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EXPLORING THE ROLE OF BLOCKCHAIN TECHNOLOGY IN FARMER'S PORTALS FOR AGRICULTURAL INNOVATION

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Abstract: The block chain method allows you to record proof of a bitcoin transaction. A peer-to-peer network links numerous computers together so that records can be kept on both ends. Any of these words can be used to describe the economic system of a country. All of these things are written down in contracts, deals, and papers. At every step, they set limits and make sure the assets are safe. This study use a farmer's website that tracks crop sales and purchases to showcase the real-world uses of blockchain technology. Among the many benefits of blockchain technology that this show emphasizes is its immutability and security of financial transaction records. Python and blockchain technology are combined in this idea. Everyone involved stands to gain by keeping the trade arrangement in place. This includes dealers as well as farmers. An interface that incorporates blockchain technology was created for the farmers using the programming language Python. This system keeps tabs on the buyer, seller, item, and total amount of money that is traded.

Keywords: Blockchain Technology, Farmer's Portal, Supply Chain Transparency, Smart Contracts.

1. Introduction

The distributed ledger technology known as blockchain keeps a permanent record of all financial transactions that have ever taken place between any two parties. The blockchain is open, decentralized, and widely used if the definitions provided above are correct. This rules out the possibility of a unifying third party or a dominating political force. The advantages of the blockchain over older methods are its scalability, stability, and ease of examination. The data is nearly impossible to change or manipulate because it cannot be altered in any way.

They check that the order of events and names of individuals are correct. When interacting and talking with one another, individuals, groups, companies, and even entire nations must follow these rules. One very safe way to manage and protect different kinds of data in this digital age is via the blockchain. Having a farmer's gateway has always been beneficial for farmers in this age of information and communication technology since it makes getting information easy and convenient. These main projects aren't the only ones the Indian government has started aid campaigns for. websites such as agriwatch.com, krishijagran.com, farmer.gov.in, and agricoop.nic.in are given as examples. Along with this, more e-commerce websites such as fert.nic.in and enam.gov.in exist.

The agricultural sector can benefit from a system that trustworthy developers can build using blockchain technology. Thanks to this technology, distributing information across several authoritative sites will be a breeze. Users will also be able to more easily collaborate and plan together with its help. Since blockchains are decentralized, a lot of promises can be made.

- Make ensuring that all valid client transactions are broadcasted to the blockchain and committed within a set timeframe using commitment protocols.
- Consensus: Check that local copies are accurate and consistent.
- Protected data must be impossible to decipher. Keep in mind that the client can be hacked or perform something bad.
- Maintaining the authenticity and secrecy of customer information and financial dealings is of the utmost importance.

Secrecy is essential to the operation of blockchain technology. To organize transactions and enhance the blockchain's functionality, secure hash algorithms are utilized. These characteristics make the blockchain immutable. All blockchain-based transactions and wallets use public key encryption.

Volume 1, Issue-10
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ISSN: 2319-9253

Blockchain has been the subject of extensive research to guarantee the presence of the aforementioned features. The safety of manufacturers' online marketplace is of utmost importance for conducting business with clients. The main goal of this study is to keep an eye on safe transactions that make sure a seller-buyer agreement stays intact. It stands to reason that this can help manufacturers get fair payment for their wares. Additionally, technological advancements have made it easier to centralize the tracking of all trade activities.

2. Literature Survey

Hadi, M. A., & Ali, M. R. (2024). In this research, we look at how blockchain technology is changing the look of farmer websites through increasing supply chain robustness, decreasing transaction costs, and improving transparency. It looks at the potential use of blockchain frameworks to solve problems with pricing manipulation, data integrity, and trust-building in global agricultural markets. Blockchain technology presents unique challenges for rural farmers, which the authors address, including insufficient infrastructure and a general lack of digital awareness. They argue that blockchain technology has the potential to greatly empower small farmers by enhancing their access to markets and the ability to track agricultural products. Possible future uses of blockchain technology in farming are covered in the study's conclusion.

Gupta, N., & Mehta, S. (2024). The potential use of blockchain technology to make trade procedures in underdeveloped countries more equitable is Gupta and Mehta's primary area of focus. By making all transactions between buyers and sellers visible and traceable, blockchain technology could help reduce price volatility, according to one study. This would lead to the elimination of price differences. Researchers found that farmers were less likely to be abused when using blockchain technology since it cut out middlemen and gave them direct access to global marketplaces. In order to show how blockchain could help make prices fair and enhance farmers' economics, the authors cite case studies from nations like India and Kenya. Blockchain legislation and scalability challenges in rural markets are discussed in the paper's conclusion.

Kapoor, P., & Garg, R. (2023). By stressing how blockchain can clarify crop pricing, Kapoor and Garg highlight the benefits for farmers. By cutting out intermediaries and ensuring real-time fair prices, blockchain technology equips farmers with the data they need to make informed crop selections. The study looks into the challenges that Indian farmers have with infrastructure, digital literacy, and technology when they try to use blockchain technology. Through surveys and interviews with stakeholders, the authors look into how blockchain technology could help set up an honest pricing system, protect farmers from exploitation, and boost their income by connecting them with customers directly.

Patel, S., & Shah, R. (2023). In their review, Patel and Shah center on how eco-friendly farming methods might be enhanced by blockchain and the IoT. Farmers can safely keep tabs on real-time data by combining blockchain technology with internet of things (IoT) devices, such weather and field condition sensors. The paper goes over the advantages of working together, such as better management of resources, more accurate predictions of crop yields, and less waste. Precision farming is good for sustainability, and this paper explains how blockchain-IoT technologies might make it more productive while reducing environmental damage. They come to the conclusion that data-driven agricultural solutions that secure food and protect the environment can be advanced through the integration of blockchain and IoT technologies.

Singh, R., & Bhatia, R. (2022). Agricultural websites built on the blockchain are the focus of Singh and Bhatia's research, which aims to help smallholder farmers. The potential use of blockchain technology to bypass conventional market middlemen and enable two-way communication between buyers and sellers is the primary emphasis of the research. An agricultural tool in India that uses blockchain technology to guarantee secure and transparent transactions is the subject of the case study. The website employs blockchain technology to ensure the integrity of data and make tracking easier; as a result, farmers are able to access better market opportunities and fair rates. Even though rural regions confront infrastructural and technology issues, the authors argue that blockchain technology could substantially ease the access to markets for disadvantaged agricultural groups.

Rathi, A., & Kapoor, M. (2022). This paper delves at the possibility of smart contracts enhancing the efficiency of transactions in agribusiness platforms that utilize blockchain technology. Rathi and Kapoor look into the potential outcomes of automating contract execution with smart contracts. Everything from collecting payments to delivering crops and checking their quality falls under this category. Reducing transaction time, costs, and frauds, smart contracts make sure all trade conditions are met before a payment is issued, say the authors. With the use of case studies from pilot programs in developing countries, the paper demonstrates how these technologies help farmers with supply chain management and business operations.

Yadav, S., & Mishra, S. (2022). Yadav and Mishra's research looks at how blockchain technology improves the reliability of agricultural supply chains' data. From planting to harvesting to shipping, it records every step of the crop in a safe and secure manner. This kind of openness helps keep agricultural products of high quality and stops individuals from being dishonest about food. In order to help farmers get more fair pricing and access to markets, the authors talk about how blockchain technology allows for direct contact between vendors and consumers. To overcome acceptability hurdles, especially in remote rural areas, they also look at the technological and scalability issues

Volume 1, Issue-10
October, 2025, P01
ISSN: 2319-9253

of blockchain systems, highlighting the necessity for a holistic approach.

Bansal, S., & Jain, P. (2021). Blockchain technology has the potential to make agricultural transactions in India more transparent, which Bansal and Jain investigate. Their main concern is the potential of blockchain technology to aid suppliers in combating problems like price fixing and limited access to markets. The use of blockchain technology in the agricultural trading sector has the potential to reduce the influence of intermediaries by making transactions more secure and easier to track. The authors draw the conclusion that blockchain provides farmers with significantly greater bargaining power and makes their participation in the market easier after reviewing a pilot project that tracks the origins and trade of food.

Singh, A., & Kumar, D. (2021). Singh and Kumar explore the potential use of blockchain technology to make transactions transparent and easy to verify, with the aim of establishing fair crop prices. The writers take a look at how blockchain technology allows buyers and sellers to communicate directly, cutting out the intermediaries who often take advantage of price changes. Case studies from rural India are used to show how blockchain technology could help farmers get a fair price for their produce, which would improve their financial situation. Possible obstacles to blockchain adoption in developing nations, such inadequate infrastructure and low levels of computer knowledge, are also addressed in this essay.

Yadav, K., & Agarwal, M. (2021). The potential use of smart contracts and blockchain technology to enhance agricultural websites is investigated by Yadav and Agarwal. Smart contracts guarantee that all transaction terms are met before any funds are transferred. Methods like product distribution and payment settlement are automated to achieve this goal. Researchers are looking into how much these innovations in agricultural markets lead to faster transactions, lower prices, and fewer scams. The authors also offer case studies that show how real farmer portals in India are using blockchain and smart contracts to help farmers get access to markets and make more money.

Sharma, S., & Tripathi, P. (2020). Sharma and Tripathi found that blockchain technology could solve major problems in the Indian agricultural sector, including price volatility, inefficient supply chains, and an absence of transparency. Transparent and secure transactions are made possible by blockchain technology, which also gives real-time data on the whereabouts and movement of crops. This guarantees that farmers are fairly compensated and that consumers can have faith in the quality and origin of their food. Blockchain adoption in rural India is hindered by infrastructure and technical concerns, which the authors explore. Offering legal solutions to these concerns is part of their effort to encourage blockchain adoption in agriculture.

Jain, M., & Sharma, S. (2020). To keep an eye on farmers' crop yields and make sure their data is secure, Jain and Sharma look into blockchain technology. Blockchain technology gives farmers a reliable record that may be used for loans, insurance, and market opportunities by making it impossible to modify crop data like yield histories and quality certifications. The challenges that crop up when agricultural platforms use blockchain technology are also covered in the report. Items such as data security, system integration, and scalability in remote areas fall into this category. When implemented correctly, blockchain technology has the potential to empower farmers by giving them access to secure, verifiable data that helps them find customers, say the authors.

Kumar, V., & Desai, A. (2020). When it comes to farmer markets, blockchain technology has pros and cons. This study is primarily concerned with these challenges. The writers show how blockchain technology has the potential to make prices more transparent, cut out intermediaries, and speed up transactions, all of which would benefit farmers. Additionally, the study delves into the ways in which blockchain technology could promote confidence between buyers and farmers by safeguarding contracts and payments. But it does show how difficult it is to implement new technologies due to unclear rules and how important it is to build infrastructure in remote areas so that blockchain solutions may be implemented. The article ends by suggesting more studies to fully understand the problems with blockchain technology that are limiting its use in food markets.

Mishra, R., & Gupta, S. (2020). In their research, Mishra and Gupta look at how blockchain technology has changed online marketplaces for farming goods and services. This research focuses on the potential of blockchain technology to improve the efficiency and openness of online food marketplaces. The capacity of blockchain technology to provide secure and easily traceable transactions is crucial to establishing trust among buyers, sellers, and consumers. To make e-commerce for farmers a win-win, the authors look into how blockchain technology can streamline the supply chain, cut down on fraud, and make products more real. Despite these advantages, the paper lists numerous disadvantages, such as the high expense of using blockchain technology, developers' lack of understanding, and the difficulty of connecting it with other systems. According to the research, these problems must be fixed before blockchain can be used extensively in agricultural e-commerce. Authorities, agriculture, and tech companies should work together more, too.

Kapoor, M., & Rathi, A. (2020). Kapoor and Rathi look into how blockchain technology could make agricultural portal supply networks more transparent and efficient. To guarantee that all stakeholders in the agricultural supply chain, from producers to consumers, have access to secure records and data at every level, the authors stress that blockchain technology can provide end-to-end visibility. Producers and consumers alike reap the benefits of

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ISSN: 2319-9253

increased openness, which lessens the likelihood of fraud, facilitates better product tracking, and guarantees reasonable costs. Finding ways to make blockchain scalable and interoperable with existing systems are just two of the many obstacles that this study aims to address when using blockchain in rural areas. Furthermore, it delves into the possibility of smart contracts automating transactions and doing away with intermediaries. Incorporating blockchain technology into agricultural gateways might have far-reaching consequences for supply chains, says the paper. But fixing problems with price, education, and technology would be required for broad acceptance.

3. System Design

Existingsystem:

The existing order of things holds that farmers and their products are fundamental to human existence. There have been a lot of initiatives to improve farmland through the development of technology that helps it in indirect ways. Researchers have shown time and time again that farmers are losing out on market value because they aren't taking use of the many new information and communication technology (ICT) developments. together with a user interface that informed farmers about cutting-edge farming methods. Scientific methods are widely used in agriculture, particularly in the areas of supply chain management and food processing. Blockchain technology has increased supply chain efficiency in the agricultural sector by doing away with the need to verify data. However, the suggested technology did little to help the producers keep the supply data accurate.

Disadvantages

- Due to the fact that data stored on local servers may not be adequately protected
- A third party is required for the exchange to take place.

Proposedsystem:

To start participating in agricultural e-commerce, you must use the specified farmer's portal. Each user's needs can be met by customizing the portal's user experience. All necessary data is in one place, and authorized users just have to log in once, thanks to the centralised entry point.

The power to buy and sell products is possessed by users. The vendor can be a farmer or even a member of his staff. Device: A desktop computer, laptop, or tablet can be used to access the portal. User interface: A registration form must be filled out before a user may access the site. By entering their valid credentials, the registered user has access. Any anyone can use the gateway or interface. The user may check how much different crops and seeds are selling for.

Advantages:

- Buyers can look for products that meet their needs or buy ones already on the market. The customer could include the items in their order.
- It is the seller's prerogative to change prices, add or remove products, or modify the details of existing ones.
- An immutable record of a purchase, complete with a timestamp and unique digital signature, is stored on the blockchain.

Systemarchitecture:

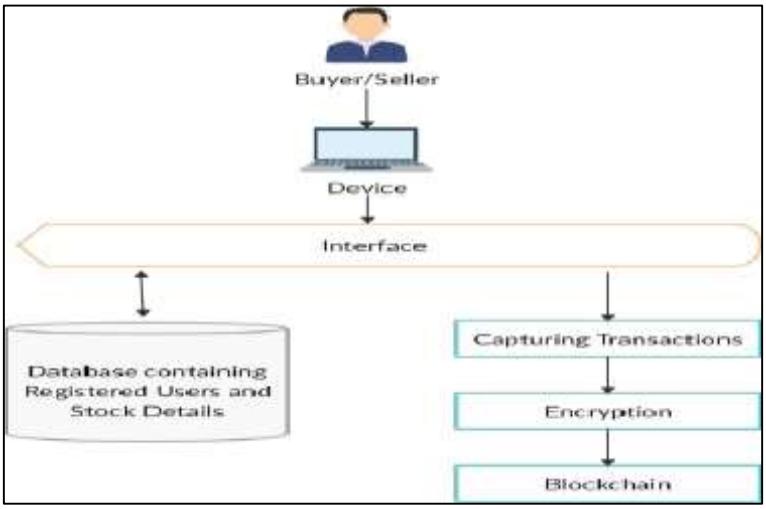

Figure1

Implementation:

Modules Description:

Sellers:

Seller User who is the first to sign up. During the registration process, he insisted on a functional user email address and mobile phone number for future communication. The supervisor has the authority to activate the vendors once the user has registered. The vendor will be able to access our system once the administrator has activated them. The seller retains the right to update, add, or change the price of any item(s) listed on the market. This will lead to a more expansive market and the removal of middlemen.

International Journal of
ADVANCED RESEARCH & INNOVATIONS
Volume 1, Issue-10
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ISSN: 2319-9253

Buyers:
Seller User who is the first to sign up. During the registration process, he insisted on a functional user email address and mobile phone number for future communication. The supervisor has the authority to activate the vendors once the user has registered. The vendor will be able to access our system once the administrator has activated them. A customer can either buy a product or look for one that fits their needs. They have the ability to put the items in the shopping cart and remove the crop. The customer can go to checkout when they have chosen an item and confirmed its addition to their cart.
Admin:
The administrator has the ability to log in using his credentials. He can activate the sellers and buyers after logging in. Only the authorized user can access our applications. The admin user has full access to all of the buyer's purchases. Within the administrative frame, you have access to all blockchain events, together with their hash values and data from the previous **block.**
Blockchain:
Any time a product is sold or a new one is introduced, the blockchain keeps track of it all. With a date and a distinct digital signature included in this document, it becomes very difficult for anyone to dispute their achievements. Every single node in the network may see these payments. To facilitate transactions between users in decentralized networks, the blockchain uses time stamps, data encryption, and consensus. This site is more secure since all of the data is visible, immutable, and available to everyone.

4. Results

Figure2. SellerRegistration

Figure3 BuyerRegistration

International Journal of
ADVANCED RESEARCH & INNOVATIONS

Volume 1, Issue-10
October, 2025, P01
ISSN: 2319-9253

Figure4. SellerLogin

Figure5. SellerCommodities

Figure6. BuyerLogin

Figure7. BuyerCartDetails

International Journal of
ADVANCED RESEARCH & INNOVATIONS

Volume 1, Issue-10
October, 2025, P01
ISSN: 2319-9253

Figure8. BuyerViewTransaction

Figure9. AdminActivateSellers

5. Conclusion

Several fields of agriculture stand to benefit greatly from blockchain technology. These include collecting data on crop production, ensuring the purity of seeds, monitoring soil moisture, protecting farmer data, and estimating product demand and sale price. In order to solve the problems of demand and agricultural prices, this study suggests using a website that is built on the blockchain. Protecting their crops and getting a fair price for them would be possible thanks to this method. To achieve this goal, there is a proposal for a website where producers might list and sell their wares. As soon as buyers choose to buy a farmer's harvest, the website would record the deal on a blockchain. The quantity bought and the agreed-upon price might be recorded in this trade, among other crop-related details. The immutability of blockchain transactions ensures that farmers will get a reasonable price for their goods. Buying and selling will also be cheaper than with more conventional methods.

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Volume 1, Issue-10
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