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

NAAS Rating: 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 7; July 2025; Page No. 644-648

Received: 09-05-2025
Accepted: 12-06-2025

Indexed Journal
Peer Reviewed Journal

Study of parity between cost and prices of gram (*Cicer arietinum* L.) in major states of India

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DOI: https://www.doi.org/10.33545/26180723.2025.v8.i7i.2196

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Abstract

The present study aimed to analyse the parity between cost and prices of gram in major states of India using secondary source data collected for the period 2003-04 to 2022-23. The Secondary data on Cost of Production, Farm Harvest Prices (FHP) and Minimum Support Prices (MSP) of gram were collected from the secondary sources. The gap between MSP and cost of production of gram in major states of India namely in Madhya Pradesh, the gap ranged from -13 to 1987 ₹/qtl, Maharashtra recorded a gap ranged from -14 to 1172 ₹/qtl and Rajasthan showed a gap between -14 and 1628 ₹/qtl. The state-wise average gap between FHP and MSP of gram ranged from -98.75 to 171.4 ₹/qtl. To examine the effectiveness of the price policy for gram in major states of India, during the harvest periods was examined by the deviations of FHP from MSP and classified into positive and negative deviations to examine whether market prices ruled higher or lower than the minimum support prices. Hence the absolute positive deviation (APD) or absolute negative deviation (AND) and mean absolute positive derivation (MAPD) or mean absolute negative deviation (MAND) was calculated. Also adjusted mean positive deviation (AMPD) and adjusted mean negative deviation (AMND) was worked out. Madhya Pradesh exhibits an equal frequency of positive (10) and negative (10) deviations, indicating potential fluctuations in the relationship. Rajasthan showed a higher frequency of positive (11) deviations, suggesting FHP often exceeds MSP. Maharashtra showed in higher frequency of negative (14) deviations, implying FHP is often lower than MSP.

Keywords: Gram, cost of production, farm harvest prices and minimum support prices

Introduction

Chickpea (*Cicer arietinum* L.), also known as gram or Bengal gram, is the most important pulse crop in India, playing a vital role in food, nutritional, and income security, as well as in environmental sustainability. It enriches soil fertility, especially benefiting subsequent crops. Rich in protein, dietary fiber, essential amino acids (lysine, methionine, threonine, valine, isoleucine, leucine) and minerals like phosphorus, iron, and calcium, chickpea offers high nutritional value. On average, 100g of chickpea provides 14.5g protein, 45g carbohydrates, and 268 kcal energy. Globally, chickpea is cultivated in over 50 countries across 14.56 million hectares, with India contributing 64.47% of global production. Increasing the area under major pulses like chickpea, especially in key states such as Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Gujarat, and Andhra Pradesh, states sharing over (90%) area. Among the major chickpea-producing states, Madhya Pradesh leads with 4.59 million tonnes, followed by Maharashtra (1.83 MMT), Rajasthan (1.68 MMT), Karnataka (0.78 MMT), Andhra Pradesh (0.58 MMT), Uttar Pradesh (0.57 MMT), and Gujarat (0.37 MMT). In terms of productivity, Gujarat ranks highest at 1,285 kg/ha, closely followed by Madhya Pradesh at 1,280 kg/ha, with Jharkhand and Uttar Pradesh recording 1,155 kg/ha and 1,228 kg/ha. respectively (2022-23).

Minimum Support Price (MSP) is a key part of India's Agricultural Price Policy, aimed at protecting farmers from distress sales by ensuring a minimum return on their crops, especially when market prices fall. It helps to stabilize farm incomes, encourages production, and supports the public distribution system. Ideally, market prices exceed the MSP, but when they don't, MSP acts as a safety measures. The Commission for Agricultural Costs and Prices (CACP) recommends MSPs for 23 crops, including cereals (like paddy, wheat, and maize), pulses (such as chickpea, tur, and lentil), oilseeds (mustard, groundnut, soybean), and commercial crops (cotton, jute, copra). Farm Harvest Prices (FHP), prevailing 6-8 weeks after harvest, are typically higher than MSP but lower than Wholesale Prices (WSP), which are observed in wholesale markets.

Materials and Methods

For the present study based on the highest area under gram cultivation, Madhya Pradesh, Maharashtra, and Rajasthan are the three main gram-growing states were selected. The data on the cost of production, farm harvest prices (FHP), and minimum support prices (MSP) of gram for the years 2003-04 to 2022-2023 were obtained from various government sources like Agriculture statistics at a glance, Indiastat.com, Government publications and website.

Analytical tools and techniques

The difference between MSP and cost of production and between FHP and MSP of gram was calculated year wise. To study the effectiveness of the price policy during the

harvest period of gram deviation of FHP from the MSP was worked out and divided into the negative and positive deviation to examine whether the market price ruled higher or lower over the MSP. Hence APD or AND and MAPD or MAND was calculated. Also AMPD and AMND was worked out. The formulae used for the mean absolute negative/ positive deviation was as follows:

MAND or MAPD = $1/n \sum | FHPi - MSPi |$

If, FHP < MSP = Negative deviation (ND)

FHP > MSP = Positive deviation (PD)

Where,
MAND= Mean absolute negative deviation,
MAPD = Mean absolute positive deviation,
MSP = Minimum support price,
FHP = Farm harvest price,
n = Frequency of positive or negative deviations.

These deviations were adjusted with MSP in order to examine the degree of their deviation from the MSP. The formulae used for the adjusted mean negative/positive deviation was as follows:

AMND or AMPD= $1/n \sum (FHPi\text{-}MSPi|/MSPi) *100$

Where,
AMND = Adjusted mean negative deviation
AMPD = Adjusted mean positive deviation,
The significance of gap between FHP and MSP of gram for major states was tested by two sample t-test.

$$t = \frac{(x - y)-(u_x-u_y)}{s\sqrt{\frac{1}{n_x} + \frac{1}{n_y}}}$$

where,
x= mean of FHP of size n_x
y= mean of MSP of size n_y
S^{p^2}= pooled variance

$$S^{p^2} = \frac{(n_x-1)S_x^2}{(n_x-1)+(n_y-1)}$$

Results and Discussion

Gap between Minimum Support Prices and Cost of Production of Gram in Major states of India

In Madhya Pradesh, the gap ranged from -13 to 1987 ₹/qtl. Positive gaps was observed in 18 times, with the highest in 2019-20 i.e.,1987 ₹/qtl. Negative gaps occurred 2 times, with the highest in 2006-07 i.e., -106 ₹/qtl. In Maharashtra, the gap ranged from -14 to 1172 ₹/qtl. Both positive and negative gaps were observed 10 times each. The highest positive was in 2020-21 i.e.,1172 ₹/qtl and the highest negative in 2015-16 i.e., -966 ₹/qtl. In Rajasthan, the gap ranged from -14 to 1628 ₹/qtl. Positive gaps was observed in 15 times, highest in 2019-20 i.e.,1628 ₹/qtl while negative gaps occurred five times, with the highest in 2014-15 i.e., -265 ₹/qtl.

Table 1: Gap between Minimum Support Prices and cost of production of Gram in Madhya Pradesh, Maharashtra, Rajasthan during 2003-04 to 20022-23

Year	Madhya Pradesh			Maharashtra			Rajasthan		
	MSP (₹/qtl)	Cost of production (₹/qtl)	Gap between MSP and Cost of production (₹/qtl)	MSP (₹/qtl)	Cost of production (₹/qtl)	Gap between MSP and Cost of production (₹/qtl)	MSP (₹/qtl)	Cost of production (₹/qtl)	Gap between MSP and Cost of production (₹/qtl)
2003-04	1400	991	409	1400	1307	93	1400	1339	61
2004-05	1425	1005	420	1425	1729	-304	1425	1095	330
2005-06	1435	1402	33	1435	1552	-117	1435	1488	-53
2006-07	1445	1551	-106	1445	1895	-450	1445	1248	197
2007-08	1600	1613	-13	1600	1614	-14	1600	1818	-218
2008-09	1730	1552	178	1730	2278	-548	1730	1692	38
2009-10	1760	1530	230	1760	2065	-305	1760	1774	-14
2010-11	2100	1729	371	2100	2096	4	2100	1516	584
2011-12	2800	2435	365	2800	2893	-93	2800	2600	200
2012-13	3000	2713	287	3000	2965	35	3000	2393	607
2013-14	3100	2928	172	3100	2777	323	3100	2138	962
2014-15	3175	2912	263	3175	3402	-227	3175	3440	-265
2015-16	3425	3395	30	3425	4391	-966	3425	3487	-62
2016-17	4000	3207	793	4000	4113	-113	4000	3215	785
2017-18	4400	2914	1486	4400	4056	344	4400	3097	1303
2018-19	4620	3136	1484	4620	3861	759	4620	3414	1206
2019-20	4875	2888	1987	4875	3876	999	4875	3247	1628
2020-21	5100	3548	1552	5100	3928	1172	5100	3919	1181
2021-22	5230	3628	1602	5230	4236	994	5230	3634	1596
2022-23	5335	3719	1616	5335	4336	999	5335	3799	1536

Gap between Farm Harvest Prices (FHP) and Minimum Support Prices (MSP) of Gram in major states of India

In Madhya Pradesh, the gap ranged from -52 to 1140 ₹/qtl. Both positive and negative gaps were observed 10 times each. The highest positive was in 2016-17 i.e.,1140 ₹/qtl and the highest negative in 2017-18 i.e., -416 ₹/qtl. In Maharashtra, the gap ranged from -72 to 1667 ₹/qtl. Positive gaps was observed in 6 times, with the highest in 2016-17 i.e.,1140 ₹/qtl. while Negative gaps occurred 14 times, with the highest in 2019-20 i.e., -₹952 ₹/qtl. In Rajasthan, the gap ranged from -19 to 1120 ₹/qtl. Positive gaps was observed in 11 times, highest in 2016-17 i.e.,1120 ₹/qtl while negative gaps occurred 9 times, with the highest in 2019-20 i.e., -873 ₹/qtl.

Table 2: Gap between Farm Harvest Prices (FHP) and Minimum Support Prices (MSP) of Gram in major states of India during 2003-04 to 2022-23

Year	Madhya Pradesh			Maharashtra			Rajasthan		
	FHP (₹/qtl)	MSP (₹/qtl)	Gap between FHP and MSP (₹/qtl)	FHP (₹/qtl)	MSP (₹/qtl)	Gap between FHP and MSP (₹/qtl)	FHP (₹/qtl)	MSP (₹/qtl)	Gap between FHP and MSP (₹/qtl)
2003-04	1348	1400	-52	1328	1400	-72	1370	1400	-30
2004-05	1335	1425	-90	1328	1425	-97	1406	1425	-19
2005-06	1707	1435	272	1326	1435	-109	1925	1435	490
2006-07	2252	1445	807	1504	1445	59	2118	1445	673
2007-08	2388	1600	788	1506	1600	-94	2337	1600	737
2008-09	2151	1730	421	1996	1730	266	2336	1730	606
2009-10	2005	1760	245	2024	1760	264	2342	1760	582
2010-11	2281	2100	181	2023	2100	-77	2143	2100	43
2011-12	3414	2800	614	2517	2800	-283	3445	2800	645
2012-13	3405	3000	405	3768	3000	768	3155	3000	155
2013-14	3014	3100	-86	2884	3100	-216	2817	3100	-283
2014-15	2892	3175	-283	2758	3175	-417	3510	3175	335
2015-16	4262	3425	837	4169	3425	744	4318	3425	893
2016-17	5140	4000	1140	5667	4000	1667	5120	4000	1120
2017-18	3984	4400	-416	3646	4400	-754	3783	4400	-617
2018-19	4231	4620	-389	4009	4620	-611	4009	4620	-611
2019-20	4474	4875	-401	3923	4875	-952	4002	4875	-873
2020-21	5027	5100	-73	4563	5100	-537	4738	5100	-362
2021-22	5021	5230	-209	4445	5230	-785	4720	5230	-510
2022-23	5052	5335	-283	4596	5335	-739	4725	5335	-610

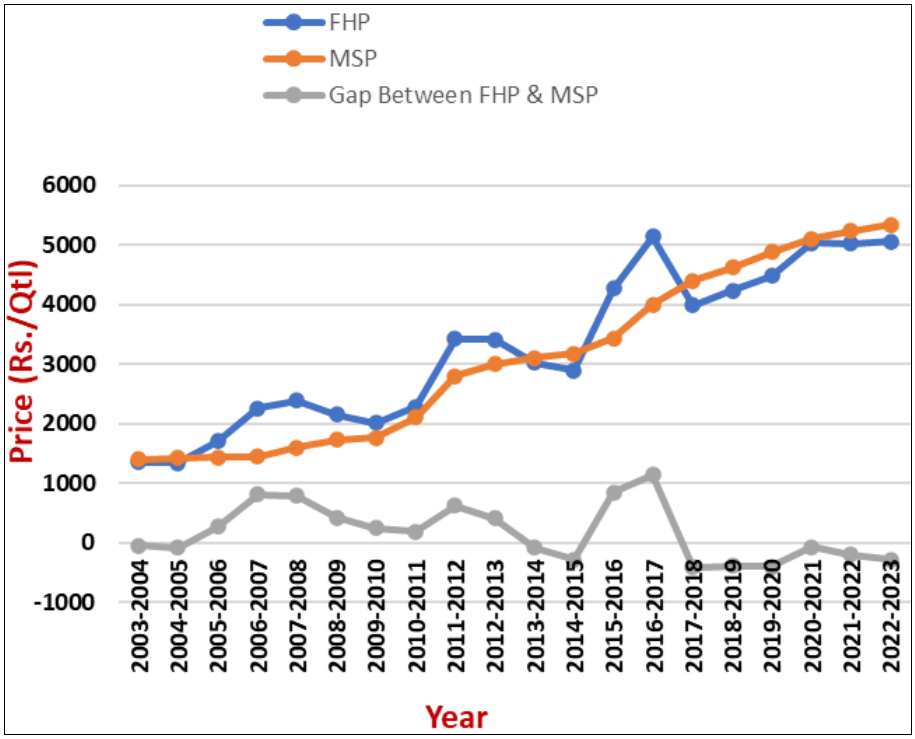

Fig 1: FHP and MSP of gram in Madhya Pradesh

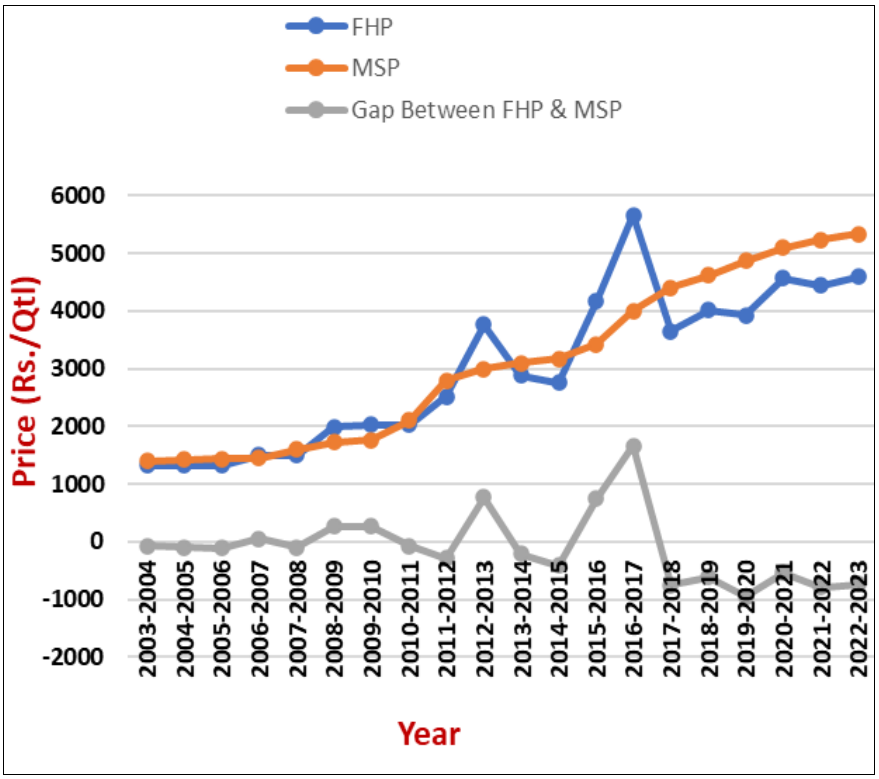

Fig 2: FHP and MSP of gram in Maharashtra

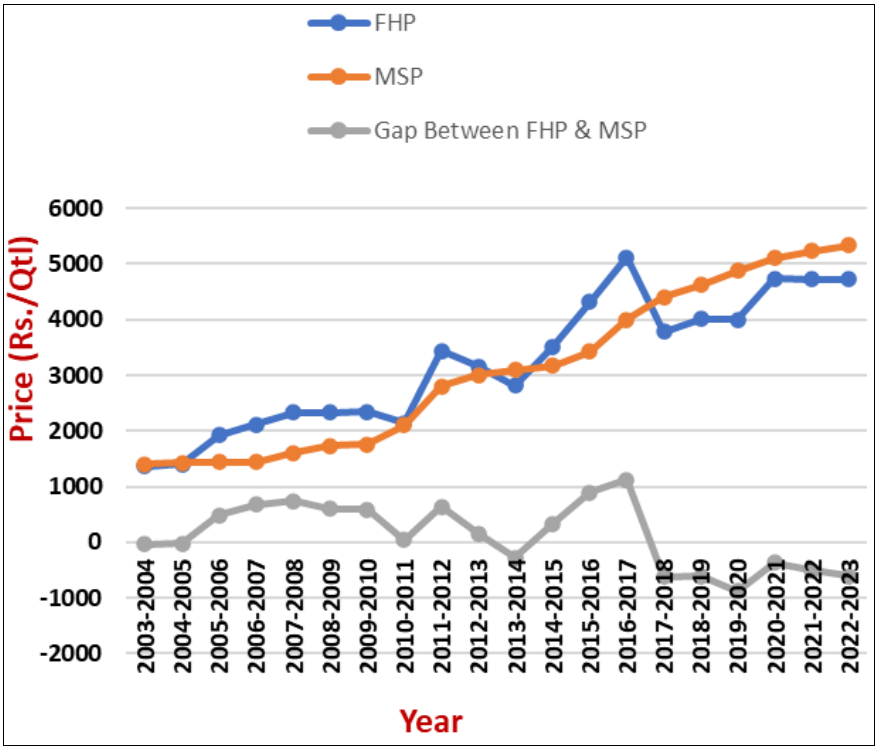

Fig 3: FHP and MSP of gram in Rajasthan

Table 3: Significance of gap between FHPs and MSPs of Gram in major states of India during 2003-04 to 2022-23

States	Mean FHP	Mean MSP	Gap FHP-MSP	T Value (t-cal)	t table	D.F.
Madya Pradesh	3269.15	3097.75	171.40	0.39	2.02	38
Maharashtra	2999.00	3097.75	-98.75	0.22	2.02	38
Rajasthan	3215.95	3097.75	118.20	0.28	2.02	38

Note- $t_{cal} < t_{tab}$ that means h_0 is accepted at (5%) level of significance and conclude that the gap between FHP and MSP do not differ significantly.

Table 3 presents the analysis of the gap between FHP and MSP of gram in major states of India from 2003-04 to 2022-23, using a t-table value of 2.02 at 38 degrees of freedom and 5% level of significance. Madhya Pradesh recorded a t-cal of 0.39, Maharashtra -0.22 and Rajasthan 0.28, all of which are lower than the tabulated t-value. Overall, the results suggest that, the calculated t-values for all states fall below the critical value, indicating no statistically significant difference between FHP and MSP during the study period. The highest average gap was recorded in Madhya Pradesh state (171.4 ₹/qtl) followed by Rajasthan state (118.2 ₹/qtl) and recorded lowest in Maharashtra state (-98.75 ₹/qtl).

Deviations of FHPs vis-à-vis MSPs of Gram in major States of India during 2003-04 to 2022-23

To assess the effectiveness of the MSP policy for gram in major states of India, the differences between FHP and MSP from 2003-04 to 2022-23 were analyzed. In Madhya Pradesh, FHP exceeded MSP in 10 times out of 20 years, with an adjusted positive and negative difference each accounting for 50 per cent of MSP. Maharashtra recorded positive deviations in only 6 times out of 20 years, with an adjusted positive difference of 30 per cent and a negative difference of 70 per cent of MSP, indicating FHP was lower in most years. Rajasthan showed FHP higher than MSP in 11 times out of 20 years, with a 55 per cent positive and 45 per cent negative adjusted difference. These trends reflect variability in price realization relative to MSP across the states.

Table 5: Deviations of FHPs from MSPs of Gram in major States of India during 2003-04 to 2022-23

States	Positive Deviation					Negative Deviation				
	Frequency	MAPD ₹/qtl	Range ₹/qtl	AMPD ₹/qtl	%	Frequency	MAND ₹/qtl	Range ₹/qtl	AMND ₹/qtl	%
Madya Pradesh	10	571.00	181-1140	25.93	50	10	-228.20	(-52) - (-416)	-5.85	50
Maharashtra	6	628.00	59-1667	20.28	30	14	-410.20	(-72) - (-952)	-10.61	70
Rajasthan	11	570.82	43-1120	26.34	55	9	-435.00	(-19) - (-873)	-9.56	45

Note: Average of the difference of FHP from MSP (+ve or-ve) and
% = Percentage of average positive or negative deviation over MSP.

Conclusions and policy implications

The analysis of difference (gap) between MSP and cost of production among the gram over the period of time i.e., 2003-04 to 2022-23 reveals that Madhya Pradesh, Maharashtra and Rajasthan showed both positive and negative difference. While Madhya Pradesh and Rajasthan recorded highest positive gaps, Maharashtra showed highest negative gaps, indicating less effective price support. Statistical analysis using the t-test showed no significant difference between Farm Harvest Prices (FHP) and Minimum Support Prices (MSP) in any of the states, suggesting that MSP has not consistently influenced market prices. Deviation analysis in which positive and negative differences, Madhya Pradesh exhibits an equal frequency of positive and negative deviations, indicating potential fluctuations in the relationship. Rajasthan showed a higher frequency of positive deviations, suggesting FHP often exceeds MSP. Maharashtra showed in higher frequency of negative deviations, implying FHP is often lower than MSP. In order to protect economic and social security of the farmers whenever there will be negative deviation (MSP-FHP) in the prices of gram, government intervention in the procurement of gram is required.

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