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TO INCREASING THE QUANTITY AND PRICES OF VEGETABLE TOMATO CROP

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ABSTRACT

Market Yards are a long felt need of the farming community of our country as it goes a long way in ensuring higher remuneration to them through better price realization of their product.

The objective of project is to examine the nature and performance of such Economics in Agriculture of the commodity, tomato in the Khed Market Yard.

The aim is achieved by using Statistical techniques like Graphical Representation, Time Series Analysis. From this project the farmers consider it as a boon to them where they can confidently sale their product and get



an appropriate return for the quantity and quality of tomato they produce year after year.

KEY WORDS: Tomato Prices, Correlation, ARIMA model.

OBJECTIVES

General objective

To collect and review secondary data in the Taluka Khed Markets in Pune and to improve the quantity of product of farmers in the markets.

Specific objectives

- + To identify the requirements of quality of tomato in the all district in Maharashtra.
- + To identify conditions for market prices in the daily sales.

Importance of tomato in the economy

Introduction

Most people are employed in jobs where their salary or hourly wage is fixed. This gives them security and allows them to plan their expenditures well in advance. The income from other professions is not so certain. Entrepreneurs must take economic uncertainty as a fact of life, especially those in the agricultural sector. The price farmers receive is rarely fixed and is difficult to predict. This also makes life difficult for those who purchase farm products.

An analysis of tomato prices at wholesale level in Khed , an application of ARIMA model. In order to develop a viable strategy for dealing with volatile farm prices, one must understand how and why agricultural prices change.

The last few years there has been an increase in the volatility of many agricultural commodity prices.

This has increased the risk faced by agricultural producers. Therefore, the importance of accurate price forecasting for producers has become even more acute. The main purpose of agricultural commodity price forecasting is to allow producers to make better-informed decisions and to manage price risk.

Price forecasting is more acute with vegetable crops particularly tomato due to its highly perishable nature and seasonality. The tomato is grown in practically every country of the world and is one of the most important agricultural products among fresh vegetables in most countries in the world. Khed is among the Taluka producing various kind of vegetable at high production level due to suitable ecological conditions.

DATA AND SAMPLING PROCEDURE:

Secondary information were collected and used in the study. Secondary data (time data) on tomato prices were collected from the records maintained by the Kyushu Utpann Bazar Samiti Khed (Taluka) of market. The period covered from Khed market was 1st April 2010 to 31st Nov 2012, and pretested schedule on tomato. Further the tomato samples were drawn from the available lots during the crop year 2010-12 from Khed markets and got analyzed by the sampling procedure adopted in the study is discussed in the following section.

Khed is the terminal markets for tomato in the Pune District and bulk of the vegetables are produced in the market. So we have chosen Khed Market as much as 60 to 70 per cent of the total vegetables produced in the state arrive to these markets. We have chosen total of 837 samples were collected at day wise during the peak season (April 2010 to Dec 2012) from these markets.

However most of the research conducted on grading and price quality aspects are found in foreign countries. Studies on this vital subject within the country are seldom available. More precisely the present study proposes to examine the following specific objectives in the vegetable markets in Khed Taluka.

The specific objectives of the study are as follows-

- ✦ To study the spatial and temporal variations in prices of important Vegetables crops.
- ✦ To determine the price, quality relationship as reflected through grades and other quality characteristics of important vegetable crops.
- ✦ To develop Quantity of different important vegetable crops.
- ✦ To assess the influence of non-quality factors on price received by vegetable producers.
- ✦ To document the problems and prospects of developing quantity in domestic marketing of vegetable crops.

Time Series - Time Series is a series of statistical observations arranged in chronological order (i.e. in the order of occurrence taking at a regular successive intervals or points of time) the nature of Time Series is usually not smoothed and not monotonic. These fluctuations are due to components of Time Series which are Trend, Seasonal Variations, Cyclical Variations and Irregular Variations. The Time Series may have some or all the components present in it.

For this purpose the prices which is one of the parameters that would help us in studying the factors connected with the economical transactions of the commodities in the Khed Market Yard is analyzed.

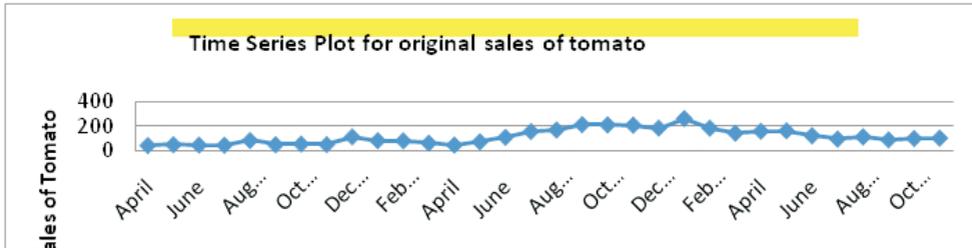
The graph of weak days in Khed Market of tomato.



Conclusion:- we plotted the data of mean sales across the weekdays. This reflected the importance of factors

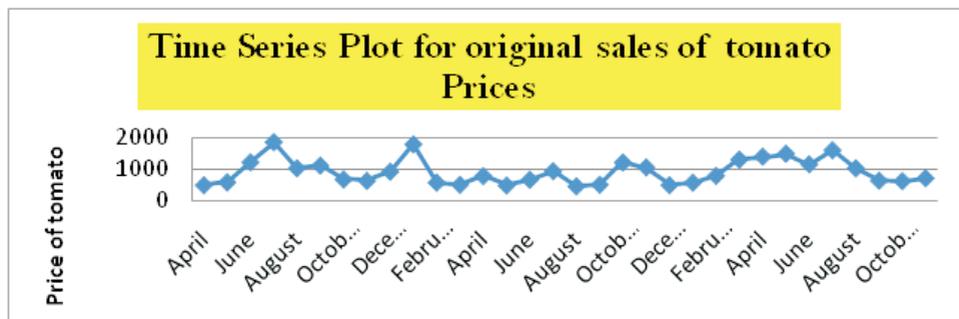
such as strikes, national holidays. It is the evident that the mean sale on Saturdays is high as compared to other weekdays, which can be attributed to the Sundays being the scheduled holidays. Hence, one can infer that scheduled holidays effect the sales in the market where as unscheduled holidays such as strikes may not have the similar effect.

Time Series Plot for original sales of tomato



Conclusion:- From the graph we observe that the sales of tomato increases of the

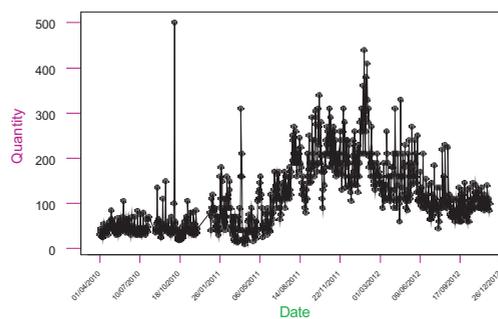
Time Series Plot for original sales of tomato Prices -Months July2011 to March2012.



Conclusion:- From the graph we observe that the prices of tomato are increases of the months July2010, Jan2011, May2012 & July2012 than other months increasing .

The data collection & analysis for ARIMA Model building. The data is collected from the portal of the agricultural Marketing information network taken from the Khed Market Yard. Total thirty -two months data is taken for tomato sales in Khed (Taluka). Initial thirty -two months data is utilized for ARIMA model identification.

Daily sales for tomato in Khed Market (01/04/2010-30/11/2012)



Conclusion:- From the graph we observe that the sales of tomato shows Slowly increasing & decreasing.

Correlation:-

Correlation technique was used to study the relationship between Quantity and Average Prices.

Correlations: Quantity, Average

Pearson correlation of Quantity and Average = -0.047

P-Value = 0.187

Conclusion:- The variables are weakly negatively correlated, since p-value is considerably high (i.e. > 0.05) So, we can say that correlation is insignificant.

Time Series Analysis

ARIMA models for a stationary time series x_t :

(1) Autoregressive model of order p (AR(p))

$$z_t = x_t - \phi_1 x_{t-1} - \phi_2 x_{t-2} - \dots - \phi_p x_{t-p},$$

i.e., x_t depends on its p previous values

(2) Moving Average model of order q (MA(q))

$$x_t = z_t + \theta_1 z_{t-1} + \theta_2 z_{t-2} + \dots + \theta_q z_{t-q},$$

i.e., x_t depends on q previous random error terms

Graph of ACF & PACF



Conclusion:- The graph of ACF & PACF are near to 0, so that AR(1) & MA(2) process is Stationary & Random.

To identified the appropriate model

$$X(t) = .9992 X(t-1) + Z(t) - .4164 Z(t-1) - .4983 Z(t-2)$$

WN Variance = .169538E+06

AR Coefficients

.999189

Standard Error of AR Coefficients

.008287

MA Coefficients

-.416352 -.498329

Standard Error of MA Coefficients

.173833 .173826

(Residual SS)/N = .169538E+06

AICC = .385183E+03

BIC = .385909E+03

-2Log(Likelihood) = .375183E+03

Accuracy parameter = .100000E-08

Number of iterations = 1

Number of function evaluations = 17666

Uncertain minimum.

Among the several methods studied in the literature to judge the fitness of the models, we used Akaike Information Criterion (AIC). According to this model with least AIC value will be selected. It is found that

ARIMA(1,0,2) is the best suited model based on the AIC value .
For that we choose the ARIMA(1,0,2) model.

ARIMA Model: Actual Price

Estimates at each iteration

Iteration	SSE	Parameters			
0	5246565	0.100	0.100	0.100	734.706
1	4992656	0.250	0.040	0.179	651.895
2	4869110	0.400	-0.007	0.288	556.676
3	4801180	0.550	-0.047	0.412	456.097
4	4751485	0.700	-0.087	0.542	355.365
5	4741415	0.850	-0.115	0.688	242.712
6	4732730	1.000	-0.140	0.837	128.499
7	4563770	1.150	-0.219	0.952	62.785
8	4251528	1.199	-0.369	0.942	149.392
9	4180669	1.223	-0.419	0.938	177.088
10	4169162	1.223	-0.420	0.948	176.852
11	4168780	1.226	-0.426	0.947	180.715
12	4168268	1.229	-0.430	0.948	180.328

Unable to reduce sum of squares any further

Final Estimates of Parameters

Type	Coef	SE Coef	T	P
AR 1	1.2295	0.1890	6.51	0.000
AR 2	-0.4296	0.1783	-2.41	0.023
MA 1	0.9482	0.1735	5.47	0.000
Constant	180.328	6.303	28.61	0.000
Mean	901.13	31.50		

Number of observations: 31

Residuals: SS = 4092098 (backforecasts excluded)

MS = 151559 DF = 27

Modified Box-Pierce		(Ljung-Box)
Lag	12	24
Chi-Square	13.0	22.5
DF	8	20
P-Value	0.112	0.314

Conclusion:- The LBQ statistics are not significant as indicated by the large p-value for either model.
After Forecasting

Row	Period	FORE1
1	2	864.73
2	3	1077.54
3	4	925.73
4	5	705.72
5	6	872.40
6	7	1087.07
7	8	933.90
8	9	711.93
9	10	880.06
10	11	1096.61
11	12	942.07
12	13	718.15
13	14	887.73
14	15	1106.14
15	16	950.24
16	17	724.36
17	18	895.40
18	19	1115.67
19	20	958.41
20	21	730.58
21	22	903.06
22	23	1125.20
23	24	966.58
24	25	736.79
25	26	910.73
26	27	1134.73

The application of ARIMA models on tomato sales for forecasting the demand for Nov 2013. The parameters of the ARIMA (1,0,2) model shows that sales in the last two period is highly influencing the sales in the current period, It can be interpreted that, the sales in the last period and the week days affects the tomato demand in the current period. It was surprising to note that the price, temp. & other variable does not significantly affect the tomato sales. The effect of weekdays is mainly due to Sundays being scheduled holiday. Other reason can be lack of proper storage facilities & market information. The efficiency forecast the tomato demand with an accuracy of MAPE value 43.24282. This value is highly significant in the vegetable market where there is almost no information of the future demand. The result And calculation of MAPE value for tomato sales is presented in following table.

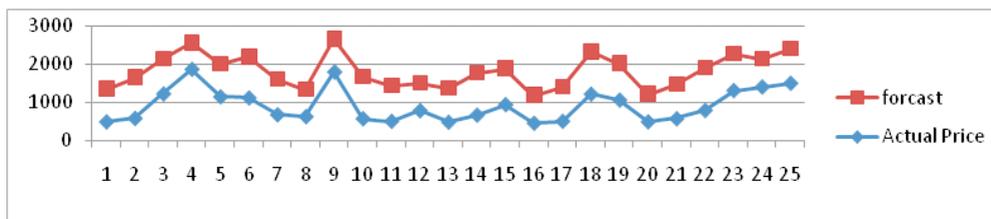
Thus proposed model can be used to facilitate the farmers & wholesalers in effective decision making.

Date	Actual Price	Forecast	APE
01/11/2012	488.462	864.73	0.770312
02/11/2012	578.846	1077.54	0.861531
03/11/2012	1219.23	925.73	0.240721
05/11/2012	1861.11	705.72	0.620807
06/11/2012	1142.31	872.4	0.236284
07/11/2012	1113.46	1087.07	0.23701
08/11/2012	673.077	933.9	0.387508
09/11/2012	625.577	711.93	0.138037
12/11/2012	1791.35	880.06	0.508717
13/11/2012	570.833	1096.61	0.92107
14/11/2012	502.778	942.07	0.87373
15/11/2012	780.769	718.15	0.080202
16/11/2012	480.769	887.73	0.846479
17/11/2012	665.385	1106.14	0.662406
19/11/2012	938.462	950.24	0.01255
20/11/2012	453.704	724.36	0.596548
21/11/2012	503.846	895.4	0.77713
22/11/2012	1211.54	1115.67	0.079131
23/11/2012	1059.62	958.41	0.095515
24/11/2012	490.741	730.58	0.488728
26/11/2012	571.154	903.06	0.581115
27/11/2012	788	1125.2	0.427919
28/11/2012	1307.41	966.58	0.260691
29/11/2012	1400	736.79	0.473721
30/11/2012	1496.3	910.73	0.391345

Σ MPE=11.3559*100= 1135.59 MAPE=43.67655

Conclusion: - The ARIMA Models in wholesale vegetable market to forecast the demand of a vegetable on daily basis. The literature addressing this problem is very scarce. Whereas, there exists a real requirement of daily demand forecast to support the farmers and wholesalers. In order to achieve this objective, we collected data for onion sales in Khed market and applied ARIMA models to forecast the demand. The forecasted values obtained shows that the model is highly efficient in forecasting the demand of vegetable on a day-to-day, and forecast the future demand with such an accuracy.

The graph of actual prices & forecast prices as given below.



Conclusion:- The forecast demand of tomato prices are increases for the month of November 2012 is greater than previous year's months.

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