

# Improving the Supply Chain Management in Indian Agriculture

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## Abstract:

India plays a significant role in the global agricultural scene. India's agricultural history begins with the Indus Valley Civilization. Despite having a long history, many farmers in this country are going hungry as global corporations profit. The aforementioned issue is probably caused, at least in part, by poor supply chain management. Agricultural equipment, as most people are aware, rapidly ages if not maintained. Although the government offers storage facilities to farmers, the current logistics management system prevents them from knowing where their product is. Businesses find it challenging to track their products throughout transportation without using guessing. Because of this, it's crucial for farmers and decision-makers to monitor the state of their products and carry out routine audits of the manufacturing process. In this study, we suggest adopting blockchain technology to promote complete product transparency and increase communication between producers and consumers. Farmers and government employees that participate in the transit will have access to all the details of the process that are recorded in the blockchain. Additionally, records stored in perpetuity may be accessed for as long as required.

**Keywords:** Supply chain management, Smart contract, Blockchain, Agriculture, Goods, Farmer.

## 1. INTRODUCTION

The Indian economy is based primarily on agricultural production. In India, the agricultural industry makes up about 17.5% of the country's GDP. Sadly, the current situation for Indian farmers is dire. Approximately 82% of farmers who manage less than 2.5 hectares of land fall under the category of small-scale farmers. Farmers' primary source of income comes from the crops they grow on their farms. Unfavourable climatic conditions are to blame for today's erratic seasons. In either case, a severe flood would destroy the crops, or there would be a drought due to a lack of precipitation. Farmers occasionally don't get paid fairly for their output since they can't preserve the valuable but brittle things for a long time. Farmer access was often denied to rural residents. There are few choices available to farmers to lessen the cost of raising and storing crops. Farmers may be able to increase their income by hoarding supplies and selling them during high-demand times of the year.

Only a few farmers were required to go from their farms to the facility since there wasn't enough storage space. Farmers have to ship their products to far-off markets in order to increase their income. Due to the longer hours needed for farming, local farmers had significantly less time for distribution and advertising. Farmers whose goods are kept in government storage facilities have no way of knowing where they are at any one time. Due to their lack of knowledge about the current condition of their products and the market environment, many farmers are likely to be easily duped by agents into paying less than the fair price for

their commodities. Therefore, it is essential to establish a system that enables farmers to monitor the location and state of their products. Internet of Things is becoming more and more popular in farming, but as the variety of IoT operating systems rises, so do the problems with IoT hierarchy.

Blockchain participants and nodes all produce transactions, which are events. Before a transaction can be added to a block, all parties must confirm it. The hash function of the preceding block must be present in the new block in order to create a connection between two blocks in the system. For agricultural data, the immutability of blockchain storage is a significant advantage. If any information in the block, including the price of agricultural goods, needs to be altered, a new transaction must be generated. The block is updated with the new event so that the buyer and seller may view the altered quote.

### 1.1 EXISTING SYSTEM

SCM was initially applied to agricultural firms many years ago. SCM is initially considered to be the connection between businesses and warehouses. It is designed to act as the connection between various components in later phases of the SCM process. Each link in the supply chain needs to be closely watched since agricultural products are time and temperature sensitive. The aforementioned should make it abundantly evident that SCM plays a significant role in the agricultural industry. The agricultural supply chain in India, however, falls short of expectations.

Farmers are unable to monitor the status of their compensation applications or observe how their processes are progressing at any given time, which is a problem that still needs to be fixed. The literature discusses a number of strategies with the intention of addressing the weakness. One solution is to use Blockchain technology to monitor SCM processes.

The potential applications of blockchain technology in farming have been thoroughly examined. In this paper, we examine the benefits and drawbacks of using blockchain technology to the agricultural sector. Scientists must figure out how to combine their various technologies because of the growing global demand for food.

### 2.LITERATURE SURVEY

"Block chain technology and agriculture industrial goods tracking: study advancements and future problems" is one such study, written by Giovannii Mira Beli. The authors of this study focused on dietary accountability issues while collecting and analysing the most pertinent writings on the topic of using blockchain in agriculture. Hormones and other substances that are frequently employed in farming help to speed up development and, as a result, boost field production. Recycled mineral oil is sometimes used to fortify grains and barley. When combined, these techniques threaten both public health and the economic value of agricultural products. This research aims to conduct a research study of blockchain statements in agricultural stream chains with a single focus on nutritional transparency. This lecture examines the relationship between food tracing infrastructure and blockchain technology.

In a research titled "Emerging Possibilities for the Utilisation of Blockchain in the Farmer Industry" by Mischa Tripoli et al., smart contracts & DLT are covered in detail. Dramatists are aware of the significant potential DLTs offer for attaining long-term evolution goals, but they are also cognizant of the executional and practical constraints that keep their full realisation from being realized.

In their article titled "A Ledger System to Enhance Consistency and Stability in the Food Logistics Chain," Gavina Baralla et al. in Sardinia created a system for controlling the flow of food complete with a smart contract and blockchain established on the Ethereum platform. Barala emphasizes the advantages of using

this tactic in order to encourage responsible tourism and protect the survival of Sardinia's native crops. Review of "Food's Tracking in the Supply Chain" by Yunchuann Li et al. The author of this paper has a peculiar job that includes FTSS; traceability practices could be connected to dietary logistics; and rival cooperation is encouraged. It takes a lot of work to provide tracking solutions that are effective and reliable. FTSSs need greater respect from society, the government, and science than they frequently receive. Future research should concentrate on determining the best ways to use big data in nutritional tracking systems and enhancing the effectiveness of traceability and shipping operations.

**3.PROPOSED SYSTEM**

The federal government's agriculture department, cooperative, and farmers' wellness implemented a number of initiatives [18]. However, whether the intended receiver actually benefits from these benefits is a significant unknown. Along the entire supply chain, state officials' help to agriculture is essential. Although several authorities have been set up at various levels to keep an eye on things, this problem persists. In this study, a Blockchain-based inventory management solution is presented. The suggested model's procedure is shown in Figure 1.

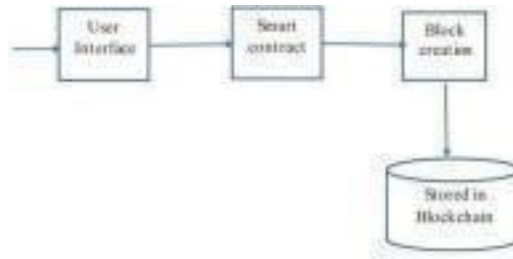


Fig.1.ProposedMethod

**A. Farm-basedBlockchainmethodology–**

Every time agricultural items leave a landowner's location for distribution, quantities, the state of the product (colour, size, organic/manure free/natural, humidity, cultivation season, and pricing) are all entered in the ledger. The aforementioned information regarding the product is gathered through a questionnaire. The information gathered through this page is subject to the smart contract's parameters. Prior to shipping, it is customary practise to examine the products' quality and condition. This inspection's goal is to confirm that just the appropriate things are being sent. This authentication is carried out through the blockchain technology's consensus mechanism.



Fig2.Blockchain technology's potential in the agricultural sector's many subsectors

### **B. IOTagent'sBlockchainprocess-**

Humidity, temperature, and the accessibility of particular compounds are just a few environmental factors that frequently affect the state of the contents. That's why the suggested system includes a thermostat, a moisture sensor, and a gaseous sensor. If vegetables and fruits are exposed to cold temperatures, fungus may start to grow on their surface. The gas sensor aids in locating the mold's source of gas production. Throughout the supply chain process, gauge the quality of agricultural products using information acquired from sensors mounted in warehouses and delivery vehicles and stored in a distributed ledger. By doing this, it is made sure that everyone who is a part of the distribution of commodities, from growers to consumers, has access to the most recent information.

### **C. Software Process-**

*When any market price changes, the built-in software compares the price noted in the blockchain with the most recent value. This software agent will also update the blockchain with the current market value if necessary.*

### **D. Implementation**

The user interface for the proposal is created using HTML, CSS, and JavaScript. The farmer uses this application to register the details of the commodities on the blockchain.

Every time a consumer or a seller acting as an intermediary makes a purchase, the location of the product, including the amount sold, ROI, and profit, must be entered in the ledger. This is advantageous to the farmer since it sheds light on the present status of the market and the worth of his crops. All of these transactions can be recorded on the blockchain, and in the meantime, the payment may be transferred from the clients' accounts to the farmer's bank.

## **4. RESULTS AND DISCUSSION**

After attempting to persuade the farmers, a representative from each of the three sectors was gathered to assess the viability of the execution. A top ROI objective was keeping track of the expenses and earnings from previous crop production. Additionally, when blockchain and IOT were deployed to their respective domains, the same information was captured. All of these details were examined using the Analysis of Variance (ANOVA). Table 1 provides a breakdown of the different crops along with the expenses and returns related to each.

The ROI that may be obtained by using blockchain, IOT, or both to track the quality of farm exports and take the necessary steps to increase their shelf life is shown in Fig. 3. It has been observed that monitoring the condition of agricultural products via the Internet of Things enables us to make sure they are in top condition when they get into the hands of consumers. The return on investment increases significantly as a result.

However, there is no guarantee that farmers would receive this benefit as it may come through intermediate companies who buy the goods from farmers and sell them in accordance with their interests. The Internet of Things and blockchain can be used together to maintain a high level of consumer and farmer confidence. The farmers will benefit greatly from this.

Table 1:- Specific details about investments and their returns

S.No	Crops	Investment in rupees	Area (in a)	ROI - Conventional way in rupees	ROI - After IOT in monitoring in rupees	ROI - After IOT in transportation	ROI - After Blockchain	ROI - After Blockchain and IOT
1	Tomatoes	55475	1	16614	29582	35093	41226	50750
2	Lady's Finger	27070	1	6502	8012	9630	10220	12038
3	Brinjal	20150	1	5701	6782	8274	8788	10482

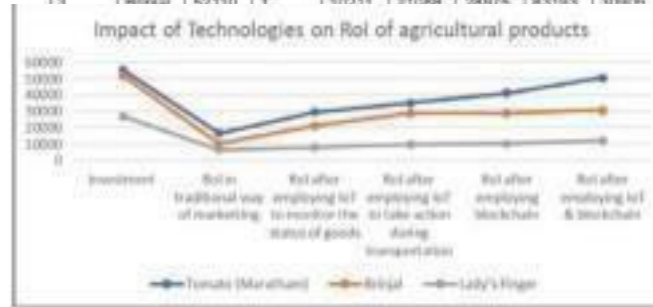


Fig.3. Modern technology's effect on the return on investment of agricultural products

### 5. CONCLUSIONS

In this article, we suggest a Blockchain-based system for tracking supplies and food. Due to the real-time status updates kept in blockchain, all SCM participants, including middlemen, may know where products are and when they will be available for delivery. Since the records saved in the Blockchain are irreversible, data once entered there cannot be modified by anybody at all. However, the data is accessible to all SCM members. Long-term use of this technique could be combined with a variety of strategies. Utilizing Blockchain and IOT technology demands an initial outlay of cash. The best people to accomplish this are farmers themselves, but if they fail, the government may step in to push the issue.

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