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## Instability pattern of wheat and rapeseed mustard in India and Haryana

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### Abstract

The green revolution technology succeed in transforming the country from a large food importer and beneficiary of food aid in the 1950s and 1960s, to a food secure country. Instability in farm production was main concern during green revolution period and removed by using high yielding varieties, irrigation facilities and other risk management strategies. The paper has estimated the instability of wheat and rapeseed mustard at national level and then has compared it with Haryana state for the period of 1966-67 to 2016-17. The overall period divided in four periods acc. to reforms separately and also analyzed jointly. The overall scenario provided clear picture about instability and accomplished that instability was very high in case of rapeseed mustard as compared to wheat irrespective of rabi crops both. In case of wheat, variations in yield were much larger than area and production. But in case of rapeseed mustard, more instability found in the pattern of production.

**Keywords:** green revolution, India, instability, mustard, wheat

### Introduction

The Indian agriculture is known for fluctuations and instability in its performance. The instability in production and productivity has a cascading effect on the farm economy and has serious implications for food security. Farmers mainly face two types of risks in farming sector – yield risk and price risk. Risk in agriculture is best specified as the risk of yield shortfall. Yield risk refers to uncertainty regarding the quantity and quality of agricultural produce harvested at the end of the production period. The price risk refers to the uncertainty about prices that farmers obtain for their produce in the markets. During years of high production in this manner glut in seasonal arrivals, prices of crops slide downwards, disturbing the economic status and income level.

The gross area sown in Haryana during period of 1966-67 was 45.99 lakh hectares; on the other hand, during 2017-18 the gross area sown in the state has been improved to 65.78 lakh hectares. The contribution of area during 2017-18 under wheat and paddy crops to the total gross area sown in the state was 60.07 percent. Both crops have played a major role in pushing up the agricultural production. Haryana has higher average yield for paddy and wheat crop in comparison to India. In the year 2016-17, the average yield of paddy of Haryana was 3213 kg/ha and that of India was 2494 kg/ha. Similarly, in the same year, the average yield of wheat of Haryana was 4828 kg/ha while that of India was 3200 kg/ha. The state therefore, undoubtedly called the “Bread basket of India”. Haryana is the second largest contributor of food-grains to the central pool with a share of around 15 percent. The state enjoys first position in the production of paddy, pearl millet, rapeseed and mustard. The export of basmati paddy was more than 60 per cent taking place from state (Economic Survey of Haryana, 2018-19).

Management of risk in agriculture is one of the major concerns of the decision makers and policy planners, because it is the primary source for farmers suffering. Both, in turn, have implications for output expansion. In order to develop mechanisms and strategies to diminish risk in agriculture it is essential to understand the sources and extent of fluctuations involved in agricultural production. The present sections is an effort in this side and examines the extent of risk by estimating year to year fluctuations jointly as well as separately in national production of these two crops and also analyze these at state level.

### Materials and Methods

The study was based on secondary data, collected from various published and unpublished sources for the Haryana state and the whole country for the 50 years.

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These were few sites like Ministry of Agriculture and Farmers Welfare, Govt. of India, Department of Agriculture and Cooperation and Farmers Welfare, Statistical Abstract of Haryana etc. The secondary data was divided into four periods to examine the extent of risk and also analyze whether risk in the reform periods decreased or increased. These periods were namely-

1. 1966-1980 (Green revolution period)
2. 1980-1991 (Post green revolution period)
3. 1991-2004 (Economic reform period)
4. 2004-2016 (Market reform period)

These periods are clearly distinguishable in terms of major policy interventions taken in the country and adoption of new agricultural technology.

### Analytical technique

Risk associated with agriculture and various crops was estimated by using instability index as an indicator of risk as below

Instability index = Standard deviation of natural logarithm ( $Y_{t+1}/Y_t$ )

Where,  $Y_t$  is the crop area/production/yield in the current year and  $Y_{t+1}$  represents the same in the next year. This index is unit free and very robust. It measures deviations from the underlying trend (log linear in this case). When there are no deviations from trend, the ratio  $Y_{t+1}/Y_t$  is constant, and thus

standard deviation at that time is zero. As the succession fluctuates more, the ratio of  $Y_{t+1}/Y_t$  also fluctuates more and standard deviation increases.

### Results and Discussion

The results contain two sets, one covering year to year fluctuation in the form of the four periods and the second showing overall fluctuations during these periods.

#### Instability pattern in wheat crop

The below table mentioned that in case of wheat, area and production followed declining trend over all time periods and became more stable after green revolution period. Instability in wheat was experiencing the highest coverage due to HYV among all crops, also increased obviously during the 1960s but its production increased at a moderately stable rate during 1970s. Yet, area and production of wheat appears to be more stable than yield. Inter period variability of area of wheat lies between 2.25 to 5.75 per cent during all periods. But, in case of yield, maximum fluctuation showed in post green revolution period. This was exceptional situation, where its value shot up more than 100 percent. Adoption of green revolution technology abridged yield instability in wheat in first period then it increased in second period and becomes high. In most of the states, yield instability was major source of instability in food grain production. Further, the instability of yield in case of India rose due to frequent severe droughts during 1992-93 to 2003-04.

**Table 1:** Instability pattern in India and Haryana for different periods (%)

Period	India			Haryana		
	Area	Production	Yield	Area	Production	Yield
1966-1980	5.75	12.88	8.76	6.41	14.40	10.64
1980-1991	4.01	8.07	104.95	4.47	10.02	8.95
1991-2004	3.76	7.71	91.16	3.15	5.69	3.56
2004-2016	2.25	5.38	5.87	2.08	9.67	10.48
Overall (1966-2016)	4.32	9.23	65.67	4.57	10.56	8.71

In the starting period, implementation of green revolution technology reduced yield instability in wheat. Overall yield instability was high in case of India (65.67%) in comparisons with Haryana (8.71%). In comparisons to area and production, variations in yield were much larger. When we move left to right, Instability trend was mainly high in green revolution period except in case of yield of India (i.e., high in post green revolution period). Higher production and yield were observed during green revolution period in Haryana which declined in the subsequent period and further increased in market reform period. For the overall period, wheat in India was showing least instability (4.32%) over the time as compared with Haryana state.

#### Instability pattern in rapeseed mustard crop

In case of rapeseed mustard; instability increased up-to the economic reform period then started declining for area. But reverse situation observed for the Haryana state, it registered decline in variability over the periods. Among these two, production in rapeseed mustard which is affected most by vagaries of nature. One of the reasons was depression in its prices due to large scale imports of edible oil after 1993-94. Yield instability was highest in green revolution period (21.26%) in India, while it was highest in the economic reform period in Haryana.

**Table 2:** Instability pattern in India and Haryana for different periods (%)

Period	India			Haryana		
	Area	Production	Yield	Area	Production	Yield
1966-1980	9.09	24.16	21.26	53.23	62.23	34.38
1980-1991	9.54	17.38	10.16	25.72	31.63	19.26
1991-2004	14.83	24.21	19.24	11.74	36.82	90.36
2004-2016	11.46	17.41	8.01	8.33	21.09	17.88
Overall (1966-2016)	11.32	20.90	15.74	30.78	41.00	49.63

The pattern of instability was higher in green revolution period for area and production in Haryana as compared with India. When we compare these with state figures, overall

instability was found maximum in area, production as well as for yield (double than India). Overall instability in area was 11.32 percent for India in comparison with Haryana

(30.78%). In case of area, Haryana registered declining trends over the years. Overall instability in production and yield was also high (41% and 50%) for Haryana in comparison with India (21% and 16%). Yield instability highest in green revolution period (21.26%).

### Conclusion

In the given study, overall pattern provided clear picture about instability which was very high in case of rapeseed mustard as compared to wheat irrespective of rabi crops both. In wheat crop, area and production followed declining trend and become more stable after green revolution period. As compared to area and production, variations in yield were much larger. In case of wheat at all India level, yield risk were maximum volatile and its value shot up more than 100 percent (i.e., 105%). The acceptance of green revolution technology reduced yield instability in first period in wheat crop. In case of other crop, production instability in the India was due to yield instability. The yield instability caused due to technological changes, poor weather, and infestation of pest and disease and government policies etc. Instability in both crops was higher for Haryana state as compared to India except in case of wheat yield which was exceptional situation for us. Over the periods, instability pattern was declined in both the crops due to several reasons like high yielding varieties, irrigation facilities and other risk management strategies.

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