

# Agribusiness Commodity Traceability using Blockchain Technology: A Systematic Review

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Article History

Article Received: 19 November 2019 Revised: 27 January 2020 Accepted: 24 February 2020 Publication: 18 May 2020 Abstract: Traceability or product tracing is an important concept. This study aims to identify which agribusiness commodity traceability within applied blockchain technology and to develop a future research agenda for blockchain the other agribusiness commodity traceability using technology. To study literatures of traceability using blockchain technology, PRISMA or Preferred Reporting Items for Systematic Reviews and Meta-Analyses is used to help the systematic literature review. The research gap based on traceability technology using blockchain technology as the main finding is blockchain technology is an innovation assure the quality of the third step of the analytical processes: data acquisition and management also can transform supply chain traceability as we know it and bring more transparency through the value chain, creating value to stakeholders. The agribusiness commodity that has implemented traceability with blockchain technology is tuna traceability. It means agribusiness commodity traceability research still has the potential to be studied.

*Keywords:* Blockchain Technology, Traceability, Agribusiness Commodity.

## I. INTRODUCTION

Traceability or product traceability is an important concept. In Europe, traceability has been regulated in the European Union (EU) General Food Law, making traceability traceable to all food and feed businesses. This requires all food and feed operators to implement a special traceability system [1]. Expectations of a food safety system require organizations to create and implement a traceability system that enables the identification of products and their links to raw materials, processes and shipping records.

The traceability system helps identify supplier materials from suppliers and the initial distribution

route of the final product (ISO 22000: 2005). Traceability records must be kept for a certain period during the system evaluation to enable the handling of potentially unsafe products and the possibility of product recall. Records must comply with legal and regulatory requirements as well as customer requirements and can be referred to final product identification. For example, in India, where small-scale agriculture and raw materials are obtained by processing units or exporters through a large number of small traders, tracing products to agriculture is very difficult. However, it is not impossible, if planned properly, it can be done, so traceability must be part of agricultural policy [1].

Tracing is the ability to re-create the history of a product in the food chain and to identify the origin,



movement and relevant relevant information of certain units in the supply chain by referring to records kept upstream. In the agricultural sector, adequate collection centers or processing units are needed. If it is not possible to trace the origin of the sample immediately, there is a possibility that the area of origin can be directed, which can be further investigated to find out the exact source of the problem [1]. Traceability becomes an integral component of modern agricultural supply chains. Higher precision traceability increases the chance of adding value to information retrieval so that improved feedback to producers is better and increases the efficiency of the supply system [2].

Traceability in the food supply chain is interesting because of the challenges associated with the nature of the food supply chain such as short code dates, high security and risks related to quality [3]. The traceability system is the key to ensuring food safety as well as creating benefits for food supply chain components [4]. This study uses the term "traceability system" which refers to a reverse process that allows products to be tracked back up the chain. Based on ISO 8402 standard defines traceability as "the ability to trace the history, usage location of an entity using recorded or identification data". Traceability has the potential to provide a number of other benefits to agricultural supply systems such as the increasingly available information [5].

Not all companies can quickly identify the causes of food safety incidents in a supply chain. This can take days or even weeks. Tracing digital and paperbased food data documentation, across a complex network of suppliers and distributors. Gaps in supply chain monitoring create vulnerability, partly due to lack of supply chain transparency. Traceability will help increase consumer confidence in food safety [6]. To identify what is wrong in a company's supply chain, a good tracing system is needed that is able to reveal the problems that occur along the chain [7]. Blockchain technology can help provide solutions to these problems by overcoming the challenges of visibility and traceability [8].

Blockchain technology promises a system that is transparent, resistant, damaged and safe [9]. Blockchain technology can safely store digital transactions and distributed software mechanisms that provide systems with a list of trusted asset transactions, without requiring central trust authority [10], [11]. Each block has a limit on how many transactions it can have, so usually the actors prioritize transactions by choosing the most profitable [11]. The blockchain structure manages all transactions in a robust and auditable manner [11]. Blockchain technology is considered as one of the main techniques that are strong in security and privacy domain [12], [13].

This paper reviews the existing literature on blockchain technology, especially supply chain tracking using blockchain technology. The analysis considers several journals. The purpose of this study is to identify the traceability of which agribusiness commodities in blockchain technology are applied and to develop a future research agenda for traceability of other agribusiness commodities using blockchain technology. This paper starts with an overview of blockchain technology, then searches using the blockchain, followed by a discussion of the methodology used in this study. This paper provides a summary of the latest developments in practice and can be a reference for further research. This is followed by a discussion of the insights the literature provides in terms of this research objectives.

## II. METHOD

This literature study on traceability using blockchain technology uses PRISMA or Preferred Reporting Items for Systematic Reviews and Meta Analysis. PRISMA is the standard for conducting systematic literature reviews. PRISMA also emphasizes review reports which can be used as a basis for reporting systematic reviews for other types of research [14].

The ATLAS.ti 7.0 software is used to help categorize and encode literature reviews. The originator of the ATLAS.ti software was named Thomas Muhr, originally from Germany. So, in German, ATLAS.ti has the abbreviation Archiv fur Technik, Lebenswelt, AlltagsSprache (Archieve of Technology, Lifeworld and Everyday Language). ATLAS name prop up the idea as a map of the world and this is described in meaningful document management. These software provides meaning of interpretation text [15]. This ATLAS.ti software is



a type of CAQDAS (Computer-Aided Qualitative Data Analysis Software) program or similar to QDA software (Qualitative Data Analysis Software).

#### **III. RESULT AND DISCUSSION**

#### Resources

The review methods of this study is conducted using one main database, namely Scopus considering that this database is robust. However, it should be noted that no database is perfect or comprehensive including Scopus. It is considering that it is reliable database containing journals related to blockchaintechnology and technology in traceability.

# The systematic review process for selecting the articles

#### Identification

The process of selecting relevant articles in this study consists of three main stages consisting of:

keyword identification, screening and eligibility.The first step is the identification of keywords. Based on keyword searches on Scopus translated 93 articles based on relevant keywords.

#### <u>Screening</u>

Articles about article duplication. In this study, no articles were excluded during the first hangover, so 114 articles were filtered based on several inclusion and exclusion criteria determined by the researcher in the second (as shown in Table 1).

The first criterion is the type of literature in which the researchers decide to focus only on research papers, review papers, conference processes as the main source. In addition to these types of literature, such as publications in the form of series of books, books, chapters in books, brief communication, were excluded from this study. This review was also only published on articles published in English in a 5-year period (2016-2020).

In total, a total of 21 articles were issued based on the criteria in Table 1.

Table 1 Criterion, Inclusion and Exclusion of Technology in Traceability Using BlockchainTechnology

Criterion	Inclusion	Exclusion			
Tunog of literature	Research paper, review paper, Book series, book, chapter ir				
Types of merature	conference proceeding	short communication			
Language	English	Non English			
Time line	Between 2016 and 2020	Before 2016			
Carling of America	Technology in traceability,	Other than technology in			
Subject Area	blockchain technology	traceability, blockchain technology			

#### Eligibility

A total of 93 articles were prepared for the third stage known as the eligibility. According to the year of issues of the papers, the following year of issues of paper publication distribution as in table 2 below:

Year	The Amount of Articles
2016	2
2017	4
2018	53
2019	28
2020	2
Total	93

# Table 2 Paper Publication Distribution Based on<br/>Year of Issues

At this stage, with reasons that excluded due to articles are not based on focus on traceability using blockchain technology. Finally, a total of 4 remaining articles is ready to be analyzed.





Figure 1 PRISMA Traceability Using BlockchainTechnolgy

Some codes applied at this stage are technology in traceability andblockchain technology. A summary of the design and characteristics of the 4 studies (refer to 2.5 above) included in the systematic

review with excluded due to articles are not based on traceability using blockchain technology (89 articles).



#### Figure 2 Traceability Using Blockchain Technology Network View

This table 3 is a summary of the review of traceability using blockchain technology based on systematic literature review.



No	Author	Year	Source	Aplication Area	Maturity
1	Juan F. Galvez, J. C. Mejuto,	2018	Journal	The use of blockchain for food	Proposal
	J. Simal Gandara			traceability Analysis	
2	Toufic Hirbli	2018	Journal	Palm oil traceability: The use	Proposal
				of blockchain technology	
3	Candice Visser, Quentin A.	2018	Journal	Blockchain in strengthening	Proposal
	Hanich			tuna traceability to combat	
				illegal fishing	
4	Feng Tian	2017	Journal	The traceability system base on	Proposal
	_			blockchain and internet of things	-

Table 3	A Summary	of Traceability	<b>Using Blockchain</b>	<b>Technology Review</b>
		or		

## RO 1: Identify which agribusiness commodity traceability within applied blockchain technology

Based on first aim, identify which agribusiness commodity traceability within applied blockchain technology, according to the result, only tuna and palm oil have implemented blockchain technology in traceability [13], [16]. Blockchain technology is now being used to improve tuna traceability which can help stop illegal and unsustainable fishing practices in the Pacific Islands tuna industry [16]. Feng Tian in 2017 reviewed about the food supply chain and stated that the blockchain technology is still in its early stages [17]. Another article, with the limitation of the article that the researcher has examined by this study, only mentions agribusiness commodities in general or food, not specifically mentioning the names of agribusiness commodities.

The following is a description of the 4 articles which constitute a summary of the review of traceability using blockchain technology based on systematic literature review pada Tabel 3

1. The first is Galvez et al did a study in 2018. Doing trace and authenticate the food supply chain is very important so that the source of contamination in a food supply chain throughout the world can be identified. One way to solve the problem of traceability and ensure transparency is to use blockchain technology. This blockchain technology aims to store data chronologically so that it cannot be manipulated afterwards. This review examines the potential of blockchain technology to ensure traceability in the food supply chain, which can be considered a true innovation and a relevant approach to ensure the quality of the data acquisition and management process [12].

- 2. Then, Hirbli et al research on blockchain technology that can change supply chain traceability, thereby increasing transparency through the value chain, creating value for stakeholders. Based ona process perspective, the proposed solution uses mass balance, and the book search and claims model established by the RSPO (Roundtable on Sustainable Palm Oil). Based on a technology perspective, one suggested solution is to utilize blockchain technology to track the flow of physical goods. Based on the perspective of people, the proposed solution includes an incentive model to support change management efforts [13].
- 3. A research is done by Visser et al in 2018 showed thatthe development of global fisheries shows the use of blockchain technology to increase tuna traceability. This is intended to help stop illegal and unsustainable fishing practices in the tuna industry in the Pacific Islands [16].
- 4. In 2017, a study by Feng Tian stated that blockchain technology is still in an early stage where scalability is first and foremost when we face mass data in the real world. This research builds a food supply chain tracking system for



real-time food tracking, which can provide information platforms for all members of the supply chain with reliability, transparency, neutrality, openness, and security [18].

# **RO 2:** Develop a future research agenda for the other agribusiness commodity traceability using blockchain technology

Based on the results, only 4 articles from the articles were reviewed (Table 3), which explains the application of blockchain technology in traceability. Through the implementation of blockchain technology, the current agriculture chain has an improvement supply [19]. Implementing Blockchain can dramatically reduce time delays, costs and mainly the human error. Apart from this, it can enhance transparency [17], [20], can give greater scalability and provide better security.[21]. In traceability systems, identifying information to be recorded is the most important requirement for developing an effective traceability system, including traceability of vegetable supply chains [22] and other agribusiness commodities.

Research gaps based on traceability technology use blockchain technology because the main finding is that blockchain technology is an innovation. Blockchain technology will guarantee quality, namely: data acquisition and management, in addition to changing the traceability of the supply chain by increasing transparency through the value chain and creating value for stakeholders [12], [23].

Based on the review of the article on the results, not many agribusiness commodities apply blockchain technology in traceability. In fact, there are so many benefits of applying blockchain technology in traceability [17], [19]–[21]. It means agribusiness commodity traceability research still has the potential to be studied.

## **IV. CONCLUSION**

Agribusiness commodities that have implemented blockchain technology in traceability are tuna and oil palm commodities. Another article, with the limitation of the article that the researcher has examined by this study, only mentions agribusiness commodities in general or food, not specifically mentioning the names of agribusiness commodities.

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