

An illustration of a fishing boat on the water, with several crew members visible. A complex digital network of glowing blue lines and nodes is overlaid on the scene, connecting various points across the boat and the water. The background shows a sunset or sunrise over the ocean.

From farm-or sea- to plate: FAO's work in support of traceability in the seafood sector

Overview of technical assistance & capacity building activities

Part of normative work since 2008

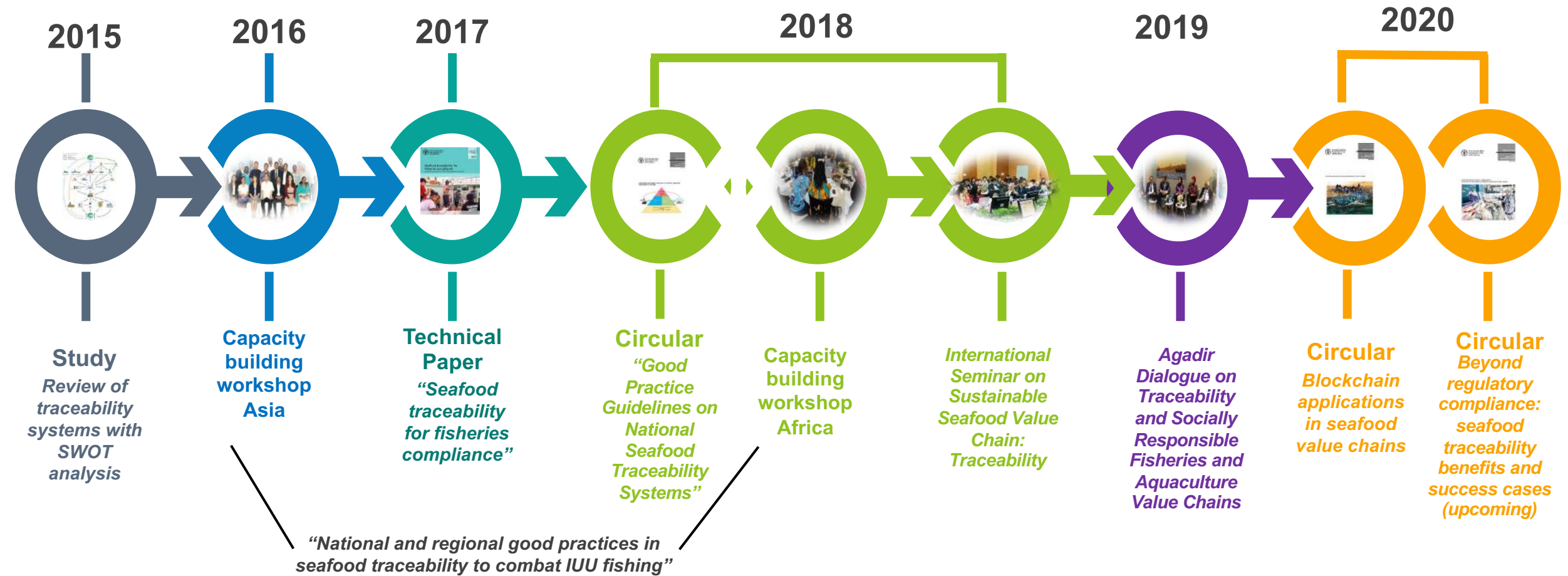
Traceability to verifying the integrity of fish supply chain to ensure

Quality, Safety and Legality

On the agenda of COFI-FT for the past 6 sessions starting from 2008



Some technical assistance, capacity building and studies



Technical assistance, capacity building

Developing countries focused

Capacity building combined with exchange of experiences

Promote experience sharing amongst countries in the same region, or across regions

Members and RFMOs involved

Number of government officials, business operators/groups, technology service providers etc
geographical balance

Technical good practice guidelines produced

Support to the development of national seafood traceability regulatory framework recommended

Harmonization of standards

Collection of recommendations for future work/support to Members

Beyond Regulatory Compliance: Seafood Traceability Benefits and Success Cases

Traceability: benefits and incentives

Recommendations to:

Raising awareness about benefits and incentives for traceability adoption:



Identify, document and disseminate benefits and incentives for the adoption of traceability systems in the seafood supply chain.



Importance for securing and increasing market access, insurance premium, claim of ownership, promotion of products and country's image, sustainability of resources



The proposed study will also build on successful business cases from both developed and developing countries

Benefits for stakeholders (1/3)

| Stakeholder group | Traceability benefits |
|-------------------|--|
| Fishers | Better able to meet documentation and chain of custody requirements for market access for Marine Stewardship Council and/or Fairtrade certification |
| | Market intelligence on where fish is sold, by who and how |
| | Profiling of desirable product characteristics |
| | Communication with downstream actors |
| Processors | Platform enables transparency of activities for marketing purposes (e.g. can be used to link product to participation in a fishery improvement project) |
| | Fulfilling of documentation requirements of export markets |
| | Profiling of desirable product characteristics |
| | Added-value of analysis of companies and market |
| | Reduction of reputational risk associated with sector |
| | Decreased losses due to potential recalls |
| | Compliance to various international food safety and environmental standards |
| | Enhanced product quality |
| | Enhanced firms' competitiveness |
| | Reduced reporting and record-keeping requirements |
| | Enhanced food risks management |
| Retailers | Transparency about where their fish is coming from |
| | The information provided adds value to the products |
| | Reduced reputational risk associated with mislabelling |
| Consumers | Clear information on source of fish, conscience-free consumerism |
| | Potential for communication with fishers if traceability is "consumer facing" |
| | Educated on fishing practices and global trade |
| | <i>Products manufactured and placed on the market with labels and identification that facilitate increased trust in the brand</i> |
| | <i>If a safety issue occurs, all dangerous products are properly identified and removed from the market rapidly, thus increased safety, health, well-being</i> |
| | <i>Product information and statements on labels are accurate</i> |
| | <i>Product information and statements on labels are verifiable</i> |
| | <i>Support regional differentiation</i> |

Note: Red highlight indicates benefits connected to "negative" drivers, green to "positive" drivers

Benefits for stakeholders (2/3)

| Stakeholder group | Traceability benefits |
|---------------------------------|--|
| Managers | Data available on key fisheries indicators for stock assessment |
| | Inclusion of small-scale fisheries enables more informed decisions over benefits and allocation |
| | Economic indicators can be included in management decisions |
| Government | Data flows available to feed into national and regional databases |
| | Meeting international obligations set by regional fisheries management organizations |
| | Better facilitation of fishers to meet illegal, unreported and unregulated (IUU) fishing regulations for export markets |
| | Improved information on trade and non-fishery related benefits of otherwise unreported fisheries |
| | Decision-making made under less uncertainty |
| | Strengthening of trust relationships with import countries for improved trade relations |
| | Improved prospects for sustainable seafood governance |
| Market surveillance authorities | <i>Facilitates the task of determining whether a dangerous product is on their market</i> |
| | <i>Helps trace economic operators that made non-compliant products available on the market</i> |
| | <i>Helps check compliance with applicable regulations</i> |
| | <i>Helps verify the presence or absence of product attributes (e.g. wild-caught)</i> |
| | <i>Helps access the technical specifications of the product and retrace the actual history of the product as necessary to protect consumers health</i> |
| | <i>Helps proceed with effective risk assessment and corrective measures based on reliable and complete information, ensuring consumer safety while avoiding irrelevant costs for economic operators when removing products from the market</i> |
| | <i>Helps proceed with enforcement actions with all relevant stakeholders</i> |

Note: Red highlight indicates benefits connected to “negative” drivers, green to “positive” drivers



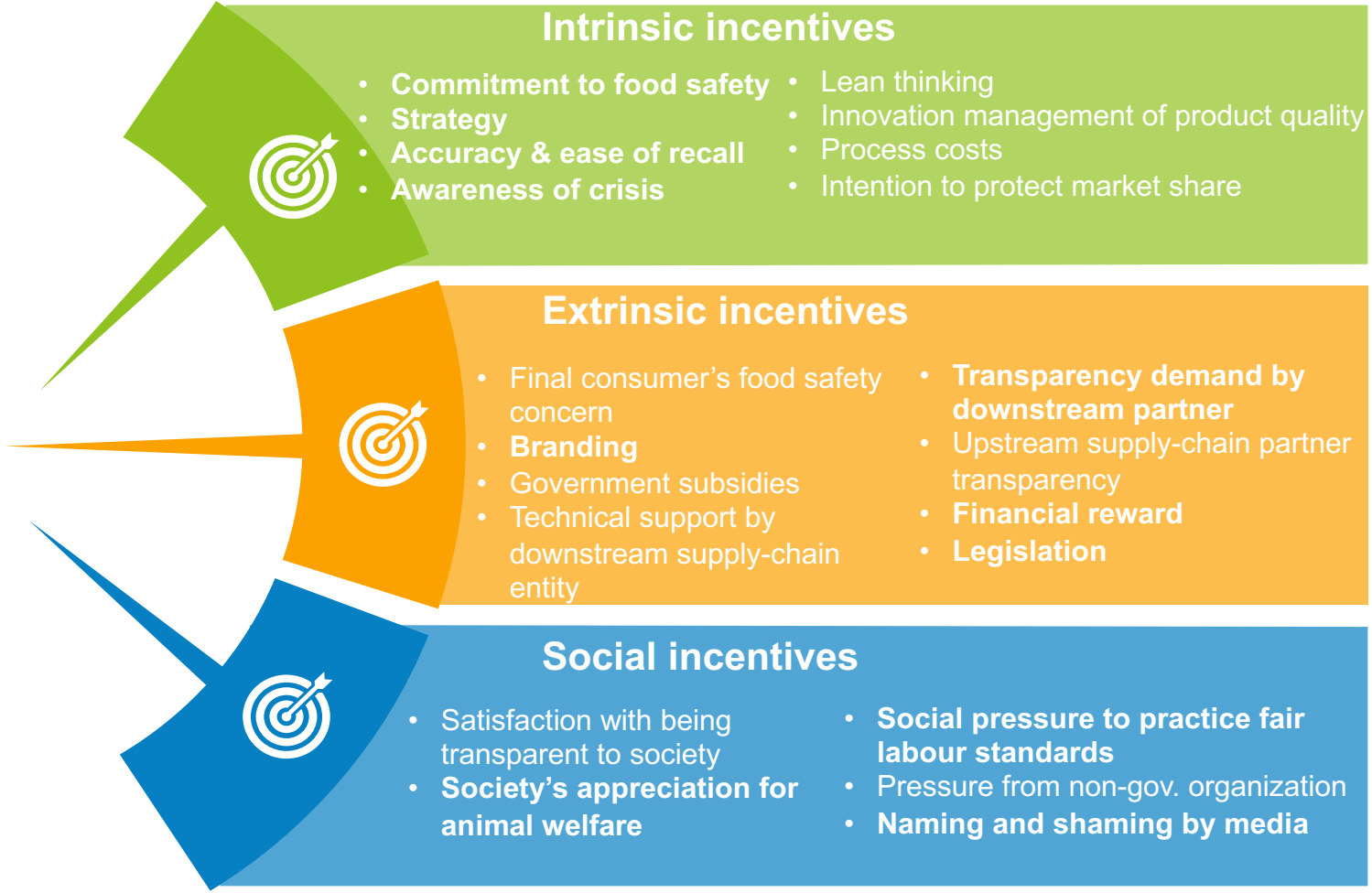
Benefits for stakeholders (3/3)

| Stakeholder group | Traceability benefits |
|---|--|
| Actors in the supply chain in general | Access to new markets and competitive advantages, no legal barriers to market access |
| | Reducing liability costs |
| | Avoiding penalties for non-compliance |
| | Waste reduction |
| | Increased product and company reputation |
| | Higher quality awareness among employees |
| | Method of securing jobs and improving income during uncertain time |
| | Reassurance of consumers, encouraging purchases of such quality-assured products |
| | More efficient communication with customers/suppliers |
| | Protection of public health |
| | Ensuring of environmental sustainability |
| | Reduced pilfering |
| | Strengthened sustainability practices |
| | Strengthened quality assurance and value-chain efficiencies |
| | Avoidance of short weighting |
| | Avoidance of species substitution |
| | Improved customer service, improve customer satisfaction |
| | Reduced quality variation |
| Increased ability to retain existing customers | |
| Faster detection of difficulties in manufacturing processes by improved process control | |

Note: Red highlight indicates benefits connected to “negative” drivers, green to “positive” drivers



Incentives for implementation

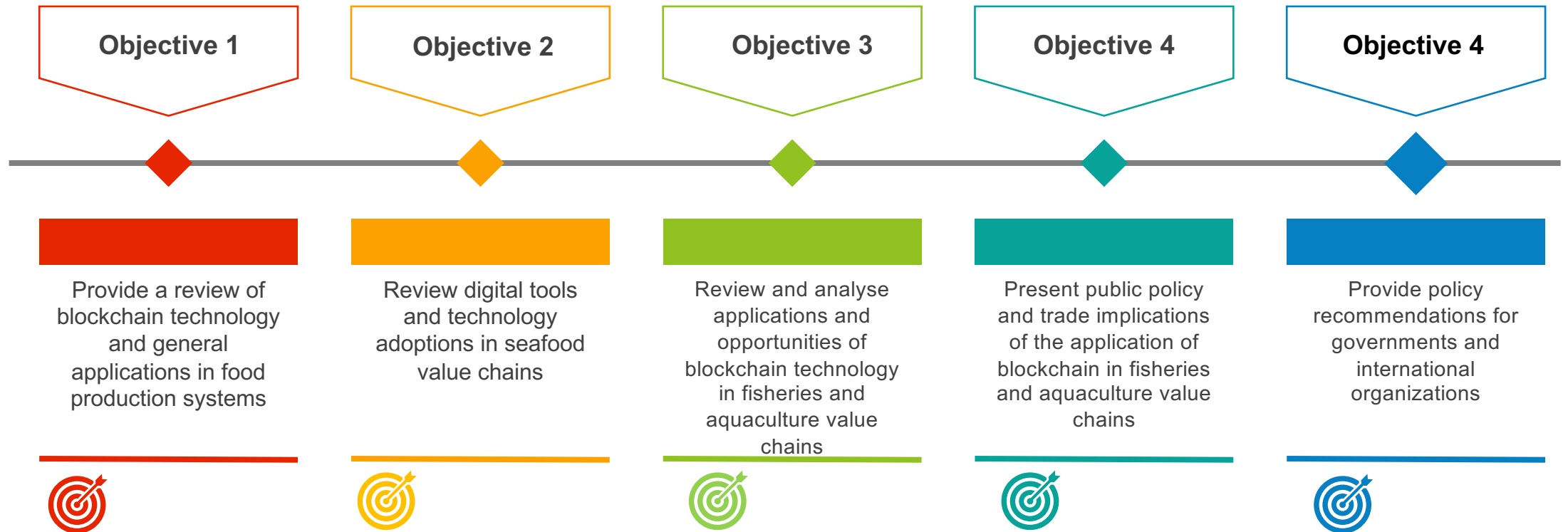


Note: Entries in bold indicate a strong incentive. Source: Compiled from Valluri (2012)

Blockchain application in seafood value chains

Study objectives

Demystify blockchain technology, provide thoughts on the opportunities and challenges in implementing blockchain-based systems as well as document some case studies on its use in seafood value chains



Study findings

Similarities across 7 reviewed blockchain projects

Immutability of data and secure data sharing

These were the most common reasons for utilizing blockchain technology



Use of QR codes on product packaging

This method was favoured, possibly because of its utility

Link between digital and physical

All projects rely on some way to link the physical with the digital, either through tagging individual fish or some other means of recording units of catch data



High-value fish species

Projects focused on tuna and Patagonian toothfish species, which are considered high-value commodities



Clearly defined value chains with known actors

Most of the projects had relatively short and clearly defined or vertically integrated value chains where the actors were known

Commonality analysis

Table 7. Commonality analysis of blockchain projects

| Project | Commodity | Blockchain | Comments |
|---|--|---|---|
| Provenance Indonesia | Tuna Fishing method: handline, pole and line | Ethereum Type: N/A | Fish are individually identified back to the fisher Fish are tracked through transformation in processing facility Uses near-field communication (NFC) on product packaging to communicate provenance story |
| WWF, New Zealand, ConsenSys, Sea Quest, TruStable Solutions, Tuna | Tuna Fishing method: pole and line | Ethereum Type: private Platform: Hyperledger | Fish are individually identified back to the fisher Tracked through response identification (RFID) on product packaging Fish are tracked through transformation in processing facility Uses Quick Response (QR) codes on product packaging to communicate provenance story |
| Pacific, Anato Pacific and import markets | Tuna Fishing method: purse seine | Ethereum Type: public Platform: Anato notary application programming interfaces | Fish are not individually identified Uses existing Parties to the Nauru Agreement Office (PNAO) fisheries information management system platform for data capture of Marine Stewardship Council (MSC) chain of custody (CoC) Anato notary service receives digital traceability data at key points and records onto blockchain Provenance story limited to lot/batch number generated on canned tuna |
| OpenSC, WWF, Australia, BCG Digital Ventures, Australia | Patagonian toothfish Fishing method: longline | N/A | Fish are individually identified back to the fisher Uses RFID and IoT sensors Uses QR codes on product packaging to communicate provenance story |
| Bumble-Bee Foods, SAP | Yellowfin tuna | Hyperledger | Fish are individually identified back to |

Study findings

Challenges across 7 reviewed blockchain projects

Tagging and labelling of fish

Physical fish tags/labels could be lost or damaged while transporting the fish or could potentially be tampered with



Complex seafood value chain scenarios untested

Solutions were not tested in real-world complex seafood value chain scenarios where the value chain actors were unknown

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| WWF-New Zealand, ConserSys, Sea Quest, TraStable Solutions Fiji | Tuna Fishing method: longline | Ethereum Type: private Platform: Treum (previously Viant) | Fish are individually identified back to the fisher Tracked radio-frequency identification (RFID) and Internet of things (IoT) sensors Fish are tracked through transformation in processing facility Uses QR codes on product packaging to communicate provenance story |
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Commonality analysis

Reliance on human input

Most of the projects rely on human input of fish data, which themselves could be open to tampering



Verifiability of private and consortium blockchain platforms

By their very nature, these types of blockchains are not open to the public and transactions on them cannot be independently verified

Critical forethought needs to be given to the value chain:

| Port State | | | | |
|-------------------|--------------------------|--------------------------------------|-------------|---|
| Supply chain stop | Critical tracking events | Main key data elements | Data source | Suitability for blockchain |
| | | Volume, form and species – estimated | | Complexity as estimates may be verified by monitoring using crane scales, mate's receipt, hatch plan, but substantial variability and port events edits |
| | | Unloading authorization code/ID | | Unloading code can be provided and could be easily be incorporated |
| | Landing | Vessel ID and licence | | Many fixed values: international radio call sign |

Table 1. Standardized supply chain with the segments covered or controlled by the various types of State

| Supply chain function | Harvesting | Trans-shipping | Landing | Transport to processing | Processing | Importation |
|-----------------------|------------|----------------|---------|-------------------------|------------|-------------|
| Costal State | ✓ | ✓ | | | | |
| Flag State | ✓ | ✓ | ✓ | | | |
| Port State | | ✓ | ✓ | ✓ | | |
| Processing State | | | | ✓ | ✓ | |
| End-market State | | | | | | ✓ |

For to cc

Source: Hosch and Blaha, 2017.

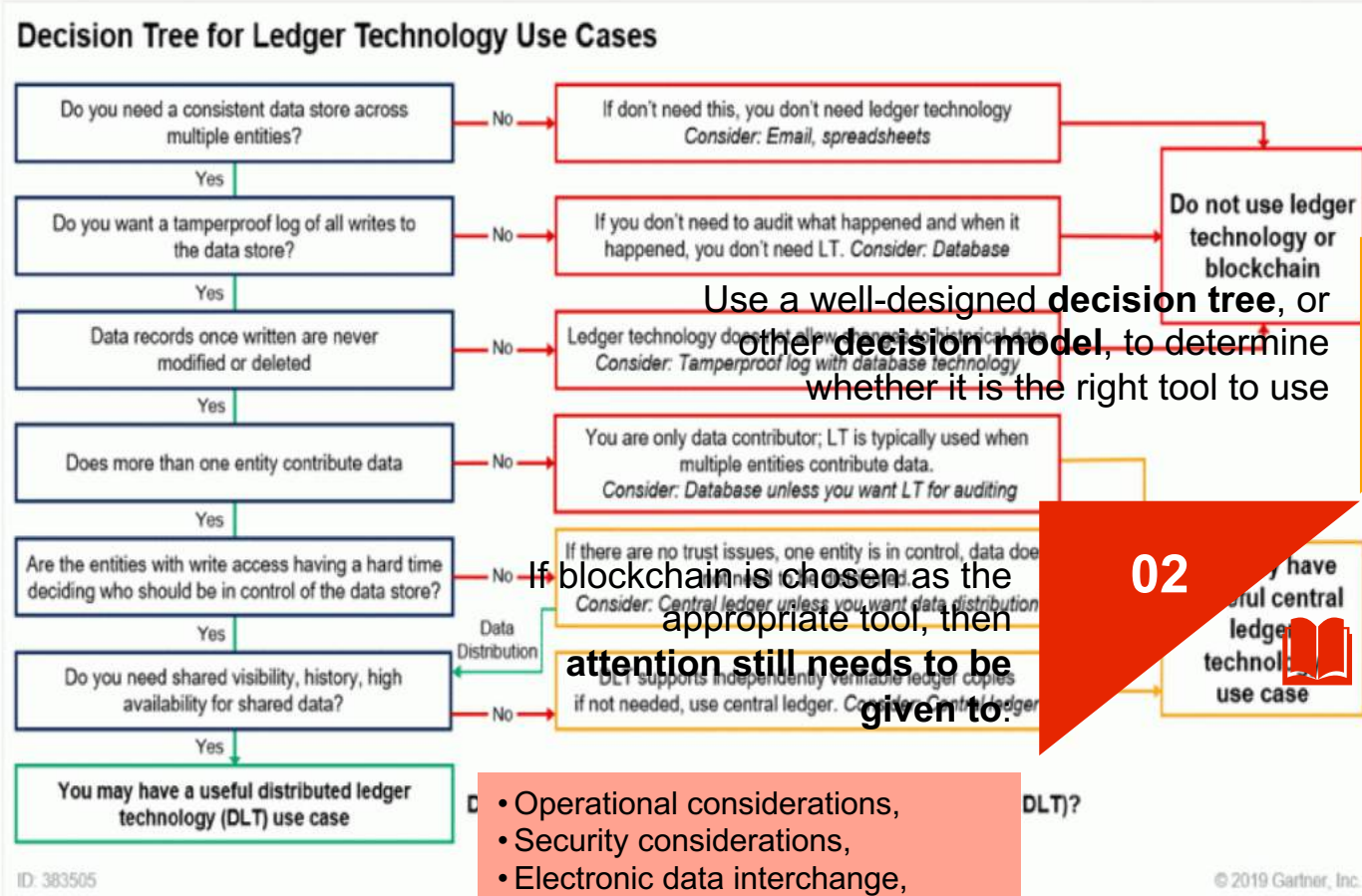
| | | | | |
|--------------|----------------------------|---|---|---|
| | | Name of first buyer | Inspection Commercial invoice Catch documentation scheme (CDS) | Simple, provided that as first buyer is a fixed identity Inspection records/notifications |
| Distribution | Factory/warehouse entrance | Verified net weight sold to individual buyers | Factory/warehouse entrance records Commercial invoice On-site monitoring by fishery authorities | Could be complex if weights and species is amended / verified later during processing Full inspection if estimated and verified differ substantially Monitoring records |

if all possible – supply chain on so ained



Main recommendations

Critical forethought needs to be given to blockchain as an appropriate tool for traceability:



Final comments:

Permissioned consortium blockchains in particular have the greatest potential in the current state of the technology to be scaled to address seafood traceability without the concerns of high energy use and slow transaction times that public permissionless blockchains have.

The study has not found limitations on the blockchain technology that cannot be overcome under the right scenario. However, whether there exists the collective will to adopt and expand an integral, value-chain-encompassing traceability system is a different matter.

The recommendation of this study for governments and international organizations in regard to the development, use and promotion of blockchain technology is to follow strict due diligence at legal, commercial and operational level prior to commitment.

The authors agree with this conclusion: “Blockchain, data mining, and AI will not stop IUU fishing, will not prevent overfishing and discarding. But they may help to make global streams of fish and seafood products with the associated flow of money becoming more visible and transparent” (Probst, 2019).

The authors view as unfair the current media discourse that seems to pin the solution to multifaceted seafood value chain problems (from IUU fishing, seafood safety and species fraud to labour issues) on one data architecture tool – blockchain.

- This risks hyperinflating expectations on what this technology can offer, with potential operators then walking away because it does not deliver on the hype built around it.

Thank you !

For more information:
nada.bougouss@fao.org

