

*CHAPTER-5*

**REGIONAL  
DISPARITIES IN  
AGRICULTURAL  
GROWTH IN HARYANA**

# **CHAPTER - 5**

## **REGIONAL DISPARITIES IN AGRICULTURAL GROWTH IN HARYANA**

### **5.1) Introduction**

This chapter is an attempt to analyse the regional disparities in agricultural growth in Haryana (district-wise & zone-wise). Agricultural growth refers as cropping pattern, area, production and productivity of selected major crops. This chapter divided in 2 sections. In the first section, the percentage share, CAGR (compound average growth rate) and  $\sigma$ -convergence have been used to measure the disparities in areas, production and productivity under cultivation of main crops. In second section used  $\sigma$ -convergence and  $\beta$ -convergence to measure the disparities in agricultural growth.  $\sigma$ -convergence convergence model used for the dispersion of area, production and productivity over the districts decreases over time. This study is based on calculating the Standard Deviation (SD) across zone-wise in Haryana for each year from 2001 to 2015.

### **5.2) Zone-wise area under cultivation of various crops**

Disparity in area under cultivation of selected major crops have shown in table 5.1

The table 5.2.1 shows that the crop wise and zone wise percentage share in area under cultivation during the period (2001 to 2015).

**Table 5.2.1 Area under cultivation of food grains crops in Haryana (2001-2 to 2014-15)**

Years / Crops	Zones	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR	C.V
Rice	Northern	39.90	38.51	49.40	48.65	48.88	47.07	43.65	46.33	39.58	42.51	43.03	35.32	44.41	52.85	2.03	14.12
	Central	41.23	43.09	32.84	33.78	32.98	33.80	35.58	33.63	37.43	36.83	35.12	42.39	32.61	43.29	0.35	13.72
	Western	14.93	13.98	15.45	13.95	14.72	15.52	16.85	16.21	18.79	16.42	17.29	20.34	21.25	2.14	-12.97	31.87
	Southern	3.93	4.42	2.32	3.62	3.42	3.61	3.93	3.83	4.20	4.23	4.56	1.94	1.72	1.72	-5.71	35.29
Wheat	Northern	21.88	28.86	24.28	22.92	23.33	25.23	22.23	21.83	22.72	23.48	22.26	23.63	24.14	23.94	0.64	9.11
	Central	29.57	28.10	26.06	29.85	29.59	24.40	30.15	29.47	29.57	30.70	29.55	31.86	31.00	31.52	0.46	9.91
	Western	32.66	29.30	33.87	32.20	32.55	35.28	33.07	34.44	34.11	31.28	34.25	37.23	37.83	37.27	0.95	7.40
	Southern	15.90	13.74	15.79	15.03	14.53	15.09	14.56	14.26	13.60	14.54	13.94	7.29	7.02	7.28	-5.43	24.78
Bajra	Northern	0.92	0.76	0.72	0.51	0.10	0.90	0.73	0.79	0.86	0.70	0.50	0.46	0.87	0.81	-0.90	34.25
	Central	16.29	15.83	18.69	17.09	15.04	22.60	20.90	20.87	20.20	20.70	19.08	19.04	21.25	22.30	2.27	17.19
	Western	44.68	44.60	52.48	44.74	46.96	23.91	39.90	41.45	40.79	39.01	44.59	41.48	32.12	19.37	-5.80	34.39
	Southern	38.11	38.81	28.11	37.66	37.89	52.58	38.47	36.88	38.15	39.59	35.83	39.01	45.76	57.52	2.98	34.17
Total cereals	Northern	24.94	25.15	25.64	25.37	26.21	25.53	24.75	24.41	24.52	25.07	24.44	26.18	27.81	26.44	0.42	3.50
	Central	30.811	30.799	30.085	29.529	29.580	29.608	30.058	29.762	30.411	30.107	30.087	32.067	32.770	33.513	0.60	4.85
	Western	27.20	27.88	30.18	29.00	29.34	30.04	29.78	30.47	30.38	29.89	30.26	31.96	31.56	31.56	1.07	6.63
	Southern	17.05	16.17	14.09	16.10	14.87	14.82	15.42	15.36	14.69	14.94	15.21	9.79	7.87	8.49	-4.86	22.75
Maize	Northern	88.68	91.06	91.19	90.96	93.04	94.25	94.78	92.75	87.88	80.33	86.32	75.00	71.19	69.15	-1.76	26.37
	Central	5.66	2.79	1.89	7.23	5.06	4.60	4.48	5.80	3.79	18.85	12.63	18.75	21.19	13.83	6.59	23.97
	Western	0.63	1.12	1.26	0.60	0.63	1.15	1.12	0.72	0.78	0.82	0.91	3.13	3.39	10.64	22.39	53.12
	southern	5.03	5.03	5.66	1.20	1.27	0.75	0.75	0.72	8.33	1.3	1.05	3.13	4.24	6.38	1.71	63.12
Gram	Northern	1.67	0.98	3.11	0.98	1.34	1.02	1.03	0.84	1.76	0.83	0.63	0.89	1.06	0.45	-8.90	47.54
	Central	1.33	5.40	9.51	3.60	0.29	1.56	2.24	1.86	1.76	2.26	1.61	2.03	3.18	1.36	0.12	55.13
	Western	89.25	82.04	72.03	77.74	92.07	90.22	88.71	86.95	86.54	91.92	87.38	87.31	79.03	82.94	-0.52	28.89
	Southern	7.75	11.58	15.36	17.68	6.31	7.20	8.02	10.34	9.94	4.99	10.38	9.77	16.74	15.25	4.96	41.63
Total pulses	Northern	7.32	6.01	5.82	5.03	5.18	4.66	5.73	4.94	5.18	6.53	3.82	6.10	9.42	7.08	-0.24	20.64
	Central	9.55	11.02	13.34	17.38	15.49	15.16	16.01	15.47	15.96	13.98	10.31	11.29	13.57	11.68	1.44	37.21
	Western	71.97	70.31	67.20	62.57	70.16	68.87	69.46	67.03	68.95	72.49	75.04	74.75	64.96	62.98	-0.95	26.67
	Southern	11.15	12.66	13.65	15.03	9.17	11.32	8.80	12.56	9.92	6.99	10.83	7.86	12.05	18.26	3.59	37.91
Total food grains	Northern	24.19	24.29	26.12	24.56	25.36	24.57	23.75	23.67	24.24	24.42	23.67	37.62	44.17	27.48	0.92	28.43
	Central	30.23	29.93	29.11	28.90	28.98	28.99	28.97	29.22	29.62	29.95	29.35	23.99	21.61	28.76	-0.36	4.16
	Western	31.22	29.76	29.06	30.85	31.03	31.79	32.27	31.86	31.74	30.98	31.93	26.10	22.48	28.39	-0.68	5.98
	Southern	14.35	16.02	15.71	15.69	14.63	14.66	15.00	15.25	14.40	14.64	15.05	12.30	11.75	15.37	0.49	4.88

**Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-15)**

### **5.2.1) Area under cultivation of major food grains crops**

The percentage share of northern zone area under cultivation of crop rice was increased 39.90 to 52.85 percent during the period. The central zone percentage share of rice was decreased whereas in western and southern zone it was increased. The percentage share of rice was higher in northern zone is compared to central, western and southern zone. The low areas under cultivation of rice were in southern zone due to lack of irrigation facilities. The highest percentage share of area under cultivation of wheat was in western zone is compared to central, northern and southern zones. Area under cultivation of wheat was increased in northern, central and western zones, whereas in southern zone it was decreased. The areas percent share of bajra was decreased in northern and western zone; on the other hand it was increased in central and southern zone increased during the period 2001 to 2015. The higher percent share of bajra was in western zone is compared to southern, central and northern zone. Except southern zone in case of total cereal area of percent share was not much difference in other zone. The highest share was recorded in central zone is compared to western, northern and southern zone. Northern zone was having highest percent share under cultivation of crop maize, whereas lowest share in western zone. Percentage share of gram cultivation was highest in western zone and lowest in northern zone during the overall period. The percentage share of area under cultivation of total pulses was highest in western zone; it was followed by central, southern and northern zone respectively during the period. The area under cultivation of total food grain was lowest in southern zone during the period. There was not much difference between central and western zone during the overall period.

This study examined compound annual growth rate of cultivation area of major food grain production in Haryana zone wise during the period 2001 to 2015. Growth rate in rice cultivation was noted 0.35% in central zone during the period which was lowest in compared to other three zone. It was negative in central and southern zones. Wheat is an important crop

of Haryana state. It was noted negative growth in southern zone. It was 0.96 % in western zone whereas it was noted 0.64 % and 0.46 % by northern and central zone respectively. Growth rate in bajra noted negatively in northern and western zones with -0.90 % and -5.80% respectively. Growth of total cereals was negatively in southern zone with -4.86%. It was highest in southern zone 1.93% in western zone. Growth rate in maize was recorded negatively in northern zone It was 0% in case of crop maize in western zone. Growth rate in cultivation of crop gram was negatively in northern and western zone whereas it was positively in central and southern zone. Except northern and western zone growth in total pulses was recorded positively over the study. CAGR in area under cultivation of food grain was recorded positive in northern and southern zones in Haryana state. C.V showed variation in area under cultivation of crops. Highest variations in case of crop rice in southern and in crop wheat in southern zone over the period. In case bajra lowest variation in central zone,

### **5.2.2) Area under cash crops**

The table 5.2.2 shows that percent share of each zone in area under cultivation of cash crops. The sugarcane area under cultivation shows that northern zone was highly dominated in cultivation over a period of time. Trend share of northern zone was highest in 2010-11.

**Table 5.2.2 Area under cultivation of cash crops in Haryana (2001-2 to 2014-15)**

Years / Crops	Zones	2001- 02	2002-03	2003- 04	2004- 05	2005-06	2006- 07	2007-08	2008- 09	2009- 10	2010-11	2011- 12	2012-13	2013-14	2014- 15	CAGR	C.V
Sugarcane	Northern	68.27	61.23	54.76	57.39	60.75	66.56	65.86	66.74	71.38	77.40	72.43	63.43	54.18	52.87	-1.81	21.04
	Central	19.32	26.92	30.74	30.69	31.05	25.08	25.60	24.82	20.00	16.29	21.07	28.64	23.24	18.11	-0.46	30.89
	Western	06.69	07.63	10.26	07.36	03.76	03.79	04.13	04.36	03.65	02.40	02.84	04.62	21.91	26.92	10.45	32.28
	southern	05.71	04.22	04.23	04.55	04.44	04.57	04.41	04.08	04.97	03.91	03.67	03.31	00.67	02.10	-6.89	24.40
Total Cotton	Northern	00.04	00.02	00.02	00.06	00.03	00.02	00.02	00.02	00.02	N.A	N.A	N.A	N.A	N.A	N.A	20.29
	Central	09.88	10.12	11.29	11.75	11.72	11.86	11.52	13.50	12.12	11.64	12.10	12.17	02.33	02.33	-9.81	09.01
	Western	89.49	89.28	87.52	86.27	84.72	85.38	87.09	85.89	87.39	88.00	87.61	87.61	19.18	19.18	-10.42	9.36
	southern	00.59	00.59	01.18	01.92	03.53	02.74	01.36	00.59	00.46	00.36	00.28	00.22	78.49	78.49	41.74	22.87
Rapeseeds & Mustrad	Northern	01.30	01.33	01.23	01.00	01.03	01.17	01.29	01.29	01.56	01.65	01.53	01.65	01.68	02.66	5.26	28.09
	Central	10.84	09.97	09.60	12.81	01.58	13.53	12.09	12.09	11.12	10.63	09.63	10.63	08.70	09.31	-1.08	34.18
	Western	46.60	42.98	45.13	52.75	55.19	49.72	49.91	49.91	47.61	47.58	51.19	47.58	36.96	51.42	0.71	20.53
	Southern	41.27	45.72	44.04	33.45	42.20	35.58	36.72	36.72	39.72	40.15	37.65	40.15	52.66	36.61	-0.85	19.95
Total oilseeds	Northern	01.59	01.67	01.49	01.90	01.79	03.07	02.07	02.22	02.81	02.85	02.49	02.28	02.66	02.28	2.60	29.87
	Central	10.87	10.76	11.17	14.00	14.27	14.50	11.46	11.45	11.07	10.61	10.31	09.68	10.70	09.68	-0.82	30.665
	Western	46.33	46.59	53.53	51.56	50.03	49.34	55.99	55.65	46.63	47.07	46.99	53.82	53.06	53.82	1.08	22.87
	Southern	41.21	40.97	33.80	32.53	33.91	33.09	30.49	30.68	39.50	39.46	40.21	34.21	33.58	34.21	-1.32	21.86

Source: Department of Economic and Statistical Analysis , Government of Haryana (2001-15)

Except western zone area under cultivation of sugarcane was negative in other three zones. Western zone were having highest area in crop of total cotton over a period of time. Northern zone were having lowest area under cultivation, it was 0.24 percent over a period of time because this areas not more profitable of this crop. Trend share of northern zone during the period 2010-11 to 2014-15 not available. Percentage share area under rapeseed and mustard was increased in northern and southern zone. On the other hand in crop total oilseed increased northern and western zone respectively. CAGR in crop rapeseed & mustard and total oilseeds negatively in central and southern zone over the period. C.V shows variation in cash crops. Highest disparities in crop sugarcane, total cotton, rapeseed & mustard and total oilseed in western, southern and central zone respectively.

### **5.3) Production of various crops in Haryana**

This section has attempted to examine the percent share of production of various crops in Haryana during the period .An attempt has been analysed the percent share of production zone-wise and compound average growth of selected various crops in Haryana state.

#### **5.3.1) Production of food grains crops**

The table 5.3.1 shows that production of crop rice was higher in northern zone are compared to other zones in Haryana. The share of western and southern zone was low is compared to northern and southern zone. Trend of production in central and western zone was increased whereas; in northern and southern zone was decreased during the period 2001 to 2015 Except southern zone there was not much disparity in production of wheat. Trend of wheat was also not much disparity in Haryana during the period 2001 to 2015.

**Table 5.3.1 Production under cultivation of food grains crops in Haryana (2001-2 to 2014-15)**

Years / Crops	Zones	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR	C.V
Rice	Northern	51.41	55.12	59.86	47.43	52.60	44.41	48.60	49.15	47.11	48.93	45.43	40.48	49.52	47.67	-0.54	22.65
	Central	30.21	16.02	22.92	30.72	28.08	27.03	27.83	28.93	27.52	29.60	30.10	36.13	30.01	33.61	0.76	23.18
	Western	14.57	13.42	15.14	17.99	16.47	13.69	20.46	18.37	21.58	17.45	20.20	21.75	19.30	17.33	1.25	24.57
	Southern	03.82	15.44	02.08	03.87	02.85	14.87	03.11	03.56	03.79	04.02	04.27	01.65	01.17	01.39	-6.96	52.23
Wheat	Northern	22.91	29.87	23.11	21.04	27.94	30.35	25.02	22.78	21.26	23.12	20.81	24.41	24.28	24.11	0.37	10.69
	Central	29.90	24.12	31.46	28.21	15.59	27.34	22.54	29.33	30.04	30.08	29.39	32.24	30.23	30.27	0.09	28.29
	Western	32.40	28.21	31.06	30.81	39.46	26.57	38.46	33.95	35.40	32.95	36.02	36.54	38.04	38.58	1.25	23.11
	Southern	14.79	17.80	14.37	19.94	17.01	15.73	13.98	13.94	13.31	13.84	13.77	06.80	07.45	07.05	-5.16	22.76
Bajra	Northern	00.61	00.32	00.87	00.80	01.55	01.02	01.18	00.87	01.41	00.65	00.51	00.54	00.82	00.93	3.09	48.27
	Central	21.19	19.00	22.71	17.69	24.15	22.40	22.43	25.43	19.72	23.44	20.17	18.87	22.37	09.87	-5.31	28.27
	Western	37.65	57.49	49.13	40.66	49.69	42.61	42.12	39.01	38.78	32.26	41.79	37.47	26.33	24.93	-2.90	26.90
	Southern	40.55	23.19	27.29	40.85	24.61	33.97	34.28	34.69	40.09	43.66	37.53	43.13	50.48	64.27	3.34	38.09
Total cereals	Northern	27.77	27.14	28.26	26.97	29.24	22.91	27.33	27.18	24.77	27.73	24.36	27.87	24.75	28.50	0.19	13.47
	Central	28.89	29.34	30.36	28.69	28.47	33.36	29.18	28.67	28.85	29.44	28.81	31.09	25.11	26.06	-0.73	11.82
	Western	29.27	27.55	28.87	29.99	29.61	30.74	31.46	30.53	33.18	29.47	33.27	32.99	27.70	24.74	-1.19	16.93
	Southern	14.06	15.97	12.51	14.34	12.68	12.99	12.03	13.62	13.19	13.36	13.55	08.06	22.44	20.69	2.80	32.94
Maize	Northern	94.12	93.62	93.10	90.24	94.87	94.44	80.00	91.89	95.83	84.62	78.95	78.95	78.95	80.00	0.43	35.58
	Central	N.A	N.A	N.A	09.76	05.13	05.56	N.A	08.11	03.33	15.38	21.05	21.05	21.05	22.4	N.A	9.27
	Western	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	Southern	05.88	06.38	06.90	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Gram	Northern	02.56	00.79	02.44	01.00	01.10	01.39	N.A	N.A	00.83	N.A	N.A	00.73	00.63	01.08	-6.02	36.9

Contd..2



	Central	03.85	05.56	12.20	05.00	02.20	05.56	03.33	03.70	02.48	02.78	01.82	01.04	01.81	02.15	-4.07	53.13
	Western	80.77	80.16	68.29	74.00	90.11	86.11	85.56	25.93	85.95	79.17	86.36	88.82	85.82	81.72	0.08	37.84
	Southern	12.82	13.49	17.07	20.00	06.59	06.94	11.11	70.37	10.74	18.06	11.82	09.40	11.74	15.05	1.15	63.35
Total pulses	Northern	08.92	05.89	06.49	05.10	04.69	05.46	04.22	04.19	04.01	05.45	04.16	04.98	05.45	07.12	-1.60	24.80
	Central	12.63	12.25	14.47	20.82	26.16	22.00	21.60	28.12	32.30	20.76	17.24	13.89	20.76	11.24	-0.83	42.66
	Western	64.83	70.21	60.03	55.56	61.97	62.70	63.46	55.43	53.00	66.91	63.13	71.65	66.91	63.30	-0.17	1726
	Southern	13.63	11.65	19.02	18.52	07.18	9.84	10.72	12.26	10.69	06.89	15.47	09.48	06.89	18.35	2.15	32.66
Total food grains	Northern	27.36	21.78	21.57	24.56	30.39	29.73	N.A	27.66	24.83	26.14	24.17	14.66	29.18	26.10	-0.34	30.33
	Central	29.20	32.40	31.67	28.90	12.64	30.24	N.A	29.47	28.62	29.97	28.66	36.43	29.93	27.57	-0.41	32.05
	Western	29.52	31.15	31.70	30.85	48.55	28.24	N.A	29.54	33.44	30.30	33.64	39.42	32.89	38.66	1.95	29.11
	Southern	13.92	14.67	15.06	15.69	08.42	11.79	N.A	13.33	13.10	13.58	13.53	09.49	07.99	07.68	-4.16	28.98

**Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-15)**

**N.A : not available**

Production of bajra was lowest Northern zone. But the trend of production of bajra was increased during the period except central zone. Except southern zone, there was not much disparity in trend of crop total cereal. Trend share of total cereal in central and western zone were decreased, whereas in northern and southern were increased. There was more disparity in of production crop maize. Because production of northern zone was highest whereas production of northern zones was very low during the period. Production of crop maize in western and southern zone was not available. Out of the total production of gram western zone was produced more over a period of time; it was followed by southern and central zone. But northern zone was produced very low over a period of time. In northern and central zone, it was decreased. There was much disparity in trend of total pulses except northern zone. Western zone was produced more over a period of time. Trend share of southern zone was increased during the period. There was not much disparity in trend of total food grain production.

This study found growth rate of rice production positively in central and southern zone of Haryana state. Growth rate of wheat production was negative in southern zone. Growth rate of bajra was highest in southern zone. It was positively in northern and southern zone of Haryana state. Growth rate of total production in total cereal was higher in southern zone, whereas lowest in northern zone. It was negative in central and western zone. Growth rate of cop gram production was positive in western and southern zone, whereas it was negative in northern and central zone. Growth rate of total pulses was negative except southern zone during the period. Western zone was produced more total food grain production with 1.95 % growth rate.

**Table 5.3.2 Production under cultivation of cash crops in Haryana (2001-2 to 2014-15)**

Years / Crops	Zones	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR	C.V
Sugarcane	Northern	66.22	56.09	59.25	63.26	63.34	68.68	66.46	65.76	70.71	79.23	72.52	67.27	64.38	66.74	0.06	17.20
	Central	23.38	30.70	26.85	26.82	17.82	24.29	27.08	26.08	20.81	15.67	22.02	25.79	28.49	27.58	1.19	32.87
	Western	6.00	8.42	10.14	6.48	12.15	3.45	3.65	4.20	3.47	2.29	2.65	3.34	2.88	2.18	-6.97	40.57
	Southern	4.41	4.79	3.76	3.44	6.70	3.58	2.81	3.97	5.01	2.82	2.81	3.60	4.24	3.50	-1.63	36.11
Total cotton	Northern	N.A	N.A	N.A	N.A	N.A	N.A	NA	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	Central	7.09	13.80	7.51	10.38	9.40	11.45	9.91	9.61	9.91	9.12	10.82	10.13	10.82	9.61	2.20	31.52
	Western	92.41	85.11	91.71	87.49	87.90	87.02	89.29	90.12	89.88	90.72	88.78	89.46	88.78	90.12	-0.18	24.95
	Southern	0.51	1.09	0.77	2.13	2.70	1.53	0.80	0.27	0.22	0.16	0.40	0.41	0.40	0.27	-4.43	37.68
Rape seed \$mustard	Northern	0.89	0.76	0.75	0.62	1.24	1.14	2.09	1.17	1.79	1.78	1.68	1.78	1.69	2.02	6.02	45.11
	Central	11.25	10.11	10.25	12.44	19.57	11.87	12.57	11.22	11.19	10.06	9.02	10.06	9.82	7.08	-3.25	20.67
	Western	44.11	46.40	47.13	52.44	32.76	47.35	52.36	43.05	43.51	48.28	50.68	48.28	40.09	39.15	-0.85	24.33
	Southern	43.75	42.73	41.88	34.51	46.43	39.65	32.98	44.56	43.51	39.88	38.61	39.88	48.40	51.75	1.21	14.06
Total oilseeds	Northern	1.08	1.21	1.41	1.79	2.05	4.16	2.72	3.77	3.12	3.28	2.46	1.97	1.95	2.05	4.64	45.13
	Central	11.30	7.78	12.40	2.30	15.11	11.48	11.73	10.90	11.00	9.86	8.92	11.00	8.17	15.11	2.10	32.57
	Western	44.02	47.38	51.05	57.87	46.96	46.03	49.18	42.03	43.14	47.69	50.44	54.84	52.07	46.96	0.46	19.60
	Southern	43.59	43.63	35.14	38.04	35.89	38.33	36.37	43.30	42.74	39.16	38.18	32.19	37.81	35.89	-1.38	16.76

Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-2015)

N A: not available

Highest variation in production crop rice, total cereal and gram in southern zone whereas in bajra and maize in northern zone during the period. In production crops, wheat, total pulses and total food grains highest variations in central zone over the study.

### **5.3.2) Production of cash crops in Haryana**

The table 5.3.2 shows that production of cash crop in Haryana zone wise. Northern zone have highest production in case of crop sugarcane whereas it was lowest in southern zone during the period. But the percent of sugarcane production in northern zone was increasing. Central zone have produced higher share in total cotton during the period of time. Northern zone did not produce this crop during the same period. This study found growth rate of cash crop production in Haryana state. Growth rate of Sugarcane production was recorded positively in northern and central zones with 0.06 percent and 1.19 percent respectively. Growth rate of production total cotton was not recorded in northern zone over a period. It was highest in central zone with 2.20 percent. There was recorded positive growth in crop rapeseed and mustard production in northern and southern zones with 6.02 percent and 1.21 percent respectively. There was noted positive growth in crop total oilseeds production in northern, central and western zones with 1.64, 2.10 and 0.46 percent respectively. In this table CV shows variations in cash crops. Highest variations in crop sugarcane in western and in crop total cotton in southern zone over the period. Highest variations in crop rapeseed & mustard and total oilseeds in northern zone.

### **5.4) Productivity of various crops**

An attempt has been made to examine average productivity of selected food grains and cash crops during the period (2001 to 2015).

**Table 5.4.1 Productivity under cultivation of food grain crops in Haryana (in kilogram/ hectare)**

Years/ Crops	Zones	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR	C.V
Rice	Northern	364.23	424.74	359.63	250.87	327.81	322.57	393.89	358.62	343.12	334.46	294.21	104.67	103.69	74.69	-10.70	39.26
	Central	207.12	110.29	207.13	233.94	259.33	273.32	276.68	290.82	212.00	233.58	238.89	81.75	85.46	86.34	-6.06	38.06
	Western	275.79	284.67	290.92	331.91	340.85	301.72	429.61	383.20	331.16	308.78	325.58	97.16	102.34	75.79	-8.81	32.04
	Southern	274.67	135.90	266.67	274.73	254.29	407.41	279.79	313.87	259.88	276.52	261.02	102.20	119.65	9329	-7.42	42.34
Wheat	Northern	429.85	301.63	409.26	383.56	386.86	414.96	429.03	433.92	432.02	432.50	432.96	111.67	104.23	100.91	-9.83	38.87
	Central	415.25	250.14	519.04	394.70	224.37	386.64	284.92	413.87	468.94	430.36	460.46	124.62	111.31	161.61	-6.52	41.09
	Western	407.41	280.64	394.25	399.71	391.59	259.78	443.26	409.91	479.15	462.77	486.82	122.36	178.14	109.83	-8.94	37.87
	Southern	382.05	377.36	391.16	554.22	378.08	359.68	365.90	406.38	451.88	418.32	457.57	119.52	116.31	125.05	-7.67	38.34
Bajra	Northern	71.43	42.55	108.11	250.00	142.86	184.21	279.07	204.08	283.02	146.34	171.43	198.11	79.44	61.43	-1.07	50.20
	Central	140.26	119.80	108.33	166.82	151.75	161.22	186.03	228.08	169.63	179.72	176.73	111.78	111.47	95.00	-2.74	25.07
	Western	90.88	128.65	83.46	146.39	100.00	289.84	182.98	176.17	165.20	131.23	156.67	165.20	45.28	85.62	-0.42	43.01
	Southern	114.75	59.63	86.57	174.74	61.39	105.07	154.46	176.03	182.63	175.00	175.14	297.50	166.55	113.39	-0.09	42.87
Total cereal	Northern	357.79	359.03	351.44	338.43	356.81	255.64	386.65	395.49	365.39	382.42	361.64	102.40	149.59	93.53	-9.14	35.53
	Central	301.28	316.96	321.77	309.27	307.81	320.91	339.84	342.23	343.11	338.10	347.39	111.47	105.36	102.22	-7.43	33.95
	Western	345.74	328.77	304.95	329.16	322.76	291.53	369.88	355.95	394.95	340.97	398.82	122.37	116.96	107.82	-7.99	34.48
	Southern	264.96	328.41	283.02	283.68	272.64	249.59	273.05	315.08	324.78	309.25	323.16	119.13	123.90	118.35	-5.59	30.24
Maize	Northern	226.95	269.94	186.21	245.03	251.70	207.32	157.48	265.63	198.28	224.49	182.93	78.77	108.28	116.16	-4.67	31.04
	Central	110.11	200.00	266.67	333.33	250.00	250.00	400.00	375.00	160.00	173.91	333.33	64.00	69.57	83.33	-2.03	32.15
	Western	250.00	230.12	172.00	211.00	100.00	100.00	200.00	140.00	190.00	200.10	250.00	N.A	N.A	N.A	N.A	28.64

**Contd..2**

Gram	Southern	250.00	233.33	222.22	200.00	150.00	170.00	190.40	220.00	180.18	150.00	250.00	N.A	N.A	N.A	N.A	28.6
	Northern	100.00	71.43	58.82	83.33	71.43	76.92	76.64	74.43	45.45	46.78	54.34	63.64	60.81	70.90	-2.43	21.46
	Central	187.50	90.91	96.15	113.64	166.67	200.00	125.00	100.00	136.36	105.26	111.11	81.82	52.63	88.89	-5.19	35.17
	Western	58.82	86.40	71.07	77.89	85.15	53.77	80.97	55.01	96.30	73.64	97.34	113.09	136.95	120.22	5.24	28.68
	Southern	107.53	103.03	83.33	92.59	90.91	54.35	116.28	142.34	104.84	109.52	112.07	115.32	201.52	96.38	-0.78	30.27
Total pulses	Northern	77.39	77.19	76.99	69.52	74.73	67.03	58.76	49.41	67.71	61.63	70.15	90.61	91.94	119.38	3.14	22.69
	Central	84.00	87.56	74.90	82.09	139.34	83.11	107.75	106.02	176.69	109.78	107.73	126.81	132.10	99.99	1.25	25.69
	Western	57.26	78.69	61.69	60.83	72.89	52.12	72.96	48.22	95.23	68.24	84.59	130.65	130.93	115.94	5.17	34.26
	Southern	77.71	72.50	96.23	84.39	64.60	49.77	97.32	56.94	94.02	72.83	92.11	145.55	146.31	94.65	1.42	31.98
Total food grains	Northern	356.04	259.30	227.56	100.00	353.95	364.93	365.10	390.90	358.72	353.05	359.88	101.35	96.74	98.57	-8.77	44.54
	Central	304.04	313.10	299.76	100.00	128.80	314.76	234.90	337.41	338.34	330.07	344.22	262.69	104.86	146.54	-5.08	36.73
	Western	297.59	302.69	300.61	100.00	462.08	268.03	274.70	310.10	368.82	322.59	371.25	79.82	120.35	135.15	-5.48	43.03
	Southern	305.35	264.73	264.33	100.00	169.95	242.60	234.90	292.27	318.53	305.94	316.95	187.43	126.11	134.93	-5.67	32.64

**Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-15)**

**N.A : not available.**

#### **5.4.1) Productivity of food grain crops**

The table 5.4.1 shows that the average productivity of major food grains crops in overall period. Northern zone was recorded higher average yield of crop rice. It was 4057.21 kg/ha over a period of time. It was followed by western, southern and central zone with 3879.48, 3268.09 and 2796.65 kg/ha over a period of time. Trend share of average productivity of crop rice was decreasing. Trend share of average productivity of crop wheat was increased in all zones during the period in all zones. Highest variation in rice in southern zone. Productivity of crops maize and gram shows highest variation in central zone, whereas in crops wheat, bajra, and total cereal in northern zone. In case of crop total pulses and total food grain productivity is highest in western zone.

#### **5.4.2) Productivity of cash crops**

The table 5.4.2 shows that the average product of cash crops. Productivity in cash of crop sugarcane was decreased in all zone of Haryana. Productivity In case of crop cotton was decreased in all three zones except northern zone. In northern zone was not recorded. Except southern zone rapeseed & mustard was increased in other three zones. Except southern zone total oilseed was also increased in other three zones. CAGR of sugarcane was negative in all zones of Haryana. CAGR was negative in only southern zone in case of crop rapeseed and mustard and total oilseed. Highest variations in productivity of crops sugarcane and total cotton in northern and southern zone respectively. Productivity of crops rapeseed & mustard and total oilseed in western zone respectively.

Years / Crops	Zones	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR	C.V
Sugarcane	Northern	595.81	438.70	609.66	679.35	690.59	647.67	688.98	621.65	568.11	734.09	715.69	91.51	82.26	113.34	-11.18	46.43
	Central	743.19	546.08	492.25	538.62	380.15	608.02	722.22	662.82	596.69	689.92	747.19	123.06	156.96	113.47	-12.56	44.95
	Western	550.56	528.46	556.70	542.37	214.00	571.43	603.45	606.56	545.45	685.21	666.67	111.83	254.89	119.91	-10.32	42.81
	Southern	473.68	544.12	500.00	465.75	100.00	491.53	435.48	614.04	577.78	516.13	548.39	131.84	577.78	105.01	-10.20	41.72
Total cotton	Northern	N.A	N.A	N.A	N.A	N.A	N.A	NA	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
	Central	178.51	158.56	133.33	236.25	267.86	250.00	286.18	269.17	332.73	297.62	316.58	113.94	124.22	119.05	-2.85	36.04
	Western	257.14	110.87	209.88	271.26	346.57	263.83	340.95	396.69	418.72	391.45	358.86	146.24	120.82	148.37	-3.85	40.19
	Southern	212.12	216.22	131.15	297.03	255.71	144.65	194.44	172.41	190.48	166.67	500.00	58.05	74.49	115.22	-4.27	56.11
Rapeseed & Mustard	Northern	94.34	93.75	96.77	96.77	109.59	111.11	207.79	90.91	197.53	178.57	205.13	93.94	180.25	160.71	3.88	34.97
	Central	142.21	166.67	170.12	151.32	125.00	100.21	132.78	92.67	173.01	156.83	175.15	61.24	15.38	156.49	0.69	36.38
	Western	129.66	177.38	166.37	154.93	53.96	108.79	134.00	86.10	157.17	168.11	185.13	55.57	291.25	154.53	1.26	41.57
	Southern	145.23	153.57	151.52	160.79	100.00	127.28	114.75	121.13	188.38	164.55	191.77	75.33	188.38	129.28	-0.83	24.10
Total oilseeds	Northern	92.42	103.30	108.79	128.69	133.59	148.05	148.67	145.63	191.89	189.93	197.50	113.16	143.64	128.29	2.37	23.11
	Central	141.33	103.07	127.96	22.44	123.82	86.53	115.75	81.80	171.75	153.15	173.59	364.44	138.70	177.00	1.62	24.19
	Western	129.14	144.97	109.93	153.11	109.79	101.97	99.34	64.85	159.84	166.98	215.35	42.36	145.58	163.76	1.71	34.74
	Southern	143.79	151.82	119.85	159.49	123.81	126.60	134.91	121.24	186.95	163.57	190.49	76.02	150.99	129.20	-0.76	20.93

**Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-15)**  
**NA: not available**



## 5.5 District-Wise Studies

Districts	Rice	Wheat	Bajra	Total Cereal	Total Pulses	Total Food Grains
Ambala	0.71	0.65	-1.58	-2.03	-4.32	0.43
Panchkula	3.32	0.21	6.37	0.70	-4.48	0.32
Yamunanagar	1.60	2.31	0.10	1.83	-3.23	1.72
Kurukshetra	0.38	0.18	0.10	0.26	-1.02	0.27
Kaithal	-0.28	0.89	0.81	0.26	-4.92	0.26
Karnal	0.17	0.22	-4.11	0.14	-0.14	0.11
Panipat	-0.19	0.26	-3.58	0.02	-0.14	0.01
Sonipat	1.16	0.18	0.19	0.68	-6.24	0.65
Rohtak	3.64	2.06	-0.47	0.81	-1.18	0.67
Jhajjar	4.51	0.21	0.37	-0.19	0.64	3.05
Faridabad	-3.55	-4.61	-7.45	-2.09	-7.58	-9.84
Gurgaon	-3.08	-3.87	-4.97	-6.70	-5.50	-6.73
Rewari	3.89	-1.44	0.69	-0.45	4.85	-0.28
Mahendragarh	N.A	-0.42	-0.66	-0.58	-2.59	-2.25
Bhiwani	5.17	1.08	-5.82	-1.69	2.40	-0.20
Jind	0.50	0.35	-4.88	-0.18	-0.93	0.18
Hisar	2.21	0.61	-4.71	-0.18	2.92	0.15
Fatehabad	2.95	0.62	-3.45	0.97	-3.17	0.92
Sirsa	3.97	0.11	0.78	1.43	-4.63	1.34

**Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-15)**  
**N.A : not available**

The table 5.5.1 shows district-wise CAGR in area under cultivation of food-grains crops. CAGR in area under rice cultivation was negative in Kaithal, Panipat, Faridabad and Gurgaon with -2.8, -0.19, -3.55 and -3.08 respectively. It was highest in Bhiwani with 5.17 and lowest in Ambala with 0.75 during the period. There are not much difference between Yamunanagar and Sonipat. CAGR in area under wheat cultivation negative in Faridabad,

Gurgaon, Rewari and Mahendergarh. It was highest in Rohtak and Yamunanagar .There is not much disparity in Panchkula, Karnal, Panipat and Jhajjar with 6.37, 0.81, 0.19 and 0.37. CAGR in area under bajra cultivation positively in Panchkula, Kathial, Sonipat and Jhajjar with 6.37, 0.81, 0.19 and 0.37 respectively. CAGR in area under cultivation total oilseed negative in Ambala, Jhajjar, Faridabad, Gurgaon, Rewari, Mehendergarh, Bhiwani, Jind and Hisar. Highest positive growth in Yamunanagar with 1.83. CAGR in area under total pulses positive in Jhajjar, Rewari, Bhiwani and Hisar with 0.64, 4.85, 2.40 and 2.92 respectively over the period of time. CAGR in area under total food grains crop negative in Rewari, and Mahendergarh. It was highest in Faridabad and lowest in Panchkula with 0.32.

<b>Table 5.5.2 : District-wise CAGR (Area under cultivation of cash crops) in Haryana</b>			
Districts	Sugarcane	Total Oilseeds	Rapeseed & Mustrad
Ambala	00.54	-02.32	08.61
Panchkula	-09.02	-01.98	01.97
Yamunanagar	04.58	07.17	08.61
Kurukshatra	-09.72	18.42	01.97
Kaithal	02.69	-09.86	-04.25
Karnal	-00.93	00.08	01.97
Panipat	02.69	01.51	01.97
Sonipat	-06.10	-03.81	-02.29
Rohtak	-01.08	01.37	-00.24
Jhajjar	01.09	00.50	-02.20
Faridabad	-19.19	-12.34	-13.35
Gurgaon	16.19	-09.14	-10.81
Rewari	-19.19	00.46	-02.02
Mahendergarh	23.75	00.45	01.10
Bhiwani	-19.19	01.41	01.02
Jind	10.77	-18.41	01.00
Hisar	-21.33	06.35	06.01
Fatehabad	02.65	-01.39	-02.90
Sirsa	-18.38	00.86	00.08
<b>Source: Department of Economic and Statistical Analysis , Government of Haryana (2001-15)</b>			
<b>N.A : not available</b>			

The table 5.5.2 shows that district-wise CAGR area under cultivation of cash crops. CAGR area under cultivation of sugarcane is negative in all districts except kaithal, Jhajjar, Gurgaon, Mahendergarh, Jind and Fatehabad. CAGR area under cultivation Oilseed is higher in Kurukshatra with 18.42 and lowest in Karnal with 0.08. It was negative in Ambala, Panchkula, Kaithal, Sonipat, Faridabad, Gurgaon, Jind and Fatehabad. CAGR area under cultivation of R&M is highest in Ambala and Yamunanagar with 8.61 whereas lowest in Sirsa with 0.08. It is negative in Kaithal, Sonipat, Rohtak, Jhajjar, Faridabad, Gurgaon, Rewari and Fatehabad.

<b>Table 5.5.3 : CAGR (Production under cultivation of food-grain crops)</b>						
Districts	Rice	Wheat	Bajra	Total Cereal	Total Pulses	Total Food Grains
Ambala	2.53	2.68	2.08	2.49	-9.55	-3.74
Panchkula	5.48	2.12	2.08	2.68	-15.98	-9.01
Yamunanagar	3.17	3.75	5.08	3.86	-6.34	-8.07
Kurukshatra	2.14	0.54	5.08	3.98	-4.83	-4.39
Kaithal	2.06	1.42	7.63	3.34	-7.15	2.30
Karnal	1.80	0.68	3.72	1.93	-10.33	-3.23
Panipat	0.19	0.53	5.08	-2.84	-6.15	-1.58
Sonipat	4.28	1.26	2.94	3.50	-3.67	-0.49
Rohtak	6.24	0.92	-2.12	-2.12	2.81	-6.58
Jhajjar	8.06	0.68	4.45	2.50	1.01	-5.10
Faridabad	-6.99	-9.18	-6.88	-3.81	-24.69	-6.93
Gurgaon	-1.58	-5.59	-1.19	-4.59	-9.02	-7.97
Rewari	8.16	-0.19	6.35	1.54	-2.06	0.00
Mahendergarh	N.A	1.72	5.11	3.14	0.35	-0.47
Bhiwani	4.08	2.89	-0.82	2.41	-0.84	-5.31
Jind	2.74	0.73	-4.42	0.94	-5.25	0.68
Hisar	4.83	0.95	4.71	0.96	14.25	-3.67
Fatehabad	4.24	2.04	0.00	2.39	-5.32	-7.06
Sirsa	6.65	2.95	0.00	3.36	2.75	-6.60

**Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-15)**  
**N.A: not available**

The table 5.5.3 shows CAGR (Production under cultivation of food-grain crops). Growth of production under rice cultivation in Rewari with 8.16 percent whereas lowest in Panipat with 0.19 percent. It was negative in Faridabad and Gurgaon. Growth of Production under wheat cultivation negative in Faridabad Gorgon and Rewari with -9.18, -5.59 and -0.19. It was higher in Yamunanagar whereas lowest in Panipat. Growth of Production under bajra was higher in Kaithal with 7.63 and lowest in sirsa. Growth of production under total cereal cultivation was negative in Panipat, Rohtak, Faridabad and Gurgaon with -2.84, -2.12, -3.81 and -4.59 respectively. Growth of production in crop total pulses positives in Rohtak, Jhajjar, Mahendergarh and Sirsa. Growth of production under total food grain production is positive in Kaithal, Rewari and Jind. It was highest in Kaithal.

<b>Table 5.5.4 District- wise CAGR (Production under cultivation of cash crops) in Haryana</b>			
Districts	Sugarcane	Total Oilseeds	Rapeseed & Mustrad
Ambala	-1.83	1.96	5.08
Panchkula	0.84	6.76	5.08
Yamunanagar	-1.99	10.24	8.16
Kurukshatra	-0.95	14.05	5.08
Kaithal	1.14	-1.86	0.00
Karnal	3.10	4.36	5.08
Panipat	3.81	5.08	5.08
Sonipat	-1.90	-2.03	-2.03
Rohtak	0.44	1.40	1.40
Jhajjar	-7.17	1.71	1.68
Faridabad	-5.37	-7.66	-7.55
Gurgaon	-1.78	-5.70	-5.73
Rewari	N.A	1.72	1.71
Mahendergarh	N.A	3.39	3.39
Bhiwani	0.00	4.21	5.38
Jind	-1.22	2.43	2.43
Hisar	-7.30	6.58	6.56
Fatehabad	-4.83	2.33	1.44
Sirsa	1.11	3.05	2.79

**Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-15)**  
**N.A: not available**

The table 5.5.4 shows district- wise CAGR production under cultivation of cash crops. Production under cultivation of cash crops sugarcane was not recorded in Rewari and Mahendergarh. It was positive in Panchkula, Kaithal, Karnal, Panipat, Rohtak, Bhiwani and Rohtak. CAGR production under total oilseed negative in Kaithal, Sonipat, Faridabad and Gurgaon. CAGR production under Rapeseed and Mustard was negative in Faridabad and Gurgaon. There are not much disparities in Ambala, Panchkula, Kurukshatra, Kaithal, Karnal and Bhiwani.

Districts	Rice	Wheat	Bajra	Total Cereals	Total Pulses	Total Food Grains
Ambala	-0.56	2.01	6.76	4.63	-9.55	-3.74
Panchkula	-1.34	1.90	-1.39	1.97	-15.98	-9.01
Yamunanagar	-2.59	1.40	5.08	1.99	-6.34	-8.07
Kurukshatra	2.56	0.37	5.08	3.71	-4.83	-4.39
Kaithal	6.03	0.53	6.70	3.07	-7.15	2.30
Karnal	5.00	0.45	8.16	1.79	-10.33	-3.23
Panipat	-1.44	0.27	8.98	-2.86	-6.15	-1.58
Sonipat	1.20	1.08	2.75	2.80	-3.67	-0.49
Rohtak	-2.12	-1.12	-1.66	-2.90	2.81	-6.58
Jhajjar	-3.37	0.47	4.06	2.70	1.01	-5.10
Faridabad	4.02	-4.47	0.62	-1.75	-24.69	-6.93
Gurgaon	0.11	-1.78	3.98	2.26	-9.02	-7.97
Rewari	-6.72	1.27	5.64	2.10	-2.06	0.00
Mahendergarh	N.A	2.14	5.81	3.75	0.35	-0.47
Bhiwani	-5.25	1.79	5.30	4.17	-0.84	-5.31
Jind	3.04	0.38	0.49	1.13	-5.25	0.68
Hisar	-5.18	0.33	8.89	1.14	14.25	-3.67
Fatehabad	-2.22	1.42	3.57	1.41	-5.32	-7.06
Sirsa	-3.95	1.82	0.78	1.91	2.75	-6.60

**Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-2015)**

The table 5.5.5 shows that district- wise CAGR (productivity of food-grains crops). CAGR under case of crop rice productivity positive in Kurukshatra, Kaithal, Karnal, Sonipat, Faridabad, Gurgaon and Jind with 2.56, 6.03, 5.1, 1.20 and 0.11 respectively over the period.

CAGR under case of crop wheat productivity negative in Rohtak, Faridabad, Gurgaon with -1.12, -4.47 and -1.78 respectively over the period of time. Productivity under bajra cultivation focused negative in Panchkula and Rohtak with -1.39 and -1.66 respectively. It was highest in Panipat with 8.98, whereas lowest in Jind 0.49. Productivity under total cereal cultivation observed negative in Panipat, Sonipat, Rohtak, Jhajjar and Faridabad with -2.86, -2.90 and -1.75. It was highest in Bhiwani with 4.17 and lowest in Jind with 1.13. Productivity under total pulses cultivation recorded positive in Rohtak, Jhajjar, Mahendragarh, Hisar and Sirsa with 2.81, 0.01, 0.35, 14.25 and 2.75 respectively. CAGR under productivity of total food grain is positive in Rewari and Jind with 0.01 and 0.68.

<b>Table 5.5.6 CAGR (Productivity of cash crops) in Haryana</b>			
Districts	Sugarcane	Total Oilseeds	Rapeseeds & Mustard
Ambala	1.03	4.76	3.12
Panchkula	4.29	6.30	1.17
Yamunanagar	1.37	3.26	1.03
Kurukshatra	1.41	-2.39	0.76
Kaithal	2.73	5.83	7.79
Karnal	1.71	2.43	3.72
Panipat	0.95	3.21	5.87
Sonipat	-1.73	1.24	1.97
Rohtak	4.18	0.95	2.77
Jhajjar	-8.89	-0.29	3.07
Faridabad	13.23	5.13	-4.11
Gurgaon	3.21	0.51	-0.74
Rewari	N.A	0.30	4.49
Mahendergarh	N.A	2.54	3.89
Bhiwani	-5.42	1.64	4.17
Jind	3.69	1.45	3.72
Hisar	4.00	1.15	3.56
Fatehabad	14.76	1.12	4.61
Sirsa	14.18	1.51	4.01
<b>Source: Department of Economic and Statistical Analysis, Government of Haryana (2001-15)</b>			
<b>N.A : not available</b>			

The table 5.5.6 shows CAGR productivity of cash crops. Productivity under sugarcane is negative in Sonipat, Jhajjar and Bhiwani with -1.73, -8.89 and -5.42. It was highest in Fatehabad with 14.76. Rewari and Mahendergarh districts have not available. There are not much disparities in Fatehabad and Sirsa districts. Productivity under total oilseed negative in Kurukshatra and Jhajjar with -2.39 and -0.29. It was highest in Kaithal with 5.83 and lowest in Rewari with 0.30. There are no disparities in Sonipat, Bhiwani, Jind, Hisar, Fatehabad and Sirsa. CAGR productivity under cultivation of rapeseed & mustard highest in Kaithal with 7.79. It was followed by Panipat, Fatehabad, Rewari, Bhiwani, Sirsa, Mahendergarh with 5.87, 4.61, 4.49, 4.01 and 3.89 per cent respectively during the period. Negative CAGR under cultivation of rapeseed & mustard in Faridabad and Gurgaon with -4.11 and -0.74 per cent respectively.

#### **5.6) $\sigma$ -convergence zone wise**

This study deals with  $\sigma$ -convergence of dispersion of area, production and productivity across the districts over time. This model is based on calculating the standard deviation (S.D) across four zone and nineteen districts of Haryana for each year starting from 2000-01 to 2014-15. As the  $\sigma$ -convergence measures the inter-regional inequality, it may very well infer that the inter-regional inequality among the districts have increased during given time period. When the dispersion of area, production and productivity across districts falls over time, there is  $\sigma$ -convergence. The model is

$$SD_t = \eta + \tau t + \omega_t$$

There, SD = Standard Deviation (Area, Production and Productivity)

$\eta$  = Intercept,  $\tau$  = Slope coefficient,  $\omega$  = Error term,  $t$  = time (2001-02 to 2014-2015)

**Table 5.6.1:  $\sigma$  –convergence for Area, Production and Productivity of food-grain crops in Haryana zone-wise**

	Intercept	Growth coefficient	R <sup>2</sup>
Area	285.03(0.000)	5.00(0.000)	0.62
Production	836.17(0.000)	48.34(0.000)	0.81
Productivity	43.92(0.000)	-1.28(0.000)	0.44
<b>Source: Researcher Calculation</b>			

The table 5.6.1 shows that zones of Haryana have exhibited not significant sigma convergence in area and productivity in food grain crops. Higher sigma convergence in production comparison to area and productivity. Growth coefficient is positive in area and production and not negative in productivity.

**Table 5.6.2 :  $\sigma$  –convergence for Area, Production and Productivity of cash crops in Haryana zone-wise**

	Intercept	Growth coefficient	R <sup>2</sup>
Area	44.34(0.000)	-1.15(0.000)	0.91
Production	254.65(0.000)	-3.41(0.000)	0.53
Productivity	78.43(0.000)	-0.65(0.000)	0.43
<b>Source: Researcher Calculation</b>			

The table 5.6.2 shows that zones of Haryana have exhibited not significant sigma convergence in productivity in cash crops. Higher  $\sigma$ -convergence in area comparison to production and productivity. Growth coefficient is negatively in cash crops in areas, production and productivity.



**Figure 5.1 Standard Deviation of area under cultivation of food grains crops zone-wise Haryana during 2001-2015**

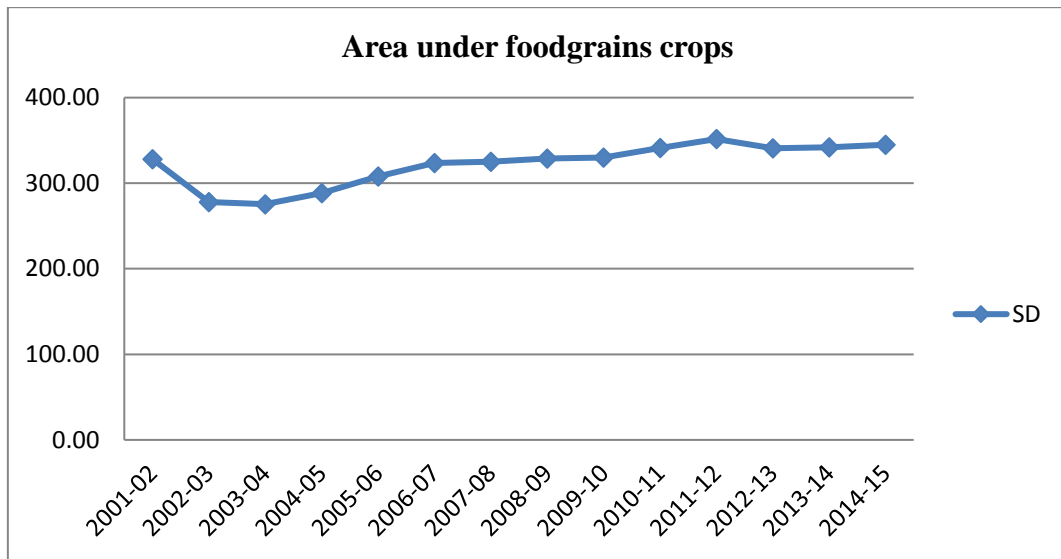


Figure 5.1 shows Standard deviation of area under food grains crops across 4 zones in Haryana during 2001-2015. S.D is increased over the time period there is  $\sigma$ -divergence in area of food grain crops.

**Figure 5.2 Standard Deviation of area under cultivation of cash crops zone-wise in Haryana during 2001-2015**

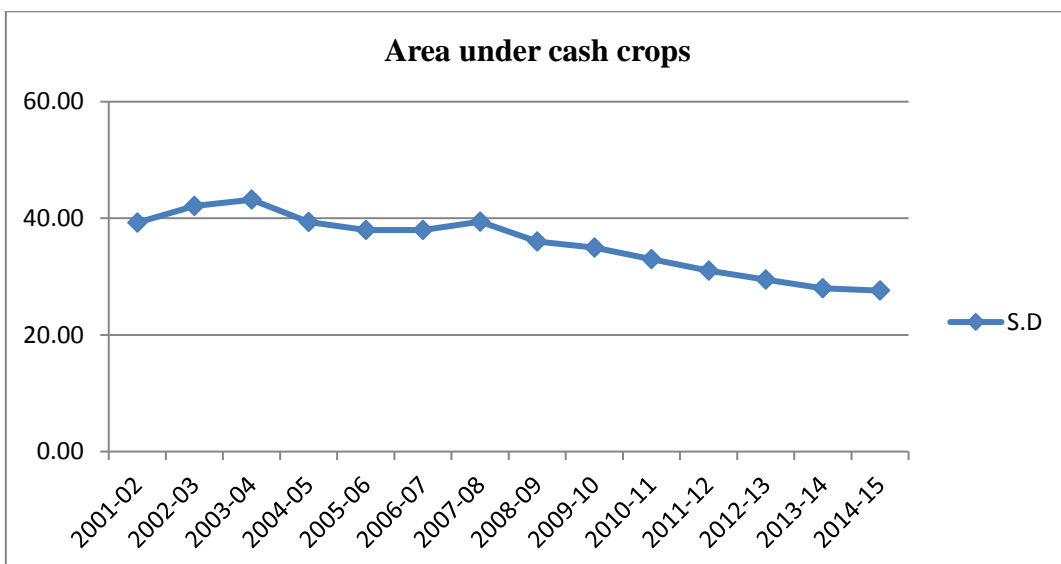


Figure 5.2 shows Standard deviation of area under cash crops across 4 zones in Haryana during 2001-2015. S.D is decreased over the time period there is  $\sigma$ -convergence in area of cash crops.

**Figure 5.3 Standard Deviation of production under cultivation of food grain crops across districts of Haryana during 2001-2015**

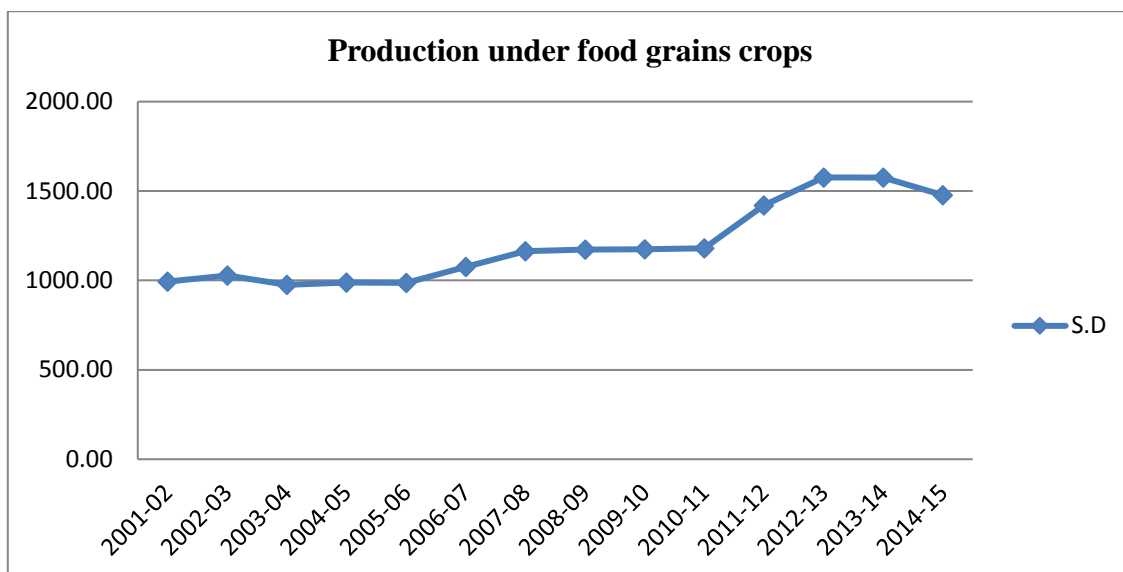


Figure 5.3 shows Standard Deviation of production under food grain crops across 4 zones in Haryana during 2001-2015. S.D is increased over the time period there is  $\sigma$  - divergence in production of food grain crops up to 2012-13. After that there is  $\sigma$  -convergence.

**Figure 5.4 Standard Deviation of production under cultivation of cash crops zone-wise in Haryana during 2001-2015**

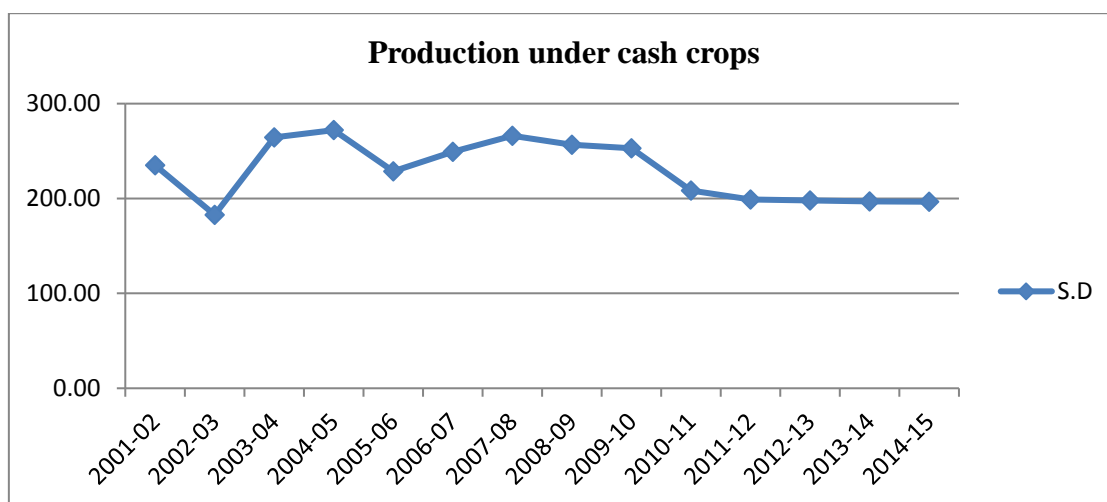


Figure 5.4 shows Standard Deviation of production under cash crops across 4 zones in Haryana during 2001-2015. S.D is decreased over the time period there is  $\sigma$  - convergence in production of cash crops. During 2002-03 to 2003-04 there is  $\sigma$  - divergence because S.D is increased.

**Figure 5.5 Standard Deviation of productivity under cultivation of food grain crops zone-wise in Haryana during 2001-2015**

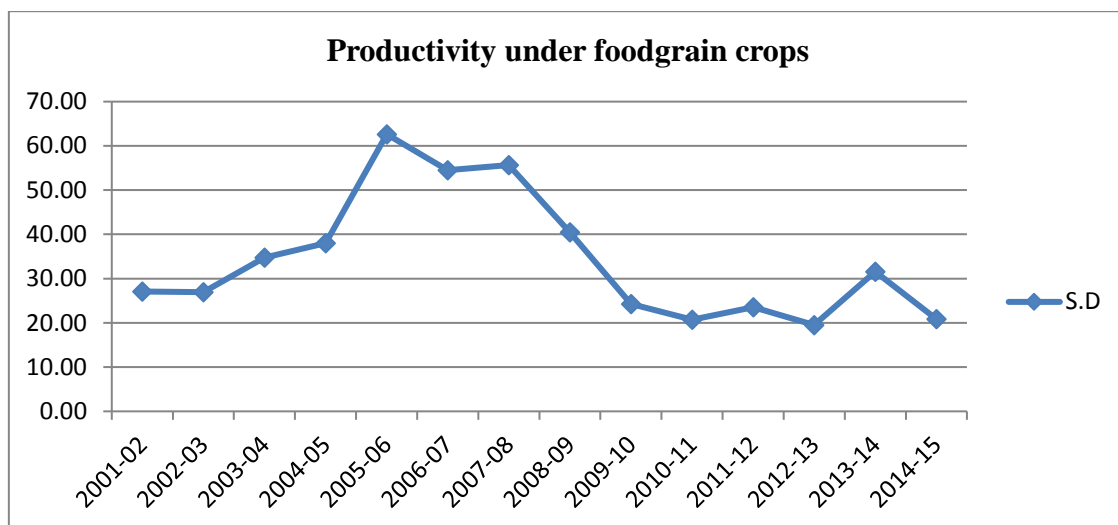


Figure 5.5 shows Standard Deviation of productivity under food grain crops across 4 zones in Haryana during 2001-2015. There is  $\sigma$  – divergence in productivity of food grain crops for the period 2001 to 2005. After the period 2005 there are sigma convergence.

**Figure 5.6 Standard Deviation of productivity under cultivation of cash crops zone-wise in Haryana during 2001-2015**

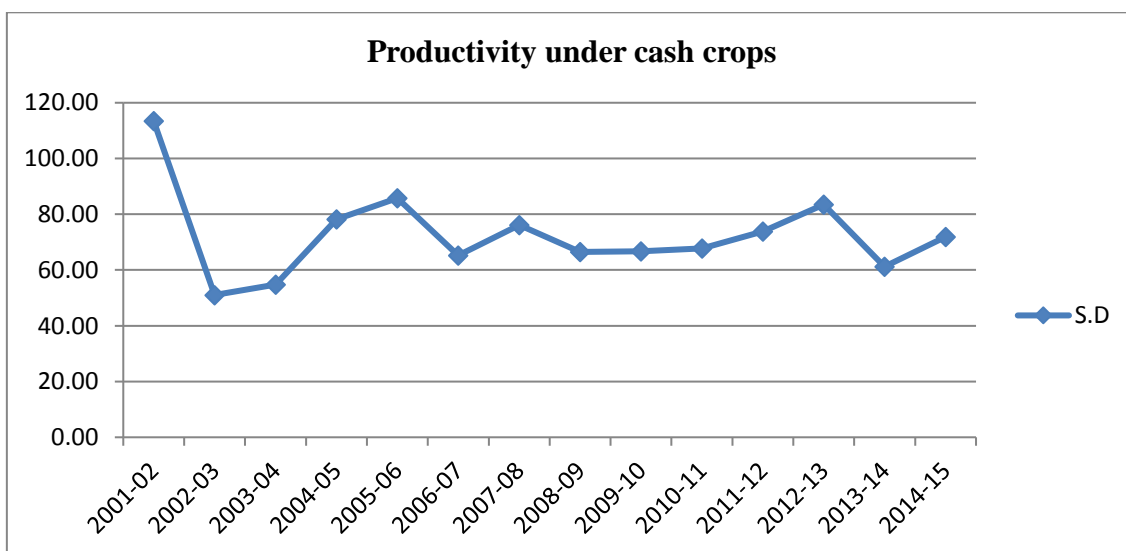


Figure 5.6 shows Standard Deviation of productivity under cash crops across 4 zones in Haryana during 2001-2015. S.D is increased and increased over the time period. There is not significant impact during the period.

**Table 5.6.3  $\sigma$  –convergence for area, production and productivity of food-grains crops in Haryana district-wise**

	Intercept	Growth coefficient	R <sup>2</sup>
Area	104.12(0.000)	0.71(0.000)	0.43
Production	318.17(0.000)	11.56(0.000)	0.73
Productivity	78.43(0.000)	25(0.180)	0.65

**Source: Researcher Calculation**

The table 5.6.3 shows that districts of Haryana have exhibited  $\sigma$  -convergence in area under food grains crops. Higher  $\sigma$ - convergence in production comparison to area and productivity.

**Table 5.6.4  $\sigma$  –convergence for area, production and productivity of cash crops in Haryana district -wise**

	Intercept	Growth coefficient	R <sup>2</sup>
Area	11.45(0.000)	-0.38(0.000)	0.73
Production	64.17(0.000)	-1.51(0.000)	0.64
Productivity	47.55(0.000)	21(0.001)	0.65

**Source: Researcher Calculation**

The table 5.6.4 shows that districts of Haryana have exhibited significant  $\sigma$ - convergence in area, production and productivity in cash crops. Higher  $\sigma$ - convergence in area in comparison to production and productivity.

**Figure 5.7 Standard Deviation of area under cultivation of food grains crops across districts of India during 2001-2015**

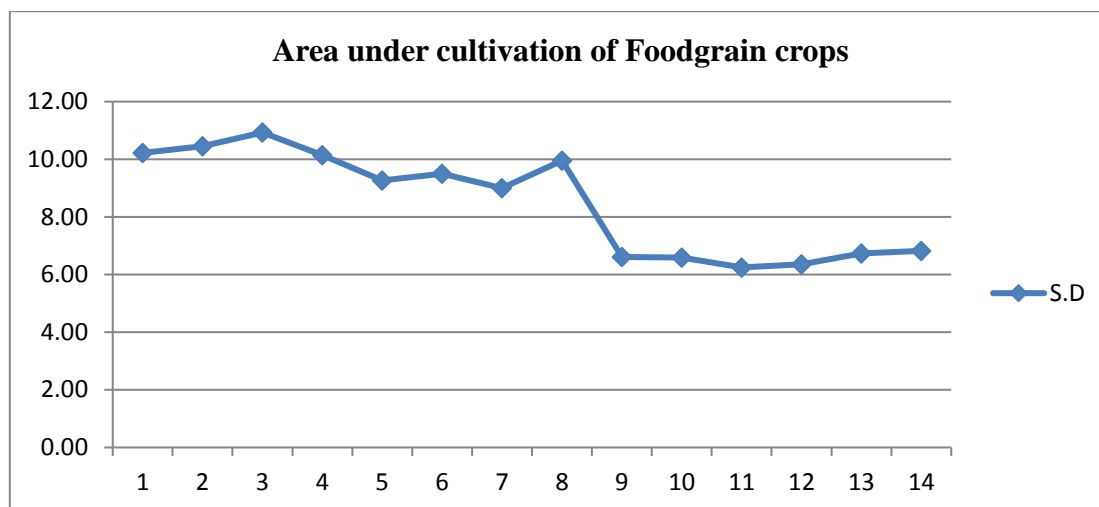


Figure 5.7 shows Standard Deviation of area under food grain crops across districts in Haryana during 2001-2015. S.D is decreased over the time period there is  $\sigma$ - convergence in area of food grain crops.

**Figure 5.8 Standard Deviation of area under cultivation of cash crops across districts of Haryana district wise during 2001-2015**

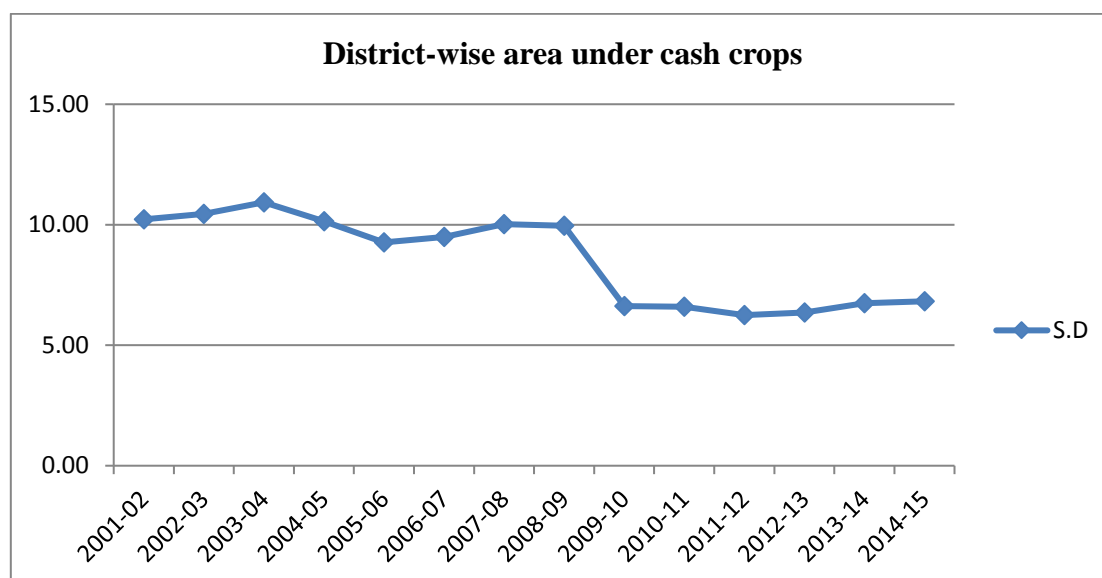


Figure 5.8 shows Standard Deviation of area under cash crops across districts in Haryana during 2001-2015. S.D is decreased over the time period there is  $\sigma$ - convergence in area of cash crops.

**Figure 5.9 Standard Deviation of production under cultivation of food grains crops across districts of Haryana during 2001-2015**

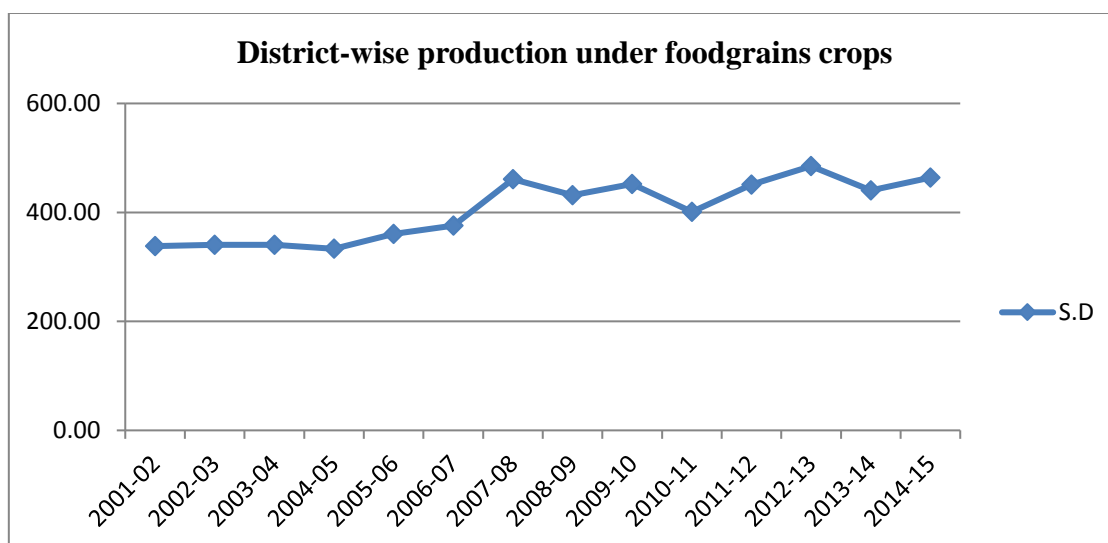


Figure 5.9 shows Standard Deviation of production under food grains crops across districts in Haryana during 2001-2015. S.D is increased over the time period there is  $\sigma$ -divergence in production of food grains crops.

**Figure 5.10 Standard Deviation of production under cultivation of cash crops across districts of Haryana during 2001-2015**

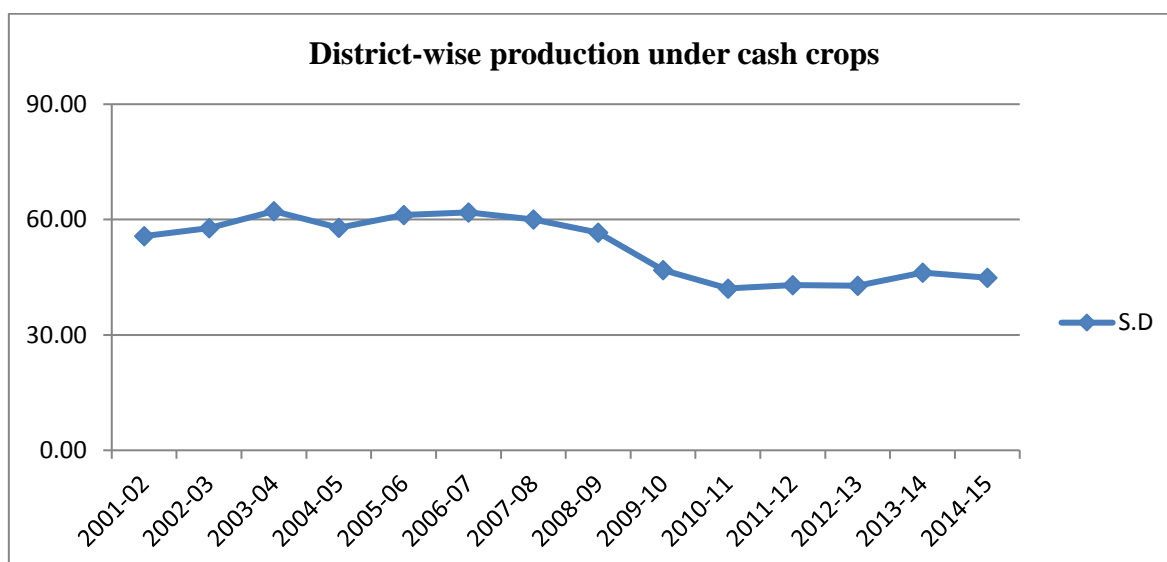


Figure 5.10 shows Standard Deviation of production under cash crops across districts in Haryana during 2001-2015. S.D is decreased over the time period there is  $\sigma$ -convergence in production of cash crops.

**Figure 5.11 Standard Deviation of productivity under cultivation of food grains crops across districts of Haryana during 2001-2015**

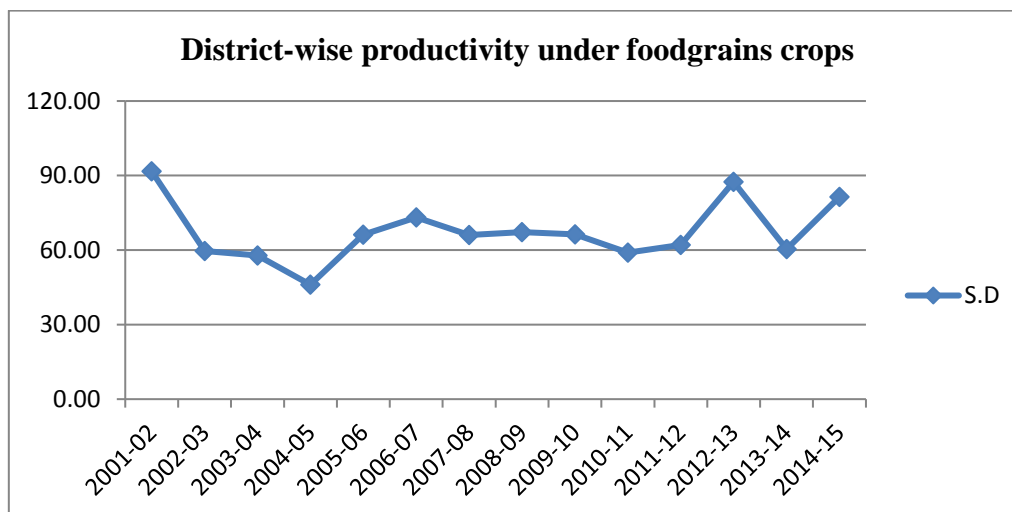


Figure 5.11 shows Standard Deviation of productivity under food grains crops across districts in Haryana during 2001-2015. S.D is decreased and increased over the time period. There is not significant growth in productivity of food grains crops.

**Figure 5.12 Standard Deviation of productivity under cultivation of cash crops across districts of Haryana during 2001-2015**

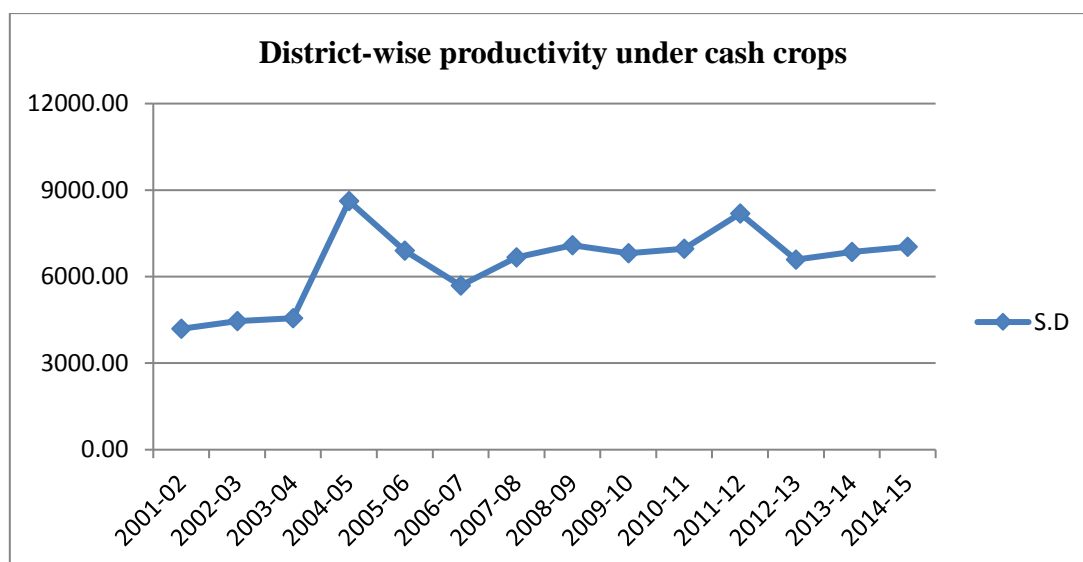


Figure 5.12 shows Standard Deviation of productivity under cash crops across districts in Haryana during 2001-2015. S.D is increased over the time period there is  $\sigma$ -divergence in productivity under cash crops.

## 5.7) Absolute $\beta$ -Convergence

B-convergence is empirically examined by estimating regression of the annual growth rate of areas, production and productivity on the initial level of areas, production and productivity. Hence, the test for the absolute  $\beta$ -convergence hypothesis is performed by estimating the following equation by the ordinary least squares (OLS) method.

$$G.W_i = \alpha + \beta X_0 + \mu_i$$

Here, G.W. = Growth rate (2001-2015) of Area (000 hectare), Production (000 tonnes) and Productivity (kg/ha)

$\alpha$  = Intercept,  $\beta$  = Slope Coefficient,  $\mu_i$  = Disturbance term,

$X_0$  = Initial area, production and productivity,  $i$  = Districts

Partial correlation between growth of area, production and productivity over time and its initial level is negative, there is  $\beta$ -convergence.

<b>Table 5.7.1 <math>\beta</math>-convergence of food grain crops in Haryana district-wise</b>				
Period		Intercept	Growth Coefficient	R <sup>2</sup>
2001-02 to 2014-15	Area	222.42	-4.87	0.73
	Production	714.16	-10.32	0.70
	Productivity	370.17	-33.46	0.60
<b>Source : Researcher Calculation</b>				

The table 5.7.1 shows that there has been  $\beta$ -convergence or divergence in food grain crops. In this table growth has negatively recorded which shows there is beta convergence of area, production and productivity of food grains crops statistically significant.



<b>Table 5.7.2 <math>\beta</math> –convergence of cash crops in Haryana district –wise</b>				
Period		Intercept	Growth Coefficient	R <sup>2</sup>
2001-02 to 2014-15	Area	7.98	0.09	0.60
	Production	49.49	-1.76	0.79
	Productivity	370.17	-33.46	0.66
<b>Source : Researcher Calculation</b>				

The table 5.7.2 shows that  $\beta$ -convergence or divergence in cash crops. In this table positive growth in area which shows there is  $\beta$ - divergence in area of cash crops, on the other side in production and productivity of cash crops is significantly negative than there is  $\beta$ -convergence.

<b>Table 5.7.3 <math>\beta</math> –convergence of food grain crops zone- wise</b>				
Period		Intercept	Growth coefficient	R <sup>2</sup>
2001-02 to 2014-15	Area	2.35	-0.001	0.73
	Production	-6.82	0.002	0.82
<b>Source : Researcher Calculation</b>				

Table 5.7.3 shows zone –wise  $\beta$ - convergence and divergence in food grain crops. This table shows growth has negatively recorded in area which shows  $\beta$ - convergence in area whereas  $\beta$ - divergence in zone-wise production of food grains.

<b>Table 5.7.4 <math>\beta</math> –convergence of Cash crops in Haryana Zone –wise</b>				
Period		Intercept	Growth Coefficient	R <sup>2</sup>
2001-02/ 2014-15	Area	1.08	-0.03	0.53
	Production	-4.16	0.00	0.65
<b>Source : Researcher Calculation</b>				

The table 5.7. 4 shows zone –wise  $\beta$ - convergence and divergence in cash crops. This showed  $\beta$ - convergence in area and beta divergence in production of cash crops.

## 5.8 Conclusion

CAGR in area under cultivation of food grain was recorded positive in northern and southern zones in Haryana state. There was noted positive growth in crop total oilseed production in northern, central and western zones with 1.64%, 2.10% and 0.46% respectively. It was negative in southern zone with -1.38% respectively. Trend share of average productivity of crop wheat was increased in all zones during 2001 to 2012, after that it was decreased in all zones. On the other side in case of district wise study growth of production under rice cultivation in Rewari with 8.16 percent whereas lowest in Panipat with 0.19 percent. It was negative in Faridabad and Gurgaon. Growth of production under wheat cultivation negative in Faridabad Gurgaon and Rewari with -9.18, -5.59 and -0.19. It was higher in Yamunanagr whereas lowest in Panipat. CAGR under productivity of total food grain positive in Rewari and Jind with 0.01 and 0.68. CAGR under case of crop rice productivity positive in Kurukshetra, Kaithal, Karnal, Sonipat, Faridabad, Gurgaon and Jind with 2.56, 6.03, 5.1, 1.20 and 0.11 respectively over the period. CAGR under case of crop wheat productivity negative in Rohtak, Faridabad, Gurgaon with -1.12, -4.47 and -1.78 respectively over the period of time. Highest variations in case of areas under crop rice in southern and in crop wheat in southern zone over the period. In case bajra lowest variation in central zone, whereas in crop total cereals and maize in northern and central zone respectively. In crop gram and total food grains, highest in central and northern zone respectively. In production crops, wheat, total pulses and total food grains highest variations in central zone during the period

### Major Findings

- This chapter found western zone was produced more total food grains production with 1.95 % growth rate. It was negative in northern, western and southern zone over a period of time.

- CAGR area under cultivation of sugarcane is negative in all districts except kaithal, Jhajjar, Gurgaon, Mahendergarh, Jind and Fatehabad.
- This chapter found  $\sigma$ -divergence in area and production of food grain crops and productivity of cash crops.  $\sigma$ -convergence in area and production of cash crops and productivity of food grain crops in Haryana zone-wise. Whereas in case of district -wise sigma convergence in area of food- grain and cash -crops and production of cash crops.  $\sigma$ -divergence in production and productivity of food grain crops. Sigma divergence in productivity under cash crops
- There is beta convergence in area, production and productivity of food grains crops district-wise statistically significant.
- This chapter found,  $\beta$ - convergence in production and productivity of cash crops district-wise.
- There is  $\beta$ - convergence in area whereas  $\beta$ - divergence in production of food grains zone-wise.
- This chapter found  $\beta$ - convergence in area and beta divergence in production of cash crops.