

A Survey on Value Forecast of Tomatoes

¹Munnelli Poojitha, ²Varsha Manohar Pujari, ³Vishwanath Y

^{1,2}M.Tech scholar, School of C & IT, REVA University, Bangalore, India

³Associate Professor, School of C & IT, REVA University, Bangalore, India

¹poojareddy174@gmail.com, ²manoharvarsha96@gmail.com, ³vishwanath.y@reva.edu.in

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Abstract

Increased awareness about nourishing and healthy lifestyles to propel the consumption of vegetables in order to meet diverse dietary and nutritional needs. The global tomato market was valued to register a Compound Annual Growth Rate of more than 6.5% over the forecast period of 2020-2025. Accurate prediction of agriculture prices along with increasing awareness among individuals about the benefits, especially in emerging economies such as India and South America is impelling the market revenue of tomato to the minimum extent. Changes in weather patterns due to upsurge in global warming across the globe have increased the adoption of advanced farming devices such as sensors, monitors, display devices and farm management software. Agriculture is one of the prominent sectors which plays a major role in food security, economic growth and poverty alleviation. Government and alternative accountable bodies ought to formulate and implement applicable market and evaluation policy, bare market data in correct media, and improve road networks to boost the effectiveness of vegetable selling.

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1. Introduction

Agribusiness is one of the most prominent sectors of work for around 58% of India's populace. Net Worth added by farming, forestry and fishing division is estimated at Rs 18.55 lakh crore. Out of all the vegetable yields, tomato is the most broadly developed harvest in India.

Tomato is one of the most notable vegetable harvests in terms of both pay and sustenance. Tomato is developed essentially in each nation of the world in open airfields, glass house, and net houses. The main tomato producing nations in the world are China, India, the USA, Turkey, Egypt, Iran, Italy, Spain, and Brazil. It involves a territory of about 4.73 million hectares with the creation of 163.96 million tons on the planet.

Tomato yield [Figure-1] is the third-largest vegetable yield in the world after onion and potato. Tomatoes are dominating summer crops, however, it very well may be developed consistently. In its organic product contains nutrients like 'A' and 'C' and cancer prevention agent in wealth amount. Because of

the remarkable properties contained in its organic product, tomato request remains nearly the equivalent consistently [16].

Vegetable especially tomato's value changes quick and precarious which has an extraordinary effect in our day by day life [2]. The vegetable cost has traits, for example, high nonlinear and high commotion. In this way, it is difficult to anticipate the vegetable cost. Value expectation is exceptionally helpful in horticulture for anticipating the market cost for the separate wares and furthermore helpful for ranchers to design their yield development exercises with the goal that they could get more cost in the market.

Data mining gives the system to change this information into helpful data for dynamic. Data-mining characterization systems can be utilized to build up an inventive model to anticipate the market cost of particular ware [3] [17].

Based on the rancher area this plan prescribes the quantities of useful plants by utilizing the accessible past informational collections. Consumers can utilize

this value expectation for their day by day way of life arranging.

The aim is to actualize crop yield and anticipate the cost of tomato. Agrarian division execution for the most part relies upon regular powers, for example, spatio-fleeting circulation of precipitation, temperature, atmosphere, and so on. Bringing about any deviation of the rainstorm from the typical example bringing about immense vacillations in territory and production. The salary for farmers is as yet not steady regardless of whether the yield is steady gratitude to the nursery. It is on the grounds that farmers can't alter the creation rapidly to showcase requests like mechanical products.



Figure 1: Tomato Crop

2. Literature Review

Gan-Qiong, Shi-Wei, and Zhe-min actualized "Short-term Price Forecasting for Agro-items Using Artificial Neural Networks". They did the ARIMA(Time-series) model and ANN (Artificial Neural Networks) methods so as to conjecture the cost of tomato on a day by day, week by week, and month to month premise. They completed a normalization method on beginning information. Considering the difficulty of acquiring the valuable information of every day, they did data demanding on the value schedule bend to pick up the misplaced day's information. At that point, they did a feed-forward neural system as it is the most broadly utilized model, yet it has the least difficult system engineering.

Changshou, Qingfeng, Liying, Junfeng, and Sufen actualized "Prediction of Vegetable Price Based on Neural Network & Genetic Algorithm". They completed their test utilizing three models include the BPNN, neural system dependent on GA and RBFN independently. In light of that, they built an

incorporated forecast model. They presumed that a model which is a blend of ANN and GA can offer a decent outcome for the agribusiness creation cost foreseeing.

Nasira and Hemaletha actualized "Vegetable Price Prediction Using Data-Mining Classification Technique" utilizing BP(Back-propagation) neural network. They reproduced the result utilizing MATLAB to anticipate the costs.

Girish K. Jha and Kanchan Sinha did their investigation "Agricultural Price Forecasting Using Neural Network Model: An Innovative Information Delivery System" They thought about the ARIMA and TDNN models as far as both demonstrating and determining utilizing month to month deduction value information of two oilseed crops, to be specific soybean and rapeseed-mustard changed Indore and Delhi markets of Asian country.

The TDNN model tired all has given asuperior figure exactness as far as regular RMSE and MAD qualities when contrasted with the ARIMA model. Additionally, TDNN has performed generously superior to straight models in foreseeing the course of progress for this arrangement and thus might be favored than linear models with regards to anticipating the defining moment, which is progressively applicable on account of value determining.

Muthyalu Meniga in his paper discussed problems of tomato marketing. A combination of measurable strategies was utilized to examine the information. Right now, discoveries of the t-test examination demonstrated that the majority of the ranchers depend on family work, substance compost, on lakes and stream/springs water system, and use donkeys to ship. During the pinnacle reaping-season the cost of tomato falls altogether and discovered progressively precarious and showcase on-screen characters in particular makers, ranch door gatherers, specialists, wholesalers, dealers, and customers assume a crucial job in the market chain.

The significant difficulties in tomato creation are tomato weed, tomato frost and transportation-related issues. The issues in tomato showcasing are low value, absence of capacity offices, and absence of market focuses. Open doors for extension of tomato promoting are advertise solidness, infrastructure, demand in the market, improved yield, better value, storeroom facilities.

Jianhua Zhanga, Fantao Kongb, Jianzhai Wu, Mengshuai Zhu, Ke Xu, and JiaJia Liu did the implementation on "Tomato prices time series prediction model based on wavelet neural network" utilizing everyday tomato retail cost information in 10 locales of Hebei from January 1, 2013, to December 30, 2013, as samples; 340 tomato retail value information from January 1, 2013, to December 5, 2013, is utilized as training samples, and

25 examples from December 6, 2013, to December 30, 2013, is utilized as test samples.

The tomato costs time arrangement expectation model dependent on a wavelet neural network could do the forecast adequately and offer specialized help to tomato advertise checking what's more, early admonition and reference to related arrangements.

Francis, John, Martin, Lot and Paul implemented Price prediction of tomato prices in Ghana, using SARIMA Model. They analyzed the tomato price data recorded from 1994 to 2015 by applying time-series. They analyzed the data using SARIMA by re-grouping the data into quarters for each year. Consequently, the best-fitted model was found to be SARIMA. The model predicted that in 2016, the tomato price will increase in the second quarter.

Koki Yamamoto, Kazuhiro Seida, Junna Nishiyama, Kaito Hayashi, Suzuki Daishi and Mikiko Sude Tanaka in order to extend the gain of tomato sales, they build a model which calculates reap and production of tomatoes for tomato ranchers who are concerned to manage the assembly.

This technique calculates the temperature during a greenhouse from temperature prediction of Mesh agricultural weather information system, using results of learning with an RNN which uses Mesh agricultural weather information system and actual temperature data during a greenhouse.

Hemageetha and Nasira discussed a forecast algorithm which is built up with the assistance of Adaptive neuro-fuzzy inference framework and contrasts the outcome and different models.

Sarah, Velandia, Christopher Boyer and Chad Hellwinckel have actualized how factors such as location, weather and consumer features effect the tomato prices at markets. A random effects panel data was used to estimate the factors influencing tomato prices at markets.

The use of Woolridge's test will permit us to test for serial autocorrelation. The Breusch and Pagan Lagrangian multiplier test checks for the survival of an unobserved time invariant effect.

Rajeswari and Suthendran have actualized "Developing an Agricultural Product Price Prediction Model using HADT Algorithm". In this paper, using the HADT algorithm they created and assessed the intelligent scheme for a short-term price forecast.

Aminulloh, Wahjoe and Dadet actualized Growth Model of tomato using Greenhouse Monitoring System. In this investigation, a conservatory was erected directed toward cultivate the advancement circumstances of tomato plants which are furnished with a data model for capturing the sensor statistics to examine the green house substantial circumstances for the expansion of tomato plants with a local-international administration strategy.

The knowledge possessed by the device node will be sent wirelessly to the organizer mistreatment blue-tooth module and organizer can operate the information.

3. Comparison of different techniques used in models.

In Table 1, different algorithms utilized in models have been compared. The ANFIS model is acceptably contrasted with the BP system and RBF model, however, it doesn't function admirably with huge datasets. Whereas, BPNN will create progressively precise outcomes for a bigger dataset. The ANN model produces exact outcomes at the point when the time interim is short.

Table 1: Comparison of Different Algorithms

Parameters	Paper 1 Reference [3]	Paper 2 Reference [1]
Authors	Nasira and Hemageetha.	Gan-Qiong, Shi-Wei, and Zhe-min.
Publication	International Journal of Computational Intelligence and Informatics.	International Conference on Agricultural Risk and Food Security.
Usage of Algorithms	Back-propagation neural network, Artificial Neural Networks.	Artificial Neural Networks.
Accuracy	89%	80 % to 90%
Advantages	ANN will produce more accurate result for larger dataset compared with smaller data set.	If the time interval of data is shorter, the accuracy is higher.
Disadvantages	Hardware Dependence. (In order to increase the accuracy percentage Genetic Algorithm based neural network will be constructed for price prediction.).	Apart from defining the general architecture of a network and perhaps initially seeding it with a random number, the user has no other role than to feed it input and watch it train and await the output.

Comparison Of Different Techniques Used In Models

Table 1(contd) comparison of different algorithms

Parameters	Paper3 Reference [14]	Paper 4 Reference [12]
Authors	Hemageetha, and Nasira.	Koki Yamamoto, Kazuhiro, Nishiyama, Hayashi, Daishi and Mikiko Sude Tanaka.
Publication	International Journal of Computer Sciences and Engineering.	IEEE 7th Global Conference on Consumer Electronics, 2018.
Use of Algorithms	Adaptive Neuro-Fuzzy Inference System.	Recurrent Neural Network.
Accuracy	96.91%	87%
Advantages	ANFIS model is better than BP network and RBF model based on the accuracy, training time and training speed.	Increases the profit of tomato sales by calculating harvest and yield of tomatoes.
Disadvantages	It doesn't work well for larger data sets.	Hard to predict when temperature fluctuations are more.

4. Conclusion

In this paper, the tomato expenses and tomato yield has been outlined. Value expectation of tomatoes was done utilizing different strategies, for example, ARIMA (Time-Arrangement Modeling), Neural-Networks, for example, BPNN, NN reliant on GA, and RBFN, Wavelet Neural Network, TDNN, ANFIS, and Decision Tree Algorithm. The test was done on a day by day, week by week, month to month, and quarterly premise. The elements on which the cost of

the tomato depends are area, climate, and consumer features, etc. A comparison between certain models based on algorithms, for example, ARIMA, BPNN, RNN, and ANFIS has been outlined in this paper. Out of these ANFIS model gave the best price prediction efficiency of 96.91% yet it doesn't function admirably with huge datasets. Whereas, BPNN will create progressively precise outcomes (89%) for a bigger dataset. The ANN model produces exact outcomes (80% - 90%) at the point when the time interim is short. Essentially, the forecast of costs was done by utilizing datasets, further, we can implement a hybrid model wherein the training phase is carried out dependent on available datasets and real-time data too.

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