A Comprehensive Analysis of Trend and Decomposition of Wheat in India

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ABSTRACT

Wheat (*Triticum aestivum* L.) is an annual crop in the Gramineae or Poaceae family. It plays an important role in Indian agriculture because it significantly contributes to food security and the national economy. This paper deals with a comprehensive assessment for parametric trend modeling and decomposition analysis of wheat in India. The secondary data on wheat covering a period of thirty years from 1994 to 2023 was utilized for the analysis. To explore trends in production, area and yield of wheat, several parametric trend models were applied to the data. These models include linear, quadratic, cubic, exponential and logarithmic. To assess the performance and predictive ability of each model, statistical metrics were computed, including the coefficient of determination (R^2), relative mean absolute percentage error (RMAPE) and root mean square error (RMSE). The cubic model was found to be the best fitted model for the production, area and yield of wheat in India. Hence, on using the cubic model, the projections of production, area and yield of wheat were made for five successive years (viz., 2024 to 2028). The empirical results of decomposition analysis revealed that the yield effect attributed significantly towards the output growth in wheat production (i.e., 54.08%), followed by the area effect (i.e., 33.02%). However, the least contribution was due to interaction effect (i.e., 12.90%). The finding of the study could be used for reliable forecasting and effective agricultural policy on wheat crop. The results also support data driven decision making to improve wheat production and ensure long-term sustainability in the agricultural sector.

Keywords Trend models, Parameters, Coefficient of determination, Root mean square error, Relative mean absolute percentage error, Decomposition analysis.

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INTRODUCTION

Wheat (*Triticum aestivum* L.) is often called the king of cereals and is a major staple food crop in India. There are commonly three cultivated species of wheat in India, namely, *Triticum aestivum, Triticum durum* and *Triticum dicoccum*. The *Triticum aestivum* covers the largest area, followed by *Triticum durum* and *Triticum dicoccum*. Wheat is mainly consumed in

processed forms such as bread, cakes, biscuits, daliya and semolina. It provides essential carbohydrates, proteins, fats, multivitamins, amino acids and other nutrients, which are vital for the human nutrition (Prakash *et al.* 2025). The wheat crop is mostly cultivated in the *rabi* season in India. After independence, India experienced food shortages and relied on wheat imports. In 1966-67, the country adopted a new strategy that initiated the Green Revolution, which increased wheat and rice production. Through combined research and food security programs, India achieved surplus wheat production and has since avoided famine, even during tough weather, ensuring food stability (Ramadas *et al.* 2019).

Globally, China is the leading producer of wheat followed by India, USA, Russia, France and Canada (FAOSTAT 2024). In India, wheat is the second most important crop after rice. In India, the leading state in the production of wheat was Uttar Pradesh, (i.e., 33.61 million tons) during the year 2022-23, followed by Madhya Pradesh (22.73 million tons), Punjab (16.78 million tons), Haryana (10.93 million tons), Rajasthan (10.64 million tons) and Bihar (6.51 million tons) (ESE Division 2024).

The wheat crop has remained the focus of attention in various research studies. For instance, Arunachalam and Balakrishnan (2012) examined wheat trends in India using non-parametric and non-linear regression models. They focused on changes in area, production and productivity over time to look at agricultural patterns and performance. Dasyam *et al.* (2015) worked on fitting a model to forecast wheat production in India using annual time series data from 1961-62 to 2013-14. They used parametric regression, exponential smoothing and ARIMA models. These models were compared to find the best econometric technique for capturing the production trend of wheat in the country. Celik (2016) studied the production of cereals like wheat, barley and maize in Turkey by using Holt, Brown and Damped trend exponential smoothing models based on time series data from 1965-66 to 2015-16 and predicted wheat, barley and maize production for 2016-17 to 2025-26 using the exponential smoothing method. Patowary *et al.* (2017) developed a simple linear regression model with ARIMA errors to ex-

amine yearly wheat production in India from 1960-61 to 2016-17. Their fitted model showed greater accuracy in forecasting than the standard ARIMA model, making it a more effective approach. Kumar *et al.* (2019) created a model to forecast wheat yield in Haryana using annual time series data from 1980-81 to 2009-10. They used various models, including random walk, random walk with drift, linear trend, moving average, simple exponential smoothing and ARIMA and compared them to find the best model for forecasting wheat yield in the region. Polisetty and Paidipati (2019) examined the change point and conducted trend analysis of wheat production in India using non-parametric methods. They applied Pettitt's test, Standard Normal Homogeneity (SNH) test and Buishand's range test to identify shifts in the data. They also used Sen's slope estimator to quantify the extent of the production trend over the study period. Madhukar *et al.* (2020) analyzed crop yield trends for three major food crops: wheat, rice and maize across 29 Indian states using annual yield data from 1967-68 to 2017-18. They fitted four types of regression models and selected the best-fit models based on the Akaike Information Criterion to accurately capture yield trends during the concerned period. Rao and Naidu (2021) forecasted the area, production and productivity of wheat in India using various non-linear models. The cubic model fit the best for trends in area and production, while the quadratic model worked best for productivity. Both models showed the highest adjusted coefficient of determination, effectively capturing growth patterns of wheat cultivation in the country. Bahaudin *et al.* (2022) focused on growth rates in the area, production and productivity of wheat in India and Afghanistan using time series data from 2000-01 to 2019-20. Their research provided insights into agricultural trends and performance in both countries. Kumar *et al.* (2024) investigated the trend patterns of wheat production in Uttar Pradesh, Haryana and Bihar. They applied various models including linear, exponential and cubic to the production data and used different statistical measures to evaluate model performance in these states. Some other recent noteworthy works on time series analysis of crops, other than wheat, have been made by Annamalai and Johnson (2023), Mahaluca *et al.* (2024), Chaudhary *et al.* (2025), Kumar and Rana (2025) and Rana *et al.* (2025).

The objective of this paper is to explore the trend in production, area and yield of wheat crop in India using well-known parametric trend models, including linear, quadratic, cubic, exponential and logarithmic models. Furthermore, a decomposition analysis is also carried out for evaluating the contribution of area, yield and their interaction on the output growth in production of wheat crop. The accuracy and performance of these models were examined using the coefficient of determination (R²), root mean square error (RMSE) and relative mean absolute percentage error (RMAPE).

MATERIALS AND METHODS

The secondary time series data on wheat production, area and yield in India, covering a period of 30 years from 1994 to 2023, were collected from the repository of Economics, Statistics and Evaluation (ESE) Division, Department of Agriculture & Farmers Welfare, India. The analytical procedure is elaborated in the following sub-sections.

Fitting of parametric trend models to the data

To study the trend patterns in wheat production, area and yield, the trend values are obtained on fitting various parametric models to the concerned time series data, which are listed in Table 1.

The terms *a, b, c,* and *d* denote the parameters of the concerned trend models. The accuracy of the fitted trend models are measured on using various model fit statistics criteria viz., coefficient of determination (R²), Root Mean Square Error (RMSE) and Relative Mean Absolute Percentage Error (RMAPE), which are symbolically represented below:

Table 1. Parametric trend models.

Sl. No.	Name of Trend Model	Model Equation
1	Linear Model	$y_t = a+bt$
2	Quadratic Model	$y_t = a + bt + ct^2$
3	Cubic Model	$y_t = a + bt + ct^2 + dt^3$
4	Exponential Model	$y_t = ae^{bt}$
5	Logarithmic Model	$y_t = a+b.\ln(t)$

$$R^2 = 1 - \frac{\sum_{t=1}^{n} (y_t - \hat{y}_t)^2}{\sum_{t=1}^{n} (y_t - \bar{y})^2}$$

$$RMSE = \sqrt{\frac{1}{n} \sum_{t=1}^{n} (y_t - \hat{y}_t)^2}$$

and

$$RMAPE = \frac{1}{n} \sum_{t=1}^{n} \left| \frac{y_t - \hat{y}_t}{y_t} \right| \times 100$$

where y_t denotes the observed value of Y (i.e., production, area or yield, as the case may be) on wheat, and $\bar{y}$ is the mean value of the variable Y. Also, $\hat{y}_t$ is the trend value of the variable Y, which is obtained on fitting the respective trend model (such as linear, quadratic, cubic, exponential or logarithmic model, as the case may be) to the variable Y.

Decomposition analysis

The relative contribution of area, yield and interaction on the production of wheat is measured using the following decomposition model:

$$P=A.Y \qquad \dots (1)$$
$$(P+\Delta P)=(A+\Delta A).(Y+\Delta Y) \qquad \dots (2)$$
$$\Delta P=Y\Delta A+A\Delta Y+\Delta A\Delta Y \qquad \dots (3)$$

where P, A, Y denote, respectively, the production, area and yield of the wheat crop.

Equivalently, the equation (3) can be written as

$$\Delta P=Y_b \Delta A+A_b \Delta Y+\Delta A\Delta Y \qquad \dots (4)$$

where

$\Delta P=P_c - P_b=$ Change in production
$\Delta A=A_c - A_b=$ Change in area
$\Delta Y=Y_c - Y_b=$ Change in yield

Here, P_c, A_c and Y_c represent the production, area and yield of wheat crop in the current year, respectively. Similarly, P_b, A_b and Y_b denote, the production, area and yield of wheat crop in the base year. In the present

investigation, the base year is taken as 1994, whereas the current year is considered as 2023.

Hence, the total change in production of wheat crop can be decomposed into three components viz., area effect, yield effect and their interaction effect, which are symbolically presented below:

$$\text{Area effect} = \frac{Y_b \, \Delta A}{\Delta P} \times 100 \qquad \dots (5)$$

$$\text{Yield effect} = \frac{A_b \, \Delta Y}{\Delta P} \times 100 \qquad \dots (6)$$

$$\text{Interaction effect} = \frac{\Delta A \Delta Y}{\Delta P} \times 100 \qquad \dots (7)$$

RESULTS AND DISCUSSION

The secondary time series data on wheat production, area and yield in India for the period 1994-2023 is summarized in Table 2. Trend values were obtained by fitting linear, quadratic, cubic, exponential and logarithmic models to the concerned data on production, area and yield, respectively, and are presented in Tables 3, 4 and 5. Also, in Tables 3, 4 and 5, the terms 'l_t' stands for the linear trend values, 'Q_t' refers to the quadratic trend values, 'C_t' indicates the cubic trend values, 'E_t' represents the exponential trend values and 'L_t' shows the logarithmic trend values for the respective variables. Moreover, the equations for the models fitted to production, area and yield of wheat are outlined in Table 6, which provides a clear overview of the modeling approach used in the analysis.

The graphical plots of observed and fitted trend values of production, area and yield of wheat in India are demonstrated in Figs. 1 to 15.

Table 2. Time series data on production, area and yield of wheat in India.

Year	Production (Million Tons)	Area (Million Hectares)	Yield (Tons/Hectare)
1994	65.77	25.70	2.56
1995	62.10	25.01	2.48
1996	69.35	25.89	2.68
1997	66.35	26.70	2.49
1998	71.29	27.52	2.59
1999	76.37	27.49	2.78
2000	69.68	25.73	2.71
2001	72.77	26.34	2.76
2002	65.76	25.20	2.61
2003	72.16	26.59	2.71
2004	68.64	26.38	2.60
2005	69.35	26.48	2.62
2006	75.81	27.99	2.71
2007	78.57	28.04	2.80
2008	80.68	27.75	2.91
2009	80.80	28.46	2.84
2010	86.87	29.07	2.99
2011	94.88	29.86	3.18
2012	93.51	30.00	3.12
2013	95.85	30.47	3.15
2014	86.53	31.47	2.75
2015	92.29	30.42	3.03
2016	98.51	30.79	3.20
2017	99.87	29.65	3.37
2018	103.60	29.32	3.53
2019	107.86	31.36	3.44
2020	109.59	31.13	3.52
2021	107.74	30.46	3.54
2022	110.55	31.40	3.52
2023	113.29	31.83	3.56

(Source: Economics, Statistics and Evaluation (ESE) Division, DA&FW, India.)

The values of model fit statistics criteria (viz., R^2, RMSE and RMAPE) for the concerned fitted models on production, area and yield of wheat are summarized in Table 7.
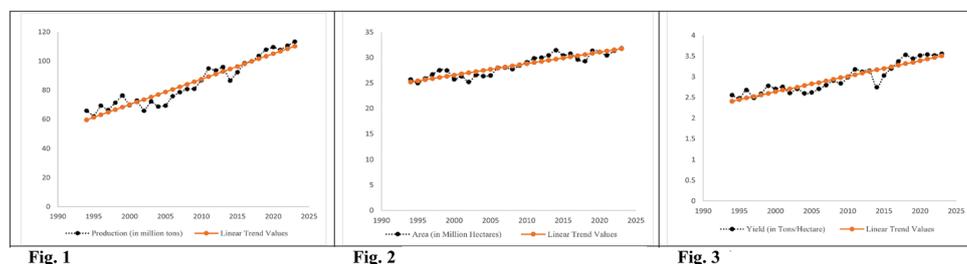
Fig. 1

Fig. 2

Fig. 3

Fig. 1. Plot of observed and linear trend values for production of wheat. **Fig. 2.** Plot of observed and linear trend values for area of wheat. **Fig. 3.** Plot of observed and linear trend values for yield of wheat.
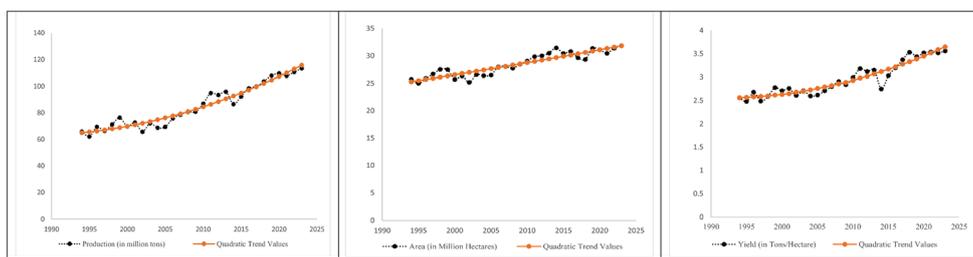
Fig. 4

Fig. 5

Fig. 6

Fig. 4. Plot of observed and quadratic trend values for production of wheat. **Fig. 5.** Plot of observed and quadratic trend values for area of wheat. **Fig. 6.** Plot of observed and quadratic trend values for yield of wheat.
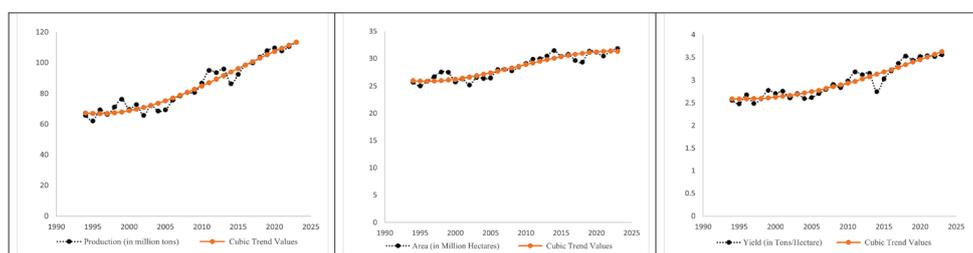

Fig. 7

Fig. 8

Fig. 9

Fig. 7. Plot of observed and cubic trend values for production of wheat. **Fig. 8.** Plot of observed and cubic trend values for area of wheat. **Fig. 9.** Plot of observed and cubic trend values for yield of wheat.
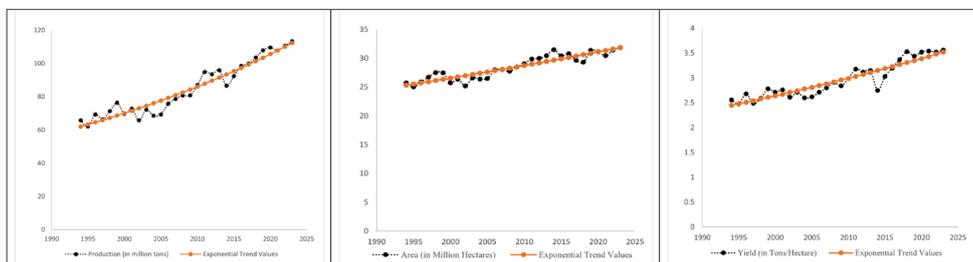
Fig. 10

Fig. 11

Fig. 12

Fig. 10. Plot of observed and exponential trend values for production of wheat. **Fig. 11.** Plot of observed and exponential trend values for area of wheat. **Fig. 12.** Plot of observed and exponential trend values for yield of wheat.

Fig. 13

Fig. 14

Fig. 15

Fig. 13. Plot of observed and logarithmic trend values for production of wheat. **Fig. 14.** Plot of observed and logarithmic trend values for area of wheat. **Fig. 15.** Plot of observed and logarithmic trend values for yield of wheat.
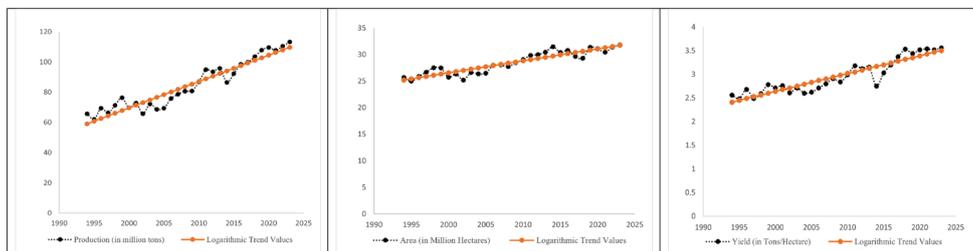
Table 3. Trends values for production of wheat in India.

Year (t)	Production (y_t)	Linear (l_t)	Quadratic (Q_t)	Cubic (C_t)	Exponential (E_t)	Logarithmic (L_t)
				Trend Values		
1994	65.77	59.52	65.02	67.38	61.98	59.06
1995	62.10	61.27	65.63	67.04	63.26	60.82
1996	69.35	63.01	66.32	66.94	64.57	62.58
1997	66.35	64.76	67.10	67.09	65.91	64.34
1998	71.29	66.51	67.95	67.46	67.27	66.10
1999	76.37	68.26	68.89	68.04	68.67	67.85
2000	69.68	70.01	69.91	68.83	70.09	69.61
2001	72.77	71.76	71.01	69.80	71.54	71.36
2002	65.76	73.51	72.19	70.95	73.02	73.12
2003	72.16	75.26	73.45	72.27	74.53	74.87
2004	68.64	77.01	74.79	73.73	76.08	76.63
2005	69.35	78.76	76.22	75.33	77.65	78.38
2006	75.81	80.51	77.72	77.06	79.26	80.13
2007	78.57	82.26	79.31	78.90	80.90	81.88
2008	80.68	84.00	80.98	80.84	82.58	83.63
2009	80.80	85.75	82.73	82.87	84.29	85.38
2010	86.87	87.50	84.56	84.97	86.04	87.13
2011	94.88	89.25	86.47	87.13	87.82	88.87
2012	93.51	91.00	88.46	89.35	89.64	90.62
2013	95.85	92.75	90.53	91.60	91.49	92.36
2014	86.53	94.50	92.69	93.88	93.39	94.11
2015	92.29	96.25	94.93	96.16	95.32	95.85
2016	98.51	98.00	97.24	98.45	97.30	97.59
2017	99.87	99.75	99.64	100.73	99.31	99.33
2018	103.60	101.50	102.12	102.98	101.37	101.08
2019	107.86	103.25	104.68	105.19	103.47	102.81
2020	109.59	105.00	107.33	107.35	105.61	104.55
2021	107.74	106.74	110.05	109.44	107.80	106.29
2022	110.55	108.49	112.85	111.46	110.03	108.03
2023	113.29	110.24	115.74	113.39	112.31	109.77

Table 4. Trends values for area of wheat in India.

Year (t)	Area (y_t)	Linear (l_t)	Quadratic (Q_t)	Cubic (C_t)	Exponential (E_t)	Logarithmic (L_t)
				Trend Values		
1994	25.70	25.22	25.31	25.98	25.33	25.21
1995	25.01	25.45	25.52	25.91	25.53	25.44
1996	25.89	25.67	25.72	25.89	25.73	25.67
1997	26.70	25.90	25.93	25.91	25.94	25.89
1998	27.52	26.12	26.14	25.98	26.14	26.12
1999	27.49	26.35	26.35	26.09	26.35	26.35
2000	25.73	26.57	26.57	26.23	26.56	26.57
2001	26.34	26.80	26.78	26.41	26.77	26.80
2002	25.20	27.02	26.99	26.62	26.98	27.02
2003	26.59	27.25	27.21	26.85	27.20	27.25
2004	26.38	27.47	27.43	27.11	27.41	27.47
2005	26.48	27.70	27.65	27.38	27.63	27.70
2006	27.99	27.92	27.87	27.67	27.85	27.93
2007	28.04	28.15	28.09	27.97	28.07	28.15
2008	27.75	28.37	28.32	28.27	28.29	28.38
2009	28.46	28.60	28.54	28.58	28.52	28.60
2010	29.07	28.82	28.77	28.89	28.74	28.83

Table 4. Continued.

Year (t)	Area (y_t)	Linear (l_t)	Quadratic (Q_t)	Trend Values Cubic (C_t)	Exponential (E_t)	Logarithmic (L_t)
2011	29.86	29.05	28.99	29.20	28.97	29.05
2012	30.00	29.27	29.22	29.50	29.20	29.28
2013	30.47	29.50	29.45	29.79	29.43	29.50
2014	31.47	29.72	29.69	30.07	29.67	29.72
2015	30.42	29.95	29.92	30.33	29.90	29.95
2016	30.79	30.17	30.15	30.57	30.14	30.17
2017	29.65	30.40	30.39	30.78	30.38	30.40
2018	29.32	30.62	30.63	30.96	30.62	30.62
2019	31.36	30.85	30.87	31.12	30.86	30.84
2020	31.13	31.07	31.11	31.23	31.11	31.07
2021	30.46	31.30	31.35	31.31	31.35	31.29
2022	31.40	31.52	31.59	31.35	31.60	31.52
2023	31.83	31.75	31.84	31.34	31.85	31.74

Table 5. Trends values for yield of wheat in India.

Year (t)	Yield (y_t)	Linear (l_t)	Quadratic (Q_t)	Trend Values Cubic (C_t)	Exponential (E_t)	Logarithmic (L_t)
1994	2.56	2.41	2.56	2.59	2.45	2.41
1995	2.48	2.45	2.57	2.59	2.48	2.45
1996	2.68	2.49	2.58	2.59	2.51	2.49
1997	2.49	2.52	2.59	2.60	2.54	2.53
1998	2.59	2.56	2.60	2.60	2.58	2.56
1999	2.78	2.60	2.62	2.61	2.61	2.6
2000	2.71	2.64	2.63	2.63	2.64	2.64
2001	2.76	2.68	2.65	2.65	2.67	2.68
2002	2.61	2.71	2.68	2.67	2.71	2.71
2003	2.71	2.75	2.70	2.69	2.74	2.75
2004	2.60	2.79	2.73	2.72	2.78	2.79
2005	2.62	2.83	2.76	2.75	2.81	2.83
2006	2.71	2.86	2.79	2.78	2.85	2.87
2007	2.80	2.90	2.82	2.82	2.88	2.90
2008	2.91	2.94	2.86	2.86	2.92	2.94
2009	2.84	2.98	2.89	2.90	2.96	2.98
2010	2.99	3.01	2.93	2.94	2.99	3.02
2011	3.18	3.05	2.98	2.98	3.03	3.05
2012	3.12	3.09	3.02	3.03	3.07	3.09
2013	3.15	3.13	3.07	3.08	3.11	3.13
2014	2.75	3.17	3.12	3.13	3.15	3.17
2015	3.03	3.20	3.17	3.18	3.19	3.20
2016	3.20	3.24	3.22	3.23	3.23	3.24
2017	3.37	3.28	3.28	3.28	3.27	3.28
2018	3.53	3.32	3.33	3.34	3.31	3.32
2019	3.44	3.35	3.39	3.40	3.35	3.35
2020	3.52	3.39	3.45	3.45	3.39	3.39
2021	3.54	3.43	3.52	3.51	3.43	3.43
2022	3.52	3.47	3.59	3.57	3.48	3.47
2023	3.56	3.51	3.65	3.63	3.52	3.50

Table 6. Model equations for production, area and yield of wheat in India.

Models	Production	Area	Yield
Linear Model	$y_t' =85.75+1.75t'$	$y_t' =28.60+0.23t'$	$y_t' =2.98+0.038t'$
Quadratic Model	$y_t' =82.73+1.79t'+ 0.041t'^2$	$y_t' =28.54+0.23t'+0.0007t'^2$	$y_t' =2.89+0.039t'+0.001t'^2$
Cubic Model	$y_t' =82.86+2.07t'+ 0.038t'^2$ $-0.002t'^3$	$y_t' =28.58+0.31t'-0.0002t'^2$ $-0.0006t'^3$	$y_t' =2.90+0.041t'+0.001t'^2$ $-(2\times10^{-5})t'^3$
Exponential Model	$y_t' =84.29e^{0.021t'}$	$y_t' =28.52e^{0.008t'}$	$y_t' =2.96e^{0.013t'}$
Logarithmic Model	$y_t' =3511.90 \ln(t') -26624$	$y_t' =451.89 \ln(t') -3408.20$	$y_t' = 75.65 \ln(t')-572.40$

Note: t'=t-2009

Table 7. Model validation for production, area and yield of wheat in India.

	Models	R^2	Model Fit Statistics	
			RMSE	RMAPE
Production	Linear model	0.9122	4.6921	4.91
	Quadratic model	0.9417	3.8277	3.77
	Cubic model	0.9461	3.6814	3.53
	Exponential model	0.9320	4.1449	4.20
	Logarithmic model	0.9118	4.7269	5.01
Area	Linear model	0.8427	0.8413	2.46
	Quadratic model	0.8432	0.8406	2.45
	Cubic model	0.8665	0.7770	2.14
	Exponential model	0.8430	0.8404	2.44
	Logarithmic model	0.8426	0.8414	2.47
Yield	Linear model	0.8486	0.1377	3.78
	Quadratic model	0.8922	0.1171	3.15
	Cubic model	0.8928	0.1168	3.16
	Exponential model	0.8652	0.1313	3.53
	Logarithmic model	0.8478	0.1384	3.83

The Table 7 revealed the following results:

i) The cubic model performed better than the other fitted models i.e., linear, quadratic, exponential and logarithmic by achieving the highest R^2 values for wheat production, area and yield in India.

ii) The cubic model achieved the least RMSE and RMAPE values for wheat production, area and yield.

iii) All the fitted models reported RMAPE values below 6% for wheat production, area and yield in India. Hence, the fitted models are suitable for analyzing the trend dynamics of wheat in India.

Based on the above results, it can be inferred that the fitted models are suitable for examining the trend patterns in wheat production, area and yield. Among them, the cubic model is the most accurate and reliable for effectively capturing and exploring the trend values of wheat production, area and yield

Table 8. Projections of production, area and yield of wheat in India.

Year	Projected Values		
	Production (Million Tons)	Area (Million Hectares)	Yield (Tons/Hectare)
2024	115.22	31.27	3.69
2025	116.94	31.16	3.75
2026	118.53	30.99	3.81
2027	119.98	30.75	3.88
2028	121.27	30.46	3.94

in India. Hence, on using the cubic model, the future projections for production, area and yield of wheat have been made for five successive years (viz. 2024 to 2028) and the findings are presented in Table 8.

The decomposition analysis is carried out to examine the relative contribution of area, yield and interaction on the production of wheat, and the results of decomposition analysis is elaborated in Table 9.

Table 9. Decomposition analysis of wheat in India for the period 1994-2023.

Crop	Relative contribution (%) due to		
	Area Effect	Yield Effect	Interaction Effect
Wheat	33.02	54.08	12.90

The results of Table 9 revealed that the yield effect attributed significantly towards the output growth in wheat production of India (i.e., 54.08%), followed by the area effect (i.e., 33.02%). However, the interaction effect reported the least contribution (i.e., 12.90%) towards the output growth in wheat production.

CONCLUSION

This paper addresses the trend dynamics in production, area and yield of wheat in India for the period 1994 to 2023. The parametric trend modeling and decomposition analysis were carried out in the present investigation. Moreover, the accuracy of the trend models was evaluated using R^2, RMSE and RMAPE.

A significant rise in production of wheat was observed in the year 2023 with respect to the base year 1994. However, a steady growth in area and yield of wheat was observed for the concerned year. The outcomes of the trend analysis revealed that the cubic model was the best fitted model for exploring the trend dynamics of production, area and yield of wheat in India. Hence, the cubic model was utilized for projections of production, area and yield of wheat for five successive years (viz., 2024 to 2028). Moreover, the empirical results of decomposition analysis revealed that the yield effect attributed significantly towards the output growth in wheat production (i.e., 54.08%), followed by the area effect (i.e., 33.02%). However, the least contribution was due to interaction effect (i.e., 12.90%).

These findings can help researchers and policymakers to develop effective import-export policies and tackle global food and nutritional security through informed decisions on wheat trade and agricultural planning.

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