Block chain Technology in Agriculture Product Supply Chain

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***Abstract*—**

Globalized delivery of manufacturing and agricultural production offer renewed attention to the health, efficiency, and validation of many vital criteria in the food and agricultural supply chain. That numbers of food safety and corruption hazards have generated an enormous need of an efficient traceability solutions which acts as an essential quality managements tools ensuring to enough product's safety within the agriculture supply chain. Block chain is the revolutionary technological method, which provides the groundbreaking result for commodity traceableness in agriculture and in food supply chains. Today's agricultural supplying chains are complicated ecosystems mixing several stakeholders making it difficult to validate several significant requirements mainly towards nation of first origin, crop growth phases, quality standards compliance, and yield monitoring. This paper proposes a strategy that levitates the block chain and conducts business operations effectively across the agricultural supply chain for tracking crop prices and traceability. The proposed framework solution discards the need for trusted centralized authority, intermediaries and offers records of the transactions, improving efficient science and safety with high integrity and reliability. All transactions are registered and then stored in block chain's unchangeable ledger with linkages to a decentralized le network, thereby ensuring vary high degree of traceability and transparency in the supply chain ecosystem in a stable, reliable and in efficient manner.

Keywords— Block chain, Smart contract, Transparency, Agriculture supply chain, Traceableness, food safety.

I. Introduction

To ensure product safety, handling the growth of farming products and effective management of logistics -chain in agricultural supply chain is censorious. That cover about food safety and the risk of contamination has renewed the prominence of tracing power across the supply chain

Moreover, farming goods exchanged across multiple nations require accurate tracking and compliance with nation-specific regulations Tracing of goods in the agricultural field requires to gather, communicate and maintain critical data by specifically identifying the source, multiple data exchanges in the logistic network.

High-spirited nature of data in the agricultural / food supply chain where products are manufactured, processed and sent through multiple intermediaries allows tracking and tracing difficult. Contamination of products and its public health consequences highlight traceability as the required policy instrument for tracking food quality and safety.

The present traceability practice in the supply chain of agriculture is mainly affected by data fragmentation and centralized controls that are susceptible to both information modification and management. In case of contamination that identifies the source and isolates the product quickly from the supply chain.

Today's supply chain is becoming really complex [1]. At various stage multiple stakeholder are present. All these Stakeholder need to collaborate with each other in various direction for efficient and effective management. To deal with food scares and accidents, the food industry becoming more customer-oriented and need quicker response time. Good traceability mechanisms help reduce the manufacture and sale of dangerous or low quality goods, mitigating the risk for false ads, liability and recalls. Reducing the impacts of food safety [2]. Improving food safety, and providing a means to verify food quality attribute are driving the development of traceability initiatives in agri-food system [3].

The United Nation Food and Agriculture Organization (FAO) and the International Telecommunications Union (ITU) are continuing to work together to facilitate the use of innovation Information and communication technologies (ICTs) in agriculture [4]. The importance of traceability has significantly increased with the globalization of the food industries. Therefore, the need for a reliable identification and tracking systemis necessary to ensure the quality and safety of food which reaches the consumer [5].

Block chain for Supply Chain is a natural fusion of two technologies, built for mutual or common ledge transactions. A supply chain often reflects a distribution of products through industries, and is also cross-border. Food provenance is one pf FSC's most difficult issue. This issue companies are facing today. A global supply chain network with asymmetric food regulation and multiple operating procedure between various countries makes end-to-end food tracking incidental to the food industry. Distributed ledger/Block chain is very important technology that can significantly impact the supply chain management. This paper shows the possibility of block chain technology using supply chain for both perishable product and manufacturing.

In food supply chain firms are rapidly adopting block chain system. Example for retailers such as Carrefour indicates that block chain can be used to provide access to rich and details information about food product, which is used to reduce the uncertainty about quality and ingredient. Food safety has been an enormous concern in china over the last few years. As conventional agri-food logistic practices can no longer satisfy consumer demands, developing a traceability framework for agri-food supply is becoming increasingly urgent.

I. Related Work

In past few year, some researchers have given focus on identification if disease in food product. The straightforward limit approach is the division strategy which is embraced in the majority of the examination [6]. To identify the disease in apple many researchers has utilize the K-means clustering approach [7-10]. Classification strategy for deformity division [11]. A system for the organic product infection acknowledgment is introduced in [12] utilizing multi-cIlIa.ss uphold vector machine. Improved aggregate and contrast histogram based surface highlights are additionally utilized for the organic product infection identification [13].

A few spectroscopic methodologies have been considered for the discovery of the organic product contaminations. Some the approaches are: atomic attractive reverberation (NMR) spectroscopy [14]; noticeable/multiband spectroscopy by [15]; infrared spectroscopy by [16]; multispectral or hyperspectral imaging by [17].0picture highlights of plant sicknesses leaves, [19] proposes a technique for recognizing plant. sicknesses dependent on component combination and nearby discriminant planning. The strategy can successfully distinguish the illness of apple leaf, and the performance rate in the infection image data set gathered is as high as 96%.

The author [20] proposes an apple acknowledgment strategy. This technique improves the acknowledgment impact and beats the issue of highlight extraction furthermore, determination in the old style plant infection recognizable proof technique. Contrasted and the customary plant illness recognizable proof strategy, this strategy is more powerful. The impact of customary AI techniques depends to a huge degree on the qualities of fake plan. It is hard to acquire high acknowledgment exactness in scenes with high commotion, for example, lopsided light.

Since the introduction of the deep convolutional network of AlexNet [21], deep learning has made an unprecedented breakthrough in the development of computer vision. it is additionally generally utilized in the identification and classification of diseases [22-24]. The creator [25] proposes a deep learning model dependent on Alex Net [26] and Google Net [27]. The author [28] replaces all the completely associated layers of the conventional profound convolutional neural organization with a worldwide normal pooling layer, and utilizes the improved Softmax classifier to distinguish apple leaf sickness classifications.

As of now, in the domain of food identification and classification, the standard strategy is to utilize a mix of a profound convolution organization also, a cross entropy misfortune work for multi-order. Be that as it may, this traditional arrangement strategy dependent on cross -entropy misfortune work doesn't perform well in uneven informational collections. Since the likelihood of some plant infections happening is little, the unevenness of plant infection informational collections is pervasive. In order to improve the recognition accuracy of deep neural networks in apple disease data sets, in this chapter Alex net and VGG-16 [29] was used as the backbone network. A data set containing apple leaf disease (Healthy Apple, Apple Scab, Apple Blotch, Apple rot) was constructed. Based on the dataset, the above methods and the traditional classification method based on cross entropy loss function in depth learning were tested and evaluated.

III. Existing System

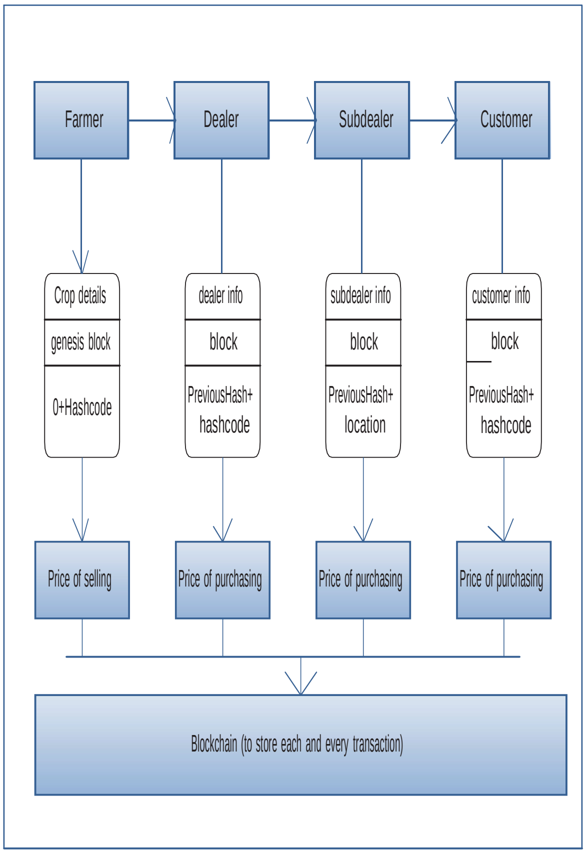
There is no computerized system in place to trace the cost of agriculture. Agricultural products cannot be obtained by the farmer.72 percent of the population in India is dependent on the farming industry. Farmers get enormous quantities of crop manufacturing, but they have not got the correct price because they can survive the present circumstances. So they are suicide and nothing is done by the government. So we are attempting to fix this issue in the suggested scheme by tracing the cost of the agricultural product from farmer to client.

IV. Proposed Framework:

There are four different phase and each phase are connected with each other to play a vital role.

Farmer: Farmer is first block of the block chain which contain the farmer details like name, address, mobile no, crop name, crop selling price(FRP). All details are added into smart contract and smart contract generate the hash code using sha256 algorithm. Then block chain mine the block and added to block chain network.

Dealer: Dealer contain the login registration which can hold the crop price details which are fix by the government and particular organization. the block chain is immutable so no one can change the crop price and farmer’s details. So dealer is contain his own data and previous hash code of the farmer.



Sub Dealer: sub dealer can buy product from the dealer which is fix price and the price is determine by the government. And sub dealer cannot increase the price of the product. because block chain contains immutable so each and every time data change block can generate different hash code.

Customer: Customer is last entity of the block chain which are purchase the product. He does not know the exact price of the product so we can give authenticate permission to check the price of the product from farmer to customer. so customer can get the all chain details and price details.

V. Proposed Methodology

Block chain is a dis t ributed databas e containing all networked t ransactions. Each part of this databas e is a " block" As t rans action s tate s hifts , a block with a connectio n to the previous block is added to the block chain in a linear and s equential order. Then the new block is replicated over the network, s o that each node has the s ame block chain. Each participant in this t rans action has a copy of a block chain on it . The refore, any participant can validate a particular t ransaction. This approach removed the need for the centralized, t rus ted confirmation of t rans actions by third parties . Block chain technology has a wide variety of us es , and tremendous innovation potential. Therefore, business leaders will use this technology to explore the range of opportunities open to their company and their industry.

Algorithm:

As we know hash is not "encryption", we cannot decrypt it back to the original text. Hash is a cryptographic one-way feature, and it is a fixed size for any source text size so This makes it convenient to compare "hashed" versions of texts when necessary, as opposed to decrypting the text to get the original version. SHA-256 is one of the SHA-1 (collectively referred to as SHA-2) successor hash functions, and is one of the strongest hash functions available. SHA-256 is not any more difficult to code than SHA-1, and has not been in any way compromised yet. The 256-bit key makes AES an excellent partner-function. It is specified in the standard 'FIPS 180-4' of the NIST (National Institute of Standards and Technology).

Message Digest:

The Java Message Digest class represents a cryptographic hash function that is capable of computing a digest message from binary data. After receiving any encrypted data, you cannot see from the data itself if it was altered during transport. A digest message will help to ease this issue. To detect if the encrypted data has been changed in transportation, the transmitter will measure a digest message from the data and send it along with the data. Upon receiving the encrypted data and digesting the message, you can recalculate the digest message from the data and check if the measured digest message matches the digest received with the data. If the two digests correspond.

VI. Advantage

- Customer can get appropriate price of the product.
- Farmer can get the FRP price for his product or crop.
- Government can trace the price of the crop and control the corruption between brokers.

VII. Dataset:

Dealer ERP Rate Dataset

id	cropname	Naturalprice
1	Wheat	2300
2	Paddy	3200
3	Maize	2300
4	Jowar	3500
5	Bajara	4000
6	Ragi	5000
7	Barley	4500
8	Gram	3600
9	Lentil	4600
10	Peas	5000
11	Urd	6000
12	Moong	8000
13	Arhar	5400
14	Cowpea	4500
15	Moth	3400
16	Groundnut	6500
17	Til	4700

Sub-Dealer ERP Rate Dataset

id	cropname	price
1	Wheat	2600
2	Paddy	3600
3	Maize	2600
4	Jowar	3800
5	Bajara	4500
6	Ragi	5500
7	Barley	4900
8	Gram	4000
9	Lentil	5000
10	Peas	5400
11	Urd	6300
12	Moong	8400
14	CowPea	4900

Customer ERP Dataset

id	cropname	price
1	Wheat	2900
2	Paddy	3900
3	Maize	2900
4	Jowar	4100
5	Bajara	5000
6	Ragi	6000
7	Barley	5400
8	Gram	4500
9	Lentil	5500
10	Peas	6000
11	Urd	6900
12	Moong	8900
13	CowPea	5400

VII. Conclusion and future scope

In our paper, we proposed generic framework and solution using smart technologies and block chain to control, track and execute company operations eliminating intermediaries and the main processing point for crop price traceability in the agricultural supply chain

We provided entity-relationship diagrams, sequence diagram, architecture, interactions and execution algorithm with details and elements relating to the scheme. We have shown how our solution is use to monitor crop prices in the supply chain.

Nonetheless, the aforementioned elements and knowledge are sufficiently general and can be apply to provide decentralized traceability and reliability for any crop in the agricultural supply chain. Block chain technology also take issues with the concerning enforcement, authentication of identity, scalability, privacy, norms and legislation.

We aim to address some of these big issues as a future job and build alternatives to them. We also intend to incorporate automated payments and delivery proof into our suggested solution-whereby parties are paid in an centralized and efficient manner using cryptocurrencies through smart chance's for effective physical plant and product distribution.

Future Scope:

1) We can scan farmer’s product through QR code for identity of quality.
2) We can real time application for farmer in future for same model.
3) We can update block chain project in hyperleadger for security purpose.

References:

[1] M. M. Aung and Y. S. Chang, ``Traceability in a food supply chain: Safety and quality perspectives,'' Food Control, vol. 39, pp. 172_184, May 2014.

[2] T. Bosona and G. Gebresenbet, ``Food traceability as an integral part of logistics management in food and agricultural supply chain,'' Food Control, vol. 33, no. 2, pp. 32_48, 2013.

[3] J. Hobbs, ``Liability and traceability in agri-food supply chains,'' in Quan- tifying the Agri-Food Supply Chain. Springer, 2006, pp. 87_102.

[4] D. Mao, Z. Hao, F. Wang, and H. Li, ``Novel automatic food trading system using consortium blockchain,'' Arabian J. Sci. Eng., vol. 44, no. 4, pp. 3439_3455, Apr. 2018.

[5] L. U. Opara and F. Mazaud, ``Food traceability from _eld to plate,'' Outlook Agricult., vol. 30, no. 2, pp. 239_247, 2001.

[6]. Li, Q., Wang, M., Gu, W.: Computer Vision Based Systemfor Apple Surface Defect Detection. Computers and Electronics in Agriculture 36, page 215-223 .

[7]. Kim, M.S., Lefcourt, A.M., Chen, Y.R., Tao, Y.:Automated Detection of Fecal Contamination of Apples Based on Multispectral Fluorescence Image Fusion. Journal of food engineering 71, page 85-91 .

[8]. Dubey, S.R.: Automatic Recognition of Fruits and Vegetables and Detection of Fruit Diseases. Master‘s theses .

[9]. Dubey, S.R., Jalal, A.S.: Adapted Approach for Fruit Disease Identification using Images. International Journal of Computer Vision and Image Processing 2(3), page 51 – 65.
[10]. Kleynen, O., Leemans, V., Destain, M.F.: Development of a Multi-Spectral Vision System for the Detection of Defects on Apples. Journal of Food Engineering 69, page 41-49 .
[11]. Leemans, V., Magein, H., Destain, M.F.: Defect Segmentation on ‗Golden Delicious' Apples by using Color Machine Vision. Computers and Electronics in Agriculture 20, page 117-130 .
[12]. Dubey, S.R., Jalal, A.S.: Detection and Classification of Apple Fruit Diseases using Complete Local Binary Patterns. In Proceedings of the 3rd International Conference on Computer and Communication Technology, page 346-351, Allahabad, India .
[13]. Dubey, S.R., Jalal, A.S.: Fruit disease recognition using improved sum and difference histogram from images. International Journal of Applied Pattern Recognition 1(2), page 199-220 .
[14]. Choi, Y.H., Tapias, E.C., Kim, H.K., Lefeber, A.W.M., Erkelens, C., Verhoeven, J.T.J., Brzin, J., Zel, J., Verpoorte, R.: Metabolic Discrimination of Catharanthus Roseus Leaves Infected by Phytoplasma using 1H-NMR Spectroscopy and Multivariate Data Analysis. Plant Physiology 135, page 2398-2410 .
[15]. Yang, C. M., Cheng, C.H., Chen, R.K.: Changes in Spectral Characteristics of Rice Canopy Infested with Brown Planthopper and Leaffolder. Crop Science 47, page 329-335.
[16]. Spinelli, F., Noferini, M., Costa, G.: Near Infrared Spectroscopy (NIRs): Perspective of Fire Blight Detection in Asymptomatic Plant Material. In Proceedings of the 10th International Workshop on Fire Blight, Acta Horticulturae, page 87-90.
[17]. Moshou, D., Bravo, C., Wahlen, S., West, J., McCartney, A., De, J., Baerdemaeker, J.D., Ramon, H.: Simultaneous Identification of Plant Stresses and Diseases in Arable Crops using Proximal Optical Sensing and Self-Organising Maps. Precision Agriculture 7(3), page 149-164.
[18] Jianfeng Wang, Shijie Zhu, Liguo Wang, Shaokang Guan, Ran Li, Tao Zhang,
Hard rhenium–boron–cobalt amorphous alloys with a wide supercooled liquid region, Materials Science and Engineering: A,Volume 645,2015,Pages 122-125.
[19] Li, Peng, J., Zhang, S., 2016. Apple leaf disease identification method based on feature fusion and local discriminant mapping. Guangdong Agric. Sci. 43 (10), Pages 134–139.
[20] Shi, Huang, W., Zhang, S., 2017. Apple disease recognition based on two-dimensionality subspace learning. Comput. Eng. Appl. 53 (22), Shi, Huang, W., Zhang, S., 2017. Apple disease recognition based on two-dimensionality subspace learning. Comput. Eng. Appl. 53 (22), pages 180–184.
[21] Krizhevsky, A., Sutskever, I., Hinton, G.E., 2012. ImageNet classification with deep convolutional neural networks. Adv. Neural Inf. Process. Syst. 25 (2), pages 1097–1105.
[22] Ma, J., Du, K., Zheng, F., Zhang, L., Gong, Z., Sun, Z., 2018. A recognition method for cucumber diseases using leaf symptom images based on deep convolutional neural network. Comput. Electron. Agric. 154, pages 18–24.
[23] Altuntaş, Y., Cömert, Z., Kocamaz, A.F., 2019. Identification of haploid and diploid maize seeds using convolutional neural networks and a transfer learning approach. Comput. Electron. Agric. 163, 104874.
[24] Zhang, Zhang, S., Zhang, C., Wang, X., Shi, Y., 2019. Cucumber leaf disease identification with global pooling dilated convolutional neural network. Comput. Electron. Agric. 162, pages 422–430.
[25] Liu, B., Zhang, Y., He, D., Li, Y., 2018. Identification of apple leaf diseases based on deep convolutional neural networks. Symmetry 10 (1), page 11.
[26] Wu, 2017. Study on the growth and disease control of apple tree by microbial fertilizer. Agric. Technol. 37 (22), 41.
[27] Szegedy, C., Liu, W., Jia, Y., Sermanet, P., Reed, S., Anguelov, D., Erhan, D., Vanhoucke, V., Rabinovich, A., 2015. Going deeper with convolutions. In: 2015 IEEE Conference on Computer Vision and Pattern Recognition (CVPR). IEEE, Piscataway, page 1–9.
[28] Zhang, Zhang, Q., Li, P., 2019. Apple disease recognition based on improved deep convolution neural network. J. Forest. Eng. 4 (04), page 107–112.
[29] Huang, G., Liu, Z., van der Maaten, L., Weinberger, K.Q., 2017. Densely connected convolutional networks [C]. In: 2017 IEEE Conference on Computer Vision and Pattern Recognition. IEEE, Piscataway, page 2261–2269.