A MODEL FOR PREDICTING DEMAND-SUPPLY INFORMATION OF TOP CROPS

Prabhakar Kumar[1], Diksha Srivastava[2] ,R Pavithra[3], Rakesh D[4], Jyothi S S[5]

[1,2,3,4] Student
[5] Assistant Professor
[1] Department of Computer Science and Engineering
Sambhram Institute of Technology, Bangalore,India

Abstract - India is majorly an agriculture-based economy. Around 42% of the people depend on agriculture for their livelihood. The economic upliftment of farmers happens when there is a seamless transfer of agricultural produce from producers to the consumers. It is evident that there is a huge gap between demand and supply of various crops, due to which both farmers and consumers are facing problems. At present, in India there is no system in place to efficiently manage this demand and supply issue. The potential of present-day technologies like data analytics, machine learning can be exploited to overcome these issues. The available data about the demand, supply, price variation of the crops and other factors affecting the supply chain of agricultural produce can be used to analyse and come up with a model to predict and forecast market variations of agricultural crops. The proposed work intends to analyse the various authentic data available for TOP (Tomato, Potato and Onion) crops and design a supply-demand prediction model to forecast the market fluctuations as an advisory measure.

Index Terms Demand-Supply, TOP Crops, Data Analytics, Demand Forecasting, Prediction Model.

I. INTRODUCTION

India population in 2021 is estimated to be 139 Crore. The increase in population will be more in developing countries like India. The economic growth also has been increased dramatically in the recent years The increase in income results in increased demand for more and better food. In India, for instance, the increased income has doubled the expenditure on food commodities It has been calculated that, due to increase in population and individual's income, the world food demand will double by 2050. In topical years, there has been a significant variation in the rates of agricultural products like Tomato, Potato and onion. As shown in Fig 1, the price variation is mainly due to the mismatch in demand and supply of these agricultural products. When the price of any commodities set too high then the suppliers (farmers) try to produce more goods to make more profit. When the price of any commodity is set too high then the consumers will tend to purchase less because of high rate, and the suppliers (farmers) incurs the loss. Conversely, if the supply is less for any commodities, as consumers have to compete with one other to buy the less supplied goods, results in increased price for the commodity, making consumers suffer with the high price. As there is no synchronization in production and demand for the agricultural commodities, either farmer fail to get good market prices for their products, or consumer suffers high prices due to less production. Crop price has attributes such as high nonlinear and high noise[fig 1].

   II. As a solution for this problem, a predictive model is built by acquiring the dataset causing demand-supply frictions particularly for TOP crops. Data Analytical techniques can be used to develop an innovative model to predict the market agriculture for forecasting the market price of the respective commodities and also useful for farmers to plan their crop cultivation activities so that they could fetch more price in forecast price for planning and implementation of agriculture development programs to stabilize the market price for the respective commodity. Data Analytical techniques can be used to develop an innovative model to predict the market agriculture for forecasting the market price of the respective commodities and also useful for farmers to plan their crop cultivation activities so that they could fetch more price in forecast price for planning and implementation of agriculture development programs to stabilize the market price for the respective commodity. Data Analytical techniques can be used to develop an innovative model to predict the market agriculture for forecasting the market price of the respective commodities and also useful for farmers to plan their crop cultivation activities so that they could fetch more price in forecast price for planning and implementation of agriculture development programs to stabilize the market price for the respective commodity. Hence, in order to reduce the mismatch in demand and supply of food crops

effectively, there must be a way to forecast and guide the farmers. So, there is a need for some system that could guide the farmers in selecting and growing the crops to satisfy the actual demand of the society. This could eliminate the gap between the consumer's demand and producer's supply and reducing the loss for both consumers and farmers. Data Analytics and Machine Learning is an emerging trend that could help us in providing solutions for such problems. This innovative application is not only useful for farmers and consumers but also useful for agriculture planning; framing polices, schemes in agriculture and market planning. The role of infrastructure is crucial for agriculture development and for taking the production dynamics to the next level. It is only through the development of infrastructure, especially at the post-harvest stage that the produce can be optimallyutilized with opportunity for value addition and fair deal for the farmers. One of the schemes under this is Operation Greens, which seeks to stabilize the supply of Tomato, Onion and Potato (TOP) crops and to ensure availability of TOP crops throughout the country round the year without price volatility.
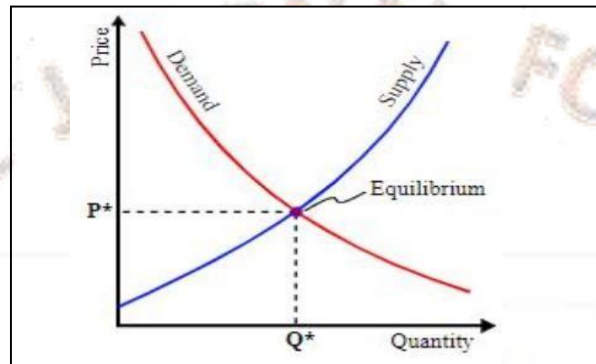

Fig.1 Demand, supply and price inflation

II. LITERATURE SURVEY

A broad literature review was carried out to single out the major causes for demand-supply issues. Literature review revealed that improper crop selection was the crucial factor for the demand-supply variations.

[1] Supply and demand for selected fruits and vegetables in Karnataka (2016) - A. S. Harsoor and A. Patil Studied that the gap in the demand for various agricultural crops from the customers and supply of same crops from farmers is huge, which is the sole reason for unexpected price variation in the market due to which consumers and farmers suffer.

[2] Developing a conceptual framework for assessing competitiveness of India's agrifood chain (2017) - Sagheer, S. S. Yadav, and S. G. Deshmukh The Agricultural sector needs more support for development in developing countries like India. Price prediction helps the farmers and also the Government to make an effective decision. Data Mining techniques can be used to solve this problem.

[3] Guidelines for value chain analysis (2006) - J. Hellin and M. Meijer The basic strategy for growth & development lies under the efficient supply chain management. The demand and supply gap can be sufficed by having an efficient model to manage the supply chain. In India there is no efficient system to manage the agriculture produce. The forecast method can help the government in the line of development.

[4] Farmers Preference For Modern Retail Formats In Marketing Of Vegetables Farmers Preference For Modern Retail Formats In Marketing Of (2012). - C. Naanwaab and O. Yeboah Crop price changes fast and unstable which makes a great impact in our daily life. Crop price has attributes such as high nonlinear and high noise. So, it is hard to predict the Crop price. Data mining techniques can be used to develop an innovative model to predict the market agriculture for forecasting the market price of the respective commodities and also useful for farmers to plan their crop cultivation activities so that they could fetch more price in forecast price for planning and implementation of agriculture development programs to stabilize the market price for the respective commodity.

[5] A Study on the Cost Analysis of Tomato and Onion in Coimbatore District of Tamil Nadu, India - Raneesh K Y , Muthuselva K An extremely important issue for agricultural planning is the accurate price calculation for the numerous crops. Data analysis is necessary approach for accomplishing practical and effective solution for this problem. Agriculture has been the understandable objective for big data. The various factors like environmental condition, properties of the soil, different inputs and the commodity price have made it more important for the farmers to get information for making important farming decisions.

[6] Impacts of population growth, economic development, and technical change on global food production and consumption. - Edverd Rich, Donald Wellis Examining global food production development until 2030 with a partial equilibrium model of agriculture and forestry. Exogenous drivers include population growth, economic development, technical change, and two alternative deforestation policies. Food prices, per capita consumption of food, and the ratio between plant and animal food changes relatively little across scenarios.

[7] Brief history of agricultural systems modeling (2008) - J. Hellin and M. Meijer Agricultural system models play increasingly important roles in the development of sustainable land management across diverse agro-ecological and socioeconomic conditions because field and farm experiments require large amounts of resources and may still not provide sufficient information in space and time to identify appropriate and effective management practices. Models can help identify management options for maximizing sustainability goals to land managers and policymakers across space and time as long as the needed soil, management, climate, and socioeconomic information is available

III. WORMHOLE ATTACK TAXONOMY

1. Wormhole Attack:
   - Definition: A wormhole attack is a type of network attack where an attacker creates a tunnel or shortcut in the network to redirect or replay communication packets between distant locations.
   - Purpose: The attacker aims to disrupt the communication between nodes and manipulate the information exchanged, specifically targeting the demand and supply information of the top crop in the project.
   - Characteristics: The wormhole attack can be characterized by the following features:
   - Tunnel Creation: The attacker establishes a tunnel between two remote locations in the network, making it appear as if the communication is direct.
   - Packet Manipulation: The attacker captures packets at one end of the tunnel and replays them at the other end, altering the timing and content of the packets.
   - Disruption: The attack disrupts the normal flow of communication, leading to delays, misinformation, and potential supply chain disruptions for the top crop.

2. Wormhole Attack Variants:
   - Temporal Wormhole: In this variant, the attacker introduces a delay in forwarding packets from one end of the wormhole tunnel to the other, causing significant disruptions in the timing of information exchange.
   - Spatial Wormhole: This variant involves the attacker physically or virtually bypassing intermediate network nodes by creating a shortcut between two distant locations, leading to a direct and unauthorized communication path.
   - Bidirectional Wormhole: The attacker establishes a bidirectional wormhole tunnel, allowing communication in both directions. This can be used to manipulate and tamper with bidirectional information flow between supply and demand nodes for the top crop.
   - Resource Consumption Wormhole: The attacker exploits the wormhole tunnel to consume network resources, such as bandwidth or processing power, thereby affecting the overall network performance and availability of demand and supply information.

3. Wormhole Attack Techniques:
   - Packet Replay: The attacker captures packets from one location and replays them at another location, causing outdated or duplicated information to be received by the intended recipients.
   - Route Manipulation: The attacker alters the routing protocol information to divert traffic through the wormhole tunnel, redirecting supply and demand information to unauthorized entities.
   - Time Synchronization Attack: By manipulating the timestamps of packets, the attacker can disrupt the synchronization of nodes in the network, leading to inaccurate timing of demand and supply information.
   - Authentication Bypass: The attacker may exploit vulnerabilities in authentication mechanisms to gain unauthorized access to the network, allowing them to inject false or malicious data into the demand and supply information.
   - Sybil Attack: In this technique, the attacker creates multiple fake identities or nodes within the network to gain control over a larger portion of the network and manipulate the information flow.

4. Countermeasures against Wormhole Attacks:
   - Secure Routing Protocols: Implementing secure and authenticated routing protocols can help detect and prevent wormhole attacks by verifying the legitimacy of network paths.
   - Packet Timestamping: By securely timestamping packets and verifying their authenticity, nodes can identify and discard packets that exhibit significant time deviations, minimizing the impact of temporal wormholes.
   - Intrusion Detection Systems (IDS): Deploying IDS can aid in detecting wormhole attacks by monitoring network traffic, identifying abnormal patterns, and raising alerts when suspicious activity is detected.
   - Secure Node Localization: Using localization techniques that consider distance, angle, or other factors can prevent the creation of spatial wormholes by ensuring accurate node positioning and network connectivity.
   - Node Identity Verification: Implementing strong authentication mechanisms can mitigate the risk of authentication bypass attacks by ensuring that only authorized nodes can participate in the network.

Note: This taxonomy specifically focuses on wormhole attacks and their implications on the demand and supply information of the top crop in the

IV CONCLUSIONS

The proposed system is about the collection of massive dataset collection, the problems in collecting the dataset and also includes collecting the dataset both in the internet as well as in the traditional way. The massive development in computer technology brings need of most of the data so they produced the system of collecting more number of dataset. By considering this datastet, a Supply-Demand Prediction forecasting model has ben developed in this work that guides the farmers in selecting the appropriate crops to grow. This in turn suffices the actual demand of the society, minimizing the loss for both farmers as well as consumers at peak times. This model helps in achieving equilibrium in demand and supply of TOP crops that could effectively solve the current crisis.

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