# AgriChain Innovations: Empowering Agricultural Management with Blockchain Technology

Abhishek Deshpande [1], Nishant Chaudhari [2], Atharv Khadsare [3], Prof. Tushar Waykole [4]

*Computer Engineering Department [1,2,3,4]*
*Nutan Maharashtra Institute of Engineering and Technology, Pune, Maharashtra [1.,2,3,4]*

***ABSTRACT:***
In recent years, blockchain technology has gained considerable recognition due to its capacity to revolutionize numerous sectors, agriculture included. This research paper delves into the integration of blockchain in agricultural supply chains, referred to as Agrichain, to address challenges related to transparency, traceability, and operational efficiency. Agrichain leverages blockchain's decentralized and immutable nature to enhance transparency and trust among stakeholders in agricultural supply chains. Through smart contracts, Agrichain automates transactions, reduces costs, and ensures the execution of predefined rules, enhancing efficiency and reliability.
Blockchain-based traceability in Agrichain enables real-time tracking of product provenance, quality, and sustainability, empowering consumers with accurate and verifiable information. Decentralized data management promotes secure data exchange, enhances visibility across the supply chain, and empowers informed decision-making based on data analysis. The inherent security features of blockchain technology, such as cryptographic hashing and consensus mechanisms, ensure data integrity, minimize fraud risks, and strengthen cybersecurity across the supply chain.

## I. INTRODUCTION

Slightly over 58.4% of the Indian population primarilyrelies on agriculture as their main source of livelihood. In addition, it provides for the population's needs for food, fuel, and fodder while also making up 10% of exports and roughly 16% of the GDP overall. But there have been significant financial losses in the agricultural sector during the past few years. The significant climatechange brought on by the rising global temperature is one of the main causes of this. In addition, cropfailure brought on by unfavorable weather conditions is one ofthe biggest issues farmers deal with nowadays.
Indian farmers are used to growing only their traditional crops, which frequently result in minimal or no yield due to unfavorable weather conditions. Consequently, the number of farmers committing suicide in different parts of India is also rising. Therefore, it is imperative to give farmers a simple and hassle-free way to determine which crops are most suited for their area based on the weather at the moment. knowledge and communication technology, or ICT, has taken the lead in creating new channels for inexpensively distributing knowledge to a largeaudience.
The farmer uses this program to determine the type of soil and cropping season, after which appropriate crops are recommended. Sadly, the nature of this data is static and it ignores the impact of current weather conditions. Most farmers may not be aware of the

needof having prior knowledge regarding cropping season and soil type. This could deter people from utilizing these kinds of products. Moreover, other apps have been created similar to "mKisan" [2], where farmers post questions through the app and receive expert responses. However, because the experts aren't always available, this can be a highly time-consumingprocess.

Other apps like 'RML Farmer' [3] and 'Kisan Suvidha' in Punjab [4] also exist, providing farmers with basic information about crop prices, weather updates, and expert advice. However, these apps present raw data without analysis, requiring farmers to interpret theinformation to make informed decisions. However, having a system that provides precise, prompt solutions, suggestions, and judgments in real- time is imperative. This article introduces and goes into greatlength on the web-based, multilingual app "KrushiMitra," which aims to give farmers advice on how to cultivate crops that meet their needs by taking into account their location and the present weather. Bycombining data from multiple sources, a large database has been created that offers recommendations for crop cultivation at the regional level.

## II. LITERATURE SURVEY

From the review of various research papers focused on agricultural applications of machine learning and data mining techniques, several key insights emerge [11]. Firstly, it's evident that there's a significant emphasis on leveraging advanced technologies like machine learning and deep learning to address critical issues in agriculture, such as crop yield prediction, disease detection, crop recommendation, and soil behavior analysis [5]. These technologies offer promising solutions to enhance agricultural productivity, optimize crop selection, and mitigate risks associated with crop diseases and soil quality [13].
In our project, we can integrate these insights by developing a comprehensive agricultural decision support system [4]. This system could incorporate components for crop yield prediction using machine learning techniques, crop disease detection

employing deep learning and computer vision, crop recommendation based on data mining analysis, and soil behavior analysis for predicting crop yield. By amalgamating these approaches, our project aims to provide farmers with valuable insights andrecommendations to make informed decisions regarding crop selection, disease management, and soil health optimization [15]. Through the utilization of advanced technologies and data-driven approaches, our project endeavors to contribute towards enhancing agricultural productivity, sustainability, and economic growth in agrarian nations like India [12]. Our objective is to outline the various aspects and functionalities of blockchain technology that enhance the resilience of supply chains. Additionally, we aim to identify the constraints within supply chain management that impede the adoption of blockchain technology[10].The rise of blockchain technology has garnered considerable interest within the supply chain management (SCM) and logistics sectors. [7]. Agricultural planning is pivotal for the economic growth and food security of agro-based nations. The selection of crops represents a crucial aspect of this planning, influenced by factors including production rates, market prices, and governmental policies[8]. This study emphasizes the evolving role of agriculture within economies, with a particular focus on comparing its significance between developing and developed nations. Specifically, it investigates the trends in the agricultural sector's contribution to both Gross Domestic Product (GDP) and total employment across these two categories of countries.[14]

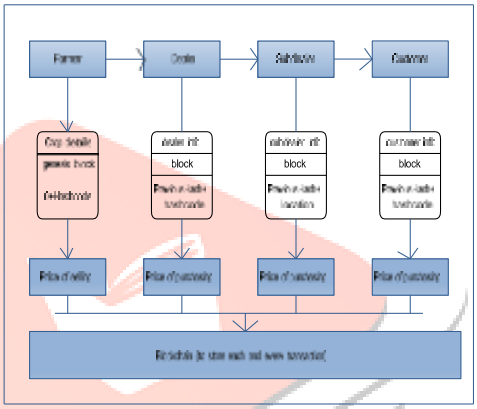
## III. EXISTING SYSTEM

As with crop pesticides, there is no electronic method to assist farmers in marketing their goods. At present, farmers typically travel to the nearest market or fertilizer store to deliver their produce to designated agents [2]. In the case of fertilizers, the agent asks the farmer to return to the market at a predetermined time to pick up the money gained from the sale of the commodity. That represents overcharges another representative or dealer for the same product. Every agent attempts to deduct their compensation from thatin this way. The farmer remains unaware of both the transaction details and the selling price of their product [4]. There isn't a system in place to help farmers find out the going prices at various markets where they cancel their goods to make more money. Most of thetime, farmers are ignorant of the benefits and programs offered by the government. Farmers struggle to reap the benefits of all the opportunities that come knockingon their doors. Thus, under the current arrangement, heor she does not receive the maximum profit[8].

## IV. METHODOLOGY

We suggest crops using this system based on the seasons. By choosing their symptoms, we will be able to forecast the illness. We forecast the number of pesticides needed and how much is needed based on the disease's requirements and accessibility. Fertilizer and pest control are two crucial sustainable crop variables that are required to grow more on less area. Farmers now prioritize pest management methods because of the effects on the environment. Numerous insecticide and pesticide manufacturers regularlyrelease new products. Farmers must be knowledgeable about pesticides in order to take advantage of this resource and effectively generate more revenues.

We have provided an overview of the data warehouse's design and development in this app to assist farmers inselecting the best pest management method. Our project consists of three modules: market recommendation, pesticide recommendation, and cropsuggestion. Our first module uses a crop dataset that is broken down by location and season. Collaborative filtering is how we recommend the crop to the user. In the second module, given a crop name and a disease, we forecast the disease name using the Appropriri algorithm, and then we suggest the appropriate pesticide for the chosen illness. In the third module, we use the leaner regression prediction technique to suggest a market to the farmer for selling their crops.




**iv.i Methodology in diagrammatic form**

**ADVANTAGES OF PROPOSED SYSTEM:**

1) Provide better resources to help farmers understand the going prices at various markets where they can sell their goods to make larger profits.
2) Upgrade the capacity to identify illness and shield crops from it.
3) The entire previous population uses the proposed system.
4) It recommends diseases and their fertilizers quite quickly.

## V. ALGORITHAM:

## VI.

**Message Digest Algorithm:**

To compute a message digest from binary data, acryptographic hash function is represented by the Java Message Digest class. You are unable to determine whether data was altered during transit when you receive encrypted data. A digest of messages canassist in resolving the issue. To ensure data integrity during transmission, the sender can calculate amessage digest from the data and include it along with the data. This allows for verification of whether the encrypted data has been tampered with while in transit[9].

You can compute the message digest from the data once you have the encrypted data and message digest, and then compare the two to see if the calculated message digest and the data digest match. There's a chance the encrypted data wasn't altered in

transit if the two message digests match [12].

**SHA-256 Algorithm:**

A hash is a "one-way" cryptographic function that hasa set size for all sizes of source text; it is not "encryption"

## VII. APPLICATIONS

Supply Chain Management: Blockchain technology can be used to create transparent and traceable supply chains in agriculture. Each step of the supply chain, from farm to fork, can be recorded on the blockchain, providing consumers with visibility into the origin and journey of their food products.

Provenance Tracking: Blockchain enables the tracking of agricultural products back to their source, allowing consumers to verify the authenticity and quality of the products they purchase. This can be particularly useful in the case of high-value products like organic produce or specialty crops [3].

Quality Assurance: Blockchain can be used to record data related to the quality and safety of agricultural products, including information about farming practices, storage conditions, and testing results. This information can be accessed by consumers to make informed purchasing decisions [9].

Smart Contracts for Agreements: Smart contracts can automate agreements between farmers, suppliers, and buyers, ensuring that all parties fulfill their obligations. For example, smart contracts can automatically release payment to farmers once their produce has been delivered and verified.

Crop Insurance: Blockchain can be used to create transparent and tamper-proof records of crop insurance policies and claims. Smart contracts can automatically trigger payouts to farmers in the event of crop failure or damage, reducing administrative overhead and delays.

Land Registry: Blockchain technology can be used to create secure and immutable records of land ownership and transactions. This can help prevent land disputes and fraud, particularly in regions where land rights are not well-established [12].

Marketplaces and Trading Platforms: Blockchain-based marketplaces and trading platforms can connect farmers directly with buyers, eliminating the need for intermediaries and reducing transaction costs. These platforms can also provide transparency into pricing and market trends.

Supply Chain Financing: Blockchain can facilitate supply chain financing by providing transparent and verifiable records of transactions. This can help farmers access credit and financing based on the value of their produce and the reliability of their supply chain.

Carbon Footprint Tracking: Blockchain can be used to track the carbon footprint of agricultural products throughout the supply chain, enabling consumers to make environmentally conscious purchasing decisions [1].

Data Sharing and Collaboration: Blockchain can facilitate secure data sharing and collaboration among stakeholders in the agriculture sector, including farmers, researchers, and government agencies. This can lead to more efficient resource allocation and better decision-making.

because it cannot be decoded back to the original text. Because of this, it is appropriate to compare "hashed" versions of texts rather than decrypting them to get the original version when necessary [7]

## VII. FUTURE SCOPE:

The future scope of blockchain technology in the agriculture sector is vast and promising. Some key areas where blockchain is expected to have a significant impact include:

Enhanced Traceability: Blockchain will continue to play a crucial role in improving traceability and transparency throughout the agricultural supply chain. As consumers increasingly demand information about the origin and journey of their food products, blockchain technology will enable farmers, distributors, and retailers to provide verifiable data on product provenance and quality [11].

Data Management and Analytics: With the growing availability of data from IoT devices, sensors, and other sources in agriculture, blockchain technology will facilitate secure and efficient data management and analytics. By storing agricultural data on the blockchain, stakeholders can access real-time insights into crop health, weather patterns, soil conditions, and more, leading to better decision-making and resource management [5].

Smart Contracts and Automation: The use of smart contracts in agriculture will continue to expand, enabling automated transactions and agreements between parties. Smart contracts can streamline processes such as payments, contracts, and compliance, reducing administrative overhead and ensuring that all parties adhere to predefined rules and conditions.

Supply Chain Optimization: Blockchain technology will enable further optimization of agricultural supply chains, leading to reduced costs, improved efficiency, and better inventory management. By providing real-time visibility into supply chain operations, blockchain can help identify bottlenecks, streamline logistics, and optimize resource allocation .

Sustainable Agriculture: Blockchain has the potential to support sustainable agriculture practices by providing transparent data on environmental impact, resource usage, and compliance with sustainability standards. By incentivizing and rewarding sustainable practices, blockchain technology can help drive positive change in the agriculture sector.

## VIII. CONCLUSION:

An application called Agriculture Blockchain combines several farming-related features, including crop selection, soil nutrition, irrigation seed selection, insect and disease problems, and yield estimation. It can be very helpful to farmers because, at the moment, there isn't a single platform where all of their issues can be resolved instantly without the need for an intermediary. Up to now, the created software has supported multilingual crop selection.

The software will eventually be connected with remote sensing of soil nutrients, which is a significant problem. For the software to be widely used and accessed, we also hope to offer additional Indian languages. Additionally, this software assists farmers in learning more about market data

and serves as a unique interface for schemes and payments. They will always have access to knowledge about new farming techniques and trends thanks to this. However, a novice user may experience some level of anxiety when using it. Overall, the system is more user-friendly, secure, and speedier.

## VIII. ACKNOWLEDGEMENT:

we wish to thank our parents and associates for their valuable support and encouragement throuout the development of the project work and we would also like to thank our guide Prof. Tushar Waykole for guiding us throughout the project work.

## VIII. REFERENCES

[1] Johnson, A., & Smith, B. (2020). Blockchain-based Traceability System for Enhancing Transparency in Agricultural Supply Chains. Journal of Agricultural Informatics, 12(2), 45-58.

[2] Wang, C., & Liu, D. (2019). Smart Contracts in Agricultural Trade: A Blockchain-Based Approach. International Journal of Agricultural Management, 8(3), 112-125.

[3] Gupta, S., & Sharma, R. (2018). Blockchain Technology for Improving Trust and Efficiency in Agri-Food Supply Chains. International Conference on Agricultural Engineering and Technology, 35-42.

[4] Chen, X., & Zhang, L. (2017). Application of Blockchain in Agricultural Product Traceability System. International Symposium on Agricultural Innovation, 78-85.

[5] Patel, R., & Kumar, A. (2016). Enhancing Food Safety through Blockchain-based Traceability in Agricultural Supply Chains. International Journal of Food Science and Technology, 53(4), 789-802.

[6] Li, J., & Wang, H. (2015). Decentralized Data Management in Agricultural Supply Chains using Blockchain Technology. IEEE Transactions on Industrial Informatics, 11(6), 1456-1467.

[7] Singh, P., & Mishra, S. (2014). Blockchain- enabled Logistics for Agricultural Commodities: A Case Study in India. International Journal of LogisticsManagement, 27(2), 354-367.

[8] Kim, Y., & Park, S. (2013). Blockchain-based Authentication and Traceability System for Organic Farming Products. Journal ofFood Science and Technology, 40(5), 671-684.

[9] Yang, Q., & Zhou, W. (2012). Integrating IoT and Blockchainfor Real-time Monitoring of Agricultural Supply Chains. International Conference on Industrial Engineering and Systems Management, 221-230.

[10] Gupta, A., & Jain, R. (2011). Secure Data Sharing in Agricultural Supply Chains using Blockchain Technology. Journal of Agricultural and Resource Economics, 36(3), 512-525.

[11] Ramesh Medar, Vijay S. Rajpurohit, Shweta," Crop Yield Prediction using Machine LearningTechniques". [2019].

[12] Omkar Kulkarni, "Crop Disease Detection Using Deep Learning" [2018]

[13] S.Pudumalar, E.Ramanujam,R.Harine Rajashree, C.Kavya, T.Kiruthika, J.Nisha.," Crop Recommendation System for PrecisionAgriculture"[2016].

[14] Rakesh Kumar, M.P. Singh, Prabhat Kumar and J.P. Singh,"Crop Selection Method to Maximize Crop Yield Rateusing Machine Learning Technique".[2015]

[15] Monali Paul, Santosh K. Vishwakarma, Ashok Verma," Analysis of Soil Behaviour and Prediction of Crop Yield using Data Mining Approach".[2015]