

Growth and Instability Analysis of Pepper with Reference to Production and Price

K. Ganaraja^{1*} and T. S. Rakesh²

¹Assistant Professor, Department of Economics, Sri Dharmasthala Manjunatheshwara College (Autonomous), Ujire – 574240, Karnataka, India

²Principal, GSSS Simha Subbamaahalakshmi First Grade College, Mysore – 570016, Karnataka, India

Abstract

Black pepper, the most traded spice in the world is native to South India. Though Pepper is popularly known as black gold, it does not provide the value of gold to its cultivators because of several persisting problems. Market imperfections, illegal imports, ineffective implementation of minimum import duty, lack of institutional support etc are some of the problems faced by pepper growers. Production of pepper has become unremunerative due to depressed prices in the domestic and/or global markets coupled with increasing input costs. In this context, the study has focused on trends in area, production and yield of pepper, the seasonal effect of price and also the impact of the production of pepper on its prices to diagnose reasons for price fluctuations. The main objective of the study is to examine trends in area, production and productivity in major pepper-producing states and monthly price variations of pepper in India. The study relies on time series data. The data on area, production, productivity and monthly average price of pepper have been collected from the Spices Board of India. To study the behaviour of prices of pepper in different months, a seasonal effect has been constructed. To study the interrelationship between the price of pepper with its production and different months, a correlation technique has been employed. Regression analysis is being undertaken to know the present and future price trends of pepper. The time-series analysis of the monthly average prices of pepper is attempted from 2018-19 to 2022-23. The study revealed that there is a strong positive correlation between the prices of pepper and different months. The regression coefficient reveals that month significantly contributes to the growth and instability in pepper prices in the market. The study also suggests that, if the government could provide enough institutional support to stabilise the market prices, the pepper growers would certainly consider their crop as black gold.

Keywords: Agriculture, Area, Black Pepper, Price Fluctuation, Production, Productivity

1. Introduction

The prices of agricultural produce are important for farmers as these determine their incomes. The movements of agricultural prices over the last many years reveal two major features: rising trends and many fluctuations. It is well known that agricultural prices tend to display wider fluctuations. Deficiencies in supply relative to demand and increases in per-capita income are the causes of the increase in agricultural prices (Desai, 1977). In a country

like India where the emphasis is being laid down on the planned development of the economy the role of price mechanism cannot be undermined in affecting desired adjustment in production (Koshta *et al.*, 1990). Unfortunately, in India the agricultural prices are not entirely decided by the market forces and the support prices not only act as firm base to stop the lower-level fluctuations but also exhibit stickiness to the wholesale prices, thereby not allowing the wholesale prices to respond to the market signals (Thippaiah *et al.*, 1998). The major objective of

*Email: gkuntikana@gmail.com

agricultural price policy is to achieve price stability without destabilizing the total revenue of the farmer and provide price support which would be economic to the grower as well as agro-based industry and at the same time subserve the interests of the consumers (Kahlon *et al.*, 1980).

Black pepper, the most traded spice in the world is native to South India. Though Pepper is popularly known as black gold, it does not provide the value of gold to its cultivators because of several persisting problems. Market imperfections, illegal imports, ineffective implementation of minimum import duty, lack of institutional support etc are some of the problems faced by pepper growers. Production of pepper has become unremunerative due to depressed prices in the domestic and/or global markets coupled with increasing input costs. In this context, the study has focused on trends in area, production and yield of pepper, the seasonal effect of price and also the impact of the production of the pepper on its prices to diagnose reasons for price fluctuations. The main objective of the study is to examine trends in area, production and productivity in major pepper-producing states and monthly price variations of pepper in India.

2. Literature Review

Black Pepper popularly known as the “king of spices” is the most traded spice in the world and is native to South India. The production of pepper is dependent upon typical hot and moist weather conditions and the pepper crop needs these sorts of climatic conditions to prosper. However, a lot of variations have been witnessed in the area, production, yield and prices of pepper within the country and abroad over the years. Production of pepper has become unremunerative due to depressed prices in the domestic and/or global markets coupled with increasing input costs (Hema *et al.*, 2007). The presence of old and senile plants, lack of proper care and management, and difficulty in harvests are the major reasons for the decline in acreage and production (Rageena, 2016). Black pepper as an internationally traded commodity has always been associated with price fluctuations which are influenced by numerous factors including production and consumption in India

and the world, international prices, export-import policies, exchange rates and trade agreements (Sabu *et al.*, 2016). Pepper growers are facing problems such as heavy rainfall, labour scarcity, lack of finance etc. The scarcity of water resources, improper integrated pest management system, and high cost of organic farming led to low productivity of pepper (Yogesh, 2017). Subha and Balamurugan (2020) in their study revealed that the area, production and productivity in all the major pepper-growing states of India is witnessing a declining trend. The area and production are significant predictors of pepper price in all countries, while yield cannot be considered as a significant determinant of pepper price across countries (Korah *et al.*, 2021). There is a huge scope for mechanization of harvesting and integrating markets with necessary market intelligence services at the grassroots levels to minimize higher price volatility (Yadava, 2022). Coordinated efforts for planting new, high-yielding vines in place of the old ones and training the farmers on proper management of the vines will aid in restoring black pepper production and income (Paul, 2023).

All the studies have emphasised area, production, yield and price volatility over the years. From the above review of literature, it is clear that pepper being one of the major spices is widely considered as a black gold across India because of its consumptive and export values. The studies have emphasised that the production and price volatility are mainly due to improper and unscientific cultivation, market imperfections, illegal and poor-quality imports, lack of institutional support etc. The past studies have not done the monthly average price analysis and its relative effects on the growers. The studies have also failed to guide the growers in which season the price is relatively favourable and unfavourable through proper statistical analysis. Hence, in the present study, special emphasis is given to the trends in area, production and yield of pepper, the seasonal effect of price and also the impact of the production of pepper on its prices to diagnose reasons for price fluctuations. The main objective of the study is to examine trends in area, production and productivity in major pepper-producing states and monthly price variations of pepper in India. However, the present study has not focused on the relative effects

of production, yield and price variation on the grower of pepper. Studies could also be undertaken on the impact of minimum import price and introduction of minimum support price to stabilise the pepper market and livelihood of the growers.

3. Methods and Tools

Black pepper, being a trade-dependent commodity, shows a high degree of price fluctuations. The main objective of the study is to examine trends in area, production and productivity in major pepper-producing states and monthly price variations of pepper in India. The study is based on Secondary data which have been gathered from various sources such as the Spices Board of India, different research articles, websites and current news. The study relies on time series data. The data on area, production, productivity and monthly average price of pepper have been collected from the Spices Board of India. To study the behaviour of prices of pepper in different months, a seasonal effect was constructed. Seasonal Effect helps to find out, during which season or month the price is high and favourable to the sellers. For constructing the Seasonal Effect index, the month-wise average price has been used and the seasonal effect is computed by simple average method. To study the interrelationship between the price of pepper with its production and different months correlation technique was employed. Regression analysis was being undertaken to know the present and future price trends of pepper. The time-series analysis of the monthly average prices of pepper was attempted from 2018-19 to 2022-23. Hence, in the present study, a special focus is given to the current trends in area, production and productivity of pepper, the seasonal effect of price and also the impact of the production of pepper on its prices to understand reasons for price fluctuations. The main objective of the study is to examine trends in area, production and productivity in major pepper-producing states and monthly price variations of pepper in India.

4. Results and Discussions

Pepper is considered to have originated in the hills of the Western Ghats of India. It is now extensively grown

in three major states of India namely Karnataka, Kerala and Tamil Nadu. However, in all the states pepper is cultivated as a subsidiary crop along with areca nut, coconut, coffee, rubber and other plantation crops. India was one of the leading producers, exporters and consumers of black pepper till the nineties when Vietnam became the largest producer (Parthasarathy *et al.*, 2008). Its share of India in the World's Production of pepper was 9.24 per cent in 2020 while the area under cultivation being was 22.06 per cent.

Table 1 presents the state-wise area, production and productivity of pepper from 2018-19 to 2022-23. The data indicates that Karnataka had the highest area under pepper during 2018-19 with 148379 hectares which had significantly increased to 211497 hectares during 2020-21. The data reveals that the growers in Kerala state had 82761 hectares of area under pepper cultivation, which fell to 76351 hectares during 2021-22. Since pepper is the most traded spice in Kerala and a significant foreign exchange earner for the state exchequer, the downward trend in production caused by a decline in the area is extremely concerning and has substantial financial implications for the state of Kerala (Paul, 2023). The data shows that there was no significant increase in the area under pepper cultivation in Tamil Nadu. The data on area and yield in major pepper-growing states in recent years reveal that post-COVID-19 had affected the yield despite the increase in the area especially in Kerala. The recent inclement weather conditions and acute water scarcity are also other factors responsible for this downtrend in the yield.

4.1 Trends in Production

The data reveals that Karnataka is the major producer of pepper in all the studied years. The production was 21000 tons in 2018-19 which increased to 39000 tons in 2021-22 and there was a slight decrease to 36000 tons during 2022-23 (Table 1). High prices coupled with good cultivation practices, favourable weather situations and fewer incidences of pests and diseases often lead to higher production levels (Abirami *et al.*, 2018). However, as far as the yield is concerned Tamil Nadu has the highest yield of pepper with 0.33 compared to Kerala with 0.26 and Karnataka with 0.20

per hectare during 2022-23. The data reveal that the yield of pepper in Tamil Nadu has been constantly increasing despite no significant increase in the area under cultivation. Hence, proper measures must be taken either to increase the productivity of pepper or to cultivate alternative crops instead of pepper in Kerala and Karnataka.

The average price of pepper has been decreasing over the years. Table 2 presents data on the month-wise average price of pepper (April to March) in India

between 2018-19 and 2022-23. The data reveals that the price is high from November to March as the seasonal effect is more than one and low from April to October as the seasonal effect is less than one. The study showed that the price of pepper is more favourable from November to March as the seasonal effect is more than one and less favourable to the growers from April to October as the seasonal effect is less than one. This type of seasonal price variation would affect small and marginal farmers who always sell their produce immediately after the harvest to meet

Table 1. Area, production and productivity of pepper in major states

State	(Area in Hectare, production in Tons)	Year				
		2018-19	2019-20	2020-21	2021-22	2022-23
Karnataka	Area	148379	160770	211497	190000	180000
	Production	21000	30000	36000	39000	36000
	Yield	0.14	0.18	0.17	0.20	0.20
Kerala	Area	82761	83770	82124	76351	82000
	Production	17000	20000	22000	21000	21000
	Yield	0.20	0.23	0.26	0.27	0.26
Tamil Nadu	Area	5571	6080	6576	6973	6098
	Production	3000	3000	1750	2000	2000
	Yield	0.53	0.49	0.26	0.29	0.33
India	Area	244209	259148	309335	283962	278050
	Production	48000	61000	65000	70000	64000
	Yield	0.19	0.23	0.21	0.25	0.23

Source: Spices Board of India (2021)

Table 2. Month-wise seasonal effect of black pepper price in India

Months	Year						Seasonal effect
	2018-19	2019-20	2020-21	2021-22	2022-23	5 Years Total	
April	387.54	352.87	330.23	402.09	534.86	2007.59	0.98307385
May	384.5	366.57	327.64	396.84	523.85	1999.4	0.97906338
June	377.54	366.5	334	421.26	508.95	2008.25	0.98339704
July	352.46	355.11	324.68	418.92	509.48	1960.65	0.96008834
August	379.52	354.72	335.33	415.78	516.88	2002.23	0.98044917
September	400.73	346.65	344.62	418.45	517.88	2028.33	0.99322979
October	393.45	331.64	341.64	440.52	509.91	2017.16	0.98776008
November	394.36	339.07	348	515.54	503.61	2100.58	1.02860906
December	386.96	354	353.76	536.38	513.51	2144.61	1.05016961
January	371.38	343.14	346.11	510.5	513	2084.13	1.02055385
February	363.58	333.37	346.67	518.14	508.33	2070.09	1.01367876
March	346.52	321.26	375.04	531.95	508.08	2082.85	1.01992706
Total	4538.54	4164.9	4107.72	5526.37	6168.34	24505.87	12

Source: Spices Board of India (2021)

their financial commitments, especially crop loans. Hence, there should be institutional support from the government to support such growers which would help them to retain their produce until the market price hikes and also to stabilise the market throughout the year. Proper awareness of farmers on post-harvest handling and the value addition of pepper also can help them to realise better income from the crop (Rageena, 2016).

The time-series analysis of the monthly average prices of pepper was attempted from 2018-19 to 2022-23. The result and figure indicate that there is a strong positive correlation between the prices of pepper and different months.

Table 3 shows the linear regression analysis for the independent variable of Price. The results show the contribution as:

Pepper Price: = 393.891, 2.237 (month).

The regression coefficient for the month (2.237) reveals that the month significantly contributes to

the growth and instability of pepper prices in the market.

The R^2 value of the regression coefficient is 0.517, which is significant at the 0.01 level. This supports the assumption that the combined contribution of independent variables for dependent variables is significant, as well as the substantial effect on the price of the product at every step in the market. The R^2 value further also states that there are extraneous factors that affect the price of the product such as variation in the quality and the quantity of the product, customer satisfaction etc. The t-value suggests that there is a significant difference between the month and the price. The obtained correlation value is $r = 0.517$, which indicates that there is a strong positive relationship between two variables, i.e., between price and different months.

The obtained Regression equation of Y on X is $Y = 393.891 + 0.753X$. This regression equation indicates that there is a positive relationship between X and Y. As shown in Figure 1, a unit change in X brings about

Table 3. Multiple regression analysis for the independent variables on pepper price

Independent variables	Constant	Beta	B	SE	t-value	R2	F
Month	393.891	.753	2.237	.613	7.33326	.571	13.307

Significant level 0.001 level
Source: SPSS output

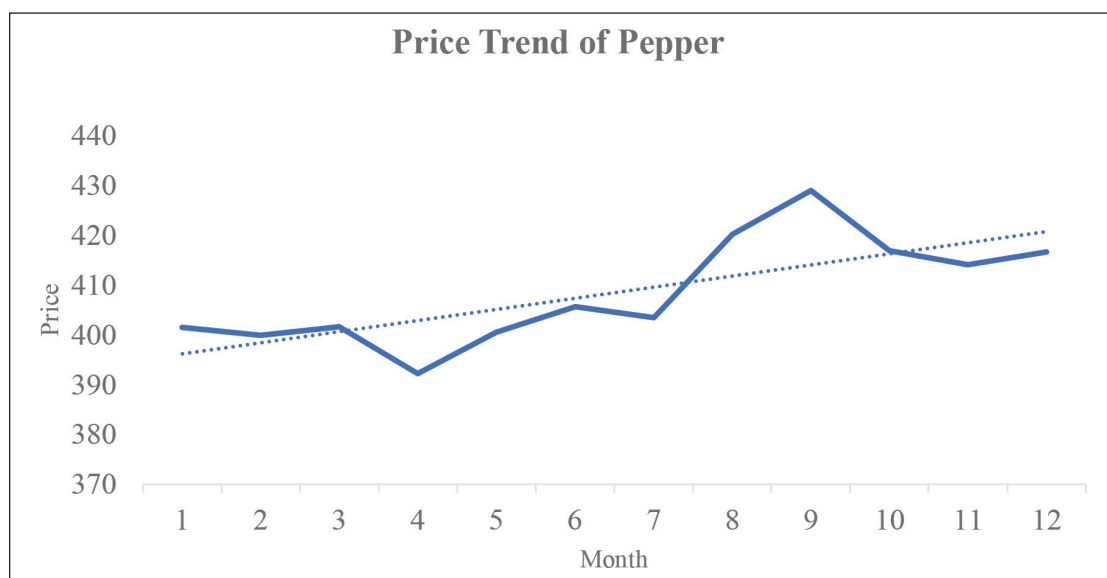


Figure 1. Price trends of pepper.

a change in Y in the same direction to the tune of 0.753 units.

To analyse the association between the production and price of pepper, a correlation technique has been used. The obtained correlation value is $r = 0.36$, which indicates that there is a weak positive relationship between two variables i.e., between price and production of pepper. The data and correlation result indicate that price has not affected much on production of pepper. Therefore, the growers instead of increasing the area and output should adopt proper marketing strategies to avail the benefits of price hikes.

5. Conclusion and Implications of the Study

The study revealed that Karnataka is the major producer of pepper in all the studied years. However, productivity has fallen due to a significant increase in the area under cultivation of pepper. Whereas the yield of pepper in Tamil Nadu has been constant despite no significant increase in the area under cultivation. Therefore, the reasons must be traced for a significant increase in the area under cultivation of pepper in Karnataka.

The study showed that the price of pepper is more favourable from November to March as the seasonal effect is more than one and less favourable to the growers from April to October as the seasonal effect is less than one. This type of seasonal price variation would affect small and marginal farmers who always sell their produce immediately after the harvest. Hence, there should be institutional support from the government to support such growers and also to stabilise the price throughout the year. Proper awareness of farmers on post-harvest handling and the value addition of pepper also can help them to realise better income from the crop (Rageena, 2016).

The study revealed that there is a strong positive correlation between the prices of pepper and different months. The regression coefficient reveals that month significantly contributes to the growth and instability in pepper prices in the market. The R^2 value of the

regression coefficient supports the assumption that the combined contribution of the independent variable for dependent variables is significant, as well as the substantial effect on the price of the product at every step in the market. The R^2 value further also states that there are extraneous factors that affect the price of the product such as variation in the quality and the quantity of the product, customer satisfaction, etc.

The findings provide guidelines to the Government while importing poor-quality pepper from neighbouring countries. Systematic mechanisms with the help of modern technology should be evolved to check the quality of pepper. The government has already fixed Rs 500 as the minimum import duty on pepper. Hence, it must strictly adhere to the import duty during the time of importation. Suitable price stabilisation policies need to be implemented to safeguard the producers of black pepper in India from price fluctuations resulting from the liberalisation of international trade in agricultural commodities (Sabu *et al.*, 2016).

The study findings are important to policymakers for bringing required reforms in the marketing mechanism. Database networks for the entire country and each block should be developed to enable the flow of produce to the point of demand, avoiding any speculations in prices. The trading activities of private traders of pepper must be based on certain ethics. Region-wise Producer and Trader Associations must be established to provide certain guidelines to both farmers and private traders under the guidance of some leading growers and traders. Moreover, the privately owned business houses must come up to bolster the growers, especially small and medium growers of black pepper. Processing units should be developed for the wide expansion of value-added products of pepper.

Though Pepper is popularly known as black gold, it does not provide values of gold to its cultivators because of several persisting problems. Market imperfections, illegal imports, ineffective implementation of minimum import duty, lack of institutional support etc are some of the problems faced by pepper growers. In this context, the study has focused on trends in area, production and yield of pepper and also the seasonal effect of price to

diagnose reasons for price fluctuations. However, the present study has not focused on the relative effects of production, yield and price variation on the grower of pepper. Studies could also be undertaken on the impact of minimum import price and introduction of minimum support price to stabilise the pepper market and livelihood of the growers.

6. References

- Abirami, V., & Venkatesan. (2018). A study of black pepper exports and the challenges faced by the merchant exporters in Coimbatore. *Journal of Emerging Technologies & Innovation Research*, 5(10). <https://www.jetir.org/papers/JETIR1810769.pdf>
- Desai, V.V. (1977). Indian Agricultural prices. *Southern Economic Review*, 2 & 3: 121-153.
- Hema, M., Kumar, R., & Singh, N. P. (2007). Volatile price and declining profitability of black pepper in India: Disquieting future. *Agricultural Economics Research Review*, 20, 61-76.
- Kahlon, A. S., & Singh, K. (1980). *Economics of farm management in India: Theory and practice*. New Delhi: Allied Publishers.
- Korah, G., & Kumar, D. S. M. (2021). Black pepper price and its determinants: A panel data analysis using different estimators. *The Journal of Contemporary Issues in Business and Government*, 27(3), 382-387. <https://cibgp.com/au/index.php/1323-6903/article/view/1611>
- Koshta, A. K., Rajput, A. M., & Karanjkar, S. V. (1990). Agricultural price policy and development of agriculture in Madhya Pradesh. *Journal of Agricultural Issues*. 1(2), 55-60.
- Parthasarathy, V. A. (2008). Black pepper research for future. In K. S. Krishnamurthy, D. Prasath, K. Kandiannan, R. S. Bhal, K. V. Sajl, & V. A. Parthasarathy (Eds.), *National Seminar on Piperaceae - Harnessing Agro-technologies for Accelerated Production of Economically Important Piper Species*. Indian Institute of Spices Research, Calicut.
- Paul, R. (2023). Analysis of area, production, productivity and export of black pepper with special reference to Kerala. *The Pharma Innovation*, 12(8):1931-1935. <https://doi.org/10.9734/ajaees/2022/v40i330852>
- Rageena, S. (2016). Economic analysis of black pepper cultivation in Kerala. *International Journal of Science and Research*, 5(2): 594-96. <https://doi.org/10.21275/v5i2.NOV161057>
- Sabu, S. S., & Kuruvila, A. (2016). Price instability in black pepper: A comparative analysis of preliberalisation and post-liberalisation periods. *Journal of Tropical Agriculture*, 54(1), 41.
- Spices Board (Ministry of Commerce and Industry, Government of India). (2021). http://www.indianspices.com/admin/international_weekly_price/upload/MONTHLY%20DOMESTIC%202020-2021%20August.pdf
- Spices Board (Ministry of Commerce and Industry, Government of India). (2021). <http://www.indianspices.com/monthly-price-domestic.html>.
- Subha, S. P., & Balamurugan, S. (2020). Economic analysis of pepper cultivation in India. *SSRG International Journal of Economics and Management Studies*. <https://www.internationaljournalsrg.org/uploads/specialissuepdf/ICIMCEH-2020/2020/EMS/P101.pdf>
- Thippaiah P., & Deshpande, R. S. (1998). Analysis of market infrastructure, prices and terms of trade: A case study of Karnataka. *Indian Journal of Agricultural Economics*, 53(3): 359-369.
- Yadava, C. G., Chandrarekha, C., Santhosha, K. M., Gagana, M. D., & Pushpa, P. (2022). Economic assessment of black pepper under hilly zone multi-storied ecosystem of Karnataka, India. *International Journal of Environment and Climate Change*, 12(12), 849-855. <https://doi.org/10.9734/ijec/2022/v12i121523>
- Yogesh, M.S. (2017). Management of black pepper economy in Kodagu District of Karnataka, India. *International Journal of Current Microbiology and Applied Sciences*, 6(4): 1124-1131. <https://doi.org/10.20546/ijcmas.2017.604.139>