



Paddy Production in Telangana State: Current and Future Trends

KEYWORDS

Paddy, MAPE, MAE and RMSE.

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ABSTRACT This paper presents the current situation and the future forecasts of paddy production in Telangana state using Box-Jenkins methodology. The forecasts can be used in planning for agriculture and public distribution system in the newly formed Telangana state. The forecasts suggest that, the paddy production in the state would meet around 7.71 million tonnes by the year 2020-21. If the present situation continues, Nalgonda, Karimnagar and Nizamabad districts would form a paddy producing belt in the state.

1. Introduction

Telangana state is the 29th state of India and it consists of ten districts namely, Adilabad, Hyderabad, Karimnagar, Khammam, Mahaboonagar, Medak, Nalgonda, Nizamabad, Rangareddy and Warangal. Agriculture is the major source of income of the rural people. Most of the agricultural production depends upon the distribution of rainfall, ground water level, bore wells and adequate electricity supply. Paddy is one of the major crops in the state and the area under the crop is 17.5 lakh hectares (AAP 2014). The area under cultivation of paddy in Kharif is 9.73 lakh ha and in Rabi it is 6.38 lakh ha. Productivity of the crop is more or less 3.4 tonnes/ ha in both the seasons during 2013-14. Paddy, the staple food crop of Telangana state, benefits also from an assured outlet in the market at remunerative prices which are in tune with the costs of production (Alary, 1999). Karimnagar district has been steadily increasing its paddy production over the years since 2006 and competing with the districts of East and West Godavari and Krishna. In Karimnagar district, farmers are getting a good yield of paddy due to a good drainage system where water is aerated quickly in the fields, compared to the waterlogged fields in Andhra region (The Hindu, 2014). Raghavender (2009, 2010) have successfully used an ARIMA model for forecasting yield and production of Paddy in united Andhra Pradesh. Ramakrishna and Boiroju (2013) used Box-Jenkins methodology for forecasting Paddy yield in Andhra Pradesh. Their predictions using Box-Jenkins methodology (Box et al. 1994) were tallied with the present observed yields. With this, it is important to assess the present situation and future availability of the Paddy in the newly carved state. In this connection, an attempt is made to forecast the future production of Paddy in the Telangana state.

2. Materials and Methods

The yearly paddy production data is compiled and collected from the Directorate of Economics and Statistics, Hyderabad, Telangana State. The data comprises the yearly Paddy production in tones from the year 1974-75 to 2013-14 and the past five year's district-wide data (up to 2011-12) is considered in the analysis. It is well known that, the paddy production is a function of area, yield and other environmental factors. It is assumed that, the historical data contain all the hidden components which are affecting the paddy production, hence the historical time series data on Paddy production is alone used

for forecasting for short term period. Box-Jenkins methodology provides a wide class of autoregressive integrated moving average (ARIMA) models. ARIMA method is an extrapolation method for forecasting and, like any other such method, it requires only the historical time series data for the variable under forecasting. Among the extrapolation methods, this is one of the most sophisticated methods, as it incorporates the features of all such methods, does not require the investigator to choose the initial values of any variable and values of various parameters a priori and it is robust to handle any data pattern. As one would expect, this is quite a difficult model to develop and apply as it involves consecutive four stages such as Identification process, Estimation, Diagnostic testing and Forecasting (Sivapathasundaram and Boghawatte, 2012). The detailed procedure for model building is explained by many authors, particularly, Raghavender (2009, 2010), Ramakrishna and Boiroju (2013) and Raghavender and Raju (2015). Compound annual growth rates (CAGR) based on the past five years district wise data and triennium ending figures of area and production for each district is tabulated.

3. Results

The following table presents the district wise percentage and growth rates of the paddy situation in the state.

Table 1. District-wise area and production of paddy in Telangana State

District	Area (ha)			Production (tonnes)		
	TE 2012	% in total	CAGR (%)	TE 2012	% in total	CAGR (%)
Adilabad	71612	4%	0.10	184326	4%	0.13
Karimnagar	295740	18%	0.05	995101	20%	0.04
Khammam	162222	10%	0.00	474085	10%	-0.04
Mahaboonagar	177541	11%	0.06	447812	9%	0.01
Medak	121568	8%	0.10	384857	8%	0.12
Nalgonda	335502	21%	0.02	1068828	21%	0.01
Nizamabad	200901	12%	0.17	735164	15%	0.19
Ranga Reddy	43796	3%	0.12	110619	2%	0.10
Warangal	205613	13%	0.05	583558	12%	0.03
State	1614496	100%	0.06	4984349	100%	0.05

From the above table, it is clear that, more than 70% of the area under paddy cultivation is observed from Nalgonda, Karimnagar, Nizamabad, Warangal and Mahaboobnagar, whereas more than 75% of paddy production is observed from Nalgonda, Karimnagar, Nizamabad, Warangal and Khammam districts in the state. A significant growth in the area and production is observed from Nizamabad whereas a very little growth in the area is observed from Khammam and Nalgonda during the past five years. A negative growth in the production is observed from Khammam and a very little growth in the production is observed from Mahaboobnagar, Nalgonda, Warangal and Karimnagar. Figure 1 shows the area, production and yield of paddy in Telangana state during the years 1974 to 2014. It is evident that there is no much growth in the area and yield levels of paddy in the state for the past five years, however the production is fluctuating in line with the area under cultivation and reached 6.6 million tons of production during 2013-14.

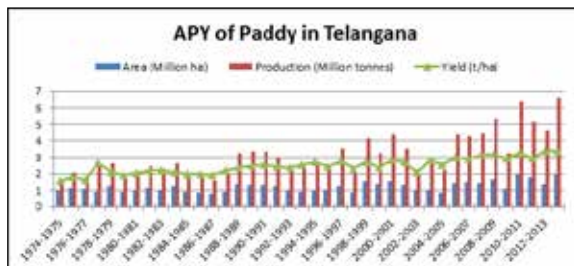


Figure 1. Area, Production and Yield of Paddy in Telangana State

Area, Production and Yield (APY) of paddy in the state during 2000-01 was 1.55 million hectares of area, 4.42 million tonnes of production with 2.85 t/ha of productivity, which is increased to 1.95 million hectares, 6.62 million tonnes of production with 3.39 t/ha of productivity during 2013-14. The production is increased mainly because of an increase in the yield by adopting high yielding hybrids in the state.

Box-Jenkins methodology is used for the historical time series data on paddy production in million tonnes. The following table presents the parameters of ARIMA model for forecasting paddy production in million tonnes.

Table 2. ARIMA Model Parameters

Parameter	Estimate	SE	t	Sig.	
Constant	0.03	0.01	1.84	0.07	
AR	Lag 1	-0.55	0.13	-4.33	0.00
	Lag 2	-0.06	0.15	-0.40	0.70
	Lag 3	-0.33	0.15	-2.23	0.03
	Lag 4	-0.67	0.14	-4.93	0.00
Difference	1				
Transformation	Natural Logarithm				

The ARIMA $(1 + 0.55B + 0.06B^2 + 0.33B^3 + 0.67B^4) / (Z - 0.03) = a_t$, where Z_t

$(4,1,0)$ model is where denote the paddy production (million tonnes) and a_t represents the residual at time t. The model adequacy also tested using Ljung-Box test and it is an adequate model. The selected model has mean absolute percent error (MAPE) as 18.285, mean absolute error is 0.548 and with low normalized BIC value of -0.185 (Table 3).

Table 3. Diagnostic statistics

Ljung-Box Q Test			Error Measures			
Statistics	DF	P-value	MAPE	MAE	RMSE	Normalized BIC
14.64	14	0.403	18.285	0.548	0.721	-0.185

The following figure and table shows the forecasts of paddy production in Telangana state.

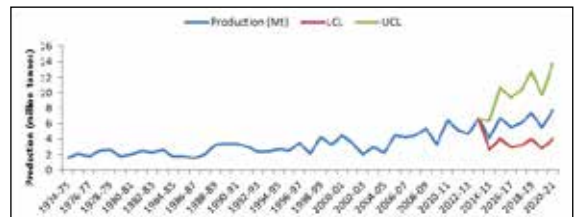


Figure 2. Forecasts of Paddy production in Telangana State

Table 4. Forecasts of Paddy production in Telangana State

Year	Production (M t)	Lower Limit	Upper Limit
2014-15	4.12	2.58	6.27
2015-16	6.81	4.08	10.76
2016-17	5.49	2.97	9.37
2017-18	6.02	3.22	10.38
2018-19	7.35	3.93	12.68
2019-20	5.44	2.79	9.66
2020-21	7.71	3.93	13.76

From the above figure and Table 4, it is observed from the forecasts that, the paddy production would reach 7.71 million tonnes by 2020-21 with the maximum scope of 13.76 million tonnes.

4. Conclusion

The developed model for paddy production was found to be ARIMA (4, 1, 0). From the forecasts available by using the developed model, it can be seen that forecasted production for the years 2015-16 and 2020-21 are 6.81 and 7.71 million tonnes respectively. On the average, it has an increasing trend in the paddy production. The selected model can be used by researchers for forecasting of paddy production in Telangana state. However, it should be updated continuously with the incorporation of recent data. Major paddy producing districts in the state are Nalgonda, Karimnagar and Nizamabad. The government programs such as the development of “seed hubs” in the state and the “Mission Kakatiya” program could help in improving the paddy production in the state. The government may introduce some subsidy schemes to the farmers to meet the demand and requirement of the newly introduced rice subsidy scheme under the public distribution system.

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