

EASY SUPPLY CHAIN MANAGEMENT FOR INDIAN AGRICULTURE BUSINESS USING IOT AND BIG DATA APPROACH

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Abstract: In the recent years, there is much more development in ICT. Lot of new devices are coming to the IT industry. We are moving towards smart cities and smart solutions. In Indian agriculture is huge area of development. The population has been increased, due to this there is huge increase in demand of agriculture product. To fulfill these fast growing demands there is need of specialized supply chain system. The farmer in rural India facing the problems due to weather change, insufficient market rates and some gaps in traditional supply. Hence, to overcome this limitation, the proposed system is based on new paradigm of Big Data and its features to provide best recommendation about fresh agricultural product and improve agricultural products quality. The benefit to farmer is that they can control the chain of development to selling of their products. Consumer gets the variety of choices of the products through and recommended and fast searching strategies. To achieve these requirements we are using the different features of Big-Data and different techniques of data mining. We are also going to take the advantages of the wide spreading popular technique of Internet of Things (IoT).

Key Words: *Big Data, IoT, Data Analysis, Data System, Recommendation, Agriculture, Statistics.*

1. INTRODUCTION

The existing system shown in figure 1.1, Indian vegetable production and marketing is traditional approach which consists of,

- a. Producer produces the different farm products traditionally
- b. Then producer sells the products to the intermediate agency or market holder on the basis of current efficient market rates
- c. Then in accordance with demands the agency sells the product to the consumer, big/small enterprises, mega food factories etc. at high rate and earns profit.

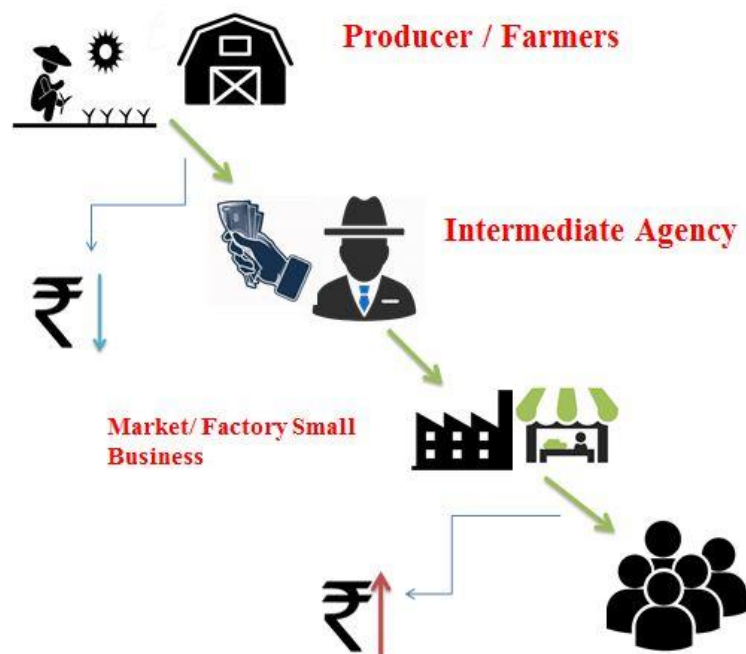


Figure 1.1 Traditional Supply Chain

This traditional way looks like simple but has many major disadvantages too. The producer has to sell the product on unsatisfactory market rate and this whole process requires lots of men power. Even the data management is weak and hence this results in data loss, time delay I order etc. Again, it is difficult to predict the interest of consumer or their need which changes time to time. Hence to overcome these drawbacks we have designed a solution.

Proposed system involves modules like Android App, Web Applications Md. Also the development and data processing include different data recommendation algorithms like collaborative filtering and cluster models. Other algorithms including search based methods and our own item-to-item collaborative filtering. Data mining algorithm includes K-nearest neighbor classifier.

2. ROLL OF BIG DATA IN AGRICULTURE

2.1 Definition:

Big data is a new emerging technology that handles large amount of data, that is structured and unstructured data generated through day to day operations & transitions. The data generated by organizations is very important, can be analyzed for insights that lead to better to better decisions and strategic business moves. The figure 2.1.1 shows 4 V's of Big Data which mentioned below:

Volume: - The quantity of Big Data is defined by Volume. The size varies in between terabytes and petabytes and up to Exabyte.

Variant: - The data types of Big Data are defined by Variant. It has been included with structured and unstructured data i.e. audio, video, text, posts, sensor data etc.

Velocity: - Now a days the generation of data becomes faster as compared to previous decades, so the process of acquiring, processing and analyzing of data must get faster and it requires faster mechanisms for that. The velocity emphasizes on the real time processing power of big data for enterprise needs.

Veracity: - Veracity refers for having accurate data as it is depended upon for all further analysis.

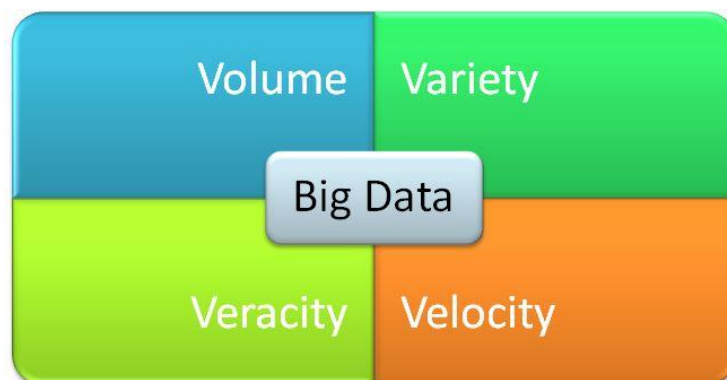


Figure 2.1.1. Big Data 4 V's

3. LITERATURE SURVEY

3.1 Dennis A. Ludeña R. and Alireza Ahrary, “Big Data Approach in an ICT Agriculture Project”, Proceedings for the 5th IEEE International Conference on Awareness Science and Technology (iCAST 2013), Aizu-Wakamatsu, Japan, pp. 261 – 264, 2013

Description: Now a days the novel nutrition based agriculture production and distribution system make usage of Big data and its benefits, which helps in generation a healthy food recommendation to the end user. This kind of project is being developed under the found of New Energy and Industrial Technology Development Organization(NEDO) in Japan. A new technique i.e. Internet of Things(IoT) in been included here along with Big Data approach to use its benefits like automation, adding more precise data which provides richer experience to the end user. The big data approach is used in this project to compare the different databases needed to generate the healthy food suggestion for end user. There are many possible threats may occur, Men in the middle attack is the biggest threats against wireless network as well as IoT networks.

3.2 Yuichi Satake, Tomaihiro Yamazaki, “Using Food and Agriculture cloud to improve value of Food Chain”, FUJITSU Sci.Tech. J., Vol. 47, pp. 378- 386 (October 2011).

Description: This paper discusses stable supply of foods and agriculture products. It goes on to present ways of solving challenges and cloud computing. The present food chain plays role of distributing necessary goods. Based on different interviews of farmers on farming sites we can surely say that sharing information in relation to production and demand could help for further improvement in efficiency in food chain. Current situation & Some challenges as 1. Insufficient information on consumption trends, 2. Insufficient production information, 3.insufficient distribution information Assumed solution for above challenges are as Sharing consumption trends, Sharing production information, Sharing distribution information. Related to all challenges in food supply chain including agriculture, this paper focused on stabilization of agriculture management and improve of food chain efficiency and presented the current situation and Fujitsu’s approach to overcoming the challenges. The paper also suggested that possibility that a greater sharing of information in food chain will contribute to agriculture related industries in addition to agriculture itself.

3.3. Chun-Wei Tsai, Chin-Feng Lai, Han-Chieh Chao and Athanasios V. Vasilakos, "Big data Analytics: A survey", Journal of Big data 2015 2;21 | DOI 10.1186/s40537-015-0030-3

Description: Focuses on the knowledge data discovery process. The KDD based on three major parameter Input, data analytics and output with preprocessing, gathering and transformation. The K-means and K-nearest neighbor algorithms for analysis problem solutions. Another major task in data analytics is clustering which is used to combine data object in group called as Cluster based on certain criteria.

3.4. Meonghun Lee, Jeonghwan Hwang, and Hyun Yoe, "Agricultural Production System based on IoT", 978-0-7695-5096-1/13 \$31.00 © 2013 IEEE DOI 10.1109/CSE.2013.126

Description: The technology is developing day to day with the increasing demand of peoples in every sector of the life. Similarly, there has been research in Agriculture areas to apply new IoT technology. This paper presents how the supply chain and demand of agricultural can be stabilized. To analyze the crop environment and to make the efficient decision, IoT based monitoring can be used. For the implementation first there is Relation analysis for target crop information with text- mining tool. Secondly, the statically prediction in system comparing RTE data with the historical data. Finally the decision making.

3.5 Badrul Sarwar, George Karypis, Joseph Konstan, and John Riedl, "Analysis of Recommendation Algorithms for E-Commerce", EC'00, October 17-20, 2000, Minneapolis, Minnesota. Copyright 2000 ACM 1-58113-272-7/00/0010

Description: In the era of computer technology, the E- commerce is widely popular. They offer millions of product for sale. Recommender system making product recommendation for customer interaction is big success in E-commerce nowadays. The algorithm gives suggestion to consumer depending on previous transactions. The paper includes research on effectiveness of Recommender system, comparison on different algorithms, and approach for online efficiency. The focus on the collaborative filtering.

4. PROPOSED SYSTEM

There are many gaps in traditional agriculture supply chain as discussed earlier. So, to fill these gaps and help the farmers to increase their profits our system is proposed. Our system makes the use of new technology, Big Data and IoT (Internet of things) & devices. The system consist of many entities which plays major role & they are,

1. Producers
2. Individual Consumers.
3. Big and Small Industries.
4. Restaurants

As shown in figure 5.1 the information is processed by each stake holder in system. In system work flow,

1. The producer can be a farmer which produces various agriculture product that can be grains, vegetables, fruits etc. Also the producer can be shop owners, manufacturer of agriculture products such as fertilizers, pesticides etc.
2. So, producers add overall product information on the web portal on his profile by providing credentials. Also he can modify his prior product data or transaction.
3. This all information is made available to different consumers. (Stake holders)
4. That is, they can view product details, purchase product and make transaction and manipulate shopping cart.
5. To increase the farmer profit and achieve satisfaction with consumer, system consists of Farmers help Community. The producer can place their queries, question on help community portal. For ex. How to use particular Govt. scheme or precautions to be taken while using certain fertilizer etc.
6. Both the consumer and producer can sell and purchase product through web interface. To make it more efficient, same operation can be performed with Smartphone app

5. SYSTEM IMPLEMENTATION

The many producer and consumer make the various transactions simultaneously. Whatever data added by producer should be stored in well structure and normalized way, to make the data access faster. There are various challenges for handling the huge amount of data produced by user transactions.

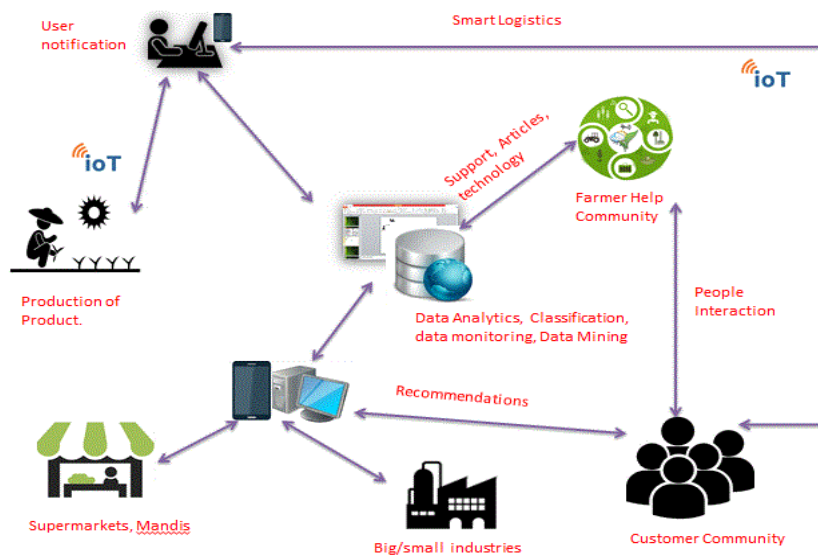


Figure 5.1 Architecture of Proposed System

The major issue is to store and process this big information. In technical term, data processing involves information retrieval, extraction, analysis and transformation for suitable representation. The proposed system used mongoDB as backend. Our system makes the use of Big data technology. With big data, various data mining algorithms can be implemented for processing of data & that are,

1. **Document selection:** The data stored in document structure. To give relevant search result to user the Boolean or Ranking model can be used. Rankings gives more appropriate result for ordinary user.
2. **Recommendation System:** or Recommendation engine is used for recommending the products based on users prior transactions. They are used to personalize the web site to

each consumer interest. The Apriori algorithm is used to solve frequent item set problem i.e. items that are bought together frequently for improving the live customer interaction.

- 3. Classification:** techniques are used for making new prediction based on old data(training data set). Classification is supervised learning problem. One of the popular algorithm is Bayesian classification. In our system using classification, the new features, modules, product can be added by analyzing users prior behavior.
- 4. Clustering:** The cluster model divides and group users data into segments called as cluster. The goal is to assign user to most similar customers.

Every supply chain industry today need smart logistic solution. There are many IoT devices that can be used for making delivery of products simpler. Such as RFID (Radio Frequency Identification), barcode reader etc. as shown in architecture.

6. FUTURE SCOPE

The proposed system helps the farmers to grow their Agriculture production and distribution business. Healthy food suggestions are given to consumer, which in turns providing benefit to both. More improvement can be done by integrating the our web domain to Government Agriculture domain, as it will help to reach our system to people. Also the agriculture product warehousing can be provided. Warehousing is necessary for proper maintenance & storage for delaying orders. To educate farmers about new technology or use of particular Govt. scheme different agriculture training programs can be arranged through farmers help community.

7. CONCLUSION

In India, agriculture is huge area of development. The populations have been increased and demands for food supply have been increased. Due to the weather changes, financial problems farmers have been facing difficulties.

New technologies like Big data allow us to meet user demands and process queries generated at high velocity. The combination of Big data and IoT can change delivery and fulfillment of consumer needs. In our system IoT can be used for tracking, localizing, tracing and for smart logistic.

In the case of our system, the future work implementation helps to achieve our goal and producer customer satisfaction. The new technology allows smart sensing and monitoring, Smart analysis & planning and smart control over supply chain system. The only issue regarding IoT is that limited computational capability, limited power supply and storage. So, proper devices should be selected for more better performance.

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