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Full Length Research Article

Analyzing the Impact of Minimum Support Price Policy on Area, Production and Productivity of Finger Millet (Ragi) in India: A Comprehensive Analysis of Trends, CAGR and Associations

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Abstract

Finger Millet, a nutritious millet crop grown primarily in Karnataka, Tamil Nadu and Andhra Pradesh is an important staple food for smallholder farmers in India. Despite its significance, the crop has often been overlooked in policy decisions, leading to unstable yields and market prices. In recent years, the government has increased the minimum support price (MSP) for finger millet from ₹360 per quintal in 1997-98 to ₹3578 per quintal in 2022-23 to address this issue. This study uses statistical tools and secondary data to analyze the association between MSP and the area under cultivation, production, and productivity of finger millet in India. The MSP has steadily increased over the years, while the area under cultivation and production have shown fluctuations. The productivity, however, has consistently remained above 1,000 kg per hectare. The compound annual growth rate (CAGR) of MSP for finger millet has been increasing significantly (9.4%), while the area under cultivation and production have been decreasing at an average annual rate of 2.65% and 1.76% respectively. The study also reveals a strong negative correlation between MSP and the area under Finger Millet cultivation (-0.84.,) a moderate negative correlation between MSP and finger millet production (-0.56), and a weak positive correlation between MSP and finger millet productivity (0.28).

***Key words*:** Finger millet, Minimum support price, Correlation, area, Production, Productivity

Agriculture is a crucial component of India's economy, contributing significantly to the nation's Gross Domestic Product (GDP) and providing employment opportunities to a substantial proportion of the population. According to NITI Aayog, in the fiscal year 2019-20, agriculture accounted for 18.29% of India's GDP and provided employment to 45.6% of the workforce. India holds 2.3 percent of the world's land and 4.2 percent of the world's freshwater resources [1]. The sector's growth is influenced by various factors, such as changing climatic conditions, the use of modern agricultural inputs, access to sufficient markets, and adequate infrastructure facilities [2]. Agriculture is not only providing employment opportunities but also promoting economic growth in various regions. For centuries, millets have formed an essential part of our diet, and they offer numerous health benefits. Additionally, millets have a positive impact on the environment since they require low water and inputs. To promote awareness and encourage increased production and consumption of millets, the United Nations, at the request of the Indian government, has designated 2023 as the International Year of Millets.

Finger Millet, also known as Ragi, is an important staple crop in many parts of India. It is known for its high nutritional value, especially its protein and fiber content. United Nations declared the Year 2023 as the International Year of Millets on 5th March 2021, on the proposal moved by India and supported by 72 countries. As per Assocham's report, India's Finger Millet cultivation area for the crop year 2021-22 is 1.01 million hectares, resulting in a total production of 1.67 million tons and a yield of 1747 kg per hectare. India is the world leader in the production of millets with a share of around 15% of the world total production. According to the Ministry of Agriculture and Farmers Welfare, India is the largest producer of Millets in the world, with 11.5 million tons of production [3].

The government of India has introduced various policies and schemes to ensure the welfare and progress of the farming community. One such policy is the Minimum Support Price (MSP), which aims to provide farmers with a fair price for their crops and protect them from market fluctuations. The policy is aimed at supporting the farmers in the procurement of essential inputs and ensuring a minimum profit margin for their produce.

Several previous studies have investigated the impact of MSP on different crops in India. According to Kumbhar [4], MSP has had a positive impact on the production and the cultivation area of crops such as rice, wheat, oilseeds, cotton,

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and sugarcane. However, the study did not find significant positive effects of MSP on the production and cultivation area of pulses, jute, and Mesta. Another study by Singh [5] found a positive correlation between MSP and paddy, soybean, and gram production, yield, and area under cultivation. However, MSP had a negative impact on arhar and jowar production and cultivation area. For maize, the MSP had a significant impact on area, production, and yield.

The MSP for finger millet has been announced by the Government of India every year, and it has been increasing steadily over the years. In 2022-23, the MSP for finger millet was increased by 5.95%, from Rs. 3,377 per quintal in the previous year to Rs. 3,578 per quintal (Ministry of Agriculture & Farmers Welfare, 2022). The increase in MSP has been expected to incentivize farmers to cultivate more Finger Millet, and to improve the productivity of the crop. Finger Millet is also a crop that is well-suited to the Indian climate, as it can thrive in both high and low rainfall areas, making it an important crop for small farmers [6]. However, despite its nutritional and economic importance, the area under Finger Millet cultivation in India has been declining over the past few decades, largely due to the lack of government support and low remuneration for farmers.

To address this issue, the Indian government has implemented the Minimum Support Price (MSP) scheme for Finger Millet cultivation, which guarantees a minimum price for the crop to farmers. This 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 Finger Millet, and explore the association between MSP and these variables. This research is important as it will contribute to the existing literature on the MSP policy's impact on finger millet cultivation in India. The findings of this study can provide insights into the trends and changes in the MSP, area under cultivation, production, and productivity of finger millet over time, as well as the association between MSP and these variables. This information can inform policymakers and help improve the livelihoods of farmers by providing a better understanding of the MSP scheme's effectiveness for Finger Millet cultivation in India.

Objectives of study:

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

MATERIALS AND METHODS

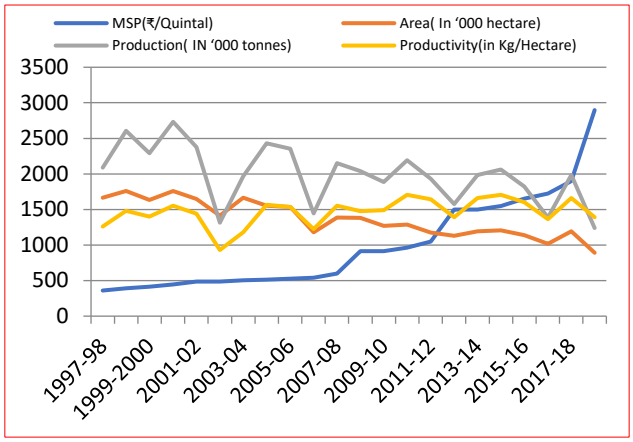
The present study utilized a quantitative research method to conduct a trend analysis, calculate the percentage change, compound annual growth rate (CAGR) of MSP, area under cultivation, production, and productivity of finger millet crop, and explore the association between MSP and these variables The 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, finger millet 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 finger millet, and explore the association between MSP and these variables. The data collection for the study has been done from secondary sources such as the 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. 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 finger millet 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 finger millet 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 finger millet. 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 finger millet crop and the collection of time series data from secondary sources. The analysis tools and techniques used in the study include percentage change, Compound Annual Growth Rate (CAGR), and correlation analysis to determine the relationship between MSP and area under cultivation, production, and productivity of Finger Millet.

RESULTS AND DISCUSSION

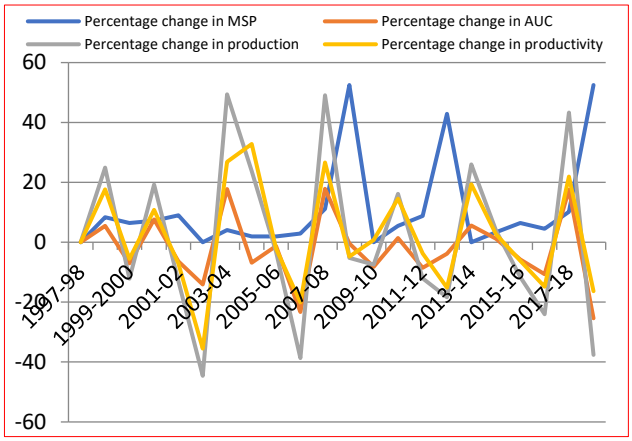
Looking at the (Fig 1), it can be observed that the Minimum Support Price (MSP) for finger millet has steadily increased over the years, from ₹360 per quintal in 1997-98 to ₹2897 per quintal in 2018-19. The area under cultivation has not shown a consistent trend, with fluctuations seen over the years, ranging from 891,000 hectares in 2018-19 to 1,759,000 hectares in 2000-01. Production of Finger Millet has also shown fluctuations, with a peak production of 2,732,000 tonnes in 2000-01 and a low of 1,239,000 tonnes in 2018-19. However, productivity, as measured in kilograms per hectare, has consistently remained above 1,000 kg per hectare, with a peak productivity of 1,705 kg per hectare in 2010-11.

The increase in MSP over the years indicates that the government is taking steps to support Finger Millet cultivation and ensure a fair price for the farmers. However, the fluctuating area under cultivation and production indicates that there are other factors at play that affect finger millet cultivation, such as weather conditions, availability of inputs, and market demand. The consistent productivity level indicates that there is scope for improving yield through better agricultural practices and technology. Further research can be done to identify the factors affecting finger millet cultivation and production and to suggest ways to improve productivity. The study can also be expanded to analyze the market demand for finger millet and explore ways to promote its consumption as a healthy and nutritious food option.



Source: Reserve Bank of India and Commission for Agricultural Costs and Prices

Fig 1 Trend analysis of minimum support price (MSP), area under cultivation, production and productivity of finger millet (Ragi) from 1997-98 to 2018-19



Source: Reserve Bank of India and Commission for Agricultural Costs and Prices

Fig 2 Percentage change in MSP, area under production, production and productivity of finger millet (Ragi)

The (Fig 2) shows the percentage change in MSP (Minimum Support Price), Area Under Production (AUC), production, and productivity of finger millet from 1997-98 to 2018-19. From the table, it can be observed that the MSP of finger millet has increased consistently over the years, with a particularly sharp increase of 52.47% in 2018-19. This indicates that the government has been providing better support to finger millet farmers by guaranteeing higher prices for their produce. The area under cultivation of finger millet has been quite volatile, with fluctuations ranging from -25.38% to 17.84%. The largest decrease in AUC occurred in 2018-19. This may be due to various reasons such as crop failure, unfavorable weather conditions, or farmers shifting to other crops.

The production of finger millet has also been volatile, with a few years of substantial increase or decrease. The largest increase occurred in 2003-04 and 2007-08, while the largest decrease was observed in 2002-03 and 2018-19. The productivity of Finger Millet has been quite volatile, with fluctuations ranging from -35.51% to 32.8%. The largest decrease in productivity occurred in 2002-03, while the largest increase was observed in 2004-05. Overall, the data shows that the MSP of Finger Millet has been consistently increasing, but the production and productivity have been volatile, with occasional years of substantial increase or decrease. The AUC has also been volatile, with some years of increase and others of decrease. This suggests that finger millet farming is subject to various factors, such as weather conditions, market demand, and government policies, which can impact its production and productivity [7].

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

Based on the results presented in (Table 1), it can be inferred that the Compound Annual Growth Rate (CAGR) of MSP for Finger Millet has been increasing significantly at a rate of 9.4% per annum. This result is statistically significant at the 5 percent level of significance and 95 percent level of confidence. It implies that the government and farmers have been successful in increasing the MSP of finger millet, which could encourage more farmers to cultivate Finger Millet in the future. However, the area under cultivation and production of Finger Millet have been decreasing at an average annual rate of 2.659% and 1.7685% respectively. Both these results are statistically significant at the 5 percent level of significance and 95 percent level of confidence, suggesting that finger millet cultivation has not been profitable for farmers, leading to a decline in cultivation and production.

Table 1 CAGR of MSP, area under cultivation, production and productivity of finger millet (Ragi)

Particulars	CAGR	Standard error
MSP	9.4**	0.005
Area under cultivation	-2.659	0.002
Production	-1.7685	0.006
Productivity	0.8838**	0.004

**Showing the results are significant at 5 percent level of significance and 95 percent level of confidence

On the other hand, there has been a slight improvement in productivity of Finger Millet, with a CAGR of 0.8838% per annum. This result is statistically significant at the 5 percent level of significance and 95 percent level of confidence. It suggests that farmers have been able to produce more finger millet per unit area of cultivation, which could be due to the adoption of better farming practices, improved technology, or other factors. Overall, the results indicate that while the MSP of finger millet has been increasing, the area under cultivation and production have been decreasing. This could be a cause of concern for the government as finger millet is an important crop for small and marginal farmers, especially in dryland areas. Therefore, policies should be formulated to encourage farmers to cultivate finger millet by providing them with better incentives, infrastructure, and access to credit. Additionally, efforts should be made to improve the productivity of finger millet through research and development, and extension services [8].

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

Spearman correlation	MSP-Area	MSP-Production	MSP-Yield
Finger millet (Ragi)	-0.84222	-0.56994	0.282224

The correlation analysis presented in (Table 2) provides insights into the relationship between MSP and the key variables of Finger Millet production, including area, production, and productivity. The analysis was conducted using Spearman's correlation coefficient, which is a non-parametric measure of correlation that assesses the strength and direction of the relationship between two variables. The results suggest a strong negative correlation between MSP and the area under finger millet cultivation, with a Spearman correlation coefficient of -0.84222. This implies that as the MSP of finger millet increases, there is a decrease in the area under cultivation of finger millet. This finding is consistent with the results

presented in (Table 2), which showed a declining trend in the area under cultivation of finger millet over the study period. The negative correlation between MSP and area under cultivation could be due to the fact that farmers may switch to other crops with higher MSPs or better market prices, leading to a decrease in the area under finger millet cultivation.

Similarly, the correlation analysis shows a moderate negative correlation between MSP and finger millet production, with a spearman correlation coefficient of -0.56994. This result suggests that as the MSP of finger millet increases, there is a decrease in finger millet production. This finding is also consistent with the results presented in (Table 2), which showed a declining trend in finger millet production over the study period. The negative correlation between MSP and production could be due to the fact that farmers may reduce the use of inputs or invest less in finger millet cultivation if they feel that the MSP is not adequate to cover their costs of production.

Finally, the correlation analysis reveals a weak positive correlation between MSP and finger millet productivity, with a spearman correlation coefficient of 0.282224. This result suggests that as the MSP of finger millet increases, there is a slight improvement in finger millet productivity. This finding is consistent with the results presented in Table 2, which showed a slight improvement in finger millet productivity over the study period. The positive correlation between MSP and productivity could be due to the fact that farmers may invest more in finger millet cultivation or adopt better farming practices if they feel that the MSP is adequate to cover their costs of production. Overall, the correlation analysis suggests that MSP has a significant impact on the area, production, and productivity of finger millet in India. The negative correlation between MSP and area and production underlines the need for policymakers to devise measures to improve the profitability of finger millet cultivation, especially for small and marginal farmers. The positive correlation between MSP and productivity suggests that an increase in MSP could motivate farmers to invest more in Finger Millet cultivation and improve their yields.

CONCLUSION

The findings of this research paper suggest that the Minimum Support Price (MSP) has had a mixed impact on the cultivation, production, and productivity of finger millet in India. While the MSP for finger millet has steadily increased over the years, the area under cultivation and production have shown fluctuations. The productivity, on the other hand, has consistently remained above 1,000 kg per hectare. The Compound Annual Growth Rate (CAGR) of MSP for Finger Millet has been increasing significantly, while the area under cultivation and production have been decreasing at an average annual rate. The study also reveals a strong negative correlation between MSP and the area under finger millet cultivation, a moderate negative correlation between MSP and finger millet production, and a weak positive correlation between MSP and finger millet productivity. These findings have important implications for policymakers and farmers in terms of promoting sustainable finger millet cultivation and enhancing the livelihoods of smallholder farmers. One implication is that the MSP policy may not be effective in increasing the area under cultivation and production of finger millet. Therefore, policymakers need to explore other strategies such as subsidies, research and development, and market interventions to incentivize finger millet cultivation among smallholder farmers. Additionally, there is a need to address the issue of market volatility and price instability of finger millet, which may discourage farmers from cultivating this crop. Further research could focus on analyzing the reasons behind the negative correlation between MSP and the area under cultivation and production of finger millet. This could involve qualitative research methods such as surveys and interviews to understand the perspectives and experiences of smallholder farmers on the MSP policy. Furthermore, future studies could also investigate the potential impact of other factors such as weather conditions, soil quality, and technological advancements on the cultivation, production, and productivity of finger millet in India. Overall, this research paper contributes to the existing literature on the detailed analysis of finger millet (Ragi) cultivation in India by studying the trends and percentage changes in Minimum Support Price (MSP), area under cultivation, production, and productivity. The study also aims to calculate the Compound Annual Growth Rate (CAGR) of MSP, area under cultivation, production, and productivity of finger millet in India. Additionally, the study explores the association between MSP and these variables to understand the relationship between MSP and finger millet cultivation in India.

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