BLOCKCHAIN TECHNOLOGY AS A KEY TOOL IN TUNA TRACEABILITY

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INTRODUCTION

Traceability is essential to assure food safety and quality from farm to fork. However, it is a challenge when supply chains are complex and fragmented such as seafood ones. Tuna, as a valued seafood product, focus sector efforts to develop systems capable of ensure a transparent and complete traceability to allow secure, reliable and sustainable practices (Howson, 2020). An option to optimise traceability is blockchain technology, which can automate transactions through executions of smart contracts to efficiently manage the fishery supply chain operations in a manner that is decentralised, transparent, traceable, secure, private, and trustworthy (Patro et al., 2022).

MATERIAL AND METHODS

Boolean searching using the following keywords: "Blockchain" AND "traceability" OR "transparency" OR "transparent" OR "trust" AND "seafood" OR "fish" OR "fishery" OR "fisheries" OR "tuna" OR "*Thunnus*". Articles from 2008. Furthermore, use of data provided by Frime S.A. to study a real case.

OBJECTIVES

The main objective is to carry out a literature research on blockchain usage along tuna supply chain, understand its general operation and potential uses. Furthermore, a second goal is to purpose a real blockchain application on tuna traceability management.
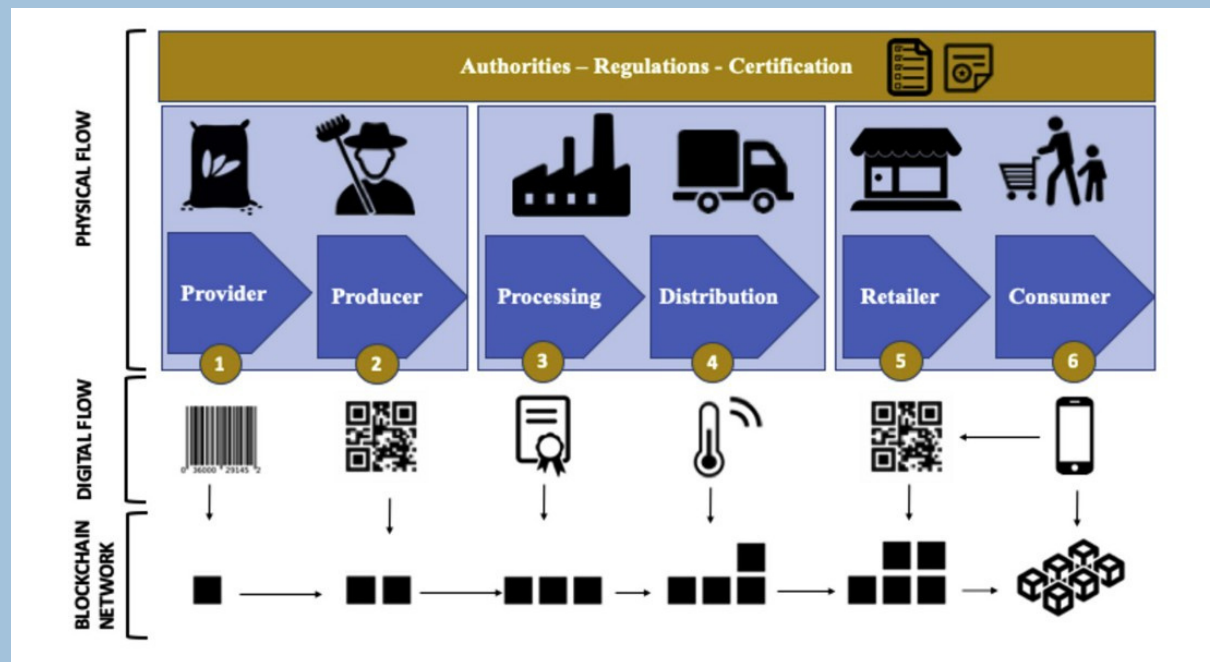
Fig 1. Diagram which describes how blockchain is made up with supply chain actors data. (Kamilaris et al., 2019)

BLOCKCHAIN IN FOOD INDUSTRY

Avoid food fraud

Assure compliance

Encourage sustainable practices

Increase consumer trust

Improve food safety

CASE STUDY: BLOCKCHAIN APPLICATION FOR RED TUNA TRACEABILITY CONTROL

Table 1. Data provided by Frime S.A. of a Balfegó S.L. fresh fish purchase on 19/12/2022

Box number	Article	Batch number	Quantity
BOX22106755	AFABC0003 Fresh Tuna HG + 100 *Thunnus thynnus*	221219653	280 kg
BOX22106809	AFABC0003 Fresh Tuna HG + 100 *Thunnus thynnus*	221219737	265,60 kg

Table 2. Smart contract algorithm based on the fresh fish purchase (see Table 1) (Adapted from Patro et al., 2022)

Algorithm 1. Creating a Purchase Order for Farmed Fish and Receiving Order
1. **Input:** Frime S.A., Balfegó Tuna S.L., 545,60 kg, *Thunnus thynnus*
2. **Output:** *CreateFarmedFishPurchaseOrderPlaced, CreateFarmedFishPurchaseOrderConfirmed, CreateFarmedFishOrderReceived* Events
3. **If** FunctionCaller ≠ Frime S.A. **then**
4.   FrimeS.A. identity is not vàlid and farmed fish purchase request is rejected
5. **end**
6. **else**
7.   **If** FunctionCaller = Frime S.A. **then**
8.   Create *FarmedFishPurchaseOrderID* using Keccak 256 function containing the details: 545,60 kg, *Thunnus thynnus*.
9.   Change the status of the Farmed fish Purchase order to "pending".
10.   T 10 Send a notification to the stakeholders regarding the farmed fish purchase order with the Farmed Fish Purchase Order ID.
11.   **end**
12.   **If**
13.   FunctionCaller = Balfegó S.L. **then**
14.   Accept the Farmed Fish Purchase Order request and change the status to *Accepted*
15.   **Else**
16.   Change the status of the purchase order to *Rejected*
17. **end**
18. **If** FunctionCaller = Frime S.A. **then**
19.   FarmedFishOrderStatus=Accepted; "The Order is not received yet"
20.   FarmedFishOrderStatus=Received; "The Order has been received"
21. **end**
22. **else**
23.   Bring the contract back to its original state by highlighting an error message.
24. **End**

CONCLUSIONS

Blockchain technology has potential to solve problems of complex and fragmented supply chains such as tuna supply chain providing a transparent, immutable and decentralised traceability record.

Moreover, the introduction of blockchain technology in supply chain management increases the efficiency and effectiveness of transactions carried out by operators while facilitating consumers access to safe and sustainable food which meets their current needs.

REFERENCES

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