

Behaviour of Prices of Groundnut in Northern Hills of Chhattisgarh

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Received: 12.04.2021 | Revised: 17.05.2021 | Accepted: 24.05.2021

ABSTRACT

This study attempted to guide the farmers and planners for reliable and specific information concerning the prices of Groundnut in the Northern Hills agro-climatic zone of Chhattisgarh. The time series data of prices was taken monthly from January, 2010 to March, 2021 (135 months) and it was used to forecast the prices for upcoming 24 months i.e. April, 2021 to March, 2023. The time trend analysis of prices of groundnut were found sharply increasing over the study period. The price remains almost similar over the year as indicated by seasonal indices. On the basis of lowest MAE, MAPE, RMSE and AIC, out of the seasonal ARIMA models we got, ARIMA (1,1,1) (0,0,2) [12] was best identified fitted model for predicting prices of Groundnut. The data analysis is done by using R ().

Keywords: Forecasting, ARIMA, Groundnut, Prices, Chhattisgarh.

INTRODUCTION

In Chhattisgarh state, the seven oilseed crops, both edible and non-edible, namely, sunflower, groundnut, sesame, niger, linseed, soybean, rapeseed-mustard are cultivated. Groundnut is the second most important oilseed crop in Chhattisgarh after Soybean. Groundnut seeds contain about 22–30% protein and 45–56% oil and much more beneficial nutrients like vitamin E, minerals, niacin, antioxidants and folic acid. The arrivals of Groundnut took place in almost all the markets of Northern Hills of Chhattisgarh namely Jashpurnagar, Patthalgaon, Ramanujganj, Baikunthpur,

Manendragarh, Pratappur, Surajpur and Ambikapur round the year.

For the expansion of agriculture it has become essential that farmers get fair prices of their commodities in the agricultural markets. Therefore, the trends in market prices of products are useful in forecasting the prices of the commodities for the betterment of farmers, governments, and agribusiness industries. By the help of price forecasting of Groundnut in Northern Hills, farmers of this agro-climatic zone would find the forecast for that particular month in which they get remunerative and high price of his/her produce.

Cite this article: Rathore, A. K., Singh, A. K., & Dhurve, M. (2021). Behaviour of Prices of Groundnut in Northern Hills of Chhattisgarh, *Ind. J. Pure App. Biosci.* 9(3), 140-144. doi: <http://dx.doi.org/10.18782/2582-2845.8673>

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MATERIALS AND METHODS

Monthly time series data of the prices of Groundnut have been collected from the records of the Agricultural Products Market Committees and the website of Chhattisgarh State Agricultural Marketing (*Mandi*) Board, <http://agriportal.cg.nic.in/agrimandi/>. The data collection have been done for the study period January 2010 to March 2021 (135 months). For the study of prices of Northern Hills, the data for monthly prices of Groundnut have been obtained by averaging the monthly prices over different constituent markets. In the present study, Statistical analyses have been done by using the powerful software “R: The Project for Statistical Computing”.

Moving Average method has been used to depict the overall trend of prices of Groundnut in Northern Hills over the entire study period. Additionally it is a good idea to refine this moving average trend values to a

straight line trend for a general interpretation of decrease or increase over a long period of time. For this we may fit a straight line regression equation to the moving average trend values obtained. To measure the seasonal variation in monthly time series data of Groundnut prices, seasonal indices are calculated by Method of Simple Averages to find out the seasonal effect. For the forecasting of prices of Groundnut in Northern Hills the model used is ARIMA model.

Autoregressive integrated moving average (ARIMA) model is the generalization of an autoregressive moving average (ARMA). The autoregressive (AR) part of the ARIMA model indicates a type of random process representing the time-varying processes in nature, economics, etc., while the moving average (MA) part is the average attained over a particular period of cycle.

This AR (p), an autoregressive model whose order is p, can be defined as,

$$Y_t = \mu + \sum_{i=1}^p \Phi_i Y_{t-i} + \varepsilon_t \quad \text{----- (1)}$$

Where ε_t is white noise, μ is a constant, Φ_1, \dots, Φ_p are the parameters of the model.

The general MA process whose order is q may be defined as,

$$Y_t = \mu + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \dots + \theta_q \varepsilon_{t-q} \quad \text{----- (2)}$$

where $\theta_1 \dots \theta_q$ are the parameters of the model, μ is the mean of series and $\varepsilon_t, \varepsilon_{t-1}, \dots, \varepsilon_{t-q}$ are the noise error terms.

Now, by the combination of the MA process with AR process and integrating, with differencing step, to remove non-stationarity from the non-seasonal time series, the ARIMA is generally denoted by ARIMA (p,d,q), where parameters p, d, and q are non-negative

integers, where p is the order of the autoregressive model, q is the order of the moving-average model and d is the degree of differencing. Thus, the ARIMA (p,d,q) model can be represented by the following general forecasting equation:

$$Y_t = \mu + \sum_{i=1}^p \Phi_i Y_{t-i} + \sum_{j=1}^q \theta_j \varepsilon_{t-j} + \varepsilon_t$$

For Arrivals and Prices of Groundnut in Northern Hills the best model will be that which have maximum R^2 , minimum MAPE (Mean Absolute Percentage Error), minimum RMSE (Root Mean Square Error) and minimum MAE (Mean Absolute Error) criterion.

RESULTS AND DISCUSSION

The moving average trend for price of Groundnut in Northern Hills has been presented in Fig. 1 along with the refined trend line indicated by a red line. Based on the estimated trend, it can be interpreted that there is overall increase in Groundnut prices in Northern Hills of Chhattisgarh.

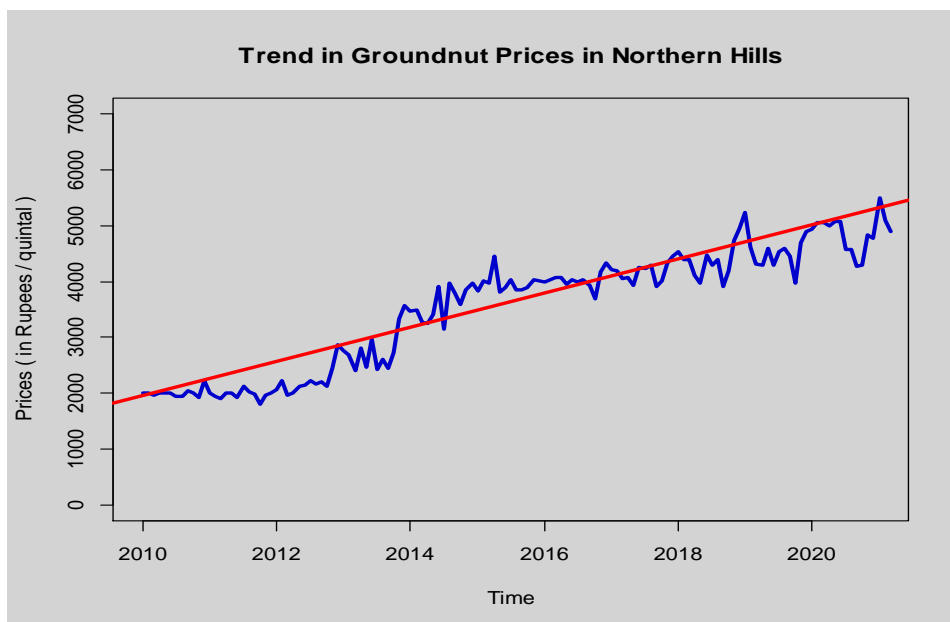


Fig. 1: Trend in Groundnut prices in Northern Hills of Chhattisgarh

The seasonal indices of prices of Groundnut in Northern Hills of Chhattisgarh is shown in Fig.

2 and it is observed that the price seasonal indices do not show much variation.



Fig. 2: Seasonal indices for Groundnut prices in Northern Hills of Chhattisgarh

The monthly time series data of prices of Groundnut in Northern Hills of Chhattisgarh was analysed by above quoted method. The

finally obtained best ARIMA model for Groundnut price after identification process is presented in the Table 2.

Table 1: Best fitted model for Groundnut prices in Northern Hills

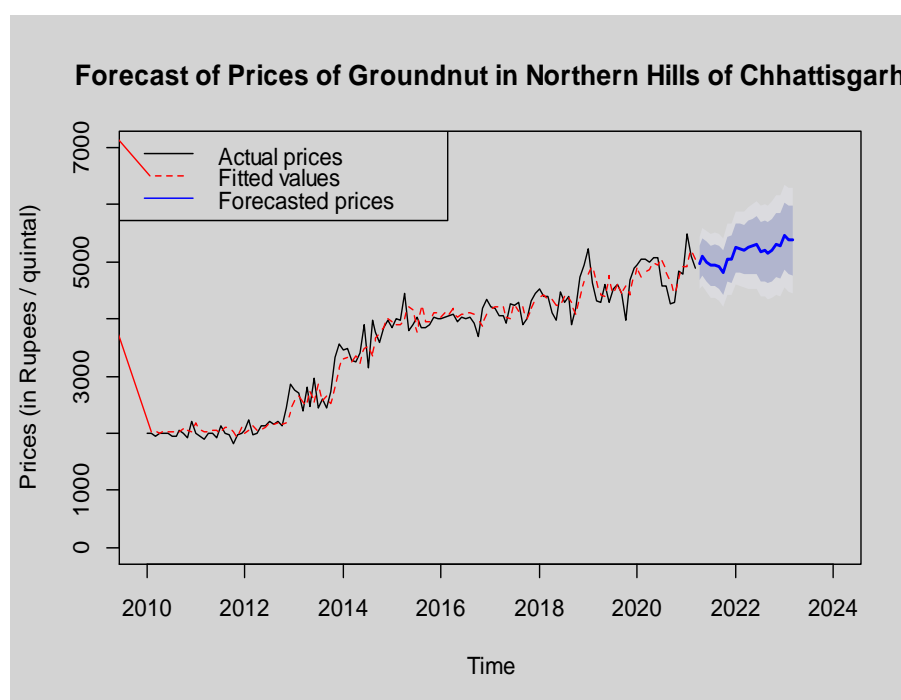
Best Model	RMSE	MAE	MAPE	AIC
ARIMA(1,1,1)(0,0,2)[12]	223.91	170.81	4.92	1846.09

The forecasts for post sample period of 24 months i.e. April, 2021 to March, 2023 were made from best fitted identified model. These

forecasted values are presented in the Table 2 and Fig. 3.

Table 2: Forecasts of Prices of Groundnut in Northern Hills of Chhattisgarh

Year	Month	Forecasted prices (in Rupees / quintal)	Year	Month	Forecasted prices (in Rupees / quintal)
2021	Apr	4979.58	2022	Apr	5245.15
2021	May	5090.64	2022	May	5268.07
2021	Jun	5002.37	2022	Jun	5298.41
2021	Jul	4931.54	2022	Jul	5182.94
2021	Aug	4941.69	2022	Aug	5196.31
2021	Sep	4904.72	2022	Sep	5161.62
2021	Oct	4808.44	2022	Oct	5208.52
2021	Nov	5044.82	2022	Nov	5297.21
2021	Dec	5048.55	2022	Dec	5280.50
2022	Jan	5243.44	2023	Jan	5459.84
2022	Feb	5229.17	2023	Feb	5393.35
2022	Mar	5214.50	2023	Mar	5373.56

**Fig. 3: Forecasts of Groundnut prices in Northern Hills of Chhattisgarh**

As shown in the Fig. 3, the fitted values by the model are found to be close to the actual values and the forecasted prices of Groundnut in Northern Hills of Chhattisgarh are showing the slight increasing behaviour over the next two years. From the Table 2, the highest forecasted price of Groundnut for Northern Hills is expected to be Rupees 5459.84 / quintal in the month of January, 2023.

CONCLUSION

The study concluded that the seasonal ARIMA models gave good fitting for the data with seasonality. The fitted values of prices of

Groundnut in Northern Hills of Chhattisgarh are very close to their actual values. The forecasted price of Groundnut is showing increasing trend over the next two years and it is observed that the price seasonal indices do not show much variation. The relevant forecasts of price can help both the Groundnut farmers as well as the planners for future planning.

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