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SUSTAINABILITY SCIENCE DAYS CONFERENCE 2022

Challenges and working practices for the application of Blockchain in Intermediate Dairy Value Chains

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Outline

1. Context and Rationale
2. Objectives and Methodology
3. Challenges
4. Discussion ongoing / future work

Context and Rationale

Feta cheese characteristics

- Product of Protected Designation of Origin (PDO)
- Most popular cheese in Greece (as it is as and as an ingredient)
- Exported, characterized as 'white gold' for Greece



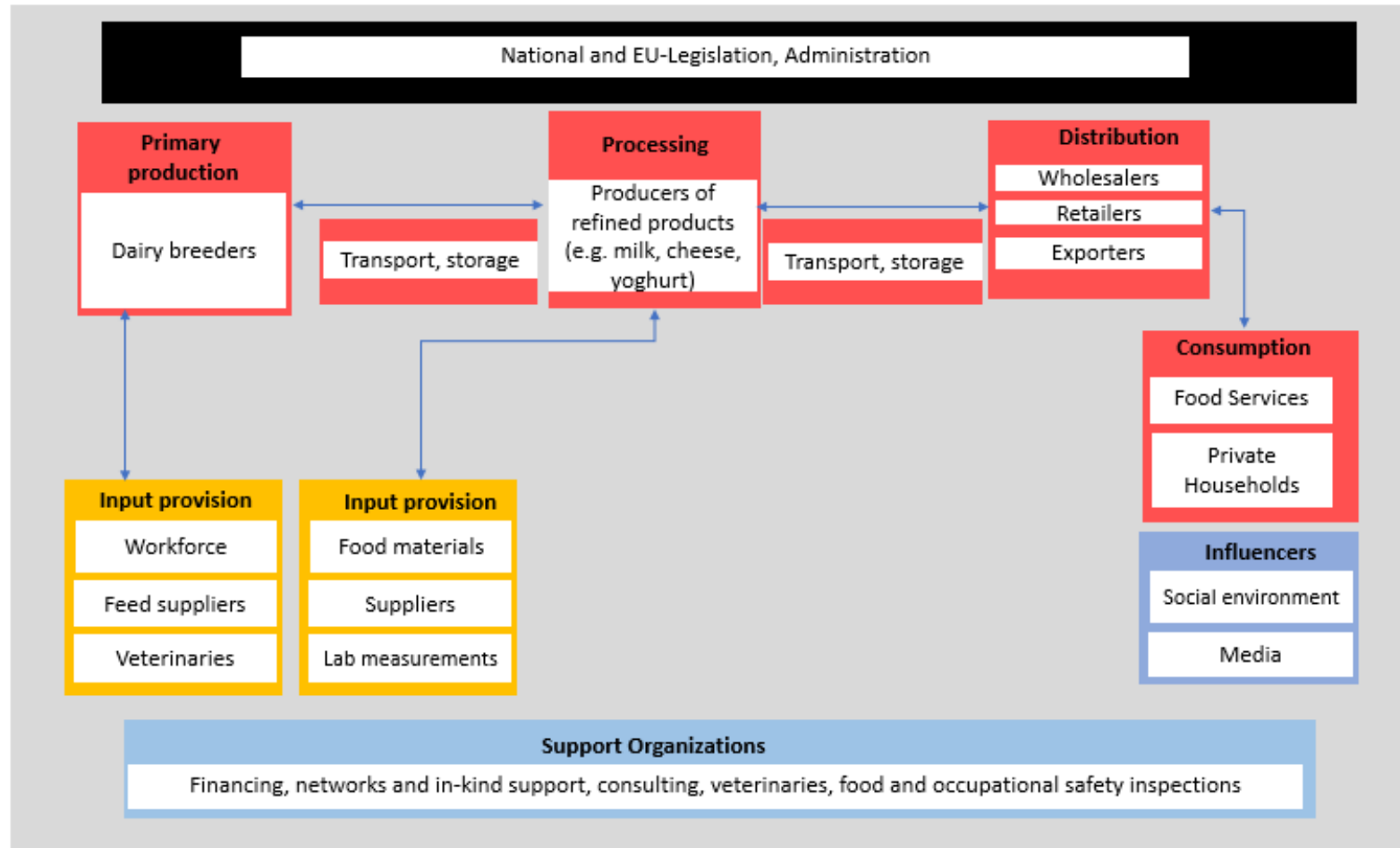
Rationale

- Consumers are increasingly interested in quality - related aspects (origin, tradition, integrity, authenticity, etc.)
- Food fraud events: Counterfeiting, adulteration related to feta events (domestic and EU)
- Concerns on EU trade agreements with third countries

→ **Need to offer trustworthy info to consumers and chain stakeholders**

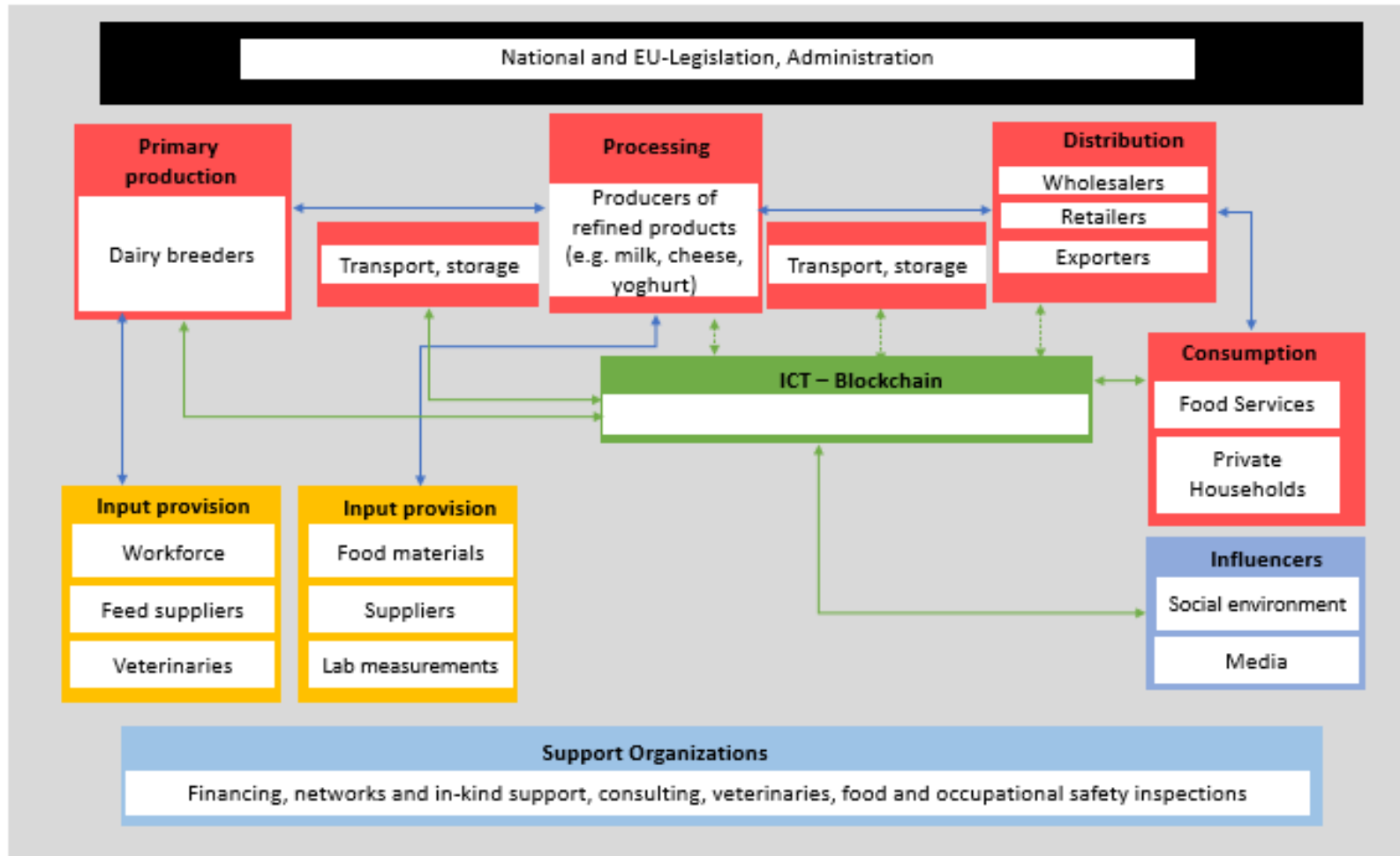
→ **Use Blockchain as reliable info sharing mechanism**

Blockchain as Trustworthy info sharing bus (1/2)



Current

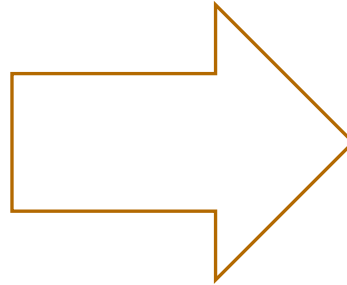
Blockchain as Trustworthy info sharing bus (2/2)



Proposed

Objectives

1. Support end-to-end transparency and traceability
2. Bring breeders and dairy in closer relationship with consumers
3. Enhance consumer trust
4. Amplify the competitive advantages of the stakeholders
5. Support the creation of new, differentiated dairy products




Plan

1. Identify product traits appreciated by consumers (e.g. origin, taste, ..)
2. Identify operational parameters (e.g., pH, temp) and rules
3. Retrieve, store and validate data *per production* in Blockchain
4. Include data on environmental aspects, animal welfare, support of local sociate
5. Allow for verification using the Blockchain (app)
6. Provide methodology and tools, for an open, extensible system


Working Challenges (1/2)

Challenge #1: Which data to register, so that they are meaningful?

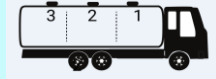
- Select high-level attributes (taste, origin, integrity, milk quality) and associate with operational parameters (temperatures and pH, microbiological checks, milk mixing and percentages, maturation duration)




Breeders (conditions, IoT, stable relationships, fair reimbursement)



Collection measurements (quantity, milk types, pH, temperature, microbiological, physiological)




Collection transport (mixing, quantities, types, cleaning – residuals, LOT generation)




Storage in dairy tanks (mixing, quantities, types, balance, dates of collections)




Consumption (info validation)



Packaging (container types, final LOT generation, printing)



Production maturation phases (first and second maturation, duration, measurements)



Production initiation, (selection of milk types /quantities, filtering, pasteurization, centrifugation, intermediate LOTs)



Working Challenges (2/2)

Challenge #2, how to verify the cheese production procedure?

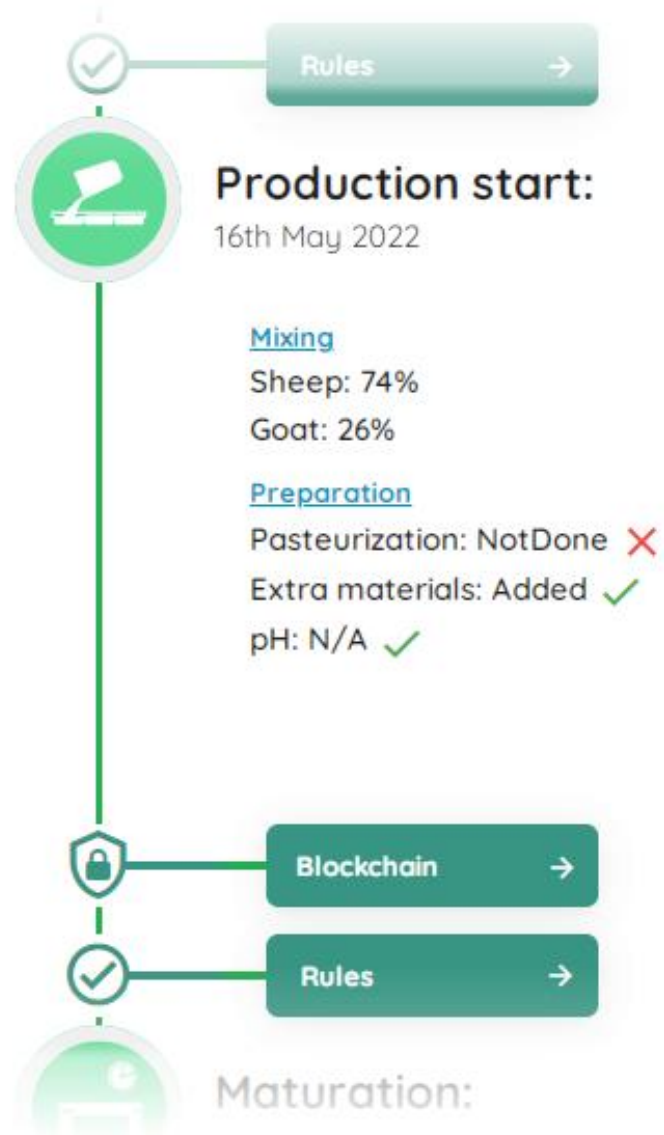
- Design a set of rules (e.g. value ranges for temperature and pH, milk mixing percentages, duration of maturation) based on the association of the operational values and the product traits
- Implement verification in Blockchain (smart contracts)
- Need to verify data at the edges (e.g. through patterns, anomaly detection)

Challenge #3, how to rationalize Blockchain implications in terms of costs and performance?

- Heavy Blockchain data can affect performance and the transaction fees (depending also on the consensus algorithm)
- Anchoring mechanism (from private to public Blockchains).
- Data granularity is an open question (trade-off needed).

Challenge #4, how to facilitate the involvement of stakeholders and build an application ecosystem?

- Facilitate usage on behalf of consumers (usage of QR)
- Offering of open APIs for new applications and scenarios e.g. public authorities for food certifications).



Discussion – Future Work

- Scenario verified as useful by dairy and breeders, to ‘close the loop’ in the dairy chain and enabler for increased responsibility and ‘due credit’
- Status: Implementation ongoing (stable application for the stakeholders, under design for consumers)
- Further adapt with additional/modified info related a) to specific productions or b) sustainability aspects (environmental, animal welfare, support of local economy).
- Need to pilot (evaluate: process overhead, performance wrt Blockchain)
- Work on business models (consumers appear willing to pay a premium price for trustworthy info)

Thank you for your attention
