P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating (2025): 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 7; July 2025; Page No. 710-712

Received: 23-04-2025
Accepted: 27-05-2025

Indexed Journal
Peer Reviewed Journal

Trend analysis of finger millet in India: State-wise analysis

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DOI: https://www.doi.org/10.33545/26180723.2025.v8.i7j.2201

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Abstract

The research entitled" Trend Analysis of Finger Millet in India: State-wise Analysis" was carried out with the objective to work on the state-wise trends of area, production and productivity of finger millet in India. The study was based on the secondary data of area, production and productivity of finger millet in India. For almost all the states the quintic function was best fitted, for all states of India. The R^2 was estimated in the range 0.40 to 0.98 for area, 0.40 to 0.93 for production and 0.26 to 0.92 for productivity. The Research and Development towards finger millet production has started paying despite the effort of different actors as yield has increased consistently over the recent years.

Keywords: Finger millet, area, production, productivity, trend analysis.

Introduction

Finger millet or ragi (*Eleusine coracana* L.) is one of the common millets in several regions of India. It is also commonly known as Koracan in Srilanka and by different names in Africa and has traditionally been an important millet staple food in the parts of eastern and central Africa and India. Finger millet has best quality protein along with the presence of essential amino acids, vitamin A, vitamin B and phosphorus. In India, finger millet is grown and consumed in Karnataka, Andhra Pradesh, Tamil Nadu, Odisha, Maharashtra, Uttarakhand. There are significant yield variations observed among the top producing states. The total area under finger millet in India is 1162 thousand hectares (2023-24) which was mainly contributed by Karnataka, Maharashtra and Uttarakhand. From this area, 1692 thousand tons of finger millet was produced in 2023-24. During this period, productivity of finger millet was recorded as 1456 Kg per hectare. Identifying the existing trends in area, production and productivity plays an important role in the way of development. By estimating the trend in area, production and productivity of finger millet. it provides rate of change of particular variables during the period of reference and the direction of change but it fails to provide the rate of change per annum. In this paper, an attempt is made to study the trend in area, production and productivity of finger millet in India.

Materials and Methods

The present study is based on time series secondary data of finger millet growing states in India. It was collected from Source-Unified Portal for Agricultural Statistics, Government of India. The data was collected on area, production and productivity of finger millet grown in India pertaining to the period from 2004-05 to 2023-24 (20 years). Six major states were selected for analysis which contribute more than 80 per cent of the total area under finger millet crop. The major six producing states are Andhra Pradesh, Karnataka, Maharashtra, Odisha, Tamil Nadu and Uttarakhand.

Analysis of Data

To study the Trend Analysis in area, production and productivity of finger millet was computed for the time series data of 20 years, *i.e.*, 2004-05 to 2023-24. To trace the path of process, different parametric trend functions as given in the table below were used. Among the competitive trend functions, the best functions were selected based on their goodness of fit (measured in terms of R^2 Value) and significance of the coefficients.

Table 1: List of different parametric models with their equation

Sr. No	Name of Function	Equation
1.	Linear	$y = a + bx$
2.	Quadratic	$y = a + bx + cx^2$
3.	Cubic	$y = a + bx + cx^2 + dx^3$
4.	Quartic	$y = a + bx + cx^2 + dx^3 + ex^4$
5.	Quintic	$y = a + bx + cx^2 + dx^3 + ex^4 + fx^5$
6.	Power	$y = ax$

Where a, b, c, d, e, f and x represent constants and coefficient in the function.

Results and Discussion

To synthesize the data of Finger Millet regarding area, production and productivity, a better statistical tool has been used in this section. The results of this analysis provided growth trends in Quintic form. For the purpose of giving main area in India a state-wise Finger Millet growing

picture of the trend in area, production and productivity of Finger Millet have been fitted on the time series data. The slope of the curve is given by the value associated with year (x). Trend analysis provides the rate of change of particular variables during the period of reference and the direction of change but it fails to provide the rate of change per annum.

The trends in area, production and productivity of Finger Millet in India were estimated. It is observed from the Tables that, for almost all the states the Quintic function was best fitted, considering the highest value of the R^2.

It was evident from Table 2 that, for area, the highest value of R^2 was observed in Andhra Pradesh and Uttarakhand with 0.98 followed by Maharashtra (0.95), Odisha (0.88) and Karnataka (0.48) whereas the lowest value of R^2 was observed in Tamil Nadu *i.e.*, 0.40. The R^2 was estimated in the range 0.40 to 0.98 for area.

From Table 3 for production, the highest value of R^2 was observed in Andhra Pradesh *i.e.*, 0.93 followed by Uttarakhand (0.89), Maharashtra (0.75), Odisha (0.65) and Karnataka (0.43) respectively whereas the lowest value of R^2 was observed in Tamil Nadu *i.e.*, 0.41. The R^2 was estimated in the range of 0.41 to 0.93 for production.

For productivity, the highest value of R^2 was observed in Maharashtra *i.e.*, 0.92 followed by Tamil Nadu (0.75), Odisha (0.63), Uttarakhand (0.59) and Karnataka (0.49) whereas, the lowest value of R^2 was observed in Andhra Pradesh (0.36). The R^2 was estimated in the range 0.36 to 0.92 for productivity as seen in Table 4.

In case of country as a whole, the R^2 for area, production and productivity was 0.72, 0.40 and 0.26 respectively.

Table 2: Trend in area of Finger Millet in India

Sr. No.	State	Function	Constant	Coefficients					R^2
			a/m	b	c	d	e	f	
1.	Andhra Pradesh	Quintic	78.17	-7.84	0.49	-0.01	-0.0005	-0.00001	0.98***
2.	Karnataka	Quintic	1064.98	-198.5	51.65	-6.25	0.33	-0.01	0.48**
3.	Maharashtra	Quintic	171.78	-31.29	8.08	-0.92	0.04	-0.001	0.95***
4.	Odisha	Quintic	87.24	-14.13	3.24	-0.34	0.01	-0.0002	0.88***
5.	Tamil Nadu	Quintic	123.46	-15.08	1.90	-0.06	-0.002	0.0001	0.40**
6.	Uttarakhand	Quintic	196.95	-41.57	9.73	-1.05	0.05	-0.001	0.98***
	India	Quintic	1809.88	-299.3	69.21	-7.68	0.38	-0.007	0.72***

Note: ***Significant at 1% level, **Significant at 5% level, *Significant at 10% level

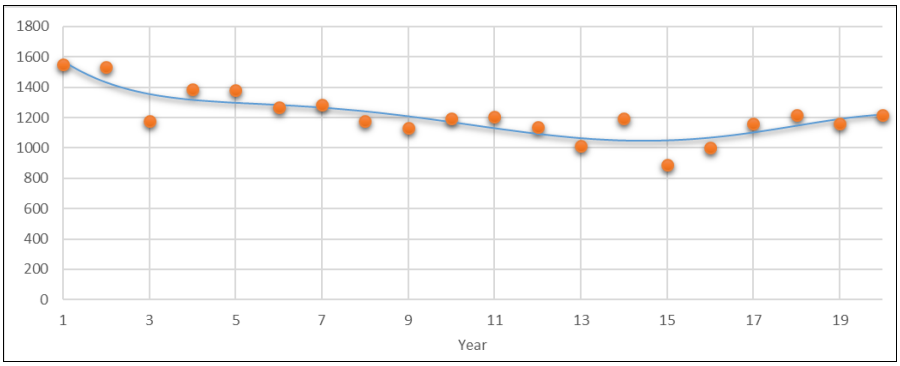


Table 3: Trend in production of Finger Millet in India

Sr. No.	State	Function	Constant	Coefficients					R^2
			a/m	b	c	d	e	f	
1.	Andhra Pradesh	Quintic	92.33	-5.67	-0.98	0.18	-0.01	0.0001	0.93***
2.	Karnataka	Quintic	2409.70	-835.3	224.24	-26.37	1.37	-0.03	0.43**
3.	Maharashtra	Quintic	186.62	-47.18	11.42	-1.14	0.05	-0.001	0.75***
4.	Odisha	Quintic	48.05	-4.67	1.24	-0.13	0.004	-0.00003	0.65***
5.	Tamil Nadu	Quintic	172.36	-24.48	5.55	-0.15	-0.01	0.001	0.41**
6.	Uttarakhand	Quintic	198.21	-13.96	3.92	-0.50	0.03	-0.0005	0.89***
	India	Quintic	3183.62	-927.7	241.12	-27.32	1.37	-0.02	0.40**

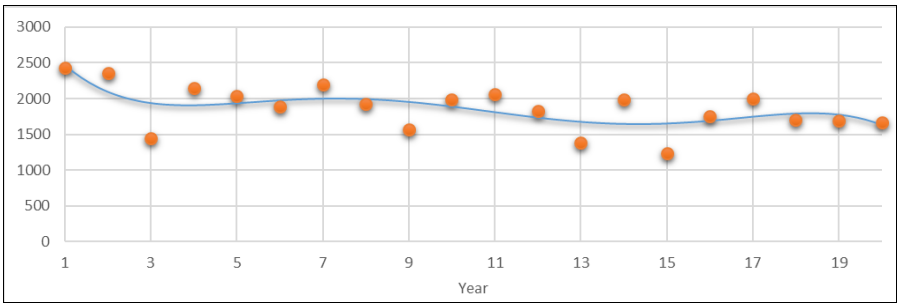
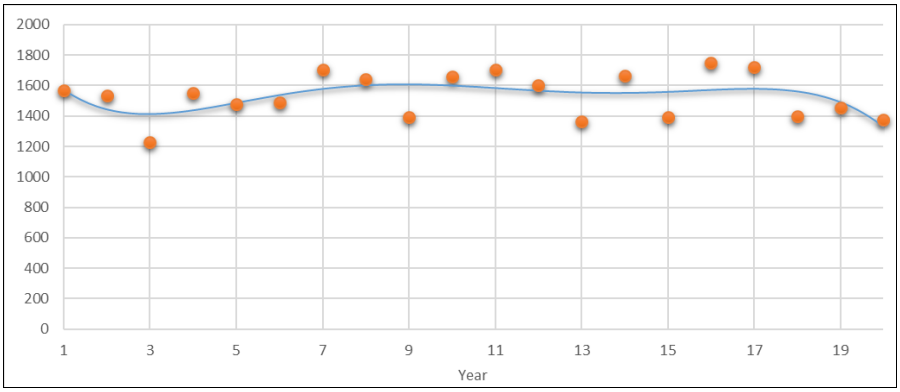


Table 4: Trend in productivity of Finger Millet in India

Sr. No.	State	Function	Constant	Coefficients					R^2
			a/m	b	c	d	e	f	
1.	Andhra Pradesh	Quintic	1107.47	149.73	-56.55	7.01	-0.35	0.01	0.36*
2.	Karnataka	Quintic	2495.24	-720.2	203.78	-23.84	1.22	-0.02	0.49**
3.	Maharashtra	Quintic	1058.60	-54.48	2.26	1.54	-0.16	0.005	0.92***
4.	Odisha	Quintic	564.71	27.66	-1.56	-0.02	0.003	0.000003	0.63***
5.	Tamil Nadu	Quintic	1284.78	46.54	20.73	-1.01	-0.02	0.001	0.75***
6.	Uttarakhand	Quintic	951.22	241.22	-51.73	5.18	-0.24	0.004	0.59***
	India	Quintic	1865.24	-391.2	114.24	-13.31	0.68	-0.01	0.26

Note: ***Significant at 1% level, **Significant at 5% level, *Significant at 10% level



Conclusion

Andhra Pradesh and Uttarakhand showed the strongest R^2 for area and production. Maharashtra had the highest R^2 for productivity. Tamil Nadu consistently showed low R^2 values, especially for area and production. Andhra Pradesh had the lowest R^2 for productivity. Nationally, R^2 was moderate for area and low for production and productivity.

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