to track provenance in origin authenticity integrity custody**

Core elements of blockchain

Transaction is requested e.g. farmer requests payment for goods OR

Insurance smart contract executed

Transaction sent to peer to peer network and then to each node on network
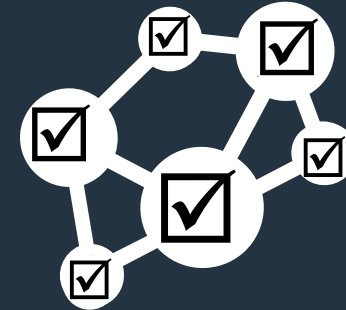
Nodes receive request & validate the transaction using cryptocodes and an algorithm (solves an equation to prove validity)

Once confirmed to be legitimate, transactions are clustered together in blocks

These approved transactions are added to a ledger as a block

Once block added the transactions are complete and permanent
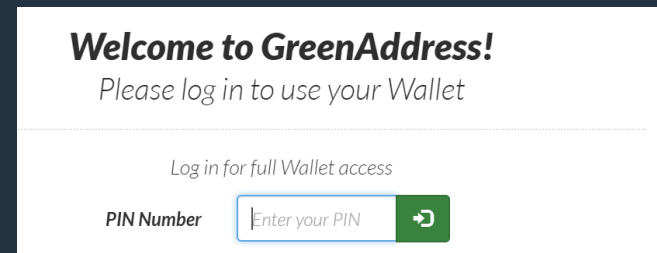
Securing the blockchain

Hash
Coded entry to describe content
E.g. SHA 256

INPUT	HASH
Hi	639EFCD08ABB273B1619E82E78C29A7DF02C1051B1820E99FC395DCAA3326B8
Welcome	53A53FC9E2A03F9B6E66D84BA701574CD9CF5F01FB498C41731881BCDC68A7C8

Digital signature
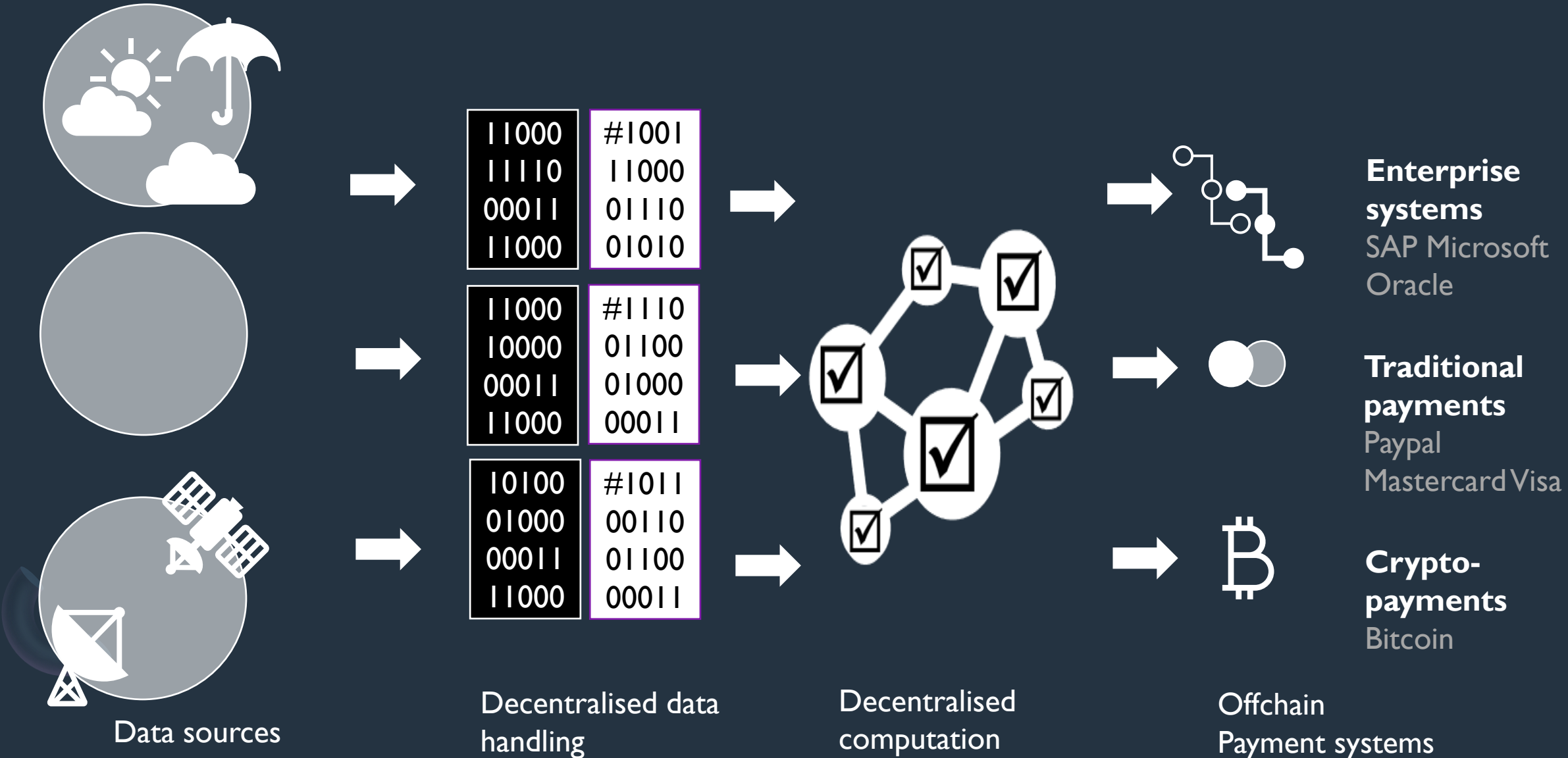ID proven by
combination of private
and public key

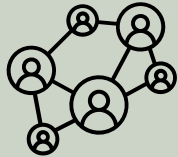**Welcome to GreenAddress!**
Please log in to use your Wallet

Log in for full Wallet access

PIN Number   Enter your PIN

Timestamp
In system can be
viewed against
transactions through
an explorer

Recent transactions

Tx hash	Timestamp	Block	From	Channel
cdc59cd3b18c0c16e21b36fb408b55ebf8b8c70d4261b1dfeccba3a09d10416e	2018-10-13 06:26:35	3643	MasternodesMSP	masternodes
9e633ff38b2f1d317e23c7062a8d33686cf93ca8ae51ce5440694cd613315a16	2018-10-13 06:26:35	3643	MasternodesMSP	masternodes
b4b537668f8266a47025ee2ca51191d889e0967958b9808c0ced517d48c7c3e2	2018-10-13 06:26:32	3642	MasternodesMSP	masternodes
ddecc4d06978f6842e8ea0b41c4c2a4d09a8f585412fdd3b096d6a4757d9a965	2018-10-13 06:26:32	3642	MasternodesMSP	masternodes
d01dbaca103c917224c880a3dab89297b7f8ce3994c07e74cf6dbf7708cc5bd5	2018-10-13 06:26:20	3641	MasternodesMSP	masternodes

Insurance payment & smart contracts

Enterprise systems
SAP Microsoft Oracle

Traditional payments
Paypal Mastercard Visa

Crypto-payments
Bitcoin

Data sources

Decentralised data handling

Decentralised computation

Offchain Payment systems

Addressing Oracle vulnerabilities

	Distributed sources & design	**Using multiple sources:** E.g. multiple weather data for an insurance payout contract. Decentralization: no one node or data source is a single point of failure
	Open software and secure protocols and hardware	**Open-source:** verify the security and reliability of source code between oracle and chain. **Advanced Cryptography and Hardware**
	Tracking performance of sources	**Data Signing:** Identify and trace performance of nodes. **Reputation Systems:** allows users to make decisions on which nodes are good. **Certification Services:** like KnowYourCustomer, geographic location, security reviews. **Service agreements:** Penalties & rewards for performance

https://blog.chain.link/what-is-the-blockchain-oracle-problem/

Blockchain in agriculture Government Pluses and Minuses

INPUT   MARKET   FINANCE   ORGANISATION   POLICY

Blockchain and the digital principles

Design with the user

Understand the Existing Ecosystem

Design for Scale

Build for Sustainability

Be Data Driven

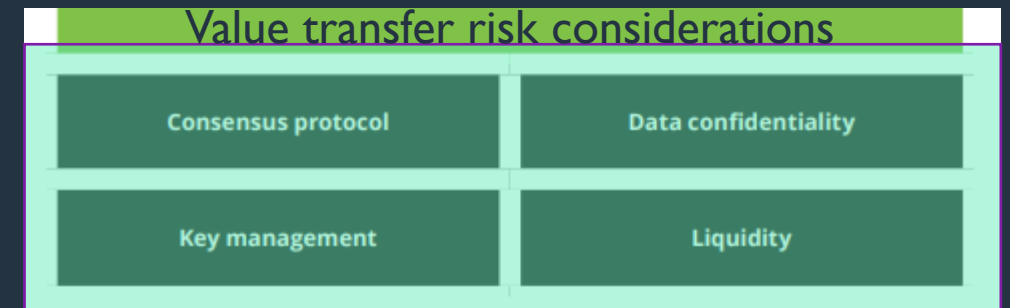Use Open Standards, Open Data, Open Source, and Open Innovation

Reuse and Improve

Address Privacy & Security

Be Collaborative

Blockchain vulnerabilities for agribusiness

Standard risk considerations

Strategic	Business continuity	Reputational	Information security
Regulatory	Ops and IT	Contractual	Supplier

Smart contract risk considerations

Business and regulatory	Legal liability
Enforcement of contract	Information Security

Value transfer risk considerations

Consensus protocol	Data confidentiality
Key management	Liquidity