

Growth and Instability in Agricultural Production in Haryana: A District level Analysis

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Abstract- Indian agriculture history is witness of the new agriculture arrangement which took place in India has changed the overall traditional cropping pattern in India as well as in Haryana. There are many agriculture reforms such as land reforms, green revolution, minimum support price, and new economic reforms have adopted in Indian agriculture. All these reforms have directly affected the agriculture sector in overall India. Even these reforms are favourable in terms of productivity and production of all the crops but they have inadequately affected in terms of crop stability. Only a few crops such as rice and wheat are going to more stable but the coarse cereals and pulses are going to highest instable in area and production in Haryana.

Index Terms- Growth, Instability Area, Production, Agriculture

I. INTRODUCTION

Haryana is the state which has large amount of fertile land, in India. It is doing well in industrial as well as agricultural sectors. About 70% of the population is engaged in agriculture, directly or indirectly. Haryana has achieved a remarkable growth in its agricultural sector, which not only has made it self-sufficient in foodgrains production but also has elevated it to the second largest contributor to India's central pool of food grains¹. On the question the relationship between growth and instability, in the cases of some crops; the modern technology reduced variation while other believe that it is bound to increase. The modern technology do help to reduce variability in yields and production only a few crops (Mehra Shakuntala 1981). There are many studies on instability conducted during 1980s concluded that agriculture production had become more unstable after the introduction of new agricultural technology (Mehra 1981; Hazell 1982; Dev 1987; and Ray et al 1988). Sharma et al 2006 estimated crop wise and state wise variability in production and yield for two time periods, namely 1981/82 - 1990/91 and 1991/92 - 2000/01, and the study find out that production of food grains became more stable during 1990s compared with 1980s at all India levels and in most of the states.

Instability, in agricultural sector, which measures the range of variation in different dimensions; it may be in area of cultivation, yield or production. Here it has been shown, the range of instability in production among different crops in Haryana. In other word, this study intends to measure the extent of instability in the production of major crops in this state. The

paper is divided in two sections. It begins with an examination of growth in area of cultivation and production of major crops in Haryana. And, secondly it measures the instability in crop production. There are many studies such as Rao (1975), Dharm Narain (1976), Mehra (1981), Hazell (1982), Rao et al (1988), etc, have pointed out that the new strategy of agri-cultural production based on high-yield varieties (HYV) seed-fertiliser technology has contributed to the growth in production and productivity. At the same time they have also pointed out that this growth has been accompanied with the increase in the output/yield variability (B P Vani and Vinod Vyasulu 1996). There are many reasons which create new agriculture arrangement in India. Among these the green revaluation is favourable only a few crops; it enhance the productivity, but only for a few crops, Minimum Support Price (MSP) and government policy are favourable only for a few specific crops. These entire factors collectively change the traditional cropping pattern in Haryana as well as in India. Thus the change in the variability and instability with the adoption of green revolution becomes an important issue (B P Vani et al 1996). It highly reduces the instability in a few crops, while it increases high instability in coarse cereals and diversifies the resource in mono-crop culture in Haryana. Instability declined progressively in some states (Punjab, Haryana, Assam, Himachal Pradesh, MP, Rajasthan and UP) whereas in some other states (Orissa, West Bengal, Thmil Nadu) it became progressively un-stable (S Mahendradev 1987).

The agricultural instability can be measured by different methods, such as the coefficient of variation (CV), dispersion, Cuddy Della Valle Index (CDI), etc. The present study applies the Cuddy Della Valle Index for measuring the instability. This Index first de-trends the given series and gives a clear direction about the instability. The use of coefficient of variation as a measure to show the instability in any time series data has some limitation. If the time series data exhibit any trend the variation measured by CV can be over-estimated, i.e. the region which has growing production are at constant rate will score high in instability of production if CV is applied for measuring instability. As against that Cuddy-Della Valle index attempts de-trend the CV by using coefficient of determination (R^2). Thus it is a better measure to capture instability in agricultural production. A low value of this index indicates the low instability in farm production and vice-versa. To calculate instability of crop production Cuddy-Della Valle index has been used in the present study.

¹ Economics survey of Haryana, 2007-08

$$\text{Cuddy-Della valle index}^2 = C.V. * (1 - R^2)^{0.5}$$

Where C.V. = Coefficient of Variation

R^2 = ESS/TSS i.e. ratio of explained variation to total variation.

ESS = Variation explained by explanatory variable.

TSS = Total Variation.

Variation can be measured by C.V. But due to presences of trend with variation in production with passes of time. Here C.V. adjusts with R^2 to de-trend the production series, because it is statistically sound. The present study divides the CDI value into three categories, which represent the different range of instability.

The ranges of instability are as follows:

- Low instability = between 0 to 15
- Median instability = greater than 15 and lower than 30
- High instability = greater than 30

Data Sources The study is based on secondary data, the data sources are Statistical Abstract of Haryana (Different Issues), Economics Survey of Haryana and India (Different Issues)

Districts Covered - This Study is based on the analysis of district-wise data pertaining of the 12 major district namely Ambala, Kurukshetra, Karnal Sonapat, Rohtak Faridabad, Gurgaon, Mahendergarh, Bhiwani, Jind Hisar and Sirsa. There were 12 districts in 1980-81 in Haryana and this study is begun from 1980-81 so that to analysis easily those districts are separated from the particularly districts are combing them. The districts are Yamunanagar and Panchkula are clubbed in Ambala, Kaithal is added in Kurukshetra, Panipat is added in Karnal, Jhajjar is added in Rohtak, Rewari is added in Mahendergarh, Fatehabad is clubbed in Hisar, and Mewat in Gurgaon district

II. AGRICULTURE GROWTH IN HARYANA

The agricultural production increased in almost the all kind of crops during the 1980s except maize, barley and massar. Gram which registered 3.1 percent of total growth from 1980-81 to 1990-91 thereafter, it registered a sharp declining trend during nineties and during 2000-01 to 2006-07 by (-82.9%) and (-12.5%) percent, respectively.

² The cuddy- Della Valle index takes in to account the time trend in a variable, which is not captured in the coefficient of variation the index is applied when a variable shows some trend which may be linear or non linear and such case Cuddy-Della Valle index is used as an appropriate measure of variability.

Table 2.1 Total Percentage growth in production

Crops	% increase in Production		
	1980-81 to1990-91	1990-91 to 2000-01	2000-01to 06-07
Rice	45.7	46.9	25.08
Wheat	84.5	50.1	3.99
Jowar	35.4	-64.6	4.35
Bajra	8.7	24.7	3.51
Maize	-41.0	-30.6	9.68
Barley	-40.9	10.3	-35.59
Gram	3.1	-82.9	-12.50
Moong	81.3	-69.0	238.89
Masoor	-6.9	-54.6	-12.24
Foodgrains	58.37	39.08	11.04
Oilseeds	239.36	-11.76	48.31
Total cotton*	79.63	19.74	31.16
Sugarcane	67.4	4.7	0.12

Data Source: Statistical Abstract of Haryana (Different Issue) *Thousand of bales of 170 k.g.

One point is to be noticed here that the production of almost all the crops increased during eighties except maize, barley and massar but during nineties there were many crops like jowar, maize, gram, moong, massar and oilseeds which showed negative growth in their production. Overall the production of total foodgrains and total cotton registered a remarkable growth over the periods. (See table no 2.1)

increasing continuously, in case of pluses it is declining. The production of total pulses was 502.3 thousand tonnes in 1980-81; it increased 686.6 thousand tonnes in 1985-86. After that its trend started declining. (Table 2.2)

2.2 Agricultural Production of major crops in Haryana:

Table no 2.1, shows; a remarkable increase in foodgrains production is visible in Haryana since 1980-81. Production of total foodgrains is likely to increase from 60.36 lakh tonnes in 1980-81 to 156.77 lakh tonnes in 2007-08 showing an increase of 159.7 percent. The Wheat and Paddy crops have played a major role in pushing up the agricultural production. The production of Rice which was 12.5 lakh tonnes in 1980-81 is likely to increase to 33.71 lakh tonnes in 2006-07. Similarly, the production of Wheat which was 34.90 lakh tonnes in 1980-81 is likely to increase to 10055 lakh tonnes during 2006-07. The production of paddy which was 12.59 lakh tonnes in 1980-81 has increase to 18.34 lakh tonnes in 1990-91 and further it has increased 33.71 lakh tonnes in 2006-07. The total share of wheat and rice in total foodgrains production was 78.6 percent in 1980-81, and it has increased to 86.4 percent in 1990-91 and it becomes 90.06 percent in 2006-07. It shows that wheat and rice are the major foodgrains crops of Haryana. State made remarkable progress in the field of agriculture production and it has emerged as the grain bowl of the country. Resultantly, foodgrains production touched an impressive figure of 147.63 lakh tonnes during 2006-07 from 25.92 lakh tonnes during 1966-67 registering a more than fivefold increase.³ Although, the total production of foodgrains is

³ Economics Survey of Haryana, 2007-08.

Table 2.2 The Agricultural Production of Major Crops in Haryana (000 tones)

YEARS	WHEAT	PADDY	TOTOL PULSES	TOTAL FOOD-GRAIN	SUGAR-CANE	COTTEN*	OILSEEDS
1980-81	3490	1259	502.5	6036	460	643	188
1985-86	5260	1633	686.6	8146	505	745	288
1990-91	6436	1834	541.7	9559	780	1155	638
1995-96	7291	1847	450.1	10171	809	1284	783
2000-01	9669	2695	99.8	13295	817	1383	805
2006-07	10055	3371	111.8	14763	965	1814	835

Data Source: Statistical Abstract of Haryana (Different Issue) *Cotton (000 Bales)

Table 2.3 Agricultural Production growth of Major Crops in Haryana (in %)

Years	WHEAT	PADDY	TOTOL PULSES	TOTAL FOODG RAIN	SUGAR-CANE	COTTON*	OIL-SEEDS
1980-81 to 1985-86	50.72	29.71	36.64	34.96	9.78	15.86	53.19
1985-86 to 1990-91	22.36	12.31	-21.10	17.35	54.46	55.03	121.53
1990-91 to 1995-96	13.28	0.71	-16.91	6.40	3.72	11.17	22.73
1995-96 to 2000-01	32.62	45.91	-77.83	30.71	0.99	7.71	2.81
2000-01 to 2006-07	8.66	34.06	11	17.92	18.53	36.30	11.80

Data Source: Statistical Abstract of Haryana (Different Issue) *Cotton (000 Bales)

A remarkable increase in foodgrains production is visible in Haryana since 1980-81. Production of total foodgrains is likely to increase from 60.36 lakh tonnes in 1980-81 to 147.63 lakh tonnes in 2006-07 showing an increase of 149.7 percent. The Wheat and Paddy crops have played a major role in pushing up the agricultural production. The production of Rice which was 12.5 lakh tonnes in 1980-81 is likely to increase from 36.13 lakh tones to 100.55 lakh tones in 2006-07 thereby showing the tremendous increase of 146.9 percent. Similarly, the production of Wheat which was 34.90 lakh tonnes in 1980-81 is likely to increase to 105.56 lakh tonnes during 2006-07. (Table 2.2)

The production of total cotton (American and Desi) is showed a remarkable increasing; it increased from 460 thousands bales in 1980-81 to 745 thousand bales in 1985-86, it was 15.8 percent higher in 1985-86 than that of in 1980-81. But a major change takes place in 1990-91, when the production of total cotton recorded 50 percent more than the production of 1985-86. It was 745 thousand bales in 1985 -86 it became 1155 thousand bales in 1990-91. After that it showed a marginal growth in its production.

The productions of sugarcane, oilseeds and cotton are increasing continuously since 1980-81, the production of sugarcane was 46 lakh tonnes in 1980-81, it increased to 78 lakh tonnes in 1990-91; and thereafter it increased to 105 tonnes in 2007-08. The production of oilseeds is increasing continuously;

it increased from 1.88 lakh tons in 1980-81 to 9.00 lakh tonnes in 2007-08. The production of cotton in the State is estimated to increase from 6.43 lakh bales in 1980-81 to 18.5 lakh bales in 2007-08. However the production of all major crops is increasing since 1980-81 except pulses. The growth in production of pulses is not satisfactory, the total production of pulses was 24 thousand tonnes in 1980-81 which increased to 55 thousand tonnes in 1990-91; but it declined to 13 thousand tonnes in 2000-01.

III. PRODUCTION INSTABILITY AMONG DIFFERENT CROPS IN HARYANA

The study finds that instability in the production of Wheat, Sugarcane and Rice remains low during the first period, followed by Desi Cotton, Groundnut, Reap Seed and Mustard, Maize, Massar, Barely and American Cotton registered medium measures of instability.

Jawar, Sesamum, Moong, Gram and Bajra showed high instability in the second period, instability in the production of Rice and Wheat shows a sharp declining trend. In the second period, three more crops American Cotton, Maize and Barley are registered into low instability crops which were noticed under medium instability crops during previous period. Gram and Moong still shows high instability in the second period. A major

change takes place in Jawar in third time period. Jawar registered low instability in this time period. Wheat, Rice and Sugarcane recorded declining trends throughout the period. On the other hand, Gram and Moong were recorded as high instability crops. (See Table No 3.1)

Table No: 3.1 Production Instability among crops in Haryana

	LOW INSTABILITY CROPS	MEDIUM INSTABILITY CROPS	HIGH INSTABILITY CROPS
1980-81 TO 1989-90	Wheat 6.30 Sugarcane 12.15 Rice 12.73	Desi 16.51 Groundnut 17.65 RP seed* 18.41 Maize 19.38 Masoor 20.54 Barley 20.64 American 25.83	Jowar 32.92 Sesamum 33.29 Moong 34.54 Gram 42.98 Bajra 44.91
1990-91 TO 1999-2000	Wheat 4.81 Rice 7.20 American 7.27 Barley 11.02 Maize 11.4 Sugarcane 11.78	Groundnut 16.19 RP seed* 16.48 Desi 20.38 Masoor 25.57 Sesamum 26.81 Jowar 28.02	Gram 34.34 Moong 37.38
2000-01 TO 2006-07	Wheat 4.42 Rice 5.75 Jowar 7.23 Sugarcane 10.55 Barley 12.55	Bajra 28.82 Maize 15.63 RP seed* 18.91 Americn 21.39 Bajra 23.91 Masoor 25.55 Desi 28.45	Gram 30.3 Moong 30.91 Sesamum 56.98

RP Seed* = Rape seed and mustered, American = American Cotton, and Desi = Desi Cotton.

3.2 Production Instability in Rice across the Districts:

The trends rate of instability in the production of rice declining in Karnal, Kurukshetra, Ambala, Jind, Hisar, Sirsa and Faridabad throughout the study period. Ambala had medium instability during the first period and in the next period it had the lowest instability. Karnal and Kurukshetra, which showed the lowest instability during the first period, have recorded medium instability in second period. Gurgaon, which recorded medium

instability during the first period, has recorded highest instability during third period of time. Rohtak has recorded high instability during first and second period, while it shows medium instability during 2000-01 to 2006-07. Because of rain fed area, the instability of rice in Gurgaon is increasing over the time period and registered as the highest instability district during 2000-01 to 2006-07 (See Table 3.2).

Table No: 3.2 - Production Instability in Rice

Rice	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2006-07
Low Instability	Karnal 7.32 Kurukshetra 10.61	Ambala 5.16	Kurukshetra 1.52
		Sirsa 6.95	Sirsa 5.5
		Sonepat 9.36	Karnal 5.59
		Faridabad 9.58	Ambala 6.95
		Hisar 10.49	Hisar 9.94
		Jind 11.15	Mahendragarh 12.01
Medium Instability	Sirsa 16.13 Gurgaon 17.64 Hisar 17.69 Ambala 23.88 Jind 23.99 Sonepat 24.69	Karnal 16.93	Sonepat 17.97
		Gurgaon 22.08	Faridabad 18.78
		Kurukshetra 23.74	Jind 20.26
			Bhiwani 21.29
			Rohtak 29.74
		Rohtak 40.09	Rohtak 40.42

High Instability	Faridabad	71.09	Mahendragarh	-	
	Mahendragarh	-	Bhiwani	-	
	Bhiwani	-			
Haryana	Rice	12.73	Rice	7.20	Rice 5.75

Data Source: Statistical Abstract of Haryana (Different Issue)

3.3-Production Instability in Jowar across the Districts:

Even in case of Jowar, instability showed a declining trend but it is still high in many districts in 2000-01 to 2006-07. During 1980-81 to 1989-90 there was no district under the low instability category. Sonapat, Bhiwani Mahendragarh and Karnal recorded

under medium instability in second period. Gurgaon recorded statistically significant downward trends during the third time period. Sonapat and Rohtak are two additional districts that showed significant declining trends during third time period.

Table 3.3 Instability in Jowar across the districts

Jowar	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2006-07	
Low Instability			Sonapat 5.41 Rohtak 7.81	
	Sonapat 22.96 Bhiwani 24.52 Mahendragarh 27.88 Karnal 28.37		Gurgaon 23.64 Faridabad 24.49	
High Instability	Kurukshetra 31.63 Rohtak 37.94 Faridabad 49.38 Jind 50.22 Gurgaon 53.56 Hisar - Sirsa -	Gurgaon 31.52 Hisar 31.63 Bhiwani 33.13 Faridabad 38.30 Sonapat 40.03 Jind 53.85 Karnal 55.28 Rohtak 64.19 Mahendragarh 73.76 Kurukshetra - Sirsa -	Kurukshetra - Karnal - Mahendragarh - Bhiwani - Jind - Hisar - Sirsa -	
	Haryana	Jowar 32.92	Jowar 28.02	Jowar 7.23

Data Source: Statistical Abstract of Haryana (Different Issue)

No one districts recorded under low and medium categories during second time period. At Haryana level instability recorded a significant downwards trend in all the time periods. The new technology has increase instability in coarse cereals, The main reason for increase in instability of cotton jawar Bajra's production after 1992-93 seems to be the extension of its cultivation to non-traditional areas where cotton has replaced jowar, pulses and other cereal crops (Ramesh Chand* and S.S. Raju 2008). (See Table No 3.3)

3.4 Production Instability in Bajra across the Districts

Instability in the case of Bajra has recorded a declining trend throughout the study period. One district recorded under low

category two districts namely; Karnal and Jind were recorded under medium instability during the first period, whereas other districts showed high instability during the first period. Even instability trends declined in all the districts but it significantly declined in Hisar, Rohtak, Kurukshetra and Sirsa; these districts showed under high instability during first period which recorded under low instability during third period. Faridabad recorded a increasing trend in instability from second time period to third time period. Karnal, which was recorded under low instability in the first period, changed to high instability during the second and third time periods. (See Table No 3.4).

Table 3.4 Production Instability in Bajra

Bajra	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2006-07
Low Instability			Hisar 5.58 Rohtak 8.6 Kurukshetra 11.67 Sirsa 12.34
Medium Instability	Jind 25.62 Karnal 26.01	Faridabad 20.00 Gurgaon 21.18 Jind 24.50 Hisar 25.51 Ambala 27.30 Bhiwani 28.99	Jind 17.6 Gurgaon 19.48 Bhiwani 23.15 Sonapat 24.93
High Instability	Hisar 32.34 Ambala 35.01 Sonapat 41.16 Faridabad 41.38 Sirsa 43.16 Gurgaon 43.83 Kurukshetra 46.74 Rohtak 54.14 Bhiwani 60.85 Mahendragarh 76.28	Rohtak 32.51 Sirsa 39.32 Sonapat 40.15 Mahendragarh 41.07 Karnal 41.37 Kurukshetra 48.32	Karnal 31.55 Mahendragarh 32.22 Faridabad 32.62 Ambala 44.27
Haryana	Bajra 44.91	Bajra 28.82	Bajra 23.91

Data Source: Statistical Abstract of Haryana (Different Issue)

3.5 Production Instability in Wheat across the Districts

The trend rates under wheat reveal that instability varied from a high declining trend in all the districts. For instance, Karnal is an advanced district in agriculture, yet even then it

showed medium instability during the first two time periods. There is no one district under high instability in all the time periods. (See Table No 3.5)

Table 3.5 Production Instability in Wheat

Wheat	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2006-07
Low Instability		Hisar 3.26	Jind 1.3
	Kurukshetra 6.63	Bhiwani 3.93	Kurukshetra 2.32
	Rohtak 9.86	Faridabad 4.85	Karnal 2.49
	Faridabad 9.89	Jind 5.59	Rohtak 2.58
	Bhiwani 9.95	Gurgaon 6.50	Hisar 2.7
	Hisar 10.4	Ambala 7.21	Sonepat 3.05
	Jind 10.72	Sirsa 8.17	Mahendragarh 3.05
	Gurgaon 10.85	Rohtak 9.96	Ambala 3.88
	Sirsa 11.26	Sonepat 13.40	Sirsa 3.94
	Sonepat 11.8		Bhiwani 4.27
	Ambala 12.05		Gurgaon 5.47
Mahendragarh 14.84		Faridabad 8.33	
Medium Instability		Karnal 17.61	
	Karnal 34.91	Mahendragarh 22.98	
		Kurukshetra 26.61	
High Instability			
Haryana	Wheat 6.30	Wheat 4.81	Wheat 4.42

Data Source: Statistical Abstract of Haryana (Different Issue)

The trends rate of production instability is below the range of 10 in all the districts during 2000-01 to 2006-07. Jind registered a high declining trend in wheat during the all time periods. At the all Haryana level, instability is under low category in all the time periods and registered declining trends in all time periods. Kurukshetra which recorded the lowest instability in first time periods was noticed highest instability during the second period and it noticed second lowest instability district during third time period. (See Table No 3.5)

3.6 Production Instability in Gram across the Districts

The condition of instability in Haryana was the worst in the case of gram since 1980-81. Not one district has been registered

in low instability in all the time period. Karnal was the only district which recorded medium instability during 1980-81 to 1989-90, except this district all districts showed high instability during first time period. A study by Ramesh Chand and S.S. Raju 2008 find the same result in the case of pulses first phase of green revolution show a decline in instability to the extent of 5.4 percent but post 1988 period witnessed an increase of 2 percent. Jind registered the highest instability during this time period. However, the instability of gram improved in some district but it was still high in all the districts. Mahendragarh, which registered the high instability during the first time period, decreased and was registered with medium instability during 2000-01 to 2006-07.

Table 3.6- Production Instability in Gram

Gram	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2006-07
Low Instability			
Medium Instability		Sirsa 13.90	Mahendragarh 22.51
		Gurgaon 16.75	Gurgaon 26.15
		Bhiwani 19.87	Rohtak 26.74
	Karnal 29.86	Karnal 23.49	Hisar 29.1
		Ambala 26.09	Sirsa 29.42

			Sonepat 26.35		
			Rohtak 28.16		
High Instability	Mahendragarh	32.86	Jind	30.38	Bhiwani 36.67
	Ambala	33.18	Hisar	32.78	Kurukshetra -
	Sirsa	34.05	Mahendragarh	36.37	Karnal -
	Kurukshetra	35.88	Faridabad	45.78	Sonepat -
	Sonepat	37.39	Kurukshetra	47.98	Faridabad -
	Gurgoan	39.05			Jind -
	Faridabad	40.08			
	Hisar	42.92			
	Rohtak	44.63			
	Bhiwani	66.09			
Jind	66.37				
Haryana	Gram	42.98	Gram	34.34	Gram 30.30

Data Source: Statistical Abstract of Haryana (Different Issue)

3.7 Production Instability in Reap seed and Mustard across the Districts

Reapseed and mustard registered medium instability at all Haryana level during all the time periods. Sonepat was the only district which registered low instability during 1980-81 to 1989-90. There were four districts which showed high instability

during 1980-81 to 1989-90. During nineties the condition of instability in some districts like, Sirsa, Faridabad, Jind, and Bhiwani improved and they showed low instability during this time period. One point to be noticed here has that the instability declined only in those districts which are rain-fed areas.

Table 3.7 Production Instability in Rape Seeds and Mustard

	1980-81 to 1989-90		1990-91 to 1999-2000		2000-01 to 2006-07	
Low Instability			Sirsa	8.71		
			Faridabad	11.30	Bhiwani	5.1
	Sonepat	14.68	Jind	12.01		
			Bhiwani	14.69		
Medium Instability	Mahendragarh	17.08	Gurgoan	17.37	Kurukshetra	15.88
	Hisar	23.14	Hisar	17.37	Rohtak	17.41
	Rohtak	23.43	Sonepat	20.66	Jind	19.18
	Sirsa	23.77	Mahendragarh	27.29	Ambala	21.37
	Gurgoan	26.19	Rohtak	28.83	Mahendragarh	23.08
	Jind	27.72			Karnal	26.15
	Faridabad	28.84				
High Instability	Karnal	32.8	Ambala	34.12	Hisar	31.79
	Kurukshetra	35.57	Karnal	35.85	Faridabad	35.09
	Ambala	37.19	Kurukshetra	39.82	Gurgoan	35.58
	Bhiwani	37.52			Sirsa	36.07
					Sonepat	37.17
Haryana	RP seed*	18.41	RP seed*	16.48	RP seed*	18.91

Data Source: Statistical Abstract of Haryana (Different Issue)

3.8 Production Instability in Total Cotton across the Districts

Total cotton shows Medium and high instability in all the districts, over the time period. Its main reason was that it is a kharif crop and there is high fluctuation in its area of cultivation.

Table 3.8 Production Instability in Total Cotton

	1980-81 to 1989-99		1990-91 to 1999-2000		2000-01 to 2006-07	
Low Instability						
Medium Instability	Hissar	15.94	Sirsa	17.82	Rohtak	15.87
	Sonepat	17.82	Hissar	19.33	Sirsa	22.78
	Rohtak	19.33	Karnal	22.35	Hissar	23.2
	Ambala	29.22	Mahendergargh	29.22	Jind	23.55
	Bhiwani	22.35			Bhiwani	26.38
High Instability	Kurukshetra	31.79	Jind	31.79	Kurukshetra	30.29
	Jind	33.04	Faridabad	33.04	Sonepat	39.78
	karnal	34.09	Bhiwani	34.09	Mahendergargh	50.51
	Sirsa	42.23	Kurukshetra	42.23	karnal	-
	Faridabad	-	Sonepat	-	Faridabad	-
	Gurgoan	-	Rohtak	-	Gurgoan	-
	Mahendergargh	-	Gurgoan	-	Ambala	-
		Ambala	-			

Data Source: Statistical Abstract of Haryana (Different Issue)

If in any time period, rainfall is good and monsoon comes on time then the area under cotton cultivated shifted towards rice. That is why there is lot of variation in its production and it makes the reason of medium and high production instability. The result

shows that production instability is comparatively low in rainfed districts like, Hisar, Sirsa, Bhiwani and Rohtak over the periods. It is comparatively high in well irrigated district like, Karnal and Kurukshetra.

Table 3.9 Production Instability in Sugarcane

Sugarcane	1980-81 to 1989-90		1990-91 to 1999-2000		2000-01 to 2006-07	
Low Instability			Bhiwani	6.29	Ambala	4.01
			Hisar	9.20	Karnal	6.89
	Sonepat	14.79	Sirsa	12.68	Faridabad	8.31
	Kurukshetra	14.93			Kurukshetra	9.31
Medium Instability	Karnal	15.42	Jind	18.94	Rohtak	15.6
	Ambala	20.19	Rohtak	27.87	Jind	20.83
	Rohtak	20.64			Hisar	28.9
	Faridabad	29.67			Sirsa	29.55
	Jind	29.82				
High Instability	Hisar	35.18	Mahendragarh	31.72	Bhiwani	50.7
	Bhiwani	55.88	Kurukshetra	35.51	Gurgoan	-
	Gurgoan	86.27	Sonepat	40.52	Mahendragarh	-

	Mahendragarh -	Ambala -		
	Sirsa -	Karnal -		
		Faridabad -		
		Gurgoan -		
Haryana	Sugarcane 12.15	Sugarcane 11.78	Sugarcane 10.55	

Data Source: Statistical Abstract of Haryana (Different Issue)

3.9 Production Instability in Sugarcane across the Districts

Sugarcane showed declining trend in instability, it registered low instability at all Haryana level and declining continuously in all the time periods. During the first time period, there were two districts, Sonapat and Kurukshetra which registered low instability but during the 1990s both districts underwent high instability. There were five districts which registered high instability during the first time period. Whereas in the 1990s there were seven districts, Mahendragarh, Kurukshetra, Sonapat, Ambala, Karnal, Faridabad, and Rohtak, which showed high instability, the major change took place in Ambala, which showed high instability during the 1990s, but underwent low instability district during 2000-01 to 2006-07. Ambala, Karnal, Faridabad, Kurukshetra and Sonapat showed declining trend in instability since 1990-91, and changed to become low instability districts in sugarcane. Bhiwani, which registered the lowest instability by 6.29 during the 1990s became the highest instable (50.7) district during 2000-01 to 2006-07.

IV. CONCLUSION

In Haryana, the growth rate of agricultural production shows changes in spatial pattern of different crops. On the one hand some crops like rice and wheat show a very satisfactory performance in their production in all the three periods (1980-81 to 1989-90, 1990-91 to 1999-2000 and 2000-01 to 2006-07). On the other hand, crops like Gram, Massar, Maize, Sesamum, groundnut, showed unsatisfactory performances in their production. All these crops registered negative growth rate in production over the periods. In the case of total pluses, the production has shown a declining trend over the periods. Gram showed highest declining trend in both, production and area. Moong registered negative growth rate during 1980's and 1990's while it showed positive growth rate during 2006-07. The production of cotton registered positive growth rate over the periods. American cotton registered higher significant growth in production and area than Desi cotton at the state level and districts wise. Oilseeds showed a marginal increase since 1980-81.

The instability has been low and also declined over the time in wheat and rice and there are clear evidence of crop diversification towards rice, wheat, cotton and other crops. Instability is declining in a few crops such as wheat, Paddy, Sugarcane not in India but it is in Punjab, five more states, namely, Haryana, J and K, Kerala, Bihar and Rajasthan recorded a statistically significant declining trend (S Mahendradev 1987). The instability in wheat, rice and sugarcane has been low, while in gram, moong, massar, it has been high in all the periods. The result shows that the trend of instability is

still high in many crops like gram, moong, massar. Instability in Jowar has declined sharply from 1980-81 to 2006-07. During eighties Jowar's production declined due to crop diversification, however being an animal feed it could not be ignored. That was why the production of jowar increased later and with this effect the instability declined and it became low instability crops during 2000-01 to 2006-07. On the other hand, the instability is still high in pluses and coarse cereals because area under these crops is shifted towards rice and wheat and increased the instability in the production of these crops.

District-wise, it is found that the instability is low in wheat in all the districts over time period. The instability in Rice is also low, however only in those districts which are relatively advance in agriculture e.g. Karnal, Kurukshetra. The instability in production of rice is declining in karnal, Kurukshetra, Ambala, Jind, Hisar, Sirsa and Faridabad throughout the study period. Gurgaon which recorded medium instability during first period has recorded highest instability during third period. It may be because larger part of Gurgaon comes under rainfed area; therefore instability of rice is increasing over the period and registered as a highest instability district during 2000-01 to 2006-07. This study finds out that there is a very positive impact of green-revolution and new economic reforms on total foodgrain production. But it has it create big ditch between superior crops such as wheat, rice, Sugarcane and coarse cereals such as Bajra, Jawar, Maize and pluses crops.

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