

The Growth Rate of Minimum Support Price of Wheat and Population in Comparison to Area, Production and Yield of Wheat in India

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ABSTRACT

The area of wheat in India was 22.14 million hectares in 1981-82 and it increased to 31.45 (42.05 %) million hectares in 2019-20. Similarly, the production of wheat in India was 37.45 million tons in 1981-82 and it increased to 107.59 (187.28 %) million tones. The production of wheat was increased about 4 times more as compared to area of wheat during the period 1981-82 to 2019-20 in India. Similarly, the yield of wheat in India was 1691 kg per hectares in 1981-82 and it increased to 3421 (102.30%) kg per hectares. The Minimum support price of wheat was 142 ₹ per quintal in 1981-82 and it increased to 1925 (1255.63%) ₹ per quintal during 2019-20. This increased was about 12.5 times from 1981-82 to 2019-20. The per person per year availability of raw wheat produce was 52.35 kg in 1981-82 and it increased to 78.74 (50.41 %) kg per person per year availability of raw wheat produce during 2019-20. The population of India was 71.54 crore during 1981-82 and it increased to 136.64 (90.99 %) crore during 2019-20. The compound growth rate of area, production, yield of wheat, minimum support price, population and per person per year availability of wheat was 0.84, 2.43, 1.58, 7.64, 1.73, and 0.69 percent during the period of 1981-82 to 2019-20 and it was significant growth at 1 percent level of significance. The simple correlation analysis was done to measure the impact of area on production and yield on production. The results showed that the impact of yields on production of wheat was more as compared to area during the period 1981-82 to 1990-91. Because the value of the correlation coefficient between yield and production was 0.97 percent (significant at 1 percent level of significance) and the value of the correlation coefficient between area and production was 0.64 percent (non significant) during the period 1981-82 to 1990-91. So this clearly indicated that, in future the scope of more area under wheat cultivation is less. So, in future we can increase the production of wheat by developing new high yielding varieties of wheat. During the overall period 1981-82 to 2019-20 the value of instability index showed 6.43, 4.35, 4.31, 3.90, 2.25, 1.44 for MSP, Per person per year variability of wheat, production, yield, area and Population. So, May be it showed low instability index but the Minimum support price showed more instability as compared to other parameters of study.

Keywords: Wheat, Compound Growth rate, Instability index

India is the second-largest producer of wheat in the world, with China being the top producer and Russia the third-largest – Ukraine is the world's eighth-largest producer of wheat. After five straight years of a bumper wheat output, India has had

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to revise downwards its estimated production. Unprecedented heat waves across the north, west and central parts of the country, and March and April being the hottest in over 100 years, have caused substantial loss to the yield at 6%, with 20% of the wheat grain shrivelling up (*The Hindu*, 2022).

In a statement, the ministry said, "Production of Wheat during 2021-22 is estimated at 106.84 million tonnes. It is higher by 2.96 million tonnes than the last five years' average wheat production of 103.88 million tonnes." The estimated wheat production figure for 2021-22 is 2.87 per cent lower than the target of 110 million tonnes. It is also lower than the total wheat output of 107.86 million tons in 2019-20 (*The Indian express*, 2022).

Wheat occupies both production and area, the second important position among food crops of India and is superseded only by Rice (Kulshresthta VP). So keeping in the view of its importance this present study was focused on the following objectives:

- ♦ To find out the growth rates of area, production and yield of Wheat from 1981-82 to 2019-20 and for different periods 1981-82 to 1990-91, 1991-92 to 2000-01, 2001-02 to 2010-11, 2011-12 to 2019-20.
- ♦ To find out the growth rates of population from 1981-82 to 2019-20 and for different periods (1981-82 to 1990-91, 1991-92 to 2000-01, 2001-02 to 2010-11, 2011-12 to 2019-20).
- ♦ To find out the growth rates of per person per year availability of wheat (in kg) from 1981-82 to 2019-20 and for different periods (1981-82 to 1990-91, 1991-92 to 2000-01, 2001-02 to 2010-11, 2011-12 to 2019-20).
- ♦ To find out the growth rates of minimum support price (in ₹/quintal) from 1981-82 to 2019-20 and for different periods (1981-82 to 1990-91, 1991-92 to 2000-01, 2001-02 to 2010-11, 2011-12 to 2019-20).
- ♦ To find out the instability index area, production and yield of Wheat, population, person per year availability of wheat, minimum support price from 1981-82 to 2019-20 and for different periods (1981-82 to 1990-91, 1991-92 to 2000-01, 2001-02 to 2010-11, 2011-12 to 2019-20).

- ♦ To find out the correlation between area and production and between yield and production from 1981-82 to 2019-20 and for different periods (1981-82 to 1990-91, 1991-92 to 2000-01, 2001-02 to 2010-11, 2011-12 to 2019-20).

Methodology

The present study was conducted on secondary data for Wheat in area, production and yield from the year 1981-82 to 2019-20 both for India. The data was collected from the Agricultural statistics at a Glance, Govt. of India (2020). The analysis was done by the simple percentages, growth rates and correlation. The correlation coefficient was also used for the analysis of the data.

The formula for the compound growth rate was calculated by the following formula:

CAGR can be calculated using the following formula:

$$CAGR = (FV/PV)^{(1/n)} - 1$$

PV stands for present value, the value at $t = 0$ FV stands for future value, the ending value at $t = n$ N is the total number of years between PV and FV.

CAGR formula can be derived by simple mathematical manipulation of the formula for present value or future value of a single sum of money.

The relationship between present value (PV) and future value (FV) of a single sum of money invested for n number of periods at annual percentage is represented by the following expression:

$$FV = PV \times (1 + i)^n$$

Rate stands for the annual compound growth rate and n is total number of years. Let us substitute i with CAGR:

$$FV = PV \times (1 + CAGR)^n$$

Let's divide both sides by PV and raise both sides to $(1/n)$:

$$(FV/PV)^{(1/n)} = ((1 + CAGR)^n)^{(1/n)}$$

n and 1/n cancel each other, and we get:

$$(FV/PV)^{(1/n)} = 1 + CAGR$$

Subtracting 1 from both sides we get:

$$(FV/PV)^{(1/n)} - 1 = CAGR$$

Note: Each value of growth rate was considered as percentage for comparison purpose.

The correlation coefficient that indicates the strength of the relationship between two variables can be found using the following formula:

$$r_{xy} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

Where:

r_{xy} – the correlation coefficient of the linear relationship between the variables x and y

x_i – the values of the x -variable (area or yield of wheat) in a sample

$\bar{x}$ – the mean of the values of the x -variable

y_i – the values of the y -variable (production of wheat) in a sample

$\bar{y}$ – the mean of the values of the y -variable

Cuddy Della Valle Instability Index (Cuddy and Della Valle 1978) is coefficient of Variation to accommodate trend present in the data, which is commonly present in the time series data. This method is superior over the scale dependend measures such as standard deviation. The cuddy della valle index (CDVI) is calculated

$$CDVI = CV \sqrt{X}$$

Where, $X = 1 - \sqrt{R^2}$

CV is coefficient variation and $\sqrt{R^2}$ is adjusted coefficient of determination.

The ranges of CDVI (Rakesh Sihmar, 2014) are given as follows:

Low instability = between 0 to 15

Medium instability = greater than 15 and less than 30

High instability = higher than 30

RESULTS AND DISCUSSION

The Table 1 indicated that the area of wheat in India was 22.14 million hectares in 1981-82 and it increased to 31.45 (42.05 %) million hectares in 2019-20. Similarly, the production of wheat in India was 37.45 million tons in 1981-82 and it increased to

107.59 (187.28 %) million tones. The production of wheat was increased about 4 times more as compared to area of wheat during the period 1981-82 to 2019-20 in India. Similarly, the yield of wheat in India was 1691 kg per hectares in 1981-82 and it increased to 3421 (102.30%) kg per hectares.

The Minimum support price of wheat was 142 ₹ per quintal in 1981-82 and it increased to 1925 (1255.63%) ₹ per quintal during 2019-20. This increased was about 12.5 times from 1981-82 to 2019-20. The per person per year availability of raw wheat produce was 52.35 kg in 1981-82 and it increased to 78.74 (50.41%) kg per person per year availability of raw wheat produce during 2019-20. The population of India was 71.54 crore during 1981-82 and it increased to 136.64 (90.99 %) crore during 2019-20.

The table 2 indicated that the compound growth rate of area, production, yield of wheat, minimum support price, and population and per person per year availability of wheat was 0.84, 2.43, 1.58, 7.64, 1.73, and 0.69 percent during the overall period of 1981-82 to 2019-20 and it was significant growth at 1percent level of significance.

The compound growth rate of area was 0.36 and 0.10 percent during the period of 1981-82 to 1990-91 and 2011-12 to 2019-20 and it was not significant growth both 1 and 5 percent level of significance. But the compound growth rate of area was 1.40 and 1.34 percent during the period of 1991-92 to 2000-2001 and 2001-02 to 2010-11 and it was significant growth at 1 percent level of significance.

The compound growth rate of production was 3.39, 3.11 and 2.51 percent during the period of 1981-82 to 1990-91, 1991-92 to 2000-01 and 2001-02 to 2010-11, it was significant growth at 1 percent level of significance. But the compound growth rate of production was 1.72 percent during the period of 2011-12 to 2019-20 and it was significant growth at 5 percent level of significance.

The compound growth rate of yield was 3.02, 1.69 and 1.16 percent during the period of 1981-82 to 1990-91, 1991-92 to 2000-01 and 2001-02 to 2010-11, it was significant growth at 1 percent level of significance. But the compound growth rate of yield was 1.61 percent during the period of 2011-12 to 2019-20 and it was significant growth at 5 percent level of significance.

Table 1: The area, production, yield, MSP of Wheat and Population in India during 1981-82 to 2019-20

Year	Area (Million Hectares)	Production (Million tones)	Yield (Kg (Hectares)	MSP (₹ in Quintal)	Per person per year availability of wheat (in kg)	Population (Crore)
1981-82	22.14	37.45	1691.00	142.00	52.35	71.54
1982-83	23.57	42.79	1816.00	151.00	58.44	73.22
1983-84	24.67	45.48	1843.00	152.00	60.69	74.94
1984-85	23.56	44.07	1870.00	157.00	57.47	76.68
1985-86	23.00	47.05	2046.00	162.00	59.99	78.44
1986-87	23.13	44.32	1916.00	166.00	55.26	80.20
1987-88	23.06	46.17	2002.00	173.00	56.33	81.97
1988-89	24.11	54.11	2244.00	183.00	64.61	83.75
1989-90	23.50	49.85	2121.00	215.00	58.28	85.53
1990-91	24.17	55.14	2281.00	225.00	63.14	87.33
1991-92	23.26	55.69	2394.00	280.00	62.48	89.13
1992-93	24.59	57.21	2327.00	330.00	62.92	90.93
1993-94	25.15	59.84	2380.00	350.00	64.52	92.74
1994-95	25.70	65.77	2559.00	360.00	69.55	94.56
1995-96	25.01	62.10	2483.00	380.00	64.42	96.39
1996-97	25.89	69.35	2679.00	475.00	70.59	98.24
1997-98	26.70	66.35	2485.00	510.00	66.29	100.09
1998-99	27.52	71.29	2590.00	550.00	69.93	101.95
1999-00	27.49	76.37	2778.00	580.00	73.57	103.81
2000-01	25.73	69.68	2708.00	610.00	65.95	105.66
2001-02	26.34	72.77	2762.00	620.00	67.69	107.50
2002-03	25.20	65.76	2610.00	620.00	60.15	109.33
2003-04	26.59	72.16	2713.00	630.00	64.92	111.15
2004-05	26.38	68.64	2602.00	640.00	60.76	112.96
2005-06	26.48	69.35	2619.00	650.00	60.43	114.76
2006-07	27.99	75.81	2708.00	850.00	65.05	116.55
2007-08	28.04	78.57	2802.00	1000.00	66.40	118.32
2008-09	27.75	80.68	2907.00	1080.00	67.20	120.07
2009-10	28.46	80.80	2839.00	1100.00	66.35	121.77
2010-11	29.07	86.87	2988.00	1170.00	70.38	123.43
2011-12	29.86	94.88	3177.00	1285.00	75.89	125.03
2012-13	30.00	93.51	3117.00	1350.00	73.88	126.58
2013-14	30.47	95.85	3146.00	1400.00	74.83	128.08
2014-15	31.47	86.53	2750.00	1450.00	66.79	129.56
2015-16	30.42	92.29	3034.00	1525.00	70.44	131.02
2016-17	30.79	98.51	3200.00	1625.00	74.37	132.45
2017-18	29.65	99.87	3368.00	1735.00	74.60	133.87
2018-19	29.32	103.60	3533.00	1840.00	76.59	135.26
2019-20*	31.45	107.59	3421.00	1925.00	78.74	136.64

Govt. of India (2020) Agricultural statistics at a Glance (Area, production and yield). MSP (Ministry of Agriculture, Government of India and Commission for Agricultural Costs & Prices (CACP). Population-(Macro trends. <https://www.macrotrends.net/countries/IND/india/population>).

Table 2: Growth rate Area, Production, Yield, Minimum support price (MSP), Population and per person availability of wheat in different periods of India

Wheat						
Period	CGR of Area (%)	CGR of Production (%)	CGR of Yield (%)	CGR of MSP (%)	CGR of Population (%)	CGR of Per person per year availability of wheat (%)
1981-82 to 1990-91	0.36 NS	3.39*	3.02*	4.88*	2.24*	1.12ns
1991-92 to 2000-01	1.40*	3.11*	1.69*	9.17*	1.91*	1.18**
2001-02 to 2010-11	1.34*	2.51*	1.16*	8.88*	1.55*	0.94ns
2011-12 to 2019-20	0.10 ns	1.72**	1.61**	5.28*	1.11*	0.60ns
Overall (1981-82 to 2019-20)	0.84*	2.43*	1.58*	7.64*	1.73*	0.69*

*1percent significance level and ** 5 percent significance level.

Table 3: Correlation of wheat between area versus production and Yield versus Production

Wheat		
Period	Between Area and production	Between Yield and Production
1981-82 to 1990-91	0.64 ns	0.97*
1991-92 to 2000-01	0.90*	0.93*
2001-02 to 2010-11	0.95*	0.96*
2011-12 to 2019-20	-0.17 ns	0.94*
Overall (1981-82 to 2019-20)	0.96*	0.98*

*1percent significance level.

The compound growth rate of minimum support price was 4.88, 9.17, 8.88 and 5.28 percent during the period of 1981-82 to 1990-91, 1991-92 to 2000-01, 2001-02 to 2010-11 and 2011-12 to 2019-20 and it was significant growth at 1 percent level of significance.

The compound growth rate of population was 2.24, 1.91, 1.55 and 1.11 percent during the period of 1981-82 to 1990-91, 1991-92 to 2000-01, 2001-02 to 2010-11 and 2011-12 to 2019-20 and it was significant growth at 1 percent level of significance.

The compound growth rate of per person per year availability of wheat was 1.18 percent during the period 1991-92 to 2000-01 and it was significant growth at 5 percent level of significance. The compound growth rate of per person per year availability of wheat was 1.12, 0.94 and 0.60 during the period 1981-82 to 1990-91, 2001-02 to 2010-11 and 2011-12 to 2019-20 and it was non significant at both 5 and 1 percent level of significance.

The table 3 indicated the impact of yield and area on production of wheat in India during different periods. The simple correlation analysis was done

to measure the impact of area on production and yield on production. The results showed that the impact of yields on production of wheat was more as compared to area during the period 1981-82 to 1990-91. Because the value of the correlation coefficient between yield and production was 0.97 percent (significant at 1 percent level of significance) and the value of the correlation coefficient between area and production was 0.64 percent (non significant) during the period 1981-82 to 1990-91. The new high yielding varieties was introduced in this period. But in the next period 1991-92 to 2000-01 the impact of area and yield on production was almost similar because the value of correlation coefficient was 0.90 percent (significant at 1 percent level of significance) between area and production and the value of correlation coefficient between yield and production was 0.93 percent (significant at 1 percent level of significance). Similarly in the next period 2001-02 to 2010-11 the impact of area and yield was almost similar because the value of correlation coefficient was 0.95 percent (significant at 1 percent level of significance) between area and production and the value of correlation

coefficient was 0.96 percent (significant at 1 percent level of significance) between yield and production. But the impact of area was negative on production as compared to yield on production during the period 2011-12 to 2019-20 because the value of correlation coefficient was -0.17 percent (non significant) between area and production and the value of correlation coefficient was 0.98 percent (significant at 1 percent level of significance) between yield and production. So this clearly indicated that in future the scope of more area under wheat cultivation is less. So in future we can increase the production of wheat by developing new high yielding varieties of wheat.

The table 4 indicated the value of instability index of area ranges between 1.27 to 2.33 in different periods of study and its value was 2.25 for the overall period 1981-82 to 2019-20. This showed low instability in area under different periods of study. Similarly, the value of instability index of production ranges between 2.87 to 3.61 in different periods of study and its value was 4.31 for the overall period 1981-82 to 2019-20. This showed low instability in production under different periods of study. Similarly, the value of instability index of yield ranges between 2.17 to 4.35 in different periods of study and its value was 3.90 for the overall period 1981-82 to 2019-20. This

showed low instability in production yield under different periods of study. Similarly, the value of instability index of minimum support price ranges between 0.91 to 6.15 in different periods of study and its value was 6.43 for the overall period 1981-82 to 2019-20. This showed low instability in minimum support price under different periods of study. Similarly, the value of instability index of population ranges between 0.06 to 0.10 in different periods of study and its value was 1.44 for the overall period 1981-82 to 2019-20. This showed low instability in population under different periods of study. The value of instability index of per person per year availability of wheat ranges between 3.09 to 4.00 in different periods of study and its value was 4.35 for the overall period 1981-82 to 2019-20. This showed low instability in per person per year availability of wheat under different periods of study. The value of instability index showed low in stability under all parameters under different periods of study. But we can arrange the value of instability index more to less during the period 1981-82 to 2019-20. During the overall period 1981-82 to 2019-20 the value of instability index showed 6.43, 4.35, 4.31, 3.90, 2.25, 1.44 for MSP, Per person per year variability of wheat, production, yield, area and Population. So, May be it showed low instability index but the

Table 4: The instability index of wheat in area production, yield, MSP of wheat, population and Per person per year availability of wheat in India during different periods

Period	Wheat																	
	Area			Production			Yield			MSP			Population			Per person per year availability of wheat		
	R ²	cv	Instability index	R ²	cv	Instability index	R ²	cv	Instability index	R ²	cv	Instability index	R ²	cv	Instability index	R ²	cv	Instability index
1981-82 to 1990-91	0.13	2.90	2.33	0.79	10.75	3.61	0.87	9.17	2.34	0.90	15.20	3.40	1.00	6.36	0.09	0.29	5.90	4.00
1991-92 to 2000-01	0.67	4.85	2.08	0.83	9.59	2.87	0.73	5.65	2.17	0.97	25.01	3.02	1.00	5.43	0.07	0.42	5.22	3.09
2001-02 to 2010-11	0.82	4.19	1.27	0.74	8.32	3.11	0.55	4.50	2.30	0.89	26.11	6.15	1.00	4.41	0.10	0.28	5.04	3.45
2011-12 to 2019-20	0.01	2.35	2.21	0.52	6.11	3.23	0.35	6.83	4.35	0.99	13.49	0.91	1.00	2.86	0.06	0.11	4.47	3.64
Overall (1981-82 to 2019-20)	0.90	9.98	2.25	0.95	26.76	4.31	0.91	17.81	3.90	0.98	73.65	6.43	0.99	18.81	1.44	0.64	9.67	4.35

Minimum support price showed more instability as compared to other parameters of study.

CONCLUSION

The area of wheat in India was 22.14 million hectares in 1981-82 and it increased to 31.45 (42.05 %) million hectares in 2019-20. Similarly, the production of wheat in India was 37.45 million tons in 1981-82 and it increased to 107.59 (187.28 %) million tones. The production of wheat was increased about 4 times more as compared to area of wheat during the period 1981-82 to 2019-20 in India. Similarly, the yield of wheat in India was 1691 kg per hectares in 1981-82 and it increased to 3421 (102.30%) kg per hectares. The Minimum support price of wheat was 142 ₹ per quintal in 1981-82 and it increased to 1925 (1255.63%) ₹ per quintal during 2019-20. This increased was about 12.5 times from 1981-82 to 2019-20. The per person per year availability of raw wheat produce was 52.35 kg in 1981-82 and it increased to 78.74 (50.41%) kg per person per year availability of raw wheat produce during 2019-20. The population of India was 71.54 crore during 1981-82 and it increased to 136.64 (90.99 %) crore during 2019-20. The compound growth rate of area, production, yield of wheat, minimum support price, population and per person per year availability of wheat was 0.84, 2.43, 1.58, 7.64, 1.73, and 0.69 percent during the overall period of 1981-82 to 2019-20 and it was significant growth at 1 percent level of significance. The simple correlation analysis was done to measure the impact of area on production and yield on production. The results showed that the impact of yields on production of wheat was more as compared to area

during the period 1981-82 to 1990-91. Because the value of the correlation coefficient between yield and production was 0.97 percent (significant at 1 percent level of significance) and the value of the correlation coefficient between area and production was 0.64 percent (non significant) during the period 1981-82 to 1990-91. During the overall period 1981-82 to 2019-20 the value of instability index showed 6.43, 4.35, 4.31, 3.90, 2.25, 1.44 for MSP, Per person per year variability of wheat, production, yield, area and Population. So, May be it showed low instability index but the Minimum support price showed more instability as compared to other parameters of study.

REFERENCES

- Indian Population, 1950 to 2021. *Macro trends*. [https:// www. macrotrends. net/ countries /IND / india/ population](https://www.macrotrends.net/countries/IND/india/population)
- Minimum support price, 1981 to 2019. Ministry of Agriculture, Government of India and Commission for Agricultural Costs & Prices (CACP). [https:// fci. gov. in/ procurements. php? view=89](https://fci.gov.in/procurements.php?view=89) and [https:// www. rbi. org. in/ scripts/ PublicationsView. aspx? id=15815](https://www.rbi.org.in/scripts/PublicationsView.aspx?id=15815)
- Kulshrestha, V.P. 1985. History and ethnobotany of wheat in India. *Journ. d' Agric. Trad. et de Bota. Appl* **XXXII**: 61-71.
- Govt. of India, 2020. *Agricultural statistics at a Glance*.
- Sharma, H. 2022. Wheat production down, but many crops set for record. *The Indian Express, E paper* 30 Dec 2022, [https:// indianexpress. com/ article/ business/ commodities/ india- fourth- advance- estimate- 2021- 22- crop- year- wheat- production- rice- maize- gram- pulses- mustard- sugarcane- 8095246/](https://indianexpress.com/article/business/commodities/india-fourth-advance-estimate-2021-22-crop-year-wheat-production-rice-maize-gram-pulses-mustard-sugarcane-8095246/)
- Vasudeva, V. and Munjal, D. 2022. Explained | What are India's plans to avert a wheat crisis? *The Hindu Epaper* . [https:// www. thehindu. com/ sci- tech/ agriculture/ explained- what- are- indias- plans- to- avert- a- wheat- crisis/ article65391281. ece](https://www.thehindu.com/sci-tech/agriculture/explained-what-are-indias-plans-to-avert-a-wheat-crisis/article65391281.ece)

