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Decomposition Analysis of Millets Production in India

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Abstract: Millets are a diverse group of small-seeded grasses that are farmed all over the world as cereal crops or grains for human use and livestock. Millets are not utilized to their full potential despite their great nutritional value and ability to thrive in poor environments. Compared to wheat and rice, millets are higher in vitamins and minerals. In the present study, an attempt has been made to analyze the trend in the production of total millet crops in India for the period 1950-51 to 2023-24. India is the world's largest producer of millet, accounting for 43 per cent (13.5 million tons) of global production in 2024. With a total planted area of 12.88 million hectares, the country produced 17.24 million metric tons of millets with an average yield of roughly 1,262 kg per hectare. Over the past 60 years, the nation's annual per capita millet consumption has decreased dramatically, from 30.94 kg to just 3.87 kg.

When the entire period under study is considered (1950-50 to 2023-24), the compound growth of production and productivity is positive and significant. The area of millets experienced a negative but substantial growth rate. The decomposition analysis determined that the sole reason for the rise in millet production from 2005 to 2024 was the yield effect. To accommodate the anticipated rise in demand, it is imperative to enhance the productivity of millets through the implementation of enhanced technologies, such as hybrid millet cultivation and a variety of production methods, due to the finite supply of resources.

Keywords: Compound growth rate, decomposition analysis, Millets, production

INTRODUCTION

Millets are significant food staples and an ancient nutritional grain, especially in the poor, semi-arid tropics of Asia and Africa (Mahendra, 2012). They are primarily grown in a range of agro-ecological conditions, including plains, coastal hills, and even diverse soils with varying rainfall. In poor nations like India and Africa, where food and nutritional security are the main issues, millets are most popular. According to APEDA, the global millet production was estimated at 30.9 million tonne. With the highest global share of over 43 per cent, India is the world's top producer of millet, followed by Africa. According to Anbukkani et al. (2017), millet consumption has decreased by almost 1 per cent globally and is predicted to increase between 2019 and 2024. Due to supply and demand variables like urbanization, rising incomes, and government policies, millet's significance as a staple grain has decreased over the past 20 years in both India (Michaelraj and Shanmugam, 2013b) and globally (King, 2017). Instead of merely being consumed as a staple, more than 50 per cent of millet output is currently finding its way into other applications.

India leads in millet production, with 43 per cent (13.5 million tons) share of the global production in 2024. The nation produced 17.24 million metric tons of millets with an average yield of about 1,262 kg per hectare, with a total planted area of 12.88 million hectares (APEDA,

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2023). The largest percentage of land used for millets is in Rajasthan (36%), followed by Maharashtra (21.67%) and Karnataka (13.46%) on a national scale. The country's yearly per capita millet consumption has dropped significantly during the past 60 years, from 30.94 kg to just 3.87 kg. Recognizing millets' multifaceted importance, India declared 2018 the National Year of Millets and dubbed these crops "Nutri Cereals". The relevance of millets in nutritional security was also highlighted at the global level, as the United Nations adopted a resolution on March 5, 2021, declaring 2023 as the International Year of Millets. This resolution was backed by 72 countries (PIB, 2023). However, much work remains to be done to fully realize millet's potential for improving food and nutritional security. This paper analyzes the trend and growth in area, production and productivity of millets in India. It also analyzes the increase in millets production by decomposition analysis.

MATERIAL AND METHODS

The secondary data on area, production, and productivity were collected from the website of the Agricultural Statistics at a Glance, Directorate of Economics and Statistics, Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India. The data was collected from 1950-51 to 2023-24.

Compound Growth Rate (CGR): In the present study, the compound growth rate of area, production, and productivity for the millets in India was estimated to study the growth in area, production, and productivity. The compound growth rates were found to be very convenient for any comparison of growth between two periods and two crops. It seems more appreciable to analyze the movement of crops in terms of compound rather than linear growth rate (Dandekar, 1980). Hence the compound growth rates were computed for the millet crops in India. The compound growth rates are usually estimated by fitting a semi-log trend equation of the form.

$$\text{Log } Y_t = \alpha + t\,\beta t + \varepsilon \qquad (1)$$

Where, Y_t = Area, production and yield of selected major agricultural crops in years 't'

T = Year which takes value 1, 2,……,

α and β are the parameters to be estimated

ε = Random error term

Equation (1) was estimated using ordinary least squares (OLS) technique. The t-test was applied to test the significance of β. This equation is generally used on the consideration that change in agricultural output in a given year would depend upon the output in the preceding year (Nikam and Deosthali, 2004).

Decomposition Analysis

From 2004-05 to 2023-24, additive decomposition was implemented. In this method, the total change in production is decomposed into three effects i.e. area effect (% contribution of area), yield effect (% contribution of yield) and interaction effect (% contribution of interaction). The contribution of area is the part of production due to additional area with the base year average yield, the contribution of average yield is the part of production due to additional yield with base year area and the contribution of the interaction is the part of production jointly due to additional yield and additional area. This is elaborated as below:

Let P_o and P_n be production in base year and n^{th} year.

$$P_o = A_o . Y_o \qquad 1$$

$$P_n = A_n . Y_n$$

Where A_o, A_n represent area Y_o, Y_n represent yield for the base year and nth year, respectively. The base year and n^{th} year observations are triennium averages.

$$P_n - P_o = \Delta P$$

$$A_n - A_o = \Delta A$$

$$Y_n - Y_o = \Delta Y$$

From 1 and 2 we can write

$$P_o + \Delta P = (A_o + \Delta A)(Y_o + \Delta Y)$$

$$\Delta P = (A_o + \Delta A)(Y_o + \Delta Y) - P_o$$

$$= (A_o + \Delta A)(Y_o + \Delta Y) - A_o.Y_0$$

$$= (A_o.Y_0 + \Delta A Y_o + \Delta Y A_o + \Delta A \Delta Y - A_o.Y_0)$$

$$\Delta P = \Delta A Y_o + \Delta Y A_o + \Delta A \Delta Y$$

Consequently, the total shift in production is divided into three effects: the area effect, the yield effect, and the interaction effect. These are represented in terms of the percent change in production (ΔP), which results in a percentage that estimates the percentage contribution of productivity, area, and their interaction.

2 RESULTS AND DISCUSSION

Trend in Area, Production, and Productivity of Millets in India

The trends for the area, production, and productivity of millets in India depicted in Figure 1 highlight substantial changes over the past few decades. Since the early 1970s, there has been a consistent decline in the area under millet cultivation, with a notable drop from 2005-06 (29.06 million hectares) to 2023-24 (24.94 million hectares). In contrast, the yield of millets in India has more than doubled since 1966 (483 kg per hectare), reaching an average of 2283 kg per hectare in 2023-24. This increase suggests the adoption of improved farming practices and technologies. Even though the cultivation area has decreased,

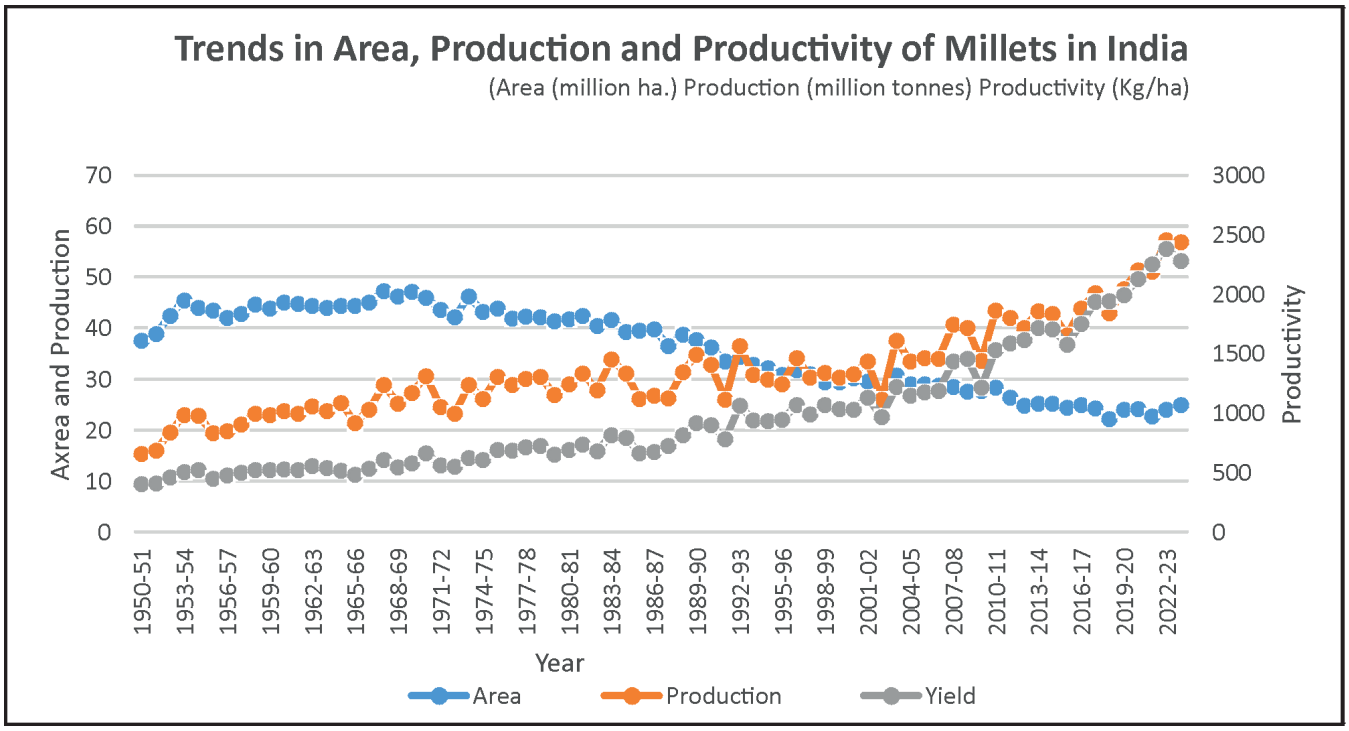

Figure 1: Trend in Area, Production and Yield of Millets in India

the rising yield levels have helped maintain a relatively stable production level over time, with some fluctuations, indicating efforts to sustain production levels or potential shifts in agricultural practices.

The compound growth rate of area, production, and productivity of millets was calculated and shown in Table 1.

The growth rate of area, production, and productivity was positive but non-significant during the pre-green revolution. During the post-green revolution, productivity was positive and significant while the growth in area is negative but significant. The production

Table 1: Compound Growth Rate of Area, Production and Productivity of Millets

	Area	*Production*	*Productivity*
1950-51 to 1964-65 (pre green revolution)	0.78^{NS} (0.0010)	2.75^{NS} (0.0023)	1.68^{NS} (0.0015)
1965-66 to 1994-95 (post green revolution)	-1.13** (0.0003)	0.80^{NS} (0.0009)	1.95** (0.00070
1995-96 to 2023-24 (post economic liberalization)	-1.11** (0.0003)	2.22** (0.0008)	3.37** (0.0006)
1950-51 to 2023-24	-1.00** (0.0002)	1.18** (0.0002)	2.22** (0.0002)

** significant at 5 percent
Figures in parentheses are standard errors

of millets was positive but non-significant. However, the compound growth rate of production and productivity was positive and significant during the post-economic liberalization, while the growth rate of area was negative but significant. When the entire period under study is considered (1950-50 to 2023-24), the compound growth of production and productivity is positive and significant. The growth rate of area of millets was negative but significant.

Area, Production, and Productivity of Millets in Major Growing States of India (TE 2023-24)

The state-wise break up of area, production and productivity of millets is presented in Table 2.

Table 2: Percentage share in area, production and productivity of millets among different states in India (TE 2023-24)

Sr. No.	*States*	*Area (Lakh ha)*	*Production (Lakh tonnes)*	*Productivity (Kg/ha)*
1	Rajasthan	47.75 (39.18)	48.09 (31.27)	1007
2	Maharashtra	20.82 (17.08)	17.15 (11.05)	824
3	Karnataka	14.25 (11.69)	17.49 (11.37)	1227
4	Uttar Pradesh	13.47 (11.05)	26.98 (17.54)	2003
5	Madhya Pradesh	6.40 (5.25)	12.68 (8.25)	1982
6	Haryana	5.90 (4.84)	11.94 (7.76)	2024
7	Tamil Nadu	4.69 (3.85)	11.94 (7.76)	1327
8	Gujarat	2.64 (2.17)	4.51 (2.93)	1707
9	Others	5.97 (4.90)	8.72 (5.67)	
10	India	121.88	153.79	1262

Note: Figure in the parentheses indicates the percentage share

Table 2 shows that Rajasthan, Maharashtra, Karnataka, Uttar Pradesh, and Madhya Pradesh occupied the top five positions in cultivated areas. Rajasthan also tops with 31.27 per cent of total millets production. But there is a slight change in the order of other states as far as production is concerned. Uttar Pradesh ranks second with 17.54 per cent of the total production followed by Karnataka (11.37 per cent), Maharashtra (11.05 percent) and Madhya Pradesh (8.25 per cent). Other states like Haryana, Tamil Nadu, and Gujarat are important millet-producing states. However, highest yield of millets was observed in Haryana (2024 kg/ha) followed by Uttar Pradesh (2003 kg/ha) and Gujarat (1707 kg/ha) during TE 2023-24.

Decomposition Analysis

To estimate the percentage contribution of area, yield and the interaction of area and yield in increasing production of millets, a decomposition analysis was carried out and presented in Table 3 for the three periods

i.e., 2005-2014, 2015-2024 and 2005-2024. The results are presented in Table 3.

Table 3: Decomposition analysis of area, productivity and their interaction

Year	*Area Effect*	*Yield Effect*	*Interaction Effect*
2005-2014	-48.71	163.68	-14.96
2015-2024	-11.86	115.40	-3.54
2005-2024	-32.30	159.15	-26.85

Table 3 shows that during 2005-2014, the area and interaction effect was negative, indicating the production increase was solely due to yield effect. The yield effect is very high accounting for 163.68 per cent. However, in the next period i.e., 2015-2024 registered negative area effect and interaction effect to the extent of -11.86 per cent and -3.54 per cent respectively, while the yield effect was highest (115.40 per cent). When the entire time period is considered (2005-2024), the area and the interaction effect was negative, indicating the production increase was solely due to yield effect. The yield component was found to be the driving force for the rise in millet production.

SUMMARY AND CONCLUSION

From the study, an increasing trend in area, production and productivity of millets is observed. However, the compound growth rate of production and productivity over six decades was positive and significant while area of millets was negative but significant. However, during different study periods, the compound growth rate of production and productivity was highest, positive, and significant during the post-economic liberalization. The increase in production was mainly due to adoption of high-yielding varieties of millets.

The major millet-growing states are Rajasthan, Maharashtra, Karnataka, Uttar Pradesh, and Madhya Pradesh. The decomposition analysis concluded that an increase in production of millets during the period 2005 – 2024 was only due to yield effect. Since the supply of resources is limited in nature, to meet the future increased demand, the productivity of millets should be boosted by adoption of improved technologies like hybrid millet cultivation and various techniques of production.

REFERENCES

Agricultural Statistics at a Glance (various issues) Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi.

Anbukkani, P., and Nithyashree, M. L. (2016). Production and Consumption of Minor Millets in India – A Structural Break Analysis. Indian Journal of Agricultural Economics, 71(3), 419.

Dandekar, V. M. (1980). Introduction to seminar on ndata and methodology for the study of growth rates in agriculture. Indian Journal of Agricultural Economics, 35(2): 1-12.

IIMR (2015). Vision 2050. Indian Institute of Millets Research, Hyderabad.

King Edio, 2017. Impact of Reduced drudgery of women in production and post-harvest processing of small millets, MSSRF Working paper. No. 9, Chennai.

Mahendra Dev, S. (2012). Small farmers in India: challenges and opportunities. Emerging Economics Research Dialogue, Beijing, China, pp. 14-15 November.

Michaelraj, P. S. J. and Shanmugam, A. (2013b). A study on millets based cultivation and consumption in India. International Journal of Marketing, Financial Services and Management Research, 2(4): 49-58.

Uma Gowri, M. and Prabhu, R. (2017). Millet Production and Its Scope for Revival in India with special reference to Tamil Nadu. International Journal of Farm Sciences 7(2): 88-93.