



Instability in area, production and yield of Rice and Gram in Haryana and India

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ABSTRACT

The issue of instability paying lot of attention of researchers in the early phase of adoption of green revolution technology who accomplished that adoption of new technology had increased instability in food grain and agricultural production in India. This conclusion was based on the period when improved technology had reached very small area. This study shows that when a little longer period is taken into consideration, which witnessed spread of improved technology to large area, the inference on increase in instability due to adoption of new technology get totally refuted. The paper has estimated the instability of rice and gram at national level and then has compared it with Haryana state for the period of 1966-67 to 2016-17. Haryana is a major contributor of food-grains to the central pool. Haryana has high average yield of rice in comparison to India. Gram is a major pulse in India which contributed about 35 per cent of area and 45 per cent of pulse production. Instability in case of yield of rice was high in green revolution period and was more than three times the instability in area during the same period. Production under gram in case of Haryana shows remarkably low instability but its show quite high in post green revolution period approx. 100 per cent. Among the two crops selected for the study, gram has been observed to be the riskiest crop in respect of production as well as yields. This underscores the need for addressing risks in farm income by devising area-specific crop insurance or other suitable mechanisms.

Key words: *Instability, green revolution period, natural disasters, insurance, yield*

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INTRODUCTION

Agriculture plays an imperative role in the economic life of India and it occupies a pivotal position in India's economic development. It is regarded as a major economic powerhouse that has a bearing on its whole economy. It is well-established truth that the success of economic planning in India, largely depends on the growth of its agriculture sector, which, in turn, indicates whether agricultural production has reached comfortable tallness especially after the green revolution. How it has reached a stage of self sufficiency and sustainable development or whether it is still conquered by nature, by unsteadiness that still haunts and critically threatens the Indian farmer's ability to boost the agricultural output and its viability? As we know near two-third of our population depends on agriculture, India has witnessed numerous upheavals over the century due to factors, both men made as well as natural, to find out the destiny of its economy [1].

Haryana is a major contributor of food-grains to the central pool. Haryana has high average yield of rice in comparison to India. In the year 2016-17, the average yield of rice of Haryana was 3213 kg/ha and that of India was 2494 kg/ha. More than 60 per cent export of basmati rice taking place from state (Economic Survey of Haryana, 2018-19). India ranked first in area (79 per cent) and production (67 per cent) at global level in case of gram. Gram is a major pulse in India which contributed about 35 per cent of area and 45 per cent of pulse production [2, 3].

Farming is intrinsically one of the riskiest economic activities. Agriculture production and farm incomes in India are normally affected by natural disasters such as floods, droughts, storms, cyclones, landslides and earthquakes. Despite the fact that the needs for increasing agricultural production or growth are obvious, the increase in instability in agricultural production is considered adverse for several reasons.

MATERIAL AND METHODS

The study was based on secondary data. Secondary data was collected from various published and unpublished sources for the Haryana state and the whole country for the years 1971 onwards like Ministry of Agriculture and Farmers Welfare, Govt. of India, Department of Agriculture and Cooperation and Farmers Welfare, Statistical Abstract of Haryana. The secondary data was divided into four periods to examine the extent of risk easily by year to year fluctuations in national and state yields of rice and gram crop and also analyze whether risk in the reform periods declined 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)

Analytical technique-

Ray [6] developed a very simple measure of instability given by standard deviation in annual growth rates. The method satisfies the properties like instability based on detrended data and comparability. Risk associated with agriculture and various crops was estimated by using instability index as an indicator of risk as below:

$$\text{Instability index (II)} = \text{Std} \left[\ln \left(\frac{Y_{t+1}}{Y_t} \right) \right]$$

Where,

std = standard deviation

ln = natural logarithm

Y_{t+1} = area / production / yield for the current year

Y_t = area / production / yield in the previous year

This index is unit free and very robust and 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 in it is zero. As the series fluctuates more, the ratio of Y_{t+1}/Y_t also fluctuates more, and standard deviation increases.

RESULTS AND DISCUSSION

The paper has first estimated the instability at national level and then has compared it with state level estimates to find dispersion and compare the change in instability over time, based on the national level data representing aggregates and state level data representing disaggregates. This paper also focuses to examine how year to year fluctuations in crop output changed from one period to another period, and what is the effect of new agricultural technology on the instability in crop output. Instability in area, production and yield of rice experienced at the national and state level during 1966-67 to 2016-17 has been presented in Table 1. Instability in area under rice at national level was quite low during the green revolution period as growth rates show standard deviation of 2.57 per cent. Dev [5] and Chand & Raju [4] reports that decline in instability in food grains at all India level. The instability in area increased to 4.69 in post green revolution period and declined in third period. It further showed small increase in the fourth period.

Table 1: Instability (%) in area, production and yield of rice in India and Haryana

Period	Rice in India			Rice in Haryana		
	Area ('000hectares)	Production ('000 tonnes)	Yield (Kgs. Per hectares)	Area ('000 hectares)	Production ('000 tonnes)	Yield (Kgs. Per hectares)
1966-1980	2.57	15.00	12.77	73.36	23.11	21.65
1980-1991	4.69	11.50	7.59	13.65	16.77	7.97
1991-2004	3.02	11.12	8.31	7.73	11.35	13.22
2004-2016	3.44	5.56	3.14	3.75	5.53	13.72

Instability in case of yield was high in green revolution period and was more than three times the instability in area during the same period. Adoption of new technology marked decline in stability in yield from 12.77 to 7.59 per cent between green revolution period and post green revolution period. Acharya [1] observed a continuous decline in instability of crop yields. When improved technology spread to larger areas, the variability in production declined year after year from 15.00 to 5.56 per cent from first to last period. Larson *et al.* [6] examined that production instability for food grains has higher. Other reasons which might have contributed to the decline in variability in yield and production of rice seem to be: (i)

expansion of irrigation, (ii) improvement in availability of other inputs and institutional credit and (iii) policy of minimum support prices that provided stable economic environment to induce investments in production.

In paddy, the initial years of adoption did not help in reducing instability in yield or production. On the contrary, the first phase of green revolution showed higher instability as compared to the post-green revolution period. The main reason for difference in variability was that expansion of irrigation in rice was far lower than wheat. Between 1965 and 1988 the coverage of rice area under irrigation increased from 37 per cent to 43 per cent only. During all the periods, it is also interesting to observe that instability in area under rice crop remained higher than instability in India. While instability in production was slightly lower than India in the fourth period but not in the other periods.

Instability in area, production and yield of gram experienced at the national and state level during 1966-67 to 2016-17 has been presented in Table 2. Instability in area under gram experienced declining trend 9.18 to 16.40 per cent from green revolution period to post green revolution period. But instability in its yield declined sharply after green revolution period. Because of these counteracting factors instability in production of gram in second and third periods remained around 22 per cent. Production under gram in case of Haryana shows remarkably low instability but its show quite high in post green revolution period approx. 100 per cent. There was decline in variability in yield from 37.09 during green revolution period to 54.10 during post green revolution period. In case of production and yield of gram for India, Instability was high in 1st decade while in Haryana it was maximum for second decade.

Table 2: Instability in area, production and yield of gram in India and Haryana

Period	Gram in India			Gram in Haryana		
	Area ('000hectares)	Production ('000 tonnes)	Yield (Kgs. Per hectares)	Area ('000 hectares)	Production ('000 tonnes)	Yield (Kgs. Per hectares)
1966-1980	9.18	27.09	22.67	36.89	67.55	37.09
1980-1991	16.40	22.04	11.63	63.28	99.46	54.10
1991-2004	15.62	22.70	11.93	52.01	66.22	20.07
2004-2016	9.57	14.61	8.90	32.72	53.04	42.08

CONCLUSION

Despite progress in irrigation and other infrastructural developments in agriculture, the instability in agricultural production has shown an increase after 1st period in gram in Haryana. In contrast, instability of rice has shown a decline in instability during post green revolution Period, then during green revolution period. The study has indicated that in a large state like Haryana, the instability status perceived through the state level data may be vastly different from that experienced at the national level. Production under gram in case of Haryana shows remarkably low instability but its show quite high in post green revolution period approx. 100 per cent. Among the two crops selected for the study, gram has been observed to be the riskiest crop in respect of production as well as yields. This underscores the need for addressing risks in farm income by devising area-specific crop insurance or other suitable mechanisms.

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