ISSN NO: ***2583-7842 (Online)***
Gateway International Journal of Innovative Research
Volume 2, Issue 2, June, 2023, pp 25-35.

Impact of Minimum Support Prices (MSP) on the Area under Cultivation of Wheat in India

*Gaurav Bhardwaj

Abstract

The paper attempts to find out the association between area under cultivation of wheat in India and its Minimum Support Price (MSP) decided by the government of India. The main objective of MSP is incentivizing the farmers to provide a safety net at the time when market prices are falling. In the light of this topic, there arises a question does there exist any long run association ship between MSP of wheat and area under cultivation? To find the solution, Ihave used the time series data on MSP of wheat and area under cultivation of wheat data and used ADF test, Cointegration test and Vector Error Correction Model. The result shows that there exists cointegration between MSP and area under cultivation of wheat in India. Further, the results of VECM shows that a rise in minimum support price of wheat by 1% leads to 0.115% rise in the area under cultivation of wheat in India.

Keywords: *Minimum Support Price (MSP), Area under cultivation, Wheat, India,Agriculture, cointegration, VECM*

*Assistant Professor, Department of Management (MBA), Maharaja Surajmal Institute, Delhi
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Introduction

Indian economy has always known for its agriculture sector. The agriculture sector acts as a pillar in achieving economic development in terms of food security and removing poverty. The share of agriculture in GDP of India is decreasing since independence but the rural India is still dependent on agriculture sector for their livelihood and employment. Even in the timesof COVID-19, among the other two sectors, manufacturing and service sector, the agriculture sector was the least hit by the pandemic and showed a positive growth rate. The total food grain production in India was 3087 lakh tonnes in 2020-21.

The price policy in the agriculture has been there since independence. The price policy has always given much importance to the food grains like wheat, rice and coarse cereals like jowar, bazar, etc. In 1950, the Food grains Procurement Committee was formed and itintroduced the practice of rationing and control of supply of food grains in the country. In 1964, the government of India introduced price policy to provide incentives to the farmers. The food grains price committee of 1964 assured the farmers that the prices of food grains will not be allowed to fall below the minimum level.

Presently, the government takes decision on the MSPs for the agricultural commodities as per the recommendations of Commission for Agricultural Costs and Prices (CACP), views of state government, ministries and other factors. The government fixes the MSP for agricultural products like wheat, maize, rice, sugarcane, cotton, pulses, etc. with an objective to safeguard the interest of farmers. The Food Corporation of India (FCI) procures the food grains at procurement prices to meet the emergency demand and to intervene in the market when market price rises.

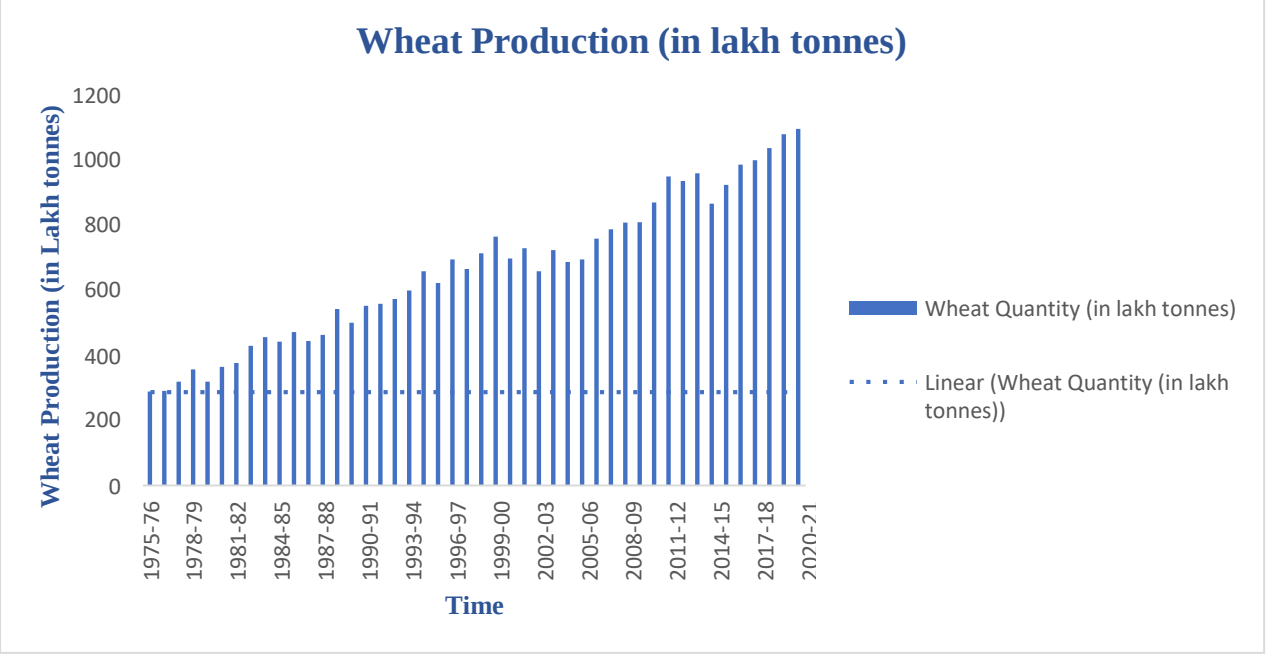
The NDA government under the leadership of Prime Minister Narendra Modi, introduced the 3 farm bills in the Parliament but later it withdrew it due to the large-scale protests by the farmers. The first bill was the Farmers' Produce Trade and Commerce (Promotion and Facilitation) Bill, 2020, second bill was the Farmers (Empowerment and Protection) Agreement of Price Assurance and Farm Services Bill, 2020; and the third bill was the Essential Commodities (Amendment) Bill, 2020. The critics and farmers were arguing that these bills will put a full stop to the Minimum Support Price (MSP) for various crops. They argued that once the policy of Minimum Support Price (MSP) is removed, they will become more vulnerable.

There are two crop seasons in India. One is Kharif crop season which is from July to October during the monsoon and another is Rabi crop season which is from October to March during the winters of every year. The minimum support prices are announced by the Government of India at the beginning of the sowing season for certain crops on the basis of the recommendations of the Commission for Agricultural Costs and Prices (CACP).

It becomes really important to analyse the relation between minimum support prices and area under cultivation in India. Do the farmers consider the minimum support prices as one of the factors while deciding the area under cultivation for a crop?

The fig 1 shows the diagram of wheat production expressed in lakh tonnes in India from 1975-76 to 2020-21 in India. It has been tremendously rising to meet the demand by growing population in the country.

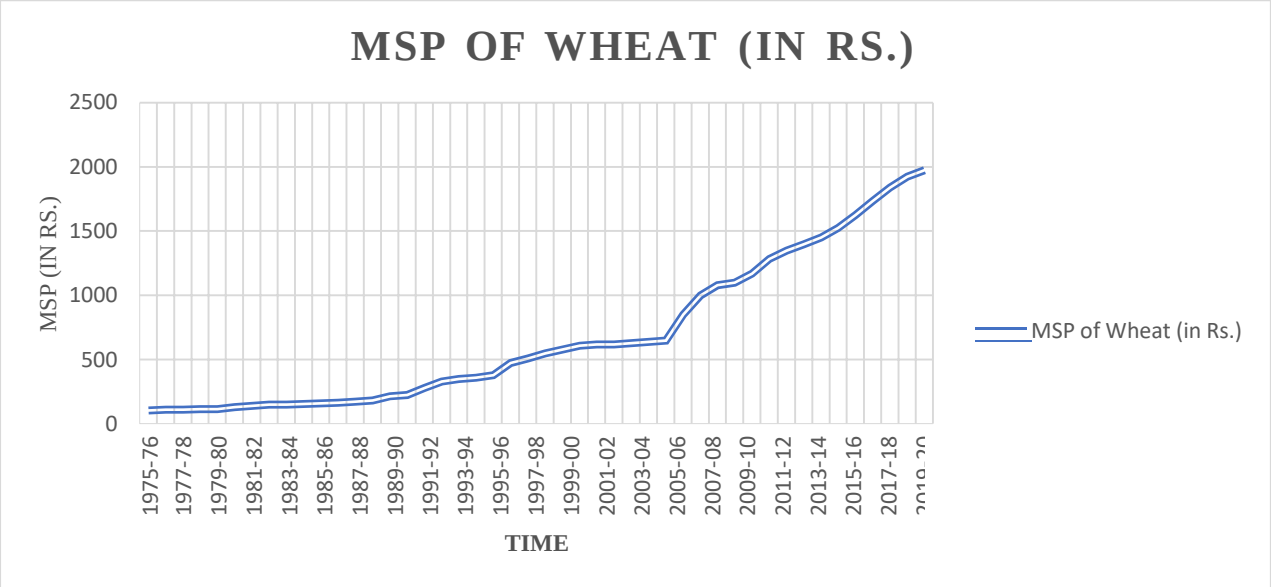
Fig 1: Wheat Production in India



Source: Author's Computation

The fig 2 shows the trend of rising MSP for wheat in India from 1975-76 to 2020-21. The diagram shows an upward trend in the MSP for wheat.

Fig 2: Minimum Support Price (MSP) for Wheat in India over the years



Source: Author's Computation

Review of Literature

Many researchers have worked upon the area of MSPs, area under cultivation, yield rates in India and I have made an attempt to provide some of the relevant literature here in the paper.

A study by Deshpande, R.S & Naika (2002) concluded that MSP does not work as an incentive price to influence the area under the crops in the state of Karnataka. As per their study, it is the market price and not the MSP that acts as an incentive for the farmer to decide the cropping pattern. Parikh et al. (2003) stated that rise in minimum support prices has caused the agricultural andnon-agricultural GDP over time. The researcher found that, the price indices have increased over time and the investment in the agricultural sector have reduced.

Another pioneering study by Chand (2003) points out that the policy of minimum support prices has favoured some selected crops. He also stated that the MSP provides a strong and safety net to the farmers. Ali, Siddhu & Vatta (2012) found the minimum support price policy has been effective for states like Punjab and Andhra Pradesh which are regarded as surplus states while it has not been so effective for deficit states. They also undertook non price factors and found them significant for food grain production.

Tiwari & Shahbaz (2013) concluded from their research that there exists a bi-directional causality between the producer's and consumer price for agricultural products.

In 2016, The NITI Aayog, Government of India, published a report which states that the minimum support price policy is found to be efficient in safeguarding the interests of the farmers but the efficacy is weak in many states except Punjab and Andhra Pradesh.

Another work by Aditya et al. (2017) have provided the farmer's awareness level about the minimum support price policy. The results showed that farmer's knowledge of minimum support prices does not lead to the specialization in the cropping pattern.

A paper by Geetha & Mahesh (2019) concluded that the cotton production has increased due to rise in minimum support prices declared by the government. They have also shown that many farmers are not aware about the minimum support policy and are at the disadvantage.

A recent study done by Das (2021) on minimum support price, yield and production of various crops concluded that there exists long run relation between minimum support prices, yield rates and production level. He also concluded that, for some crops minimum support prices granger causes to the yield rates.

Objectives of the Study

- To analyse if there is any long run relationship between Minimum Support Price (MSP) and Area under wheat cultivation in India.

Research Question

1. Is there any long run association ship between Minimum Support Price (MSP) and Area under cultivation of wheat in India?

2. How the changes in the Minimum Support Prices of wheat are impacting the area under cultivation of wheat in India?

Motivation for the Study

The literature review gives us many studies conducted on MSP and related policies but there are less studies available that attempts to study the association between the Minimum Support Price (MSP) and Area under cultivation. This study attempts to fill the research gap by developing the link between minimum support prices and area under cultivation of wheat in India.

Data Source

The study has used a secondary time series data. I have taken the data on two variables: Minimum Support Price (MSP) for Wheat (Fair Average Quality) expressed in Rs. perquintal and Area under Cultivation (in Lakh hectares) for the time period 1975-76 to 2020-21. The data on both the variables has been obtained from Database on Indian Economy, Reserve Bank of India.

Methodology

The study uses exploratory research design and employs time series analysis to evaluate the research questions. The first step while doing the time series analysis is to convert the variables into logarithmic forms and then

The Adjusted Dickey Fuller (ADF) test: It is used to check the stationarity of the variables that are necessary condition in time series analysis. By stationarity we mean that,

(i) $E(y_t)$ should be constant for all time period 't'.

(ii) $Var(y_t)$ should be constant for all time period 't'.

(iii) $Cov(y_t, y_{t+k})$ should be constant for all t and k not equal to zero.

The three possible functions are there for ADF test. The intercept, drift and trend equations.

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=1}^{\rho} \beta_i \Delta y_{t-1} + u_t$$

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \sum_{i=1}^{\rho} \beta_i \Delta y_{t-1} + u_t$$

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + a_2 t + \sum_{i=1}^{\rho} \beta_i \Delta y_{t-1} + u_t$$

The null hypothesis will be there is presence of unit root which means that data is non-stationary. If the null hypothesis is accepted, then we will go for first difference of the series and again check the ADF test.

Johansen's Cointegration Test: It is used to test the number of cointegrating relationships between the variables. Test procedure involves testing for rank of π matrix, and want to know

the number of linearly independent columns of π matrix and 'r' columns. If there are n variables, the cointegrating relationships will be (n-1).

(i) Maximum eigen value statistic:

λ max (r, r_{t+1}) = -rρ(1-λ^{r+1})

Null hypothesis: Rank (π) is less than equal to r

Alternate: π = r+1

(ii) Trace statistic (it is commonly used)

λ trace (τ) = -r Σ ln (1-λ^{r+1})

Null Hypothesis: π is less than equal to r

Alternate: π is greater than r

Vector Error Correction Model (VECM): If two series are cointegrated of order 1 then there exist unique x and y such that $u_t = y_t - \alpha_0 - \alpha_1 x_t$ is I (0). In the single-equation model of cointegration where we thought of y as the dependent variable and x as an exogenous regressor, we saw that the error-correction model

$$\Delta y_t = \beta_0 + \beta_1 \Delta x_t + \delta u_{t-1} + \varepsilon_t = \beta_0 + \beta_1 \Delta x_t + \delta [y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}] + \varepsilon_t$$

Was an appropriate specification. The vector error correction model extends this single-equation model to allow y and x to evolve jointly over time as in a VAR system. In the two-variable case, there can be only one cointegrating relationship and the y equation of the VEC system is similar to the above equation, except that we mirror the VAR specification by putting lagged differences of y and x on the righthand side. With only one lagged difference (there can be more) the bivariate VEC can be written as:

$$\Delta y_t = \beta_{y0} + \beta_{yy1} \Delta y_{t-1} + \beta_{yx1} \Delta x_{t-1} + \delta_y (y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v^y{}_t$$

$$\Delta x_t = \beta_{x0} + \beta_{xy1} \Delta y_{t-1} + \beta_{xx1} \Delta x_{t-1} + \delta_x (y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v^x{}_t$$

The δ coefficients are again the error-correction coefficients, measuring the response of each variable to the degree of deviation from long-run equilibrium in the previous period.

Results:

I have employed two time series variables, Area under cultivation (in lakh hectares) and Minimum Support Prices (in Rs.) and their results for descriptive statistics is mentioned in table 1.

Table 1: Descriptive Statistics for the variables used in the study

Variables	No. of Observations	Average	Standard Deviation	Minimum Value	Maximum Value
Area Under Cultivation (in lakh Hectares)	46	260.826	31.22	205	316
Minimum Support Price (in Rs. per quintal)	46	680.652	579.727	105	1975

Source: Author's Computation

The above table shows the mean of area under cultivation of wheat and MSP of wheat along with their standard deviation. The average area under cultivation of wheat in the span of 46 years is 260.82 lakh hectares while the average MSP for wheat is Rs. 680.65 per quintal. The standard deviation for MSP is high means that there are large deviations from the mean value.

After checking the descriptive statistics for the variables, we can convert the variables into logarithmic forms to start with time series analysis. After converting them into logarithmic forms, it isimportant to check the stationarity condition on level and 1st difference using Augmented Dickey Fuller (ADF) test. The results of ADF tests are shown in the table 2. The optimum lag selection was found as per the AIC criteria. The optimum lags for area under cultivation of wheat was 4 lags whereas for minimum support prices of wheat was 2 lags.

The log (Area under cultivation) is not stationary on level with intercept model and intercept & trend model because the p-value is greater than level of significance (0.05). After taking first difference, the log (Area under cultivation) becomes stationary (p-value is less than level of significance. The log (MSP) is also not stationary on level with intercept model and intercept & trend model so the first difference is taken and it is found to be stationary after first difference. Both the variables are stationary at first difference, i.e. I(1).

Table 2: Results of ADF Test (Unit Root Test)

Variables	Intercept		Intercept & Trend	
	Level	**1st Difference**	**Level**	**1st Difference**
Log (Area Under Cultivation)	-0.591 (0.8729)	-3.229* (0.0184)	-2.631 (0.2659)	-3.171* (0.0090)
Log (MSP)	-0.457 (0.9002)	-3.971* (0.0016)	-2.471 (0.3428)	-3.903* (0.0120)

Source: Author's Computation
*the variable is stationary (does not have the presence of unit root)

Once the series have been converted into stationary series and both variables are stationary at first difference, I (1). Before proceeding to the cointegration test, we checked the combined lag selection as per the AIC and it was found to be 2 lags. We can run the Johansen test for co-integration to check the long run association between area under cultivation and minimum support prices (MSP) of wheat in India. The results are presented in table 3. At zero rank, the null hypothesis is, there is a zero cointegrating vectors. The value of trace statistic is more than 5% critical value. Therefore, we reject the null hypothesis. It means there exists non-zero cointegration. Similarly, we can proceed to next level. The null hypothesis is now that there is 1 cointegration among the variables. Since, the trace statistics is less than 5% critical value, we fail to reject the null hypothesis. It means there exists at least one cointegration among the area under cultivation and minimum support prices of wheat.

Table 3: Results of Johansen Tests for Cointegration

Maximum Rank	Eigenvalue	Trace Statistic	5% critical Value
0	.	15.7452	15.41
1	0.29843	0.1502*	3.76
2	0.00341		

Source: Author's Computation
*indicates that it is insignificant (no cointegration equation)

After checking the Johansen cointegration analysis where we found that there exists long run relationship between area under cultivation and minimum support prices. Now, we can apply the vector error correction model (VECM). The independent variable which is minimum support prices of wheat is found to be significant as the p-value is less than 5% level. Therefore, the minimum prices will have positive impact on the area under cultivation of wheat. Mathematically, we can say that, In the long run, a 1% rise in the minimum support prices of wheat will raise the area under cultivation of wheat by 0.11584%.

Table 4: Results of Vector Error Correction Model (VECM)

Johansen Normalization Restriction Imposed for Log (Area under Cultivation) as Dependent Variable			
Independent Variable	Coefficient	Standard Error	P-Value
Log (Minimum Support Prices)	0.11584	0.0066	0.0000*
Constant	4.848	-	-

Source: Author's Computation
*indicates the variable is significant at 5% level of significance.

The equation for VECM is given by:

$$\Delta Ln(Area\ under\ cultivation)_t = 0.0065 + 0.0741 Ln(Area\ under\ cultivation)_{t-1} + 0.0394 Ln(MSP)_{t-1} - 0.660(ECT)_{t-1}$$

The above equation implies, the adjustment term (-0.660) is significant at 5% level of significance with p-value as zero, suggesting that previous year's errors are corrected for within the current year at a convergence speed of 6.6%.

The model has also been checked for the presence of autocorrelation using Lagrange multiplier test in which the null hypothesis is no autocorrelation at lag order. The results for the autocorrelation are presented below:

Table 5: Results of Autocorrelation using Lagrange Multiplier Test

Lags	Chi-square value	P-Value	Remarks
1	1.6672	0.79666*	No Autocorrelation
2	1.2536	0.86919*	No Autocorrelation

Source: Author's Computation
*indicates we fail to reject null hypothesis at 5%

As per the above table we can see that, that the p-value for lag 1 and lag 2 is found to be greater than 5% level of significance, so there is no autocorrelation present in the study.

Conclusion

The results conclude that there exists a long run association between the minimum support prices and area under cultivation of wheat in India. This means that, the farmers do consider the minimum support prices crops announced by the government of India at the beginning of

the sowing season and decides the optimal area under cultivation for each crop. Note that, the minimum support prices act as a safety net but in reality, government purchases only few crops from selected regions. Our results show that, a 1% rise in minimum support prices of wheat, raises the area under cultivation by 0.115%. It shows a positive relation between them.

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The data on variables has been downloaded from RBI website (https://dbie.rbi.org.in/DBIE/dbie.rbi?site=statistics)