

# **A Study on Growth Performance and Instability in Area, Production and Productivity of Millets in India**

## **ABSTRACT**

The nutrient rich millet crops are cultivated in marginal and poor soil as rainfed crop in India. Millets are rich in proteins, and minerals like Zinc, Iron and Phytochemicals, because of its rich nutrient status it's called as Nutri-cereals. The market demand on millets is increasing day by day. So, this study focussed on the growth performance and instability in area, production and productivity. This study considered the period from 1990 to 2021. The secondary data like area, production and productivity were collected from various publications like APEDA, Agriculture Statistics Handbook and India Stat. Over the entire period the area, production and productivity showed a decreasing trend. The estimated CDVI (Cuddy-Della Valle Index) value revealed that the production of millets had high instability while the area had the lowest instability. Hence the government should create awareness among the farmers and consumers.

**Keywords: Area, Production, Productivity, Instability, Growth rate**

## **INTRODUCTION**

Millets are one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purposes. The United Nations General Assembly has declared the year 2023 as the International Year of Millets. Millets have been an integral part of staple food in the states of Odisha, Rajasthan, Madhya Pradesh, Jharkhand, Karnataka, and Uttarakhand and now it's getting popular in urban areas (M Uma Gowri and K.M. Shivakumar, 2020). Millets are grown in about 131 countries, and it is a traditional food for around 60 crore people in Asia and Africa (FAO, 2023). India, Nigeria, and China are the largest millet producers in the world. India accounts for about 33-37 per cent (Karuppasamy, 2015) of total millet production. During the year 2022, India is known to have exported 1,69,049.11 MT valued at Rs 608.12 crore (APEDA). The area under millet cultivation has decreased to 423 ha in 2021 from 2447 ha in 1990. Likewise, the production has also decreased from 375 tonnes in 2021 to 1190 tonnes in 1990. Major export destinations of millets include UAE, Saudi Arabia, Nepal, Bangladesh and Japan. The global area under millet cultivation has seen a decline of 25.7 per cent and it may be attributed to a lack of government policies and low farm

profitability (FAO, 2023). So, this study mainly estimates the growth performance and the variation in area of land cultivated for millet, production and productivity.

### Methodology

The assessment of the growth rate in area, production, and productivity of millets in India utilized the compound annual growth rate. The formula applied in this study closely aligns with the one outlined by Muthulakshmi *et al.* (2023) in their research paper.

$$Y_t = ab^t U_t \dots\dots\dots (1)$$

In conducting this analysis, annual time series data encompassing the years 1990–2021 were compiled from diverse published sources such as India Stat, Agricultural Statistics Handbook and APEDA. The ensuing description outlines the variables incorporated in formula (1).

$Y_t =$  Area of land cultivated for millet (thousand hectares), Production (thousand tonnes) and Productivity (kg/ha)

a= Intercept

b= Regression coefficient

t = Time period (1990-2021)

$U_t$  = Disturbance term

Subsequently, the recommended model was transformed into logarithmic form, as depicted below, and employed to ascertain the coefficients of selected study variables.

$$\ln Y_t = \ln a + t \ln b + \ln U_t \dots\dots\dots (2)$$

The Ordinary Least Squares (OLS) method was employed to compute estimates for the regression analysis. Subsequently, utilizing the provided formula, ascertain the calculated estimate (b) value for each variable utilized in deriving the compound annual growth rate (CAGR).

$$CAGR (r) = [\text{Antilog}(\log b) - 1] \times 100 \dots\dots\dots (3)$$

Where,

r = Compound growth rate in per cent

The t statistic was used to determine the standard error of growth rate and assess its significance.

$$t = b_i / \text{Se}(b_i) \dots\dots\dots (4)$$

Where,

$b_i$  = Regression coefficient

Se = Standard error of the regression coefficient

### **Instability Analysis**

Using two distinct metrics of instability, such as the Coefficient of Variation and the Cuddy-Della Valle Index, the instability in the area, production, and productivity of millets was investigated (Rohini *et al.*, 2022).

#### **Coefficient of Variation**

The simplest measure of instability, the coefficient of variation (C.V.), overestimates the degree of instability in time series data, which are distinguished by long-term trends. You can compute a CV in this way:

$$(C.V) = (\text{Standard Deviation} / \text{Mean}) * 100$$

#### **Instability Index: Cuddy-Della Valle Index**

The Cuddy-Delta Valle Index was used to analyse the instability in millets' **area of land cultivated for millet**, production and productivity. The long-term trend's coefficient of variance is corrected by the Cuddy-Della Valle Index. As a result, it is a more accurate indicator of agricultural production instability. Reduced instability in **area of land cultivated for millet**, production and productivity is indicated by a low value of this indicator, and vice versa. This is how the Cuddy-Della Valle Index fixes the CV:

$$\text{Cuddy - Della Valle Instability Index (\%)} = CV \sqrt{(1 - R^2)}$$

Where,

C.V. - Coefficient of Variation in per cent and

$R^2$  - The coefficient of determination ( $R^2$ ) derived from a temporal trend regression was modified to account for its degrees of freedom.

**The ranges of CDVI are given as follows.**

Low instability = 0 to 15

Medium instability = 15 to 30

High instability = 30 and above

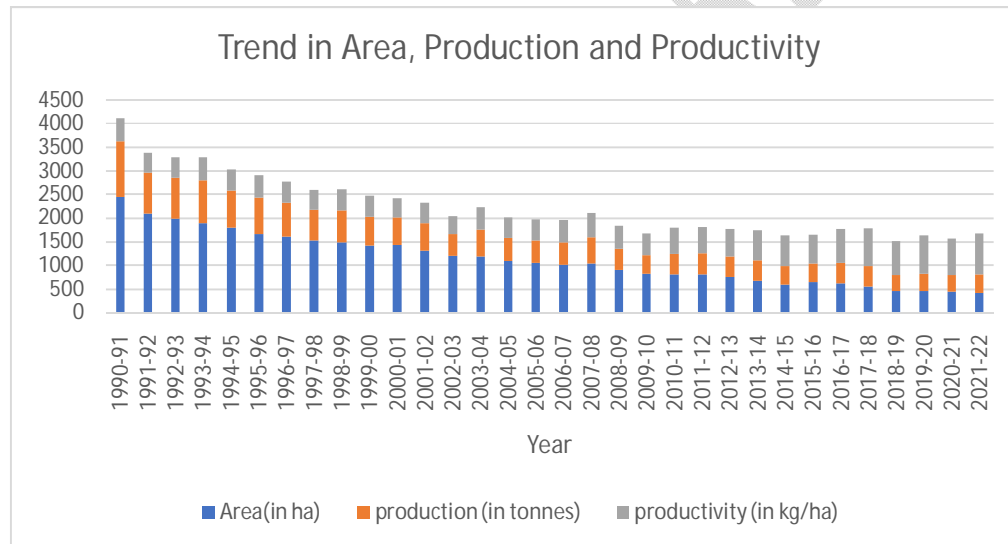
**Results and Discussion:**

A compound annual growth rate was examined, and Fig.1 shows the trend in the area, production and productivity of millets for the period 1990-2021. From Table 1, we came to know that the growth rate of area and production were negative.

**Table 1: Compound annual growth rate of millets**

Particulars	CAGR (Per cent)
	Period (1990-2021)
Area of land cultivated for millet	-5.19
Production	-3.17.
Productivity	2.12

Source: Authors calculation based on the data collected from the India stat (1990-2021)



**Fig 1: Trend in the area, production, and productivity of millets for the period 1990-2021**

During the whole period of study(1990-2021), the compound annual growth rate of millets for the area and production was decreased due to urbanization, increased marginal cultivation and unconventional areas for fine cereals (Saraswathi and Hameed 2022). Likewise, productivity has increased to 2.12 due to the drought-tolerant nature of millet crops and the economic efficiency of millet cultivation (Vennila *et al.*, 2020 and Gangadharan *et al.*, 2023). From Table 2 it can be observed that the production and productivity showed a higher

degree of variation during the study period 1990-91 to 2021-22. In the case of area, the variation was found less in millets. This study suggests encompassing some technologies to enhance productivity and reduce the variation in millet production and productivity.

**Table 2: Instability analysis for area of land cultivated for millet, Production and Productivity of millets.**

Particulars	Area of land cultivated for millet	Production	Productivity
Mean	1130.96	560.46	542.56
Standard Deviation	542.66	202.31	137.68
Coefficient of variation	47.98	36.09	25.37
Adjusted R Square	0.95	0.78	0.69
CDVI	10.55	16.60	13.95

Source: Authors calculation based on the data collected from the India stat (1990-2021)

### Conclusion:

This study found that the millet area and production have a negative growth rate however productivity has a positive growth rate. Instability analysis revealed the higher degree of variation for both production and productivity than the area of millets in India. Nowadays consumers are aware of the nutritional diet and millets play a major role in the nutritional diet because of its high nutrients and minerals. Millets have yet another advantage like drought-resistant and adapted towards poor soils. Millets may be promoted by different extension activities among the small and marginal farmers to improve the area and production.

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