AN ANALYTICAL STUDY ON THE PRODUCTION AND THE GROWTH TRENDS OF SPICES IN INDIA

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ABSTRACT *In this study, an attempt has been made to know the trends in production of spices in India for the period from 2001-02 to 2015-16. It has been observed that the overall growth rate in production of spices in India showed a positive trend. The Indian spices industry is a dynamic and fast emergent sector and plays a pivotal role in the economic development of the country. India has a large growing domestic market for spices, growing international demand for Indian spices have the potential for increasing growth trend of spice industry of India.*

Keywords: *Area, ARIMA Model, Correlation, Production, Regression, Spices*

INTRODUCTION

The Indian spices is a growing market and its worth Rs.40000 Crore annually. India produces key spices which include Pepper, Cardamom, Chilli, Ginger, Turmeric, Coriander, Cumin, Celery, Fennel, Fenugreek, Ajwain, Dill seed, Garlic, Tamarind, Clove, and Nutmeg among others. India presently exports nearly 52 different spices out of the 109 spices listed by the Indian Standards Institute. The climatic condition of the country from tropical to sub-tropical to temperature which is an ideal for the growth of almost all the spices and it accounts of 45% of the global exports. The spice industry provides better opportunities for income generation and employment.

Almost all the states in India are producing spices. Andhra Pradesh is the largest spice producer of Chilli and Turmeric, Rajasthan emerges as the largest producer of Coriander, Cumin and Fenugreek, Kerala tops in Pepper, Cardamom and Ginger production. India export market share accounts for 38% of Chilli , 29% of Ginger, 78% of Turmeric, 10% of Pepper, 31% of Cardamom. India's spices are acknowledged as having unique taste and aroma, making it a top favorite in western market.

The production of spices depends on monsoon. There will be a short fall in production if there is an unfavorable monsoon since most of the spices are monsoon sensitive and production directly dependent on the timing and quantum of rain. Too much rain injures the crops whereas shortfall of rain affects the volume of the production. International supply situation and production in the competitive countries also determines India's spice production which will have a direct impact on the price variation for Indian spices in the international market.

OBJECTIVES OF THE STUDY

The main objective of the study is to

1. To examine the relationship between Area and Production of spices.
2. To study the impact of area on the growth of spice production.
3. To analyze the trend of spice production in India.

LITERATURE REVIEW

Dr. Rajababu, R (2015) of the view that production and exports can be enhanced through introduction of advance technologies, Bio-technology, tissue culture, better marketing infrastructure, storage and good transport facilities to facilitate spice exports. The role of spice park to improve the quality of processed spices can further strengthen India's competitiveness in the international market.

Sajith Mohan.,et al (2013) analyzed the performance of Indian spice exports. India is the largest producer and consumer and exports of spices with 46 per cent share by volume and 23 per cent share by value. Indian spice exports consist of 50 spices in whole and more than 80 per cent in value added form. But the sector has yet to achieve the desirable target due to problem in marketing, supply chain, pre and post harvesting practices, quality requirement to match the international standards.

Kalpana Agrawal (2012) stated that India has a suitable topography to support production of various spices. Cheap labour, Government support, low operating cost are some of the major strength of India. Inferior

quality Guatemalan cardamom has helped Indian exporters to make their dominant presence in the international market.

Rohatash K, Bhardwaj et al (2011) opined that exporters need to deliver products to comply with the quality standards with increase in social and environmental standards of volatile markets. Small holders of agriculture are poorly prepared for facing these challenges.

Krishnadas, M (2010) analyzed the growth and instability of production of major spices for the period from 1994-95 to 2006-2007. The result of growth rate analyzes revealed that growth in area under chilli was found to be negative. Malaysia, Sri Lanka, UAE and Indonesia are the loyal buyers of Indian Chilli. Black Pepper's area, production and productivity showed positive and significant growth. USA, Germany, Italy and Canada are the prime importers of Black pepper. Turmeric export price and production trends showed positive growth. The export of growth of Coriander in terms of quantity and value was found positive.

RESEARCH METHODOLOGY

In this study, analytical research design has been used to examine the impact of area on the growth of spice production in India with the help of statistical tools.

Data Collection method: The data used in this study is based on secondary sources. The secondary data has been collected from the Indian Spice Board and other research journals. The data has been taken and analyzed from the year 2001-2002 to 2015-2016. The area of cultivation in Hectares and Production in Tonnes are collected for this study.

Tools for Analysis: The researcher has used the statistical tools like Correlation, Regression and ARIMA to find out the relationship between Area and Production and future trends of spice production in India.

Table 1

YEAR	AREA In '000 ha	Production in '000 Tonne
2001-02	3220	3765
2002-03	3220	3765
2003-04	5155	5113
2004-05	3150	4001
2005-06	2366	3705
2006-07	2448	3953
2007-08	2617	4357
2008-09	2629	4145
2009-10	2464	4016
2010-11	2940	5350
2011-12	3212	5951
2012-13	3076	5744
2013-14	3163	5908
2014-15	3317	6108
2015-16	3474	6988

OUTPUT OF ANALYSIS

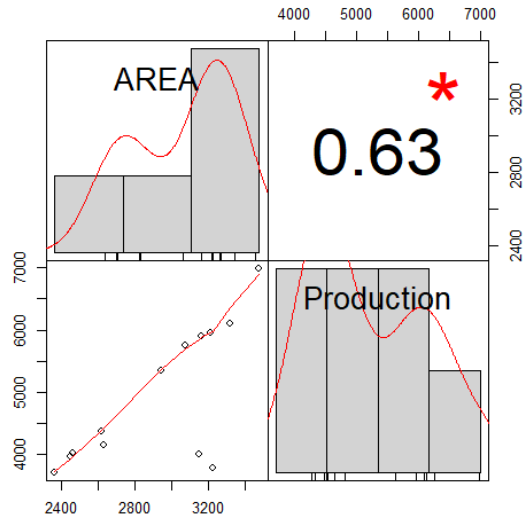
Correlation analysis: Correlation analysis is a statistical tool used to study the closeness of the relationship between two or more variables. The variables are said to be correlated when the movement of one variable is accompanied by the movement of another variable.

Based on the given data, the following hypothesis has been framed to find the relationship between area and cultivation of spices.

Null hypothesis: There is no linear relationship between Area of cultivation and Spices production.

Alternative hypothesis**:** There is linear relationship between Area of cultivation and Spices production.

Chart 1



Inference: From the above diagram, the correlation value 0.63 is lays between 0 and 1. It states that there is a positive linear correlation between Area of cultivation and Spices production. The correlation is significant at 1 % level which is explained in the diagram. It is observed that when the area of land increases, the production of spices also increased.

Regression Analysis: With help of regression analysis it is possible to predict the value of unknown variable (dependent variable) using the value of known variable (Independent variable).
To study the cause and effect relation between two variables, the simple regression analysis is used. To find the cause and effect between Area and Production of spices, the following hypothesis is framed.
Null Hypothesis: There is no impact of Area of cultivation on Spices production.
Alternative Hypothesis: There is impact of Area of cultivation on Spices production.

Table 2 : Model Summary

R	R Square	Adjusted R Square	F value	Sig. value	Result
.629	.396	.345	7.857	0.016*	Significant

* Significant at 5 % level

From the above table, the R value explains the relationship between Area of cultivation and Spices production. R value 0.629 says that there is a good relationship between Area of cultivation and Spices production. The coefficient of determination (R Square) value 0.396 explains the variations in the model. The Area of cultivation makes an impact 39.6 % on the Spices production. The significance value of F test 0.016 is less than 0.05 which is significant at 5 % level. It is inferred that the overall relationship between Area of cultivation and Spices production is significant.

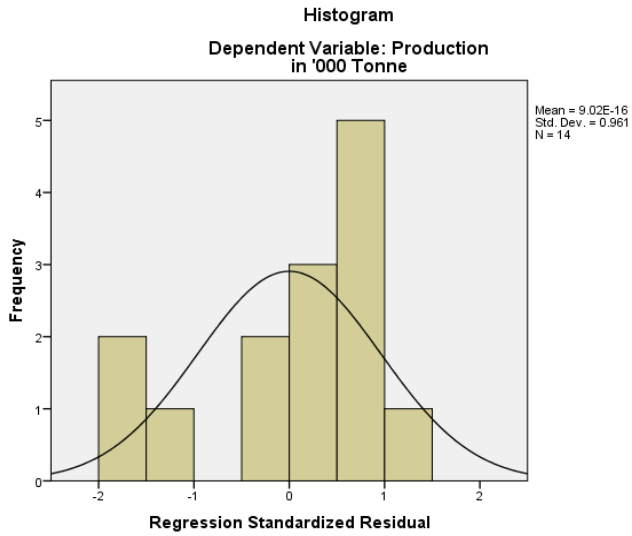
Table 3 : Coefficient

Variables		Unstandardized Coefficients		t	Sig. value	Result
		B	Std. Error			
1	(Constant)	-769.472	2015.541	-.382	.709	Not Significant
	AREA In '000 ha	1.902	.678	2.803	.016*	Significant

* Significant at 5 % level

The significant value of constant 0.709 is more than 0.05 which is not significant at 5 % level. The significant value of Area of cultivation 0.016 is less than 0.05 which is significant at 5 % level. It is concluded that the null hypothesis is rejected and alternative hypothesis is accepted that is there is impact of Area of cultivation on Spices production. It explains that one hectare increase which influences the production of Spices by 1.902 tonnes.

Chart 2



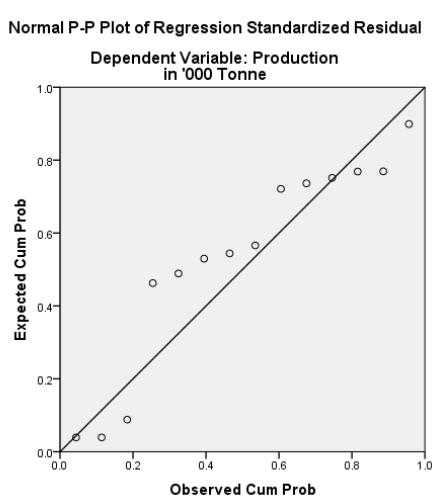
As per the assumption of regression model, the standardized residual needs to follow normality assumption. The above histogram infers that the residual approximately follows normality assumption. This is one of the assumptions to build the good model to relate independent and dependent variables.

Table 4

One-Sample Kolmogorov-Smirnov Test		Standardized Residual
N		14
Normal Parameters a,b	Mean	.0711486
	Std. Deviation	.95824173
Most Extreme Differences	Absolute	.192
	Positive	.192
	Negative	-.156
Kolmogorov-Smirnov Z		.719
Asymp. Sig. (2-tailed)		.680

The normality assumption is proved through Kolmogorov-Smirnov Z statistical test. The significant value 0.680 is more than 0.05 which is not significant at 5 % level. It infers that the observed residual values are following normality assumption.

Chart 3

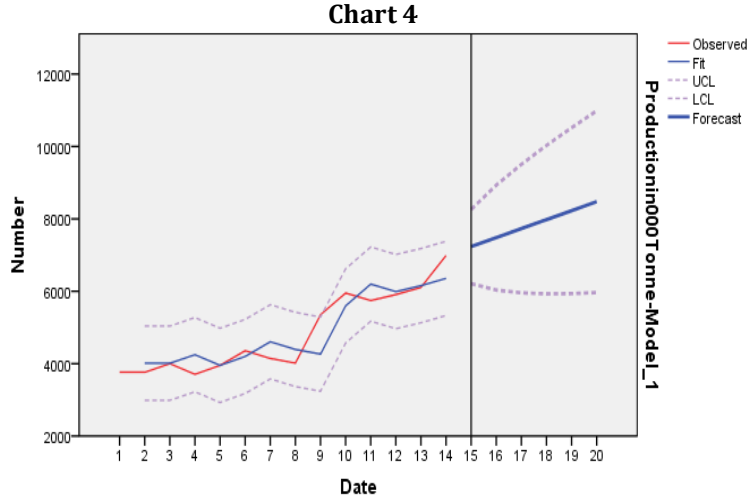


The probability plot is another criterion to explain the good model. The expected cumulative probability values should fall very closer to the observed cumulative probability which is straight line. From the above diagram the expected cumulative probability values are laying in and around the straight line. It confirms that this model is good model.

ARIMA Model: Auto Regressive Integrated Moving Average is a forecasting technique. ARIMA is the key tool in Time series analysis. It is a "Stochastic" modeling approach that can be used to calculate the probability of a future value lying between two specified limits. ARIMA is known as Box-Jenkins approach and it is popular because of its generality.

The ARIMA is constructed with all possible combination of ARIMA (p,d,q). The Box Jenkins value is more than 0.05 which is not significant at 5% level. It explains the model is a good model. The fit indices of the model are also observed to explain the model performance. The index normalized Bayesian information criterion value 12.505 is less among all possible combination of ARIMA (p,d,q) model. In this model, the maximum absolute percentage error estimated which is around twenty per cent. The R^2 value explains the model variations in terms of percentage. It is observed that 82.2% variations are observed in this model. The ARIMA (0,1,0) is used to predict the future production of spices and finally it is observed that ARIMA (0,1,0) is highly fitted model to explain the variations.

Chart 4



From the above chart, two doted horizontal lines, called the upper control limit (UCL) and the lower control limit (LCL), are shown on the chart. These control limits are chosen so that almost all fitted points fall within these limits as long as the process remains in-control. The next five year of production of Spices forecasted using the fitted model and projected in the chart with bold line implies that it lies within the control limit.

FINDINGS

Production of spices in India shown a modest growth rate over the period from 2010-2015, growing from 5350 tonnes in 2010-2011 to 6988 tonnes in 2015-2016. Trends in spice production of Indian spices are likely to increase every year after year. The population growth in India is surging and consumer expenditure on food is also swelling. The demand for Indian spices from the European nations is expanding. The spice industry is also showing a positive trend and the forecasted trend of spice production for the next five years would gradually increase. The Government is also keen on increasing value addition in spices. It is now about eight per cent, and is expected to double in the next five years. It is observed that the future of spice industry in India is blooming and the units and the firms involved in production, processing and trading of spices will reap more benefits in future.

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