the Indian economy the present study aims at forecasting the area and production of chickpea by using a sound econometric technique known as Auto Regressive Integrated Moving Average (ARIMA) process which is widely used in literature. The forecasting of area and production would be of great help to farmers and policy makers in their decision making.

LIETERTURE REVIEW

The present study employs the univariate time series analysis popularly known as Box-Jenkins (BJ) procedure also as ARIMA process for the purpose forecasting area and production of Chickpea at all India level. This technique is very popular and extensively used in literature by the experts to forecast area, production and yield of various commodities in India and in different countries of the world. Here an attempt is made to review some of the studies. Area and production of rice in India was forecasted by using ARIMA model (1,1,1) and validity of the forecasted values were checked (Prabhakarn&Sivapragasam, 2014). ARIMA (BJ) model was employed to predict the future paddy prices in India based on the monthly data for the period 2006 to 2016. The performance of the fitted model was examined by the various measures of goodness of fit like AIC, BIC and MAPE (Darekar& Reddy, 2017). Wheat production in India was forecasted based on the univariate time series analysis known as ARIMA process with the help of annual time series data for the period 1950-51 to 2009-10 and the model projected 15.3 percent increase in wheat production for the year 2020-21 (Biswas et al, 2014). Forecasting of Area, production and productivity of Rice and Wheat in SAARC countries was done by using the technique Box-Jenkins ARIMA modelling based on the analysis of the information from 1961 through 2010 (Mishra et al, 2015). Number of studies are available on similar themes using BJ technique for forecasting purpose (Awal&Siddaque, 2011; Padhan, 2012; Xin & Can, 2016;Gurang et al, 2017).

MATERIALS AND METHODS

The present study is based on the secondary data collected from the database - Centre for Monitoring Indian Economy (CMIE)..

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3.1 Box-Jenkins (BJ) Procedure

The present analysis used BJ process which is popularly known as ARIMA process is an iterative process and involves four steps (Gujarati & Sangeeta, 2007).

3.1.1.Identification: This step involves the identification of values for p,d,q in ARIMA (p,d,q), where p represents number of Auto Regressive (AR) terms, q number of Moving Average (MA) terms and d the number of times the time series to be differenced in order to make them stationary if they are non-stationary. The ARIMA model can be built only for stationary time series hence, it is necessary to ensure that series are stationary before proceeding for identification of the values for p and q. The values for p and q can be identified based on the Auto Correlation Function (ACF) and Partial Auto Correlation Functions (PACF) of the stationary series.

The General ARIMA(p,d,q) model can be written as

$$\phi(B)\Delta^d Y_t = \theta(B)\varepsilon_t$$

where,

$\phi(B) = 1 - \phi_1 B - \phi_2 B^2 - \cdots - \phi_p B^p$; p are AR parameters

$\theta(B) = 1 - \theta_1 B - \theta_2 B^2 - \cdots - \theta_q B^q$; q are MA parameters

p and q are AR and MA parameters respectively and $\phi(B)$ and $\theta(B)$ indicate autoregressive r and moving average operators respectively (Pindyck&Rubinfeld 1998).

3.1.2 Estimation: Once the values for p,d,q are identified in the first step the next step is to estimate the identified ARIMA model with appropriate technique. We have used Maximum Likelihood Method to estimate the parameters of AR and MR terms. The suitable software will do the analysis routinely. The present study used EViews for model estimation.

3.1.3 Model Adequacy Check: The third step in BJ procedure is to check whether the estimated model in the step two fits the data reasonably well. This is done on the basis of various diagnostic checks. Firstly, the estimated residuals must be white noise which can be verified with the help of ACF and PACF of the residuals. Secondly, homoscedasticity and normality assumptions of the residuals need to checked. Thirdly, criteria like multiple R^2, Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), etc., are adopted to validate the estimated model. If the estimated model found to be inadequate on the basis of the diagnostic checks then there is need to find the suitable model by repeating the process from stage 1 of model identification.

3.1.4Forecasting: Last step in BJ procedure is to forecast the values for the variable under consideration. ARIMA models are known for their forecasting accuracy.Then the various forecasting adequacy checks will be done to ensure the accuracy of the forecasts. Tests like RMSE, MAPE, Theil's U, etc., are adopted.

4. RESULTS AND DISCUSSIONS

The BJ procedure has been adopted in the present study to forecast the values for area and production of Chickpea in India. The results of the same are discussed in this section.

4.1 Model Identification: The area and production of Chickpea (gram) are tested for stationarity of the series using Augmented Dicky Fuller (ADF) test and Phillips – Perron (PP) test and the results of the same are presented in Table 1. The results indicate that in case of area ADF test shows that the series are nonstationary but it is interesting to observe that PP test revealed that series are stationary at 5% level of significance. But in the present study area series are considered nonstationary at levels hence, data are difference once to make them stationary and the same ADF and PP tests have adopted to test the stationarity and results (Table 1) indicated that differenced area series are stationary at 1% level of significance.Similarly, unit root tests for production series using ADF and PP tests indicated that series are made stationary after first difference (Table 1). Now the series are made stationary which is the initial requirement for model identification of the BJ procedure. The value for 'd' is 1 in case of both area and production of Chickpea. In order to identify the values for 'q' and 'p' we need to check the ACF and PACF of the differenced series of area and production which are presented in Figure 1 and 2 respectively. The ACF and PACF of area (Figure 1) showed that both cut off after first lag and tests. Similarly, ACF and PACF for production also specify that (Figure 2) both cut off after first lag. This helped in identifying the suitable values for p and q.

Table 1: Unit Root Tests of Stationarity

Gram Area (at levels) with constant			
		t-statistics	Probability *
ADF test statistic		**-4.338296**	**0.0009**
Test critical values	1% level	-3.533204	
	5% level	-2.906210	
	10% level	-2.590628	
		Adj t-statistics	Probability *
Phillips – Perron test statistic		**2.888885**	**0.0521**
Test critical values	1% level	-3.534868	
	5% level	-2.906923	
	10% level	-2.591006	
Gram Area (first difference) with constant			
		t-statistics	Probability *
ADF test statistic		**-11.17520**	**0.0000**

Test critical values	1% level	-3.536587	
	5% level	-2.907660	
	10% level	-2.591396	
		Adj t-statistics	Probability *
Phillips – Perron test statistic		**-11.80477**	**0.0000**
Test critical values	1% level	-3.536587	
	5% level	-2.907660	
	10% level	-2.591396	
Production of Gram (at levels) with constant			
		t-statistics	Probability *
ADF test statistic		**-2.467327**	**0.1282**
Test critical values	1% level	-3.536587	
	5% level	-2.907660	
	10% level	-2.591396	
		Adj t-statistics	Probability *
Phillips – Perron test statistic		**-3.775119**	**0.0050**
Test critical values	1% level	-3.534868	
	5% level	-2.906923	
	10% level	-2.591006	
Production to Gram (first difference) with constant			
		t-statistics	Probability *
ADF test statistic		**-13.03786**	**0.0000**
Test critical values	1% level	-3.536587	
	5% level	-2.907660	
	10% level	-2.591396	
		Adj t-statistics	
Phillips – Perron test statistic		**-14.35789**	**0.0000**
Test critical values	1% level	-3.536587	
	5% level	-2.907660	
	10% level	-2.591396	

*Mackinnon (1996) one -sided p-values

1: Correlogram of Gram Area (first difference)

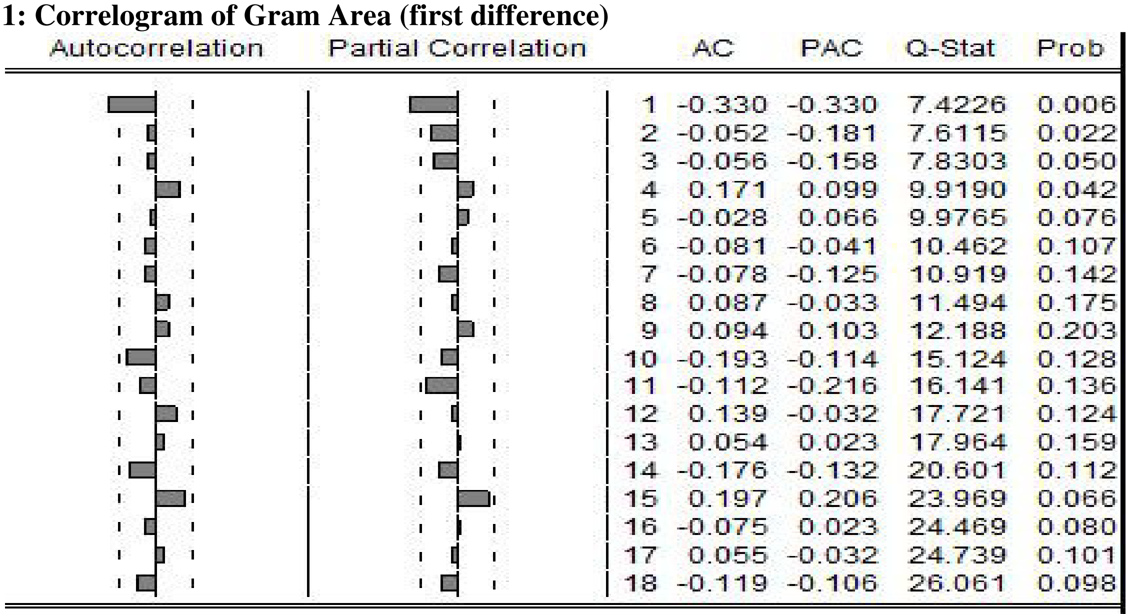
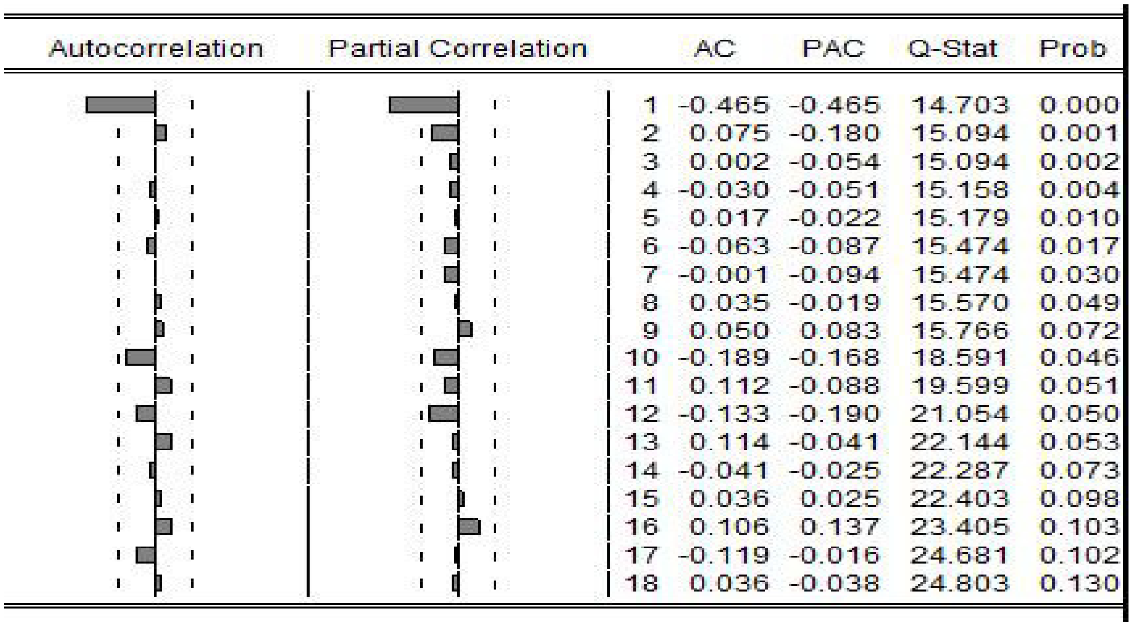


Figure 2 : Correlogram of Gram Production (first difference)



	AC	PAC	Q-Stat	Prob
1	-0.465	-0.465	14.703	0.000
2	0.075	-0.180	15.094	0.001
3	0.002	-0.054	15.094	0.002
4	-0.030	-0.051	15.158	0.004
5	0.017	-0.022	15.179	0.010
6	-0.063	-0.087	15.474	0.017
7	-0.001	-0.094	15.474	0.030
8	0.035	-0.019	15.570	0.049
9	0.050	0.083	15.766	0.072
10	-0.189	-0.168	18.591	0.046
11	0.112	-0.088	19.599	0.051
12	-0.133	-0.190	21.054	0.050
13	0.114	-0.041	22.144	0.053
14	-0.041	-0.025	22.287	0.073
15	0.036	0.025	22.403	0.098
16	0.106	0.137	23.405	0.103
17	-0.119	-0.016	24.681	0.102
18	0.036	-0.038	24.803	0.130

4.2 Model Estimation: The next step is to estimate the various specifications of the ARIMA models based on the ACF and PACF of area and production of Chickpea using Maximum Likelihood Method (MLM). The results of the final ARIMA model fitted to the data based on the different criteria are presented in Tables 2 & 3 for area and production respectively. Table 2 depicts the results for area variable. ARIMA (2,1,2) is the fitted model for Gram Area. This model is selected on the basis of AIC, BIC, DW test, and H-Q criteria.

Table 2: Fitted ARIMA (2,1,2) Model for Gram Area

Variable	**Coefficient**	**Standard Error**	**t-Statistics**	**Probability**
C	23.34513	85.62505	0.272644	0.7861
AR(1)	0.245904	0.208596	1.178854	0.2432
AR(2)	-0.712919	0.169363	-4.209407	0.0001***
MA(1)	-0.579179	0.233507	-2.480351	0.0160**
MA(2)	0.726005	0.167032	4.346509	0.0001***
R^2	0.177145**		AIC	16.30168
Adjusted R^2	0.107411		SIC	16.50239
F-statistics	2.540309		Hannan-Quinn criteria	16.38087
Probability (F-statistic)	0.037805		Durbin-Watson stat	2.179781

Note: ***, ** indicate significance at 1% and 5% respectively

ARIMA (2,1,1) is the fitted model for Gram production (Table 3).

Table 3: Fitted ARIMA (2,1,1) Model for Gram Production

Variable	**Coefficient**	**Standard Error**	**t-Statistics**	**Probability**
C	38.02369	23.33796	1.629263	0.1085
AR(1)	0.392769	0.144689	2.714570	0.0087***
AR(2)	0.314668	0.139186	2.260783	0.0274**

MA(1)	-1.000000	771.0199	-0.001297	0.9990
R^2	0.298359***		AIC	16.63228
Adjusted R^2	0.251583		SIC	16.79954
F-statistics	6.378460		Hannan-Quinn criteria	16.69827
Probability (F-statistic)	0.000241		Durbin-Watson stat	2.058094

Note: ***, ** indicate significance at 1% and 5% respectively

4.3 Diagnostic Checking: The next step is to check the adequacy of the fitted model. This has been done on the basis of various criteria explained in the methodology part. Firstly, significance of the coefficients of the AR and MA terms. AR(2), MA(1) and MA(2) coefficients are found to be significant at 1% level of significance (Table 2) in case of area. In case of production AR(1) and AR(2) coefficients are found to be significant at 1% and 5% level of significance respectively. R^2 is also significant at 1% level of significance. Secondly,we need to check for the residuals and correlogram of the residuals for the area and production are presented in Figures 3 & 4 respectively. None of the Auto correlations (AC) and Partial Auto Correlations (PAC) of the residuals are significant in case of area (Figure 3) confirming that the residuals are white noise and this is validated by the high value of Q -probability. The same conclusions are drawn for residuals in case of production (Figure 4). Thirdly, The correlogram for residual squares are presented in Figures 4 & 5 respectively for area and production and figures indicate that none of the ACs and PACs are significant as Q-probabilities are high more than 0.05 signalling the absence of heteroskedasticity in both area and production series.

Figure 3: Correlogram of Residuals from ARIMA (2,1,2): Gram Area

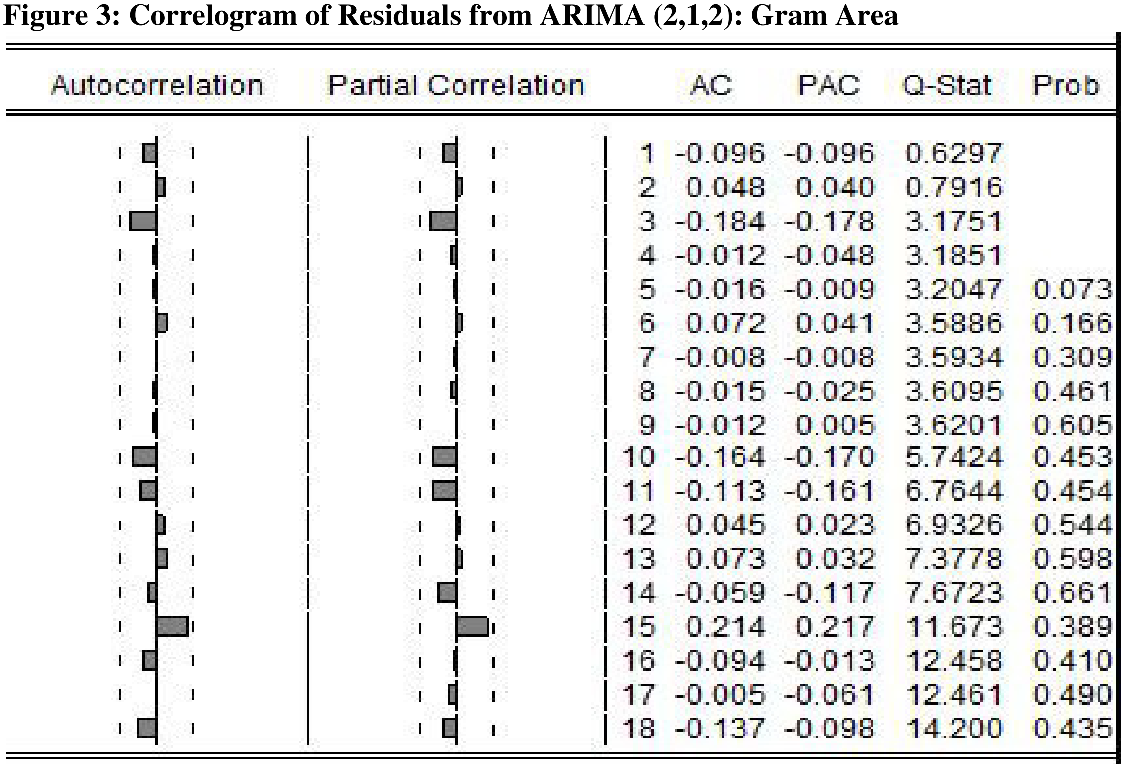


Figure 4: Correlogram of Residuals from ARIMA (2,1,1): Gram Production

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.036	-0.036	0.0874	
		2	-0.035	-0.036	0.1725	
		3	0.088	0.085	0.7120	
		4	0.018	0.023	0.7355	0.391
		5	0.017	0.025	0.7565	0.685
		6	-0.049	-0.054	0.9335	0.817
		7	0.006	0.000	0.9366	0.919
		8	0.080	0.074	1.4269	0.921
		9	-0.000	0.014	1.4269	0.964
		10	-0.180	-0.177	3.9812	0.782
		11	-0.004	-0.030	3.9827	0.859
		12	-0.076	-0.097	4.4632	0.878
		13	0.072	0.101	4.8964	0.898
		14	0.016	0.036	4.9182	0.935
		15	0.083	0.119	5.5137	0.939
		16	0.107	0.084	6.5287	0.925
		17	-0.091	-0.088	7.2803	0.923
		18	-0.004	-0.014	7.2820	0.949

Figure 5: Correlogram of Residuals Squared ARIMA (2,1,2); Gram Area

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.052	0.052	0.1867	0.666
		2	-0.297	-0.300	6.2751	0.043
		3	0.085	0.134	6.7867	0.079
		4	0.118	0.011	7.7729	0.100
		5	-0.107	-0.061	8.6026	0.126
		6	-0.063	-0.020	8.8925	0.180
		7	-0.087	-0.161	9.4567	0.222
		8	-0.041	-0.030	9.5871	0.295
		9	0.130	0.099	10.901	0.283
		10	0.051	0.028	11.106	0.349
		11	0.001	0.092	11.106	0.434
		12	0.114	0.102	12.166	0.432
		13	0.090	0.061	12.843	0.460
		14	-0.045	0.001	13.016	0.525
		15	-0.001	0.028	13.016	0.601
		16	-0.064	-0.089	13.381	0.645
		17	-0.186	-0.156	16.523	0.487
		18	-0.020	-0.021	16.559	0.554

Figure 6: Correlogram of Residuals Squared ARIMA (2,1,1); Gram Production

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.032	0.032	0.0716	0.789
		2	-0.114	-0.115	0.9696	0.616
		3	-0.193	-0.188	3.5824	0.310
		4	-0.023	-0.027	3.6189	0.460
		5	-0.151	-0.202	5.2674	0.384
		6	-0.079	-0.130	5.7255	0.455
		7	-0.118	-0.196	6.7695	0.453
		8	0.147	0.038	8.4145	0.394
		9	-0.005	-0.123	8.4162	0.493
		10	-0.094	-0.207	9.1215	0.521
		11	-0.147	-0.238	10.864	0.455
		12	0.230	0.084	15.212	0.230
		13	0.238	0.149	19.945	0.097
		14	0.000	-0.062	19.945	0.132
		15	0.037	0.150	20.066	0.169
		16	-0.086	-0.088	20.727	0.189
		17	-0.159	-0.130	23.032	0.148
		18	-0.142	-0.079	24.901	0.128

Fourthly, the normality assumption of the residuals is checked with the help of Skewness, Kurtosis and Jarque-Bera (JB) test and the results are presented in Table 4. The results amply support that the residuals are normally distributed in both area and production cases. JB probability is high validating the results further.The estimated residuals from the fitted ARIMA models are white noise and no pattern is left in them. All the diagnostic checks validated that the selected ARIMA models for area and production of Gram arefitted reasonably well to the data.

Table 4: Normality Test Statistics for the Fitted ARIMA Models

Variable/Model	**Skewness**	**Kurtosis**	**Jarque-Bera (Probability)**
Gram Area ARMA(2,1,2)	0.057593	2.599371	0.470631 (0.790322)
Gram Production ARIMA(2,1,1)	-0.163907	2.522367	0.908903 (0.634796)

The actuals and fitted values of the selected ARIMA models for area and production are presented in Figures 7 & 8 respectively. The graphs clearly show that the fitted ARIMA models could catch the important shifts in the data pattern of both area and production. The fitted ARIMA models may be used for forecasting which is the main aim of the univariate time series analysis. That takes us to last step of the BJ procedure.

Figure 7: Actual and Fitted Values for Gram Area

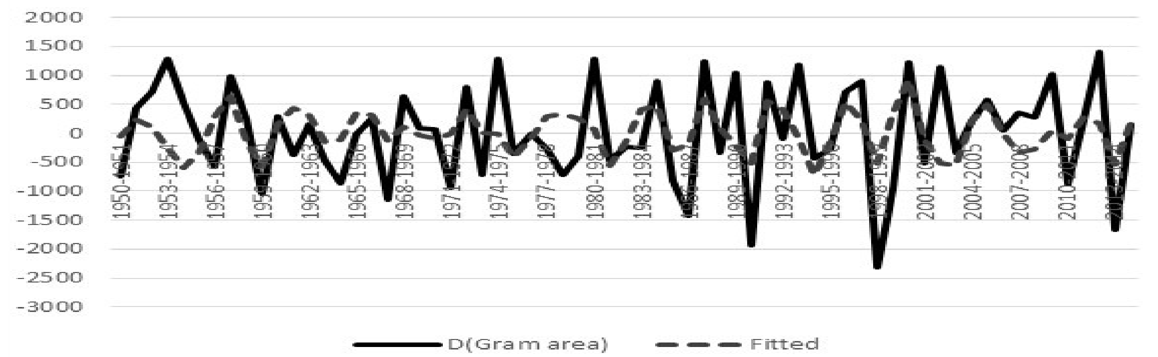
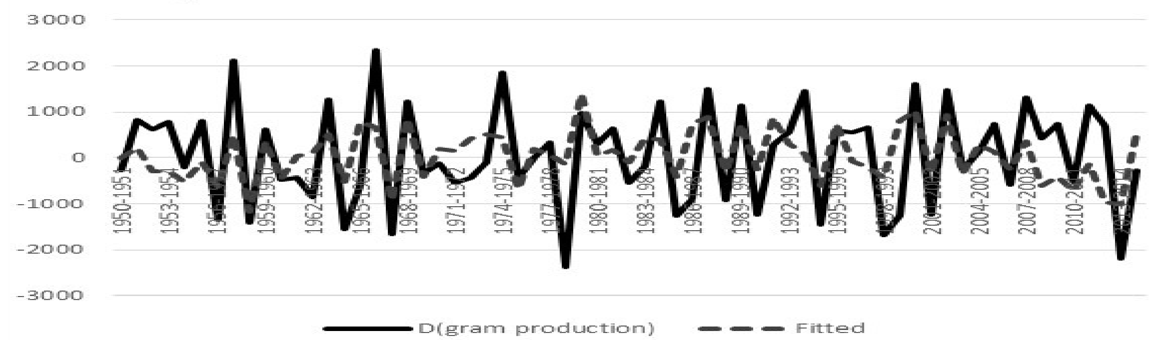


Figure 8: Actual and Fitted Values for Gram Production



4.4 Forecasting: The fitted ARIMA models are used for forecasting and the forecasted values for the period 2016-17 to 2020-21are presented in the Table 5. The forecasting accuracy statistics are presented in the Table 6. It can be observed that Theil's Inequality Coefficient is near to zero in case of both area and production authenticating the forecasting accuracy of the fitted ARIMA models (Table 6).

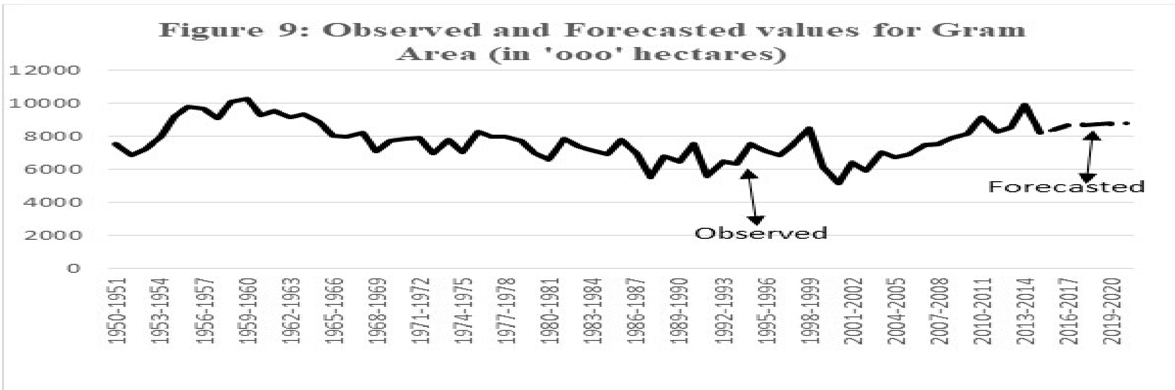
Table 5: Forecasted Values for Area and Production of Gram in India

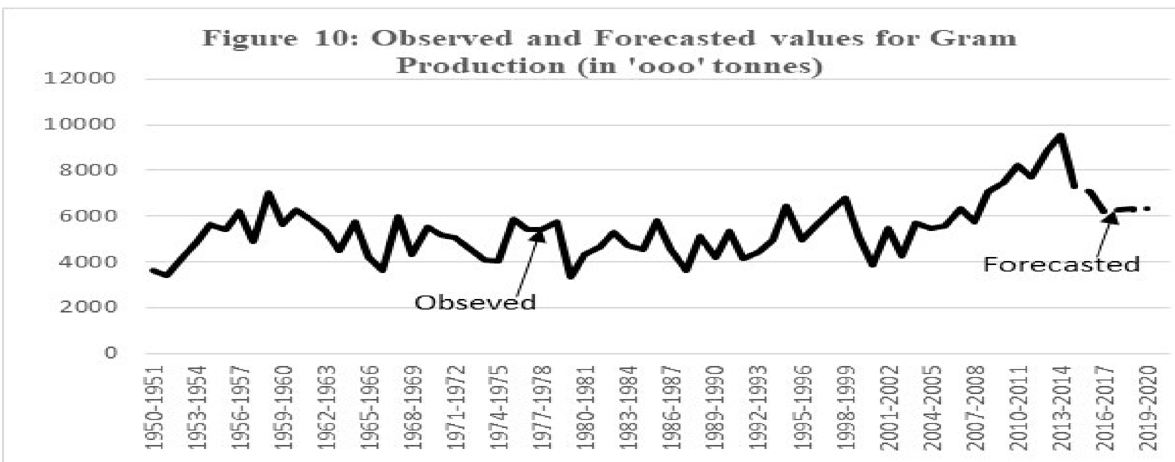
Year	**Area ('000' hectares)**	**Production ('000' tonnes)**
2016-17	8696	6230
2017-18	8719	6268
2018-19	8743	6306
2019-20	8766	6344
2020-21	8789	6382

Table 6: Forecast Evaluation Statistics for the Fitted ARIMA Models

Variable/Model	**RMSE**	**MAPE**	**Theil's Inequality Coefficient**
Gram Area ARMA(2,1,2)	1402.437	15.18114	0.088706
Gram Production ARIMA(2,1,1)	1216.192	17.121441	0.113671

The actual and forecasted values of area and production of gram are presented in the graphs 9 and 10 respectively. It is clear from the graphs that area and production showed a slight increasing trend but not significant increase in the values for the next five years.





5. CONCLUSION

Pulses play very important role in the Indian Economy in terms of sustainable agriculture by fixing nitrogen into the soil on one hand and meeting protein requirements of the vegetarian population of rural mass on the other. Among variety of pulses grown in the country Chickpea (gram) is an important pulse. It has the highest area under the crop compared to all other pulse varieties. Gram is an important source of protein to the majority of people in India hence, it has lot of economic importance. Realising the importance of the gram Government of India initiated various programmes to enhance the area, production and productivity of the chickpea in the country. In view of this the present forecasts for area and production of gram based on the univariate ARIMA analysishelps the policy makers in understanding how far their policy initiatives are effective in realising their objectives and what needs to be done to enhance the production of the gram in future in order to bridge the gap between supply and demand for gram in the country. The forecasts are also of interest to farmers in their decision making.

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Impact of GST on Electronic Sector in India

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Introduction

The "term"tax" is extracted from Latin word "*taxare*" means to estimate. A tax is an enforced contribution, exacted pursuant to legislative authority. According to AbhishekJha "A good tax system is characterized by a high responsiveness of tax revenue to change the income of public organisations or national income; the technique of measuring this response is tax elasticity and tax buoyancy". Tax policy forms an important part of development process in a developing economy. The total tax revenue is rely upon three termsi.e. tax rate, tax base, and national income. According to the IMF, Indian tax system is characterized by high dependence on indirect taxes, low average effective tax rates and tax productivity and large tax induced distortions on investment and financing decisions.A tax policy is administratively