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TRENDS IN PRODUCTION AND PRODUCTIVITY OF PRINCIPAL CROPS IN HARYANA

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Abstract: *Haryana is one of the smallest states of India, having geographical area of 4.42 million hectares i.e. only 1.4 per cent of total geographical area of the country. Haryana is the second largest contributor of food grains to national food basket of India. Since 1966, the traditional agriculture practices are gradually being replaced by modern technology (Green Revolution). The main objective of the new modern technology is to increase the agricultural production and productivity and to make the nation self-reliant in term of agricultural production, especially in food grains. The present study analyses the trend in production and productivity of principal crops in Haryana state. The results show that productivity trend has remained positive for all principal crops except gram during the pre reform period. Though the productivity trend has remained positive for all the principal crops during the post reform period also, yet the growth of yield/productivity of many crops i.e. rice, wheat, pulses and oilseeds, has stagnated during the post reform period.*

Keywords: *Green Revolution, Production, Productivity, Compound Annual Growth Rate, Exponential Growth Rate*

INTRODUCTION

Since 1966, the traditional agriculture practices are gradually being replaced by modern technology (Green Revolution). Traditional agriculture was heavily dependent upon indigenous inputs such as the use of organic manures, seeds, simple ploughs and other primitive agricultural tools, bullocks, etc. While, modern technology consists of high yield variety of seeds (HYVs), chemical fertilizers, pesticides, extensive irrigation, machinery, use of diesel and electric power, etc. This modern technology is termed as green revolution. Adoption of HYVs of wheat and rice have replaced the traditional varieties at a fast pace and a significant breakthrough occurred in the production of rice and wheat in Haryana. The wheat and rice crops have played a major role in pushing up the agricultural production.

The main objective of the new modern technology is to increase the agricultural production and productivity and to make the nation self-reliant in term of agricultural production,

especially in food grains. Because agriculture production and productivity can be increased by using the yield enhancing inputs like chemical fertilizers, access to irrigation and choice of crops or cropping pattern (Chand et.al, 2011).

The objective of present study is to analyze the trend in production and productivity of principal crops in Haryana State. The study is based on the secondary data scanned from different sources like Statistical Abstract of Haryana (various issues), Economic Survey of Haryana and Agriculture Statistics at A Glance.

The results of the study are presented by using simple descriptive statistics, linear and non-linear growth rates. The trends growth rate in production and productivity for all nine major crops is estimated by using Compound Annual Growth Rates (CAGR). The CAGR is estimated for the period from 1966-67 to 2012-13. The CAGR is estimated using exponential and non-exponential/linear growth functions. The exponential growth function is nothing but considers data information throughout the period under consideration, whereas non-exponential/linear growth functions considers data only two points (i.e., for the base period and current period data). The exponential growth is estimated using logistic functions. The Compound Growth Rate (CGR) estimated using exponential function is termed as exponential growth rates (EGR) in the study and CAGR estimated using linear functions is called simple compound annual growth rate (CAGR).

The exponential compound annual growth rates are estimated by using log linear functions on the time series data on production and productivity for major crops. The semi log exponential functional form is used to analyze the trend in growth rate, which is one of the appropriate functional forms to estimate the growth rate. That is, the growth rate is estimated by using the following semi log functional form:

$\log Y_t = a + bt$..... (1)

This equation (1) can be elaborated in details as:

$Y_t = Y_o (1+r)^t$..... (i)

Taking log on both sides, we get

$\text{Log } Y_t = \text{Log } Y_o + t \text{ Log } (1+r)$..... (ii)

Equation (ii) can be rewritten as

$Y = a + bt$..... (iii)

Where $Y = \text{Log } Y_t$; $a = \text{Log } Y_o$; $b = \text{Log } (1+r)$,

In equation (iii)

Y_t= production/ productivity, as the case may be, of nine major crops

a= constant

t= Time variable in year (1, 2,...n)

b= Regression Coefficient that shows the rate of change or growth rates in a series

The exponential compound growth rate (s) can be worked out by using:

Antilog(b)=Antilog (log (1+r)).

Antilog(b)=1+r

and

r = Antilog b-1

When multiplied by 100, it gives the percentage growth rate in production and productivity of major crops. That is, Exponential Compound Growth Rate (EGR)(%) : r = (Antilog B-1)x100

The simple CAGR is estimated in Microsoft excel by using formula: CAGR= r = (Y_t/Y_0)^(1/t)-1;

The variables Y_t is value of production/productivity at time period t (i.e., the current year value) and Y_0 is value of production/productivity at time period 0 (i.e., the base year value) and t is time period.

AGRICULTURAL PRODUCTION

Green Revolution technology has changed the overall picture of agricultural production. Total cropped area has increased with the introduction of HYVs. Use of Irrigation facilities, consumption of fertilizers and pesticides have also increased with the application of HYVs. Cropping pattern has also changed in favour of wheat and rice. As a result of all these facilities, a remarkable increase in agriculture production has been seen in Haryana since 1966-67. Table 1 (A) shows the trend in total food grains production and crop wise production of principal crops in Haryana during the pre reform period. Table 1(A) shows that total food-grains production have increased from 2592 thousand tonnes during 1966-67 to 6036 thousand tonnes during 1980-81 and further increased to 8709 thousand tonnes during 1989-90.

The production of rice increased from 223 thousand tonnes in 1966-67 to 1259 thousand tonnes in 1980-81 and further increased to 1750 thousand tonnes in 1989-90. The production of wheat increased from 1059 thousand tonnes in 1966-67 to 3490 thousand tones in1980-81 and further increased to 5907 thousand tonnes in 1989-90.

The production of bajra increased from 373 thousand tonnes in 1966-67 to 552 thousand tonnes in1983-84 and further declined to 436 thousand tonnes in 1989-90.There is decline in the production of bajra during 2012-13. The production of cotton was 288 thousand bales in 1966-67 which increased to 643 thousand bales in 1980-81 and 1191 thousand bales in 1989-90.The production of oilseeds was 92 thousand tonnes in 1966-67. It increased from 188 thousand tonnes in 1980-81 to 436 thousand tonnes 1989-90. The production of gram was 531 thousand tonnes in 1966-67 which increased to 1044 thousand tonnes in 1978-79, after 1978-79 it start declining. It decreased to 66 thousand tonnes in 1987-88 and further increased to 367 thousand tonnes in 1989-90. The production of sugarcane was 5100 thousand tonnes in 1966-67 which increased to 8970 thousand tonnes in 1977-78. After 1977-78 it decreased to 7360 thousand tonnes during 1989-90. The production of pulses was 32 thousand tonnes in 1966-67 which increased to 63 thousand tonnes in 1989-90. The production of jowar has declined from 49 thousand tonnes in 1966-67 to 27 thousand tonnes in 1989-90. Table 1(A) clearly shows that the production of almost all principal crops has increased except bajra, jowar and gram. Production of bajra has shown fluctuating trend while the production of oilseeds has shown fluctuating and increasing trend. On the other side, the production of jowar has shown fluctuating and declining trend during the entire period.

Table-1(A) Crops wise Production of Principal Crops in Haryana

(Production in '000' Tonnes/ 170 kg per bales)

Years	Rice	Wheat	Pulses	Bajra	Jowar	Gram	Cotton	Sugar Cane	Oil seeds	Total Fg
1966-67	223	1059	32	373	49	531	288	5100	92	2592
1967-68	287	1438	49	459	58	1267	396	4710	120	3970
1968-69	272	1529	27	232	25	421	357	6690	43	2763
1969-70	372	2147	42	514	54	1179	360	7920	88	4626
1970-71	460	2342	43	826	57	789	373	7070	99	4771
1971-72	536	2402	35	624	45	647	465	5140	98	4543
1972-73	462	2231	35	467	55	551	448	5600	106	4074
1973-74	540	1811	36	691	55	448	467	5930	62	3837
1974-75	393	1954	34	215	38	343	451	5910	148	3342
1975-76	625	2428	43	608	35	907	465	6870	79	5038
1976-77	815	2735	53	548	37	824	478	7280	78	5261
1977-78	965	2845	41	284	21	965	463	8970	99	5341
1978-79	1228	3398	41	384	26	1044	601	6390	94	6334
1979-80	941	3295	37	278	39	313	587	4110	75	5040

1980-81	1259	3490	48	474	48	455	643	4600	188	6036
1981-82	1252	3686	37	496	31	310	685	5760	150	6039
1982-83	1276	4347	33	504	28	282	840	5500	117	6649
1983-84	1332	4458	49	552	20	315	567	5870	165	6890
1984-85	1363	4421	48	478	44	319	608	4840	306	6848
1985-86	1633	5260	61	315	28	625	745	5010	288	8146
1986-87	1543	5057	66	351	41	413	903	6740	226	7639
1987-88	1077	4861	47	113	14	66	690	5240	331	6311
1988-89	1443	6225	69	958	40	604	846	6580	484	9510
1989-90	1750	5907	63	436	27	367	1191	7360	436	8709
CAGR	9.37	7.76	2.99	0.68	-2.56	-1.59	6.37	1.61	7.0	5.41
EGR	8.82	6.71	2.35	-0.74	-2.78	-4.55	4.62	-0.10	7.46	4.43

Source: *Statistical Abstract of Haryana (various issues) and Agriculture Statistics at a Glance 2011, Department of Agriculture Haryana.*

Note- Total Fg means Total Foodgrains

CAGR- Compound Annual Growth Rate

EGR- Exponential growth rate

Table-1(B) Crops wise Production of Principal Crops in Haryana

(Production in '000' Tonnes/ 170 kg per bales)

Years	Rice	Wheat	Pulses	Bajra	Jowar	Gram	Cotton	Sugar Cane	Oil seeds	Total Fg
1990-91	1834	6436	73	526	65	469	1155	7800	638	9559
1991-92	1803	6496	71	314	29	202	1341	9050	762	9078
1992-93	1880	7108	66	743	46	260	1411	6720	558	10281
1993-94	2061	7217	66	328	25	403	1124	6460	836	10243
1994-95	2230	7297	76	720	29	440	1371	6960	862	10972
1995-96	1847	7291	70	409	30	381	1284	8090	783	10176
1996-97	2463	7826	69	650	29	276	1507	9020	985	11447
1997-98	2556	7528	67	674	32	309	1107	7500	456	11332
1998-99	2432	8568	29	618	25	294	874	7010	653	12105
1999-2000	2583	9650	20	582	22	58	1304	7640	605	13065
2000-01	2695	9669	19	656	23	80	1383	8170	571	13294
2001-02	2726	9437	27	832	22	122	722	9270	811	13299
2002-03	2468	9188	43	458	22	41	1038	10650	712	12330
2003-04	2790	9114	43	1006	26	100	1407	9280	1002	13193
2004-05	3010	9043	44	746	26	91	2075	8230	836	13057
2005-06	3194	8853	40	706	26	72	1502	8310	830	13006
2006-07	3375	10059	46	1021	27	90	1805	9650	837	14763
2007-08	3606	10232	48	1156	41	54	1882	8850	620	15294
2008-09	3299	11360	49	1087	44	129	1862	5210	911	16178
2009-10	3628	10488	36	930	39	62	1919	5710	862	15345
2010-11	3465	11578	45	1183	38	110	1747	6042	965	16568
2011-12	3757	13119	34	1175	33	73	2616	6953	758	18390

2012-13	3941	11117	23	791	28	53	2378	7500	971	16194
2013-14	3998	11800	20	831	40	75	2017	7446	899	16974
CAGR	3.45	2.67	-5.47	2.01	-2.09	-7.66	2.45	-0.20	1.50	2.53
EGR	3.56	2.70	-3.70	3.99	0.09	-8.21	2.97	-0.44	1.24	2.71

Source: Statistical Abstract of Haryana (various issues) and Agriculture Statistics at a Glance 2011, Department of Agriculture Haryana.

Note- Total Fg means Total Foodgrains

CAGR- Compound Annual Growth Rate

EGR- Exponential growth rate

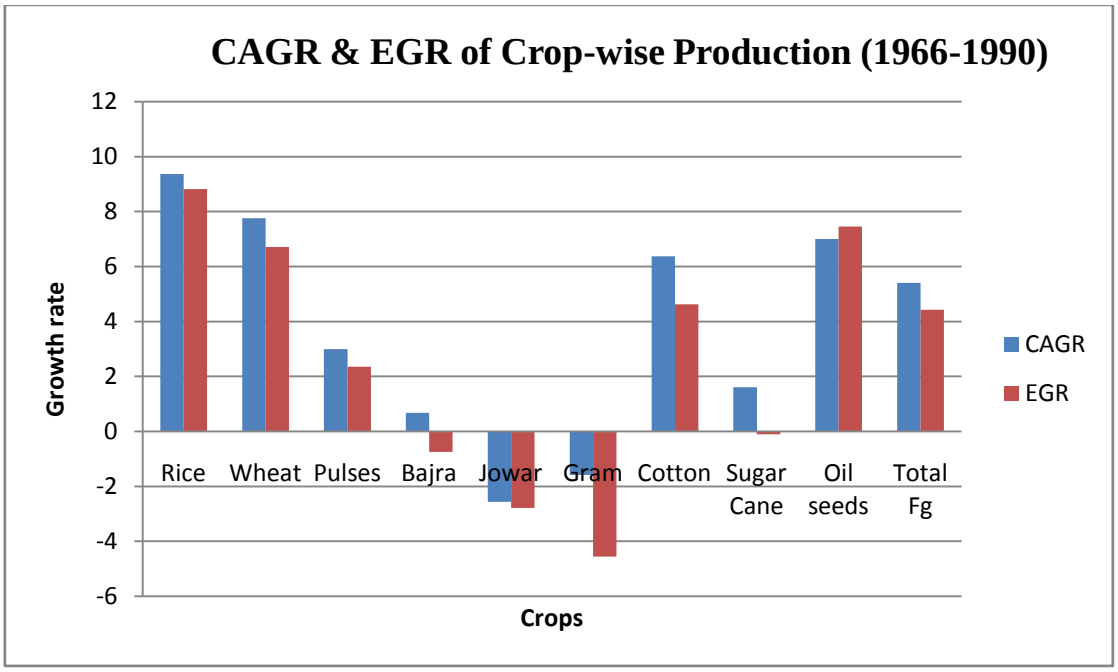

Figure 1

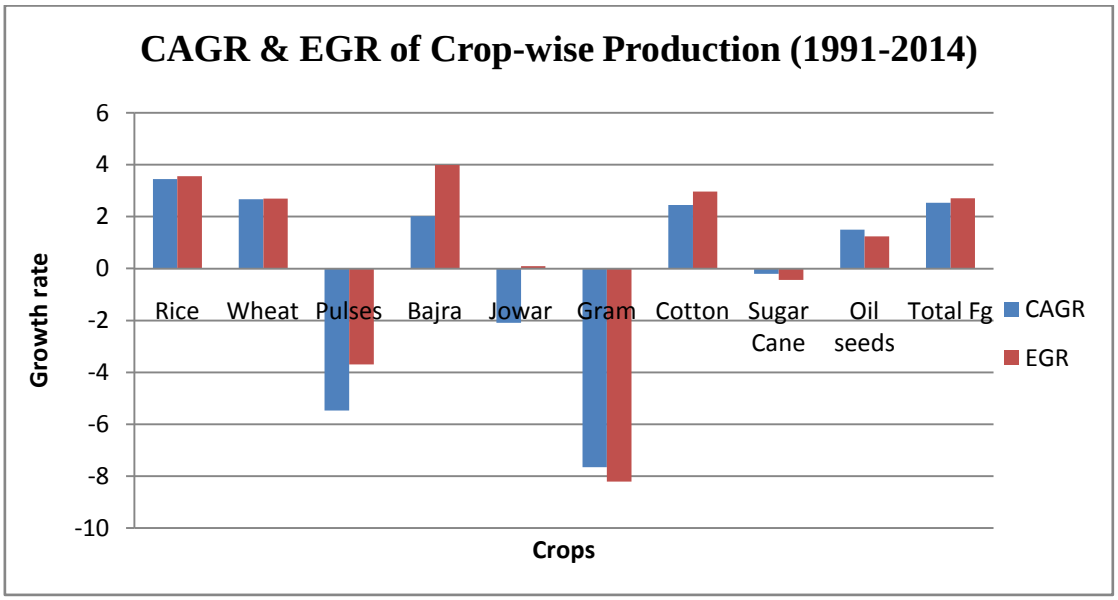

Figure 2

Compound annual growth rate (CAGR) has remained positive in case of rice, wheat, pulses, bajra, cotton, sugarcane, oilseeds and total food-grains during the pre reform period. Compound annual growth rate is 9.37 per cent, 7.76 per cent 2.99 per cent and 0.68 per cent for the crop of rice, wheat, pulses and bajra respectively. Compound annual growth rate is -2.56 per cent, -1.59 per cent, 6.37 per cent, 1.61 per cent, 7 per cent and 5.41 per cent for the crop of jowar, gram, cotton, sugarcane, oilseeds and total food grains respectively during the pre reform period. Compound annual growth rate has remained negative in case of jowar and gram. Exponential growth rate (EGR) for these crops is 8.82 per cent, 6.71 per cent, 2.35 per cent, 7.46 per cent and 4.43 per cent respectively. Exponential growth rate (EGR) has remained positive in case of rice, wheat, pulses, cotton, oilseeds and total food-grains during pre reform period while exponential growth rate has remained negative in case of bajra, jowar, gram and sugarcane. Exponential growth rate for these crops is -0.74 per cent, -2.78 per cent, -4.55 per cent and -0.10 per cent during pre reform period. Table 1(B) shows crop wise production of principal crops in Haryana during post reform period. Production of rice has increased from 1834 thousand tonnes in1990-91 to 3998 thousand tonnes in 2013-14. Production of wheat also increased from 6436 thousand tonnes in 1990-91 to 11800 thousand tonnes in 2013-14. Total food grains production has increased from 9559 thousand tonnes in 1990-91 to 16974 thousand tonnes in 2013-14. Production of pulses has increased from 73 thousand tonnes in 1990-91 to 76 thousand tonnes in 1994-95 and further decreased to 20 thousand tonnes in 2013-14. Production of bajra has increased from 526 thousand tonnes in1990-91 to 1183 thousand tonnes in 2010-11 and further decreased to 831 thousand tonnes in 2013-14. Production of jowar and gram has decreased from 65 and 469 thousand tonnes in 1990-91 to 40 and 75 thousand tonnes in 2013-14 respectively. Production of cotton has increased from 1155 thousand tonnes in 1990-91 to 2616 thousand tonnes in 2011-12 and further decreased to 2017 thousand tonnes in2013-14. Production of oilseeds has increased from 638 thousand in 1990-91 to 1002 thousand tonnes in 2003-04 and further declined to 899 thousand tonnes in 2013-14.Compound annual growth rate is 3.45 per cent, 2.67 per cent, -5.47 per cent, 2.01 per cent for the crop of rice, wheat, pulses and bajra respectively. Compound annual growth rate is -2.09 per cent,-7.66 per cent, 2.45 per cent,-0.2 per cent, 1.5 per cent and 2.53 per cent for the crop of jowar, gram, cotton, sugarcane, oilseeds and total food

grains respectively. Exponential growth rate is 3.56 per cent, 2.70 per cent, -3.70 per cent, 3.99 per cent and 0.09 per cent for the crop of rice, wheat, pulses, bajra and jowar respectively. Exponential growth rate is -8.21 per cent, 2.97 per cent, -0.44 per cent, 1.24 and 2.71 for the crop of gram, cotton, sugarcane, oilseeds and total food grains respectively. Table 1(B) clearly shows that the production of almost all the principal crops has shown fluctuating and decreasing trend except rice and wheat. Compound annual growth rate has remained positive in case of rice, wheat, bajra, cotton and total food grains. Compound annual growth rate is negative in case of pulses, jowar, gram and sugarcane. Exponential growth rate is positive in case of rice, wheat, bajra, jowar, cotton, oilseeds and total food grains. While, Exponential growth rate is negative in case of pulses, gram and sugarcane during post reform period.

PRODUCTIVITY TRENDS OF PRINCIPAL CROPS IN HARYANA

The productivity trends provide a true picture of the production of a crop in the area sown of that crop. That is, the productivity of a crop is estimated by dividing the production of a crop by area sown under that crop. Yield rate of the crops is an important indicator of agricultural development. Table 2 (A) depicts the average yield of principal crops in Haryana during the pre reform period. The table shows that average yield per hectare of rice has increased from 1161 kg per hectare in 1966-67 to 2730 kg per hectare in 1989-90. The average yield of wheat in Haryana is increasing almost continuously. It increased from 1425 kg per hectare in 1966-67 to 2360 kg per hectare in 1980-81 and further increased to 3181 kg per hectare in 1989-90.

Average yield per hectare of jowar has increased from 181 kg per hectare in 1966-67 to 354 kg per hectare in 1980-81 and further decreased to 252 kg per hectare during 1989-90. The yield rate of bajra has increased from 418 kg per hectare in 1966-67 to 1219 kg per hectare in 1988-89 and further decreased to 695 kg per hectare in 1989-90. Average yield of cotton has increased from 268 kg per hectare in 1966-67 to 346 kg per hectare in 1980-81 and further increased to 431 kg per hectare in 1989-90. The average yield of pulses and oilseeds was 718 kg per hectare and 434 kg per hectare in 1966-67, respectively, which increased to 1298 kg and 605 kg per hectare in 1980-81, respectively. In 1989-90, it increased to 1512 kg per hectare of pulses and 978 kg per hectare of oil seeds. Average yield of sugarcane has increased continuously from 3400 kg per hectare in 1966-67 to 4067 kg per hectare in 1980-

81 and further increased to 6375 kg per hectare in 1989-90. Average yield of gram has increased from 500 kg per hectare in 1966-67 to 980 kg per hectare in 1978-79 and further decreased to 699 per hectare in 1989-90. Compound annual growth rate (CAGR) of the average yield of principal crops is 3.79 per cent, 3.55 per cent, 1.45 per cent, 2.24 per cent, 3.29 per cent, 2.09 per cent, 2.77 per cent, 1.47 per cent, 3.60 per cent and 4.92 per cent for the crop of rice, wheat, jowar, bajra, pulses, cotton, sugarcane, gram, oilseeds and total food grains respectively. Exponential growth rate (EGR) of the average yield of principal crops is 3.36 per cent, 3.01 per cent, 0.29 per cent, 0.82 per cent, 3.65 per cent, 0.94 per cent, 0.81 per cent, -1.04 per cent, 3.35 per cent and 4.11 per cent for the crop of rice, wheat, jowar, bajra, pulses, cotton, sugarcane, gram, oilseeds and total food grains respectively. It means that productivity trend has remained positive for all the principal crops except gram during the pre reform period.

Table 2 (B) depicts the average yield of principal crops in Haryana during the post reform period**.** Table shows that average yield per hectare of rice has increased from 2775 kg per hectare in 1990-91 to 3256 kg per hectare in 2013-14. Average yield per hectare of wheat has increased from 3479 kg per hectare in 1990-91 4722 kg per hectare in 2013-14. Average yield per hectare of jowar and bajra has increased from 492 and 864 kg per hectare in 1990-91 to 550 and 2057 kg per hectare in 2013-14 respectively. Average yield per hectare of pulses and cotton has increased from 1466 and 400 kg per hectare in 1990-91 to 1850 and 608 kg per hectare in 2013-14 respectively. Average yield per hectare of sugarcane has increased from 5273 kg per hectare in 1990-91 to 7300 kg per hectare in 2013-14. Average yield per hectare of gram and oilseeds has increased from 722 and 1305 kg per hectare in 1990-91 to 1128 and 1710 kg per hectare in 2012-13 and further decreased to 903 and 1638 kg per hectare in 2013-14 respectively. Compound annual growth rate (CAGR) of the average yield of principal crops is 0.70 per cent, 1.34 per cent, 0.49 per cent, 3.84 per cent, 1.02 per cent, 1.84 per cent, 1.42 per cent, 0.98 per cent, 0.99 per cent and 2.19 per cent for the crop of rice, wheat, jowar, bajra, pulses, cotton, sugarcane, gram, oilseeds and total food grains respectively. Exponential growth rate (EGR) of the average yield of principal crops is 0.85 per cent, 1.26 per cent, 2.81 per cent, 4.46 per cent, 0.27 per cent, 3.16 per cent, 1.57 per cent, 0.48 per cent, 1.56 per cent and 1.96 per cent for the crop of rice, wheat, jowar, bajra, pulses, cotton, sugarcane, gram, oilseeds and total food grains

respectively. It means that productivity trend has remained positive for all the principal crops during the post reform period.

Table-2(A) Average yield of Principal Crops in Haryana

(Kg/ Hectare)

Years	Rice	Wheat	Jowar	Bajra	Pulses	Cotton	Suger cane	Gram	Oil seeds	Total Fg
1966-67	1161	1425	181	418	718	268	3400	500	434	736
1967-68	1324	1710	198	519	713	279	3891	1092	458	1005
1968-69	1186	1703	122	266	710	286	4183	729	514	886
1969-70	1545	2111	235	552	779	315	4689	1082	658	1197
1970-71	1697	2074	277	939	872	329	4504	742	692	1233
1971-72	1843	2041	231	708	824	327	4512	578	563	1149
1972-73	1594	1757	292	517	825	296	4477	568	481	1028
1973-74	1849	1539	297	723	833	316	3983	451	337	968
1974-75	1425	1748	235	233	874	310	3671	487	694	927
1975-76	2063	1980	216	605	1125	311	4323	820	514	1201
1976-77	2470	2029	201	572	1304	334	4333	801	672	1267
1977-78	2608	2093	122	321	1261	298	4552	841	524	1273
1978-79	2680	2293	182	440	1271	357	3607	980	726	1483
1979-80	1852	2231	215	341	1451	317	3117	571	535	1365
1980-81	2601	2360	354	544	1298	346	4067	629	605	1523
1981-82	2475	2357	264	582	1127	354	3975	296	697	1391
1982-83	2604	2524	238	646	1279	360	3744	555	667	1747
1983-84	2485	2499	133	656	1313	239	4450	487	799	1655
1984-85	2447	2593	294	639	1287	353	4176	513	937	1720
1985-86	2797	3094	244	487	1408	367	4864	821	800	2021
1986-87	2457	2837	273	453	1527	404	5436	677	779	1847
1987-88	2322	2808	103	232	1390	281	3691	329	988	1983
1988-89	2397	3407	255	1219	1551	332	5021	936	1238	2261
1989-90	2730	3181	252	695	1512	431	6375	699	978	2220
CAGR	3.79	3.55	1.45	2.24	3.29	2.09	2.77	1.47	3.60	4.92
EGR	3.36	3.01	0.29	0.82	3.65	0.94	0.81	-1.04	3.35	4.11

Source: Statistical Abstract of Haryana (various issues) and Agricultural Statistics at a Glance 2011, 2012 &2014

**: In term of gur.*

CAGR- Compound Annual Growth Rate

EGR- Exponential growth rate

Table-2(B) Average yield of Principal Crops in Haryana

(Kg/Hectare)

Years	Rice	Wheat	Jowar	Bajra	Pulses	Cotton	Suger cane*	Gram	Oil-seeds	Total Fg
1990-91	2775	3479	492	864	1466	400	5273	722	1305	2344
1991-92	2831	3597	286	563	1577	451	5587	659	1087	2538
1992-93	2659	3621	394	1168	1618	450	4269	669	947	2590

1993-94	2730	3619	272	646	1658	339	5768	995	1389	2632
1994-95	2802	3676	255	1265	1811	419	5849	1099	1393	2735
1995-96	2225	3697	238	713	1922	335	5616	1010	1282	2533
1996-97	2964	3880	222	1138	1889	392	5568	799	1464	2843
1997-98	2797	3660	244	1154	1548	298	5319	872	740	2706
1998-99	2239	3916	194	1008	1205	255	5477	824	1241	2701
1999-00	2385	4165	196	991	1262	408	5577	577	1307	3045
2000-01	2557	4106	209	1079	1341	424	5713	640	1360	3063
2001-02	2652	4103	209	1422	1400	195	5758	853	1475	3126
2002-03	2724	4053	195	891	1514	340	5635	745	1136	3100
2003-04	2749	3937	257	1607	1401	455	5800	813	1549	3069
2004-05	2939	3901	272	1318	1494	568	6188	843	1176	3098
2005-06	3051	3844	272	1117	1626	437	6442	554	1128	3016
2006-07	3239	4232	286	1649	1567	582	6845	841	1346	3395
2007-08	3361	4158	450	1841	1733	664	6322	505	1211	3415
2008-09	2724	4614	500	1773	1645	694	5700	1040	1725	3500
2009-10	3008	4215	500	1592	1543	646	7210	735	1648	3379
2010-11	2788	4624	535	1792	1529	602	7108	982	1852	3524
2011-12	3044	5183	500	2040	1750	739	7325	924	1388	3966
2012-13	3268	4452	500	1925	1800	681	7363	1128	1710	3698
2013-14	3256	4722	550	2057	1850	608	7300	903	1638	3854
CAGR	0.70	1.34	0.49	3.84	1.02	1.84	1.42	0.98	0.99	2.19
EGR	0.85	1.26	2.81	4.46	0.27	3.16	1.57	0.48	1.56	1.96

Source: Statistical Abstract of Haryana (various issues) and Agricultural Statistics at a Glance 2011, 2012 &2014

**: In term of gur.*

CAGR- Compound Annual Growth Rate

EGR- Exponential growth rate

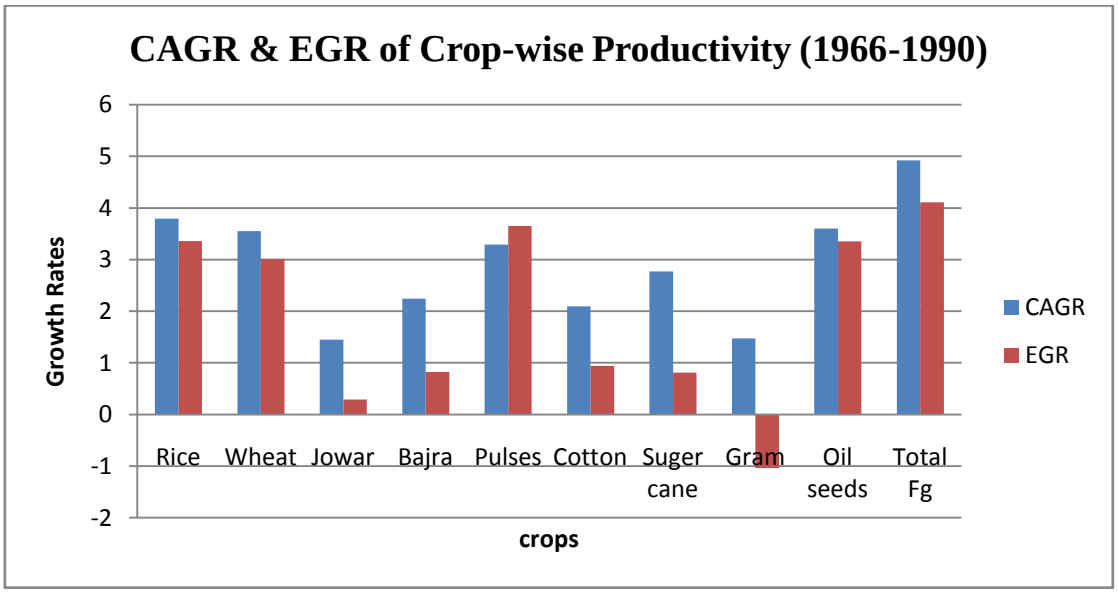

Figure 3

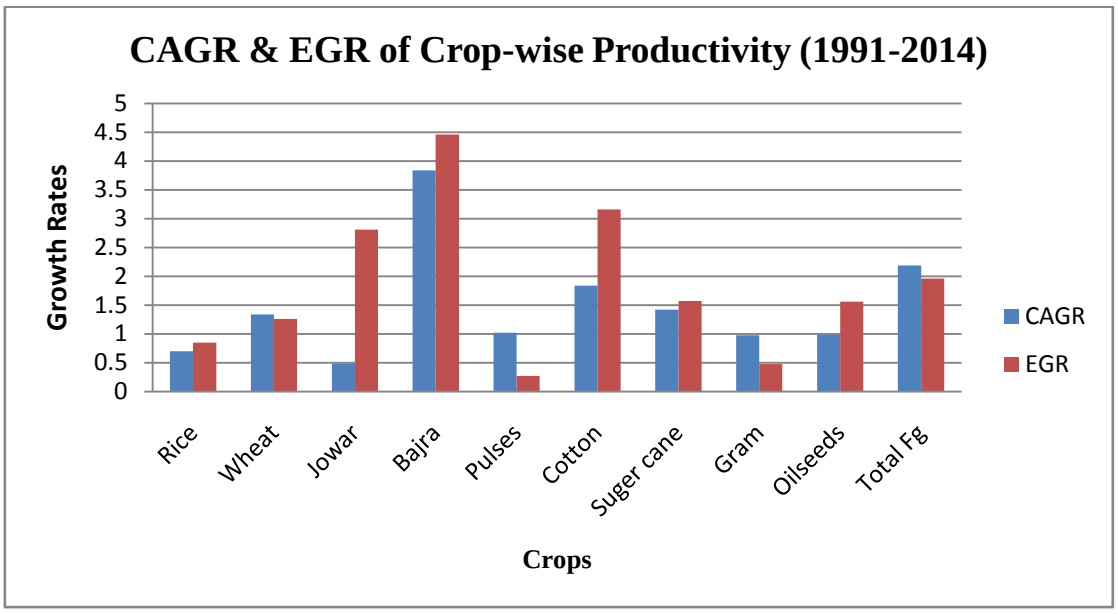

Figure 4

Above explanation clearly shows that the production of almost all principal crops has increased except bajra, jowar and gram. Production of bajra has shown fluctuating trend while the production of oilseeds has shown fluctuating and increasing trend. On the other side, the production of jowar has shown fluctuating and declining trend during the entire period. Compound annual growth rate (CAGR) has remained positive in case of rice, wheat, pulses, bajra, cotton, sugarcane, oilseeds and total food-grains during the pre reform period while CAGR has remained negative in case of jowar and gram. On the other hand, exponential growth rate (EGR) has remained positive in case of rice, wheat, pulses, cotton, oilseeds and total food-grains during pre reform period. While EGR has remained negative in case of bajra, jowar, gram and sugarcane during pre reform period.

Table 1(B) clearly depicts that the production of almost all the principal crops has shown fluctuating and decreasing trend except rice and wheat. Compound annual growth rate (CAGR) has remained positive in case of rice, wheat, bajra, cotton and total food grains, while compound annual growth rate is negative in case of pulses, jowar, gram and sugarcane. On the other hand, exponential growth rate (EGR) is positive in case of rice, wheat, bajra, jowar, cotton, oilseeds and total food grains. But exponential growth rate is negative in case of pulses, gram and sugarcane during post reform period.

In nutshell, productivity trend has remained positive for all the principal crops except gram during the pre reform period. Though the productivity trend has remained positive for all the principal crops during the post reform period also, yet the growth of yield/productivity

of many crops i.e. rice, wheat, pulses and oilseeds, has stagnated during the post reform period.

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