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Full Length Research Article

Minimum Support Price and Its Effect on Area, Production and Productivity of Gram in India

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Abstract

Gram, also known as *Cicer arietinum* L., is an important pulse crop in India, the world's largest producer and consumer of Gram. This study aims to analyze the trends, determine percentage changes and compound annual growth for MSP, cultivation area, production, and productivity of Gram, while also exploring the relationship between MSP and these factors. The study finds that the MSP for gram has shown a significant increase over the years, while the area under cultivation of gram has shown a decreasing trend. Interestingly, the production of gram has not seen a significant decline despite the decreasing trend in the area under cultivation. the CAGR of Gram's MSP increased significantly by 8.2%, while its area under cultivation (2.0%), production (3.2%), and productivity (1.2%) grew at a relatively slow to moderate pace, as per the study. Additionally, Higher MSP is positively correlated with higher area, production, and productivity of gram, as evidenced by the Spearman correlation coefficients of 0.78, 0.85, and 0.82, respectively. The results of this study will inform policy decisions and aid in the development of strategies for sustainable and profitable cultivation of gram in the country, thereby contributing to the goal of achieving food security and addressing malnutrition.

***Key words*:** *Cicer arietinum* L., Minimum Support Price, Correlation, Area, Production, Productivity

The agriculture sector serves as the main source of livelihood for 58 percent of India's population [1]. Due to decrease in agricultural and related rural employment, farmers are exploring alternative business opportunities [2]. The agricultural sector is no longer limited to just producers and consumers, as numerous stakeholders are now involved in the industry and contributing to job creation [3]. Increasing global population is leading to decline the availability of good quality food [4]. The Government of India has taken various initiatives in agricultural marketing. On 14th April, 2016, the Indian government took a significant step in the agricultural marketing by introducing E-NAM (electronic national agriculture market) for electronic trading of agricultural commodities [5]. E-NAM allows traders from any state to participate in the purchase of agricultural commodity from any state in India. Even the agricultural commodity markets also play a critical role in ensuring that prices for agricultural commodities are fair and transparent, providing a stable environment for farmers to operate in and helping to promote global food security [6].

Gram, also known as Chickpea, is an important pulse crop in India, with a long history of cultivation dating back to ancient times. It is a rich source of protein, fiber, and other nutrients and plays a crucial role in providing food security and income for farmers. As per the Ministry of Agriculture & Farmers Welfare, the total production of gram in India for the crop year 202-21 was 11.62 million tons, with a cultivation area of 10.72 million hectares and a yield of 1085 kg per hectare [7]. the top leading states in gram production in India for the year 2019-20 were Madhya Pradesh, Rajasthan, Maharashtra, and Uttar Pradesh [8]. The Minimum Support Price (MSP) scheme has been implemented by the Indian government for several crops, including gram, to ensure a fair price to farmers for their produce. The MSP for gram has been steadily increasing over the years and was fixed at Rs. 5,550 per quintal for the crop year 2022-23, up from Rs. 5,100 per quintal in the previous year [9]. The impact of MSP on the area under cultivation, production, and productivity of gram in India is an important area of research, given the significance of the crop for farmers' livelihoods and food security.

According to a study by Ritu *et al*. [10], while the impact of Minimum Support Price (MSP) on the area under cultivation of bajra and barley is higher, there is no significant impact on the productivity of food crops. The research also found that the minimum support prices of food crops in the previous year significantly influenced the area under cultivation, but there was no significant variation in productivity. Another study conducted by Ali *et al*. [11] revealed that while the MSP policy for rice has shown remarkable effectiveness in surplus-producing states such as Punjab and Andhra Pradesh, it has not been as successful in states facing a deficit. Punjab, with its

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efficient implementation of the price policy, has experienced significant improvements in rice production and productivity. However, there is a lack of research on conducting a trend analysis, calculating the percentage change, compound annual growth rate (CAGR) of MSP, area under cultivation, production, and productivity of Gram, and exploring the correlation between MSP and these factors.

This research paper aims to analyze the trend and percentage change in the Minimum Support Price (MSP), area under cultivation, production, and productivity of gram in India. It will use Compound Annual Growth Rate (CAGR) and correlation analysis to explore the association between MSP and these variables. The study findings will provide valuable insights into the effectiveness of MSP policy in promoting gram cultivation and can help policymakers in developing strategies to improve the livelihoods of farmers and ensure food security. The paper will use data from various sources, including Ministry of Agriculture and Farmers' Welfare, the Commission on Agriculture Costs and Prices (CACP), The associated chambers of commerce and industry of India, Government of India and Reserve Bank of India, Agricultural and Processed Food Products Export Development Authority, Government of India and other accessible government websites and scholarly articles.

Objectives of study:

- To analyze the trend and percentage change in minimum support price, area under cultivation, production, and productivity of Gram in India.
- To compute the compound annual growth rate (CAGR) of minimum support price, area under cultivation, production and productivity of Gram in India.
- To study the association of Minimum Support Price (MSP) on area, production and productivity of Gram in India.

MATERIALS AND METHODS

The present study utilized a quantitative research method to conduct a trend analysis, calculate the percentage change, compound annual growth rate (CAGR) of MSP, area under cultivation, production, and productivity of Gram, and explore the association between MSP and these variables. The research methodology comprised three main components: selection of crops, data collection, and analysis tools and techniques. The selection of crops is the first step in any agricultural study. In this study, Gram crop has been chosen, and the time-series data of MSP, area under cultivation, production, and productivity have been analyzed. The study aims to conduct a trend analysis, calculate the percentage change, compound annual growth rate (CAGR) of MSP, area under cultivation, production, and productivity of Gram, and explore the association between MSP and these variables. The data collection for the study has been done from secondary sources such as Ministry of Agriculture and Farmers' Welfare, the Commission on Agriculture Costs and Prices (CACP), The associated chambers of commerce and industry of India, Government of India and Reserve Bank of India, Agricultural and Processed Food Products Export Development Authority, Government of India and other accessible government websites and scholarly articles. The data collected covers the period of 1996-97 to 2018-19, and the data is based on published reports and surveys.

The analysis tools and techniques used in the study include percentage change, Compound Annual Growth Rate (CAGR), and correlation analysis. The percentage change method has been used to study the percentage change in MSP, area under cultivation, production, and productivity of Gram from 1996-97 to 2018-19. This method indicates the increase or decrease in the value of a variable when compared to its previous year. The Compound Annual Growth Rate (CAGR) method has been used to calculate the annual average percentage increase in MSP, area under cultivation, production, and productivity for Gram crop in India from 1996-97 to 2018-19. This method assumes exponential growth and helps in determining the average rate of revenue growth between two time periods. The correlation analysis method has been used to determine the relationship between MSP and area under cultivation, production, and productivity of Gram. This method is a statistical tool for calculating the relationship between two variables and measuring the strength of their linear relationship. It helps to determine how much one variable changes as a result of the change in the other. In summary, the research methodology used in the present study involves the selection of Gram crop and the collection of time series data from secondary sources.

RESULTS AND DISCUSSION

The table shows a trend analysis of the Minimum Support Price (MSP), area under cultivation, production, and productivity of gram from 1997-98 to 2018-19. The MSP for gram has shown a significant increase over the years, with the highest growth seen from 2008 to 2010, which could be attributed to the launch of The National Food Security Mission (NFSM) by the Ministry of Agriculture and Farmers Welfare, Government of India, which boosted efforts on activities on pulses. The hike in MSP is based on the recommendations of the Commission for Agricultural Costs and Prices [12]. However, the area under cultivation of gram has shown a decreasing trend over the years, with a significant decline seen after 2011-12. This could be due to several factors, including untimely rain and the shift in farmers' preferences towards more remunerative crops like commercial vegetables or cereals [13]. Additionally, farmers in drought-prone areas have switched from cultivating gram to tobacco crops, leading to a decrease in the area under cultivation of gram [14].

Interestingly, the production of gram has not seen a significant decline despite the decreasing trend in the area under cultivation. This could be due to the increasing productivity of gram, which has shown a gradual increase over the years, with the highest productivity seen in 2012-2013. However, in recent years, the productivity of gram has shown a decreasing trend, which could be attributed to the impact of climate change on agricultural production. Overall, the trend analysis of the MSP, area under cultivation, production, and productivity of gram highlights the complex nature of the factors that influence agricultural production in India. While the MSP has been an important factor in boosting production, the impact of climate change, farmer preferences, and other external factors cannot be ignored.

Based on the data presented in (Fig 2), we can see that there have been fluctuations in the percentage change in Minimum Support Price (MSP), Area Under Production, Production, and Productivity of Gram (a type of legume) over the years from 1997-98 to 2018-19. In terms of MSP, there was a continuous increase from 1997-98 to 1999-2000, followed by a slight decrease in 2000-2001, and then another increase until 2010-11. The largest increase in MSP occurred in 2011-2012 with a percentage change of 33.33%. After that, there were smaller increases until 2017-18, with a slight decrease of 5% in 2018-2019.

The area under production showed a similar trend, with a continuous increase from 1997-98 to 1999-2000, followed by

a significant decrease in 1999-2000. After that, there was an increase in 2001-2002, a decrease in 2002-2003, and then a fluctuation until 2017-18. However, there was a decrease of 9.6% in 2018-2019. Regarding production, there was a continuous increase from 1997-98 to 1999-2000, followed by a

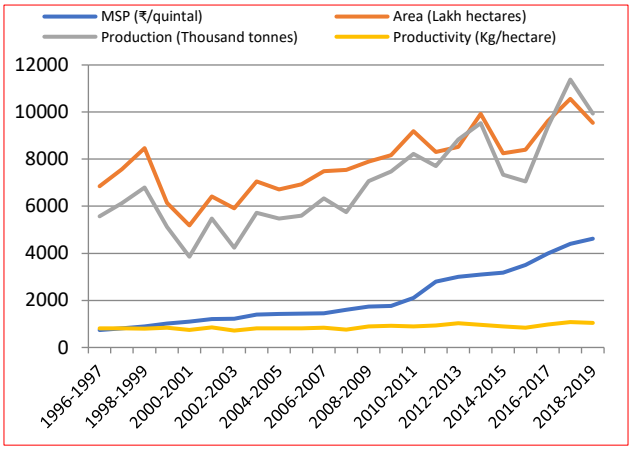

Fig 1 Trend analysis of MSP, Area under cultivation, production and productivity of Gram from 1997-98 to 2018-19

Productivity showed a fluctuating trend, with a slight decrease in 1997-98, followed by an increase in 1999-2000, and then a significant decrease in 2000-2001. There was a fluctuation until 2008-2009, with a significant increase in 2009-2010. After that, there was a fluctuation until 2017-18, with a slight decrease in 2018-2019. Overall, the results suggest that there have been fluctuations in the production and productivity of Gram, which may have been influenced by various factors such as weather conditions, pest attacks, and government policies. The increase in MSP may have contributed to the increase in production and productivity in some years, while the decrease in area under production may have been influenced by various factors, including crop diversification, land-use change, and shifting agricultural practices. Further research is needed to identify the underlying causes of these fluctuations and to develop appropriate strategies to improve the production and productivity of Gram.

Compound annual growth rate (CAGR) of minimum support price, area under cultivation, production and productivity of Gram in India

Data depicted in (Table 1) presents the Compound Annual Growth Rate (CAGR) and standard error for MSP, Area under Cultivation, Production, and Productivity of Gram. The CAGR for MSP is 8.2%, which indicates a significant increase in the MSP for Gram over the study period. The CAGR for area under cultivation is 2.0%, which indicates a relatively slow growth in the area under cultivation of Gram. The CAGR for production is 3.2%, which indicates moderate growth in the production of Gram. The CAGR for productivity is 1.2%, which indicates a relatively slow growth in the productivity of Gram. The standard errors for all the variables are relatively small, indicating that the CAGR estimates are reliable.

Table 1 CAGR of MSP, area under cultivation, production and productivity of Gram

Particulars	CAGR	Standard error
MSP	8.2**	0.003
Area under cultivation	2.0**	0.003
Production	3.2**	0.005
Productivity	1.2**	0.002

Tthe results are significant at 5 percent level of significance and 95% level of confidence

significant decrease in 1999-2000. There was a slight increase in 2001-2002, followed by a decrease until 2005-2006. After that, there was a fluctuation until 2010-11, with a significant increase in 2011-2012. However, there was a decrease of 12.67% in 2018-2019.

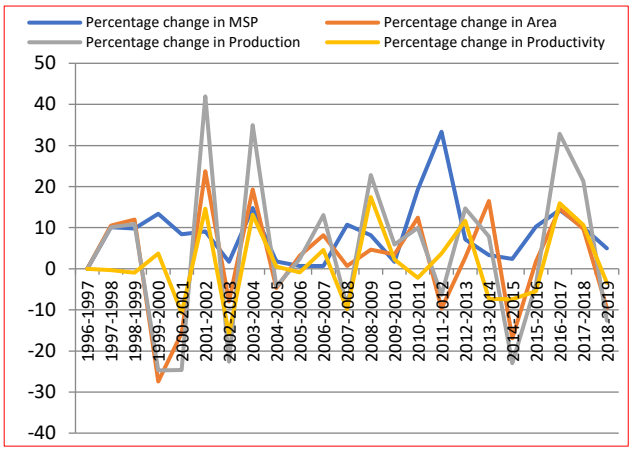

Fig 2 Percentage change in MSP, area under production, production and productivity of Gram from 1997-98 to 2018-19

Overall, the results suggest that the MSP for Gram has increased at a faster rate compared to the other variables, which may have incentivized farmers to increase the cultivation of Gram. However, the slow growth in area under cultivation and productivity indicates that there may be other factors that are limiting the growth of Gram cultivation and productivity. These factors could include issues related to access to credit and markets, soil health, and pest control measures. The moderate growth in production may be due to improvements in agricultural practices or technology adoption. Nevertheless, the slow growth in productivity may be a concern for policymakers, as it indicates that the increase in production is not being accompanied by a proportional increase in output per unit of land. This could result in unsustainable agricultural practices and have adverse impacts on the environment and the livelihoods of farmers. Therefore, policymakers should adopt a comprehensive approach that addresses multiple factors that influence the growth of Gram cultivation and productivity, such as access to credit and markets, soil health, and pest control measures. Such an approach can help to improve the overall sustainability of agriculture and the livelihoods of farmers.

Table 2 Correlation analysis between MSP-area, MSP-production, and MSP-productivity

Spearman correlation	MSP-Area	MSP-Production	MSP-Yield
Gram	0.7879	0.8584	0.8228

The correlation analysis in (Table 2) shows that there is a strong positive association between MSP and area, production, and productivity of Gram in India. The Spearman correlation coefficient for MSP-area, MSP-production, and MSP-productivity for Gram are 0.7879, 0.8584, and 0.8228, respectively. These results suggest that higher MSP is associated with higher area, production, and productivity of Gram. The findings of this study provide important insights into the impact of MSP on the cultivation of Gram in India. The positive correlation between MSP and area indicates that farmers are more likely to cultivate Gram when the MSP is higher. This is because higher MSP provides farmers with a greater incentive to invest in the production of Gram. Similarly, the positive correlation between MSP and production suggests that higher MSP is associated with higher production of Gram,

as farmers are motivated to increase their production in response to higher prices. Moreover, the positive correlation between MSP and productivity of Gram indicates that higher MSP is associated with higher yields. This could be due to the fact that farmers are more likely to invest in inputs such as fertilizers and irrigation when the MSP is higher, which in turn increases productivity [15]. further research can be conducted to determine the underlying reasons for the observed associations.

CONCLUSION

The study's findings indicate that there has been a significant increase in the MSP for gram over the years, as evidenced by trend analysis, while the area under cultivation has shown a decreasing trend. However, the production of gram has not seen a significant decline despite the decreasing trend in the area under cultivation. The study also found that the MSP, area under cultivation, production, and productivity of gram has fluctuated over the years, and the CAGR analysis showed that the MSP has increased significantly over the study period. the correlation analysis, suggest that the MSP policy has a positive impact on the area, production, and productivity of gram in India. The strong positive association between MSP and area, production, and productivity of Gram in India indicates that higher MSP is associated with higher area, production, and productivity of Gram. These results suggest that the MSP policy has played a significant role in encouraging farmers to cultivate Gram and improve their productivity. However, other factors such as climate change and farmers' preferences for more remunerative crops have also influenced the area under cultivation. Therefore, promoting sustainable agricultural practices and providing support to farmers to cultivate crops that are resilient to climate change and have a stable demand in the market are crucial for the growth and development of agriculture in India. Further research can be conducted to explore the causal relationship between MSP and the cultivation of Gram in India. In conclusion, this study highlights the significant role of MSP in influencing the cultivation, production, and productivity of Gram in India. The findings of this study could be useful for policymakers and stakeholders in making informed decisions regarding the pricing policies for Gram. However, it is important to note that this study only provides a correlation analysis, and further research is required to establish a causal relationship between MSP and Gram cultivation. Additionally, future studies can investigate the impact of other factors such as weather conditions, soil quality, and government policies on the cultivation of Gram in India. The need of the hour is to shift towards climate-smart agriculture by adopting technologies that are resilient to adverse weather conditions, cultivating crops and varieties that are less susceptible to climate-related challenges, and implementing policies that promote growth while maintaining environmental equilibrium to ensure the sustainability of our food security.

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