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# BLOCKCHAIN BASED AGRICULTURAL FRANCHISE IN YARUMORI COOPERATIVE

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**ABSTRACT**

This study rigorously investigates the cutting-edge advancements in franchise business models, aiming to rectify prevalent deficiencies. Through an exhaustive literature review, this research proposes integrating blockchain technology and Web3 frameworks into conventional franchise systems. Specifically, the study spotlights Yarumori, an agricultural enterprise that adheres to a traditional franchise model. The innovation initiative centralizes on two main goals: firstly, to overcome operational hurdles inherent in the existing system, and secondly, to revitalize the Yarumori franchise framework. This rejuvenation aims to enhance the efficiency and effectiveness of its business operations significantly. The proposed system employs Solidity and Ethereum for its blockchain network, capitalizing on their widespread community support and robust infrastructure. This research contributes substantially to the evolution of franchise systems, positioning blockchain technology as a critical and transformative element in modernizing business processes.

**Keywords:** *Blockchain, Waterfall, Etherium, Web3, Unified Modeling Language*

## 1. INTRODUCTION

The agricultural sector, especially fruit and vegetable production in Indonesia, is one of the main sectors in the country's economy because 88.57% of Indonesian people work in the agricultural sector [1]. Indonesia has excellent potential to develop it, and 80% of all types of plants in the world can grow in Indonesia[2], [3].Therefore, business development in the world of agriculture can have an impact on creating jobs and maintaining economic stability [4]. So, Indonesia has a strong potential to become a significant producer of food and agricultural commodities at the global level [5].

Yarumori is a cooperative that operates in the agricultural business sector and has several ongoing franchises. The reason Yarumori took the business sector in the franchise sector is because this sector has developed very quickly, as proven by more than 81 thousand franchises registered in Indonesia, and this sector grew by 10% in in 2019 [6], [7]. There is also still much land in Indonesia that is still abandoned. According to existing data, 42.6 hectares of land in Indonesia is still abandoned [8]. Apart from that, according to the Yarumori cooperative, there are still many people who have capital and want to do business but don't have the time, skills, experience, and business networks.

However, the franchise system built by Yarumori is still traditional. An example of the main problem is the contract where the system is still in physical form, which not only makes it easy to manipulate documents but also carries a high risk of loss. Plus, the franchise registration process is inflexible and very long, which results in limiting the potential for company growth, as potential franchise partners require easier options in line with modern business standards. Then, the company's commitment to loving the environment means that Yarumori has the desire to become a Zero Waste company. However, the use of paper in physical contracts goes against these values.

To overcome this, the author suggests digitizing the Yarumori franchise system by using the Blockchain and Web3 systems for transparency, security, and efficiency of franchise collaboration documents. Apart from that, on the franchise website built by the author, there is a feature to view the franchise catalog and Customer Service Chat, which is useful to make it easier for customers when they want to make a transaction. Integrating this technology is hoped that it can solve existing problems.

The primary objective of this paper is to address the challenges faced by the traditional franchise system of Yarumori, particularly in terms of contract management and registration processes. By

digitizing the Yarumori franchise system using Blockchain and Web3 systems, this research aims to bring transparency, security, and efficiency to the management of franchise collaboration documents. The integration of these technologies is expected to not only streamline the franchise operations but also align with Yarumori's commitment to environmental sustainability by reducing the reliance on paper-based contracts. This approach is anticipated to solve the existing problems in the franchise system, paving the way for more efficient and secure business practices in the agricultural sector

## 2. LITERATURE REAVIEW

### 2.1 Franchise

Franchise is a business model in which the owner of a business gives the rights to other parties to use the trademark operational system used by the business owner [9]. Later, the franchise owner will receive initial fees and ongoing loyalty from the franchise buyer [10]. Franchise business owners are usually called Franchisors [11].

The advantage of franchise buyers is that they can take advantage of brands that are well known and have strong support from the franchise owner, such as in terms of marketing, training, and business development [12]. So, franchise buyers do not really need experience in business to run the franchise they buy [13].

### 2.2 Agriculture Business

Agribusiness, also called agricultural business, is a business activity related to the production, processing, and marketing of agricultural products [14]. Agricultural businesses will greatly help food security, feed, and provide other agricultural products [15]. Apart from that, agricultural business can also improve the economy and can even become the main sector of the economy [16]. The business covers various aspects related to agricultural production, such as crop cultivation, animal husbandry and fisheries [17].

### 2.3 Unified Modeling Language

Unified Modeling Language (UML) is modeling used to define, visualize, build, and document systems [18]. It provides a standardized set of diagrams for object-based software development [19]. It helps in improving the quality of software systems by enabling better analysis, design, and implementation [20],[21].

#### 2.3.1 Use Case

Use case functions to explain the interaction between actors and systems [22], [23]. The actor here is an entity that communicates with the system, which can be a user, an external system, or hardware [22], [25]. The relationship between actors and use cases is shown using lines and arrows [25].

The line in the use case connects the actor with the related use case, while the arrow shows the direction of communication between the actor and the use case [26]. However, this diagram does not provide details of system implementation. Therefore, this diagram needs to be combined with other diagrams, such as Class Diagrams [27], [28].

#### 2.3.2 Class Diagrams

Class Diagrams function to explain the relationship between classes and object classes that form a system and have an important role in visually depicting the structure of the system [29]. The classes are illustrated in this diagram using frames that are partitioned into three distinct sections. The initial segment comprises the class name, while the intermediate segment comprises the class attributes. Ultimately, the class methods are in the final segment [30].

### 2.4 Blockchain

Blockchain technology provides a decentralized, distributed, and centralized authority-free environment, which ensures data integrity and security [31], [32]. Blockchain technology can help achieve traceability by storing data irreversibly and permanently, thereby increasing credibility [33]. One type of Blockchain network is Ethereum, which allows Smart Contracts and Distributed Apps (DApps) to be built.

#### 2.4.1 Smart Contracts

Smart Contract is a form of electronic or digital contract [34]. With the existence of a Smart Contract, ownership of an asset cannot be manipulated and is a definite answer to a sense of security in online transactions, which usually emphasizes a structure of trust between individuals [35],[36].This is a technology that allows the creation of a negotiation process that can run independently, without human intervention [37], [38].Following publication to the Ethereum network, a Smart Contract becomes immutable, even for its creator [39].

### 2.5 Web3

Web3 is the third generation of the World Wide Web. With Web3, a website can process information more intelligently, such as reading, writing, and coordinating the integration of digital rights exchange [40]. The main function of Web3 in Blockchain is to allow users to access and interact with Blockchain applications without the need to install special software or understand the programming language used in Blockchain development [41].Web3 plays an important role in the development and use of Blockchain by allowing

users to interact with Blockchain applications directly through a web browser, increasing the accessibility and use of Blockchain through an easy-to-use user interface [42], [43].

### 2.6 Blackbox Testing

A black box is a testing method that is based on system specifications without the need to know the system's internal structure [44]– [46]. The aim is to ensure that the system being built functions properly. Good and meets the specified requirements [47]. The Tester executes the Test Case and compares the actual output of the system with the expected output, which is carried out from the end user's perspective [48], [49].

### 2.7 System Usability Scale

System Usability Scale is a questionnaire developed by John Brooke that is easy to use, and the calculations are not complicated [50]– [52]. Usability itself is the user's experience in using a system and a parameter that influences the success of a system [53], [54]. The focus of this testing is to ensure ease of use of the system according to what the user will encounter [55], [56].

### 2.8 Previous Research

*Table 1: previous research*

| Author | Summary |
|---|---|
| [57] | Blockchain technology was created as an alternative to overcome security problems, buying, and selling processes, and rights registration costs. Blockchain can also be used to store data and information concisely. Since there is no time limit, it can be accessed anywhere and does not require any assistance from any authorized party. Additionally, there is no requirement for a written agreement when it comes to buying and selling. If both parties fulfil the four legal conditions of the agreement, namely agreement, competence, object of the agreement, and valid reasons, then both parties will be bound to each other by the consequences of the agreement. |
| [58] | The healthcare system employs blockchain and smart contract technologies to regulate the accessibility, privacy, security, and availability of electronic medical record (EHR) data. Blockchain technology has the potential to mitigate transaction costs through the implementation of Smart Contracts, which streamline processes, alleviate administrative complexities, and do away with intermediaries. |
| [59] | This research aims to increase the level of security, authentication, and accessibility of digital certificates. The system works when someone uploads a certificate then the system will record the Serial Number for the certificate in the Blockchain. |
| [60] | As the number of counterfeit documents increases, so does the risk to the credibility of the issuance authorities and the document holders themselves. The outcomes demonstrate the secure storage of user documents on the blockchain. |
| [61] | Designing a Remote Healthcare system with Blockchain for reporting to all related parties. So, the data that comes from the first person will not change once the last person sees the data. |
| [62] | Proposing the Development of a Blockchain-based Proof of Delivery system for Digital Assets. The IPFS Decentralized System is utilized by the smart contract to safeguard the agreement between both parties and ensure its integrity against a variety of vulnerabilities. |
| [63] | Contracts or tenders are frequently used by businesses to acquire goods and services. Conventional paper-based systems frequently experience inaccuracies, delays, and malfeasance. In order to surmount these challenges, the author implements blockchain technology. |
| [64] | The author discusses the shortcomings of manual contract management, namely low efficiency because it costs a lot of human and material resources. Therefore, blockchain technology is proposed by the author. |
| [65] | An experiment utilizing blockchain technology to store documents and an overview of various technologies for data protection and authentication as they pertain to text documents are included in the paper's discussion of the application of blockchain technology to address issues of data integrity and transparency. |
| [66] | This publication details how the utilization of blockchain technology to store an immutable contract copy can be advantageous for all involved parties, as it serves as admissible evidence in a court of law if one party violates the agreement. |

Building upon prior research, there is a notable absence of initiatives resembling the unique contribution the author is poised to make—specifically, the introduction of blockchain technology within the agricultural sector. Furthermore, existing research often remains confined to the conceptual realm, with some proposals merely suggesting integrating a blockchain system without its practical implementation in real-world business scenarios.

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In this paper, the author endeavors to bridge this gap by proposing and implementing a blockchain system tailored to franchise businesses in the agricultural domain. The objective is to address and surmount security, transparency, and efficiency challenges in collaborative document management and franchise reporting. This endeavor is distinguished by incorporating a blockchain concept that has undergone thorough examination in previous research, providing a solid foundation for overcoming the identified problems in the specified context.

## 3. METHODOLOGY

The author will implement the Waterfall method during the website development process. The waterfall method is a sequential execution of multiple segments that comprise the development process [67]. The waterfall is a sequential approach in which each phase must be finished prior to proceeding to the subsequent phase [68]. The waterfall's phases are illustrated in Figure 1.

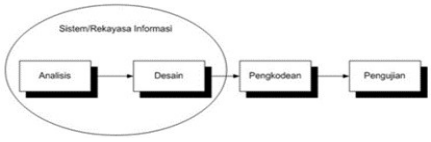


*Figure 1: Waterfall Step*

### 3.1 Analysis

This stage involves an intensive and focused process of collecting system requirements, which aims to understand the needs of users and the system to be built [70], [71]. At this stage, the author collects and elaborates data from several sources to analyze the needs for creating the application to be built. The background of the sources can be seen in table 2.

*Table 2: Primary research sources*

| Person | Title | Method |
|---|---|---|
| Dicky | Stakeholders | Focus Group Discussion |
| Shandi prasetya | Stakeholders | |
| Rizky | Agricultural Expert | |
| Harya | Agricultural Expert | |

### 3.2 Desain

The design stage is divided into two stages, which need to be carried out very carefully to ensure that the system design meets the needs [72]. The first is the architectural stage, namely the stage where the author designs the structure of the entire system [73]. Here, the author will use the Unified Modeling Language (UML) for system architecture, which is continued with user interface design to design the layout, colors, icons, and other elements that will be used [72]. To design a Website Prototype, the author will use the Figma.

### 3.3 Implementation

After the design stage, the implementation stage is carried out, where the system that has been designed is coded into a program that can be run [74]. Researchers develop applications using programming languages that suit system requirements [75]. The author will use JavaScript for the Back end and front end with MySQL database, and for the blockchain side, it will use smart contract on Ethereum network. The Smart Contract code will be compiled and deployed to Ethereum network, securely records franchise partnership agreements, ensuring transparency and automating contract enforcement. The smart contract code that the author created can be seen in Figure 2.

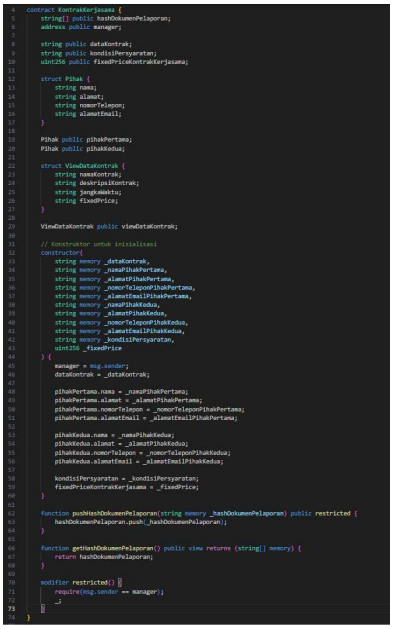

*Figure 2: Smart Contract Code*

### 3.4 Testing

The testing stage aims to ensure that the system being built runs well in terms of functionality and performance and meets user requirements [76]. The author will use Blackbox testing to test the system, and users will use the System Usability Scale, which will be tested on 30 users of modern farmers in the city of Sukabumi. Then, the users are asked to give a rating from "Strongly disagree" to "Strongly agree" [77] for the statement proposed can be seen in Table 3.4

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*Table 2: Usability Testing Question*

| No | Question |
|---|---|
| 1 | I think that I would like to use this system frequently. |
| 2 | I found the system unnecessarily complex. |
| 3 | I thought the system was easy to use. |
| 4 | I think that I would need the support of a technical person to be able to use this system. |
| 5 | I found the various functions in this system were well integrated. |
| 6 | I thought there was too much inconsistency in this system. |
| 7 | I would imagine that most people would learn to use this system very quickly |
| 8 | I found the system very cumbersome to use. |
| 9 | I felt very confident using the system. |
| 10 | I needed to learn a lot of things before I could get going with this system. |

Each question is assigned a score between zero and four. For points 1, three, five, seven, and nine, the scale position is deducted by one. For points 2, four, six, eight, and ten, the scale position is deducted by five. To calculate the score from zero to one hundred multiply the score by 2.5 [79–81]

## 4. RESULT

### 4.1 Desain

#### 4.1.1 Use Case Diagram

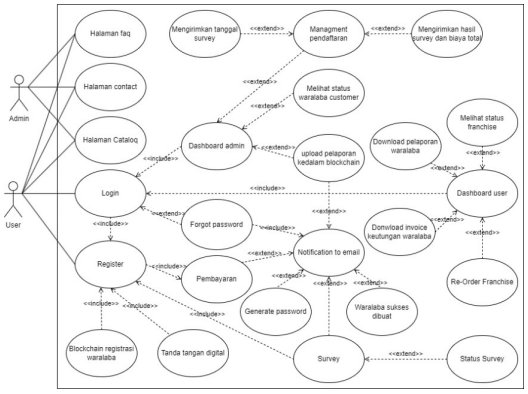


*Figure 3: Use Case Diagram*

#### 4.1.2 Class Diagram

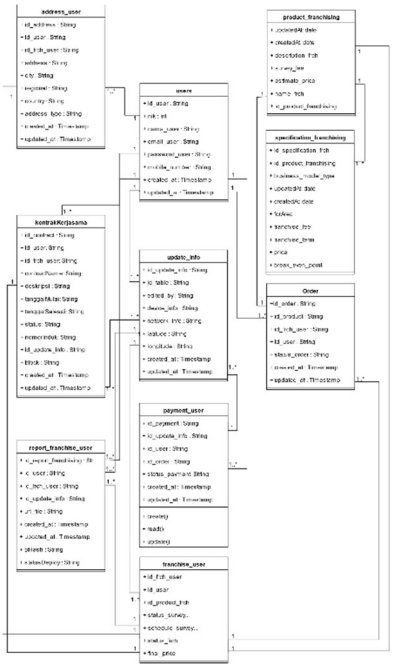

*Figure 4: Class Diagram*

#### 4.1.3 System architecture

The flow of blockchain that the author suggests to companies can be seen in Figure 4.

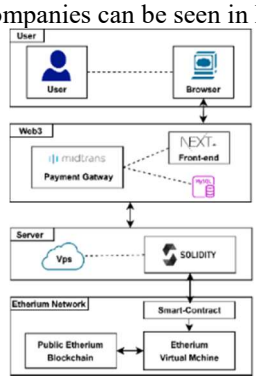


*Figure 5: System architecture*

Firstly, users can access the platform via a browser using Web3 technology. When a user registers, the data entered is not stored on a central server as in the traditional model but is stored securely on the blockchain. Every user data and payment transaction are encrypted and stored in blocks spread throughout the blockchain network, and this makes data difficult to access by unauthorized parties because to access or manipulate data, such parties must access most of the nodes on the network, which is very difficult to do. Apart from that, security is also enhanced through the concept of decentralized (centralized) and system transparency is also guaranteed through recording every transaction in blocks that cannot be changed.

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Every payment transaction is processed through Midtrans, and then the transaction data is stored via a Smart Contract using the Ethereum Virtual Machine (EVM). Each smart contract produced has a unique Hash Address, which serves as proof of identity of ownership of the smart contract. This Hash Address consists of alphanumeric characters in small letters, ensuring the uniqueness and security of each transaction.

### 4.1.4 User Interface

#### 4.1.4.1 Home

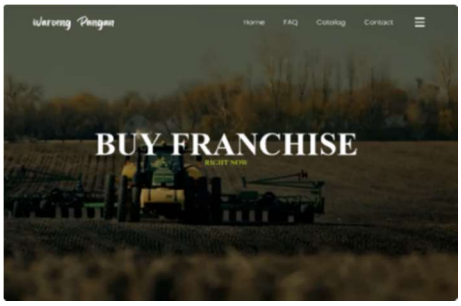


*Figure 6: Home User Interface*

#### 4.1.4.2 Catalog

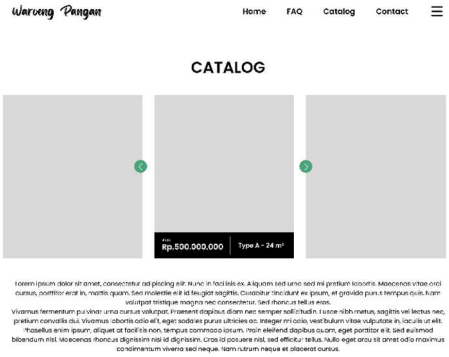


*Figure 7: Catalog User Interface*

#### 4.1.4.3 Contact


*Figure 8: Contact User Interface*

#### 4.1.4.4 Payment

Figure 9 shows the display of transactions starting from the first stage. The user will carry out a down payment process to pay the survey fees according to the package chosen by the user. After that, the franchise will determine a Survey date to check the land location, and the date itself will be displayed on the Website, which users can see. After the company surveys the user's location, the company will send the results, and the user will carry out the agreement process by visiting them digitally. The final stage is the payment process for building the franchise that the user has selected.

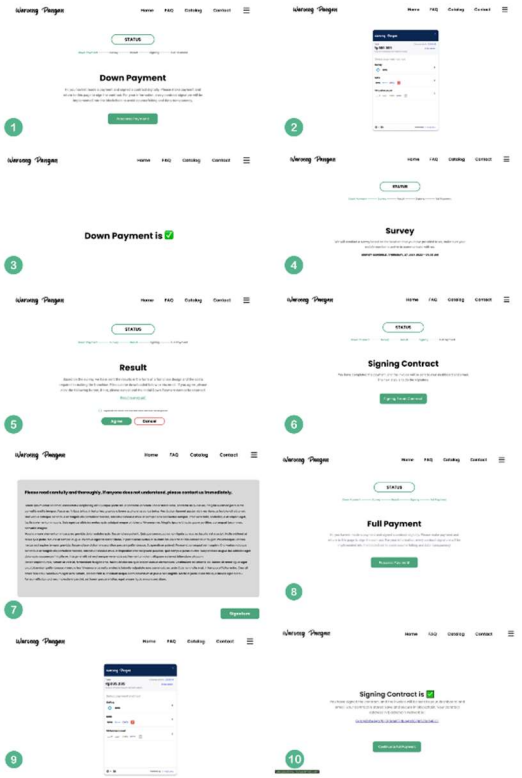


*Figure 9: Payment User Interface*

## 4.2 Testing

### 4.2.1 Blackbox Testing

Table 3 displays the outcomes of system testing conducted by the author on websites constructed utilising the Blackbox method.

*Table 3: Blackbox Testing Result*

| Feature | Test Case | Status |
|---|---|---|
| *Register* | Fill in the registration data form | **Pass** |
| Payment | Pay the survey fee and pay the final franchise fee when you have signed the contract | **Pass** |
| contract | Cooperation contract to start franchise cooperation | **Pass** |
| Cataloq | Can access the franchise cataloq page | **Pass** |

| | | |
|---|---|---|
| FAQ | Can access the FAQ page | **Pass** |
| Chat | Chat with customer service | **Pass** |
| Status Survey | View the survey status via the website | **Pass** |

### 4.2.2 Usability Testing

Based on the results of testing on 30 respondents using the SUS method on the website built by the author, it can be seen in table 4

*Table 4: Usability Testing Result*

| 🙍 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Tot |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 2 | 4 | 2 | 5 | 2 | 4 | 2 | 4 | 1 | 80 |
| 2 | 5 | 1 | 5 | 2 | 4 | 1 | 5 | 2 | 4 | 1 | 90 |
| 3 | 3 | 1 | 4 | 3 | 4 | 2 | 4 | 2 | 4 | 1 | 75 |
| 4 | 5 | 1 | 5 | 1 | 4 | 1 | 4 | 2 | 5 | 2 | 90 |
| 5 | 5 | 1 | 5 | 1 | 4 | 4 | 5 | 1 | 4 | 3 | 82.5 |
| 6 | 5 | 1 | 3 | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 80 |
| 7 | 5 | 1 | 5 | 1 | 4 | 1 | 5 | 1 | 5 | 1 | 97.5 |
| 8 | 5 | 1 | 5 | 3 | 5 | 3 | 4 | 2 | 5 | 2 | 82.5 |
| 9 | 5 | 2 | 3 | 4 | 4 | 2 | 5 | 1 | 3 | 1 | 75 |
| 10 | 3 | 3 | 4 | 3 | 3 | 1 | 5 | 1 | 5 | 1 | 77.5 |
| 11 | 5 | 2 | 3 | 2 | 4 | 2 | 4 | 2 | 5 | 3 | 75 |
| 12 | 5 | 2 | 5 | 2 | 4 | 1 | 5 | 2 | 5 | 1 | 90 |
| 13 | 5 | 1 | 5 | 2 | 5 | 2 | 5 | 4 | 5 | 1 | 87.5 |
| 14 | 5 | 1 | 3 | 2 | 4 | 1 | 5 | 1 | 5 | 1 | 90 |
| 15 | 5 | 1 | 5 | 1 | 4 | 1 | 5 | 3 | 5 | 1 | 92.5 |
| 16 | 5 | 1 | 4 | 2 | 1 | 2 | 4 | 1 | 5 | 1 | 80 |
| 17 | 4 | 1 | 5 | 2 | 4 | 2 | 4 | 1 | 5 | 2 | 85 |
| 18 | 5 | 1 | 5 | 1 | 4 | 2 | 5 | 1 | 5 | 1 | 95 |
| 19 | 4 | 1 | 5 | 2 | 3 | 2 | 4 | 1 | 5 | 1 | 85 |
| 20 | 4 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 4 | 2 | 92.5 |
| 21 | 5 | 2 | 5 | 2 | 5 | 2 | 4 | 2 | 5 | 1 | 87.5 |
| 22 | 5 | 1 | 5 | 1 | 5 | 1 | 4 | 2 | 4 | 2 | 90 |
| 23 | 4 | 2 | 4 | 1 | 4 | 2 | 5 | 1 | 4 | 3 | 80 |
| 24 | 5 | 1 | 5 | 2 | 5 | 2 | 3 | 2 | 5 | 1 | 87.5 |
| 25 | 5 | 1 | 4 | 1 | 4 | 1 | 5 | 1 | 5 | 1 | 95 |
| 26 | 4 | 2 | 4 | 1 | 5 | 2 | 5 | 1 | 5 | 2 | 87.5 |
| 27 | 5 | 1 | 5 | 1 | 4 | 2 | 5 | 1 | 4 | 1 | 92.5 |
| 28 | 4 | 1 | 5 | 2 | 5 | 2 | 4 | 2 | 3 | 1 | 82.5 |
| 29 | 4 | 2 | 5 | 2 | 5 | 2 | 4 | 1 | 4 | 1 | 85 |
| 30 | 5 | 1 | 5 | 2 | 4 | 2 | 5 | 2 | 5 | 1 | 90 |
| **Average** | | | | | | | | | | | 86 |

As depicted in Figure 10, the Acceptability, Grade Scale, and Adjective Rating methods are then utilised to determine the degree of user acceptance [82], [83].

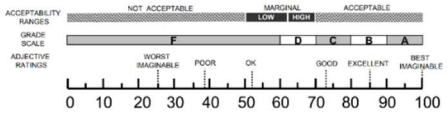


*Figure 10: Interpretation of SUS assessments [52]*

The acceptance range falls within the acceptable range, as indicated by the results. Respondents to the author-built website are classified as category B on the level scale, with a level adjective rating of very good.

## 5. CONCLUSION

In conclusion, the implementation of blockchain technology by the Yaurmori cooperative has gone through rigorous testing, showing impressive results with an average usability test score of 86 and black box testing with no problems. These results align with the primary objective of this paper and underscore the success of exploring the potential of blockchain to improve agricultural franchise agreements, Efficiency, transparency, and security. The successful implementation and positive results confirm the continuity of the system and its significant contribution to the field.

This research makes a significant contribution by providing empirical evidence regarding the real benefits of blockchain technology for agricultural cooperatives. By addressing key challenges such as transparency and security in franchise agreements, this research provides valuable insights that have practical implications for the broader agricultural sector. These findings are a foundation for future efforts, guiding further research and development in

applying blockchain technology within a collaborative framework.

However, this research acknowledges the main limitation regarding the need for more in-depth development because several features in the use case diagram were not fully realized due to time constraints. These insights highlight areas that need improvement and expansion in the future, aiming to unlock the system's full capabilities in the agricultural franchise sector. Overall, the objectives of this paper have been successfully achieved, demonstrating the promising impact of blockchain technology in agricultural cooperative settings and establishing a solid foundation for continued exploration and innovation in the field.

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