International Journal of Research in Economics and Social Sciences (IJRESS)
Available online at: http://euroasiapub.org
Vol. 7 Issue 4, April- 2017, pp. 138~148
ISSN(o): 2249-7382 | Impact Factor: 6.939 | Thomson Reuters Researcher ID: L-5236-2015

Growth and Pattern of Fertilizer Consumption in Haryana

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Abstract
Agriculture sector plays a very significant role in the economy of the country as it contributes about 17.4 (Economic Survey 2013-14) per cent share in the GDP of the country and provide employment opportunities for the growing population of the country. As a result, providing food grains to the growing population is a matter of concern as it is possible only by increasing the productivity of food grains coupled with increasing use of fertilizers. The study examines the growth of fertilizer consumption in Haryana. The consumption of fertilizers has increased in Haryana but there are inter district variations are present as the CSS value shows that the maximum fertilizer consumption was in Sirsa and the minimum was in Panchkula. The consumption of fertilizers (NPK) ranges between -4.320 to +6.041 as shown by CSS values for the year 2014-15.

Key words: Fertilizers, Productivity, Nitrogen, Phosphorus, and Potash.

Introduction: -

Indian agriculture has made remarkable progress in the last few decades especially after the introduction of Green Revolution and the high yielding variety seeds, fertilizers, pesticides and expansion of irrigation facilities are responsible for the higher production and productivity in the country. In the last few decades 'India has achieved significant growth in the production of food grains and reached at a level of 252.68 million tonnes in 2014-15, but the growing population have need of more food for consumption. So there is an urgent need to increase the production of food grains. As a result, the importance of fertilizers has increased for the improvement in productivity, which is necessary for increasing the production of food grains because it's not possible to increase the production by increasing the area under cultivation.

Consumption of fertilizers has been increasing continuously over the years. Fertilizer consumption in 1951-52 was 65.6 thousand tonnes which was 25576.1 thousand tonnes in 2014-15. The intensity of fertilizer use was 128.07 kg per hectare in 2014-15 which was relatively low as compared to other developed and developing countries like USA (130.3 kg), Brazil (146.9kg), China (428 kg), Japan (228.4 kg), Pakistan (174.8 kg), and Sri Lanka (137 kg). but inter-state, inter-region and inter-districts disparities is present in the country as intensity of use was as low as 6.34 kg per hectare in Nagaland and very high in Punjab i.e., 227.46 kg per hectare and 209 kg per hectare in Haryana. The intensity of use in Punjab and Haryana is quite high as compared to the national average.

By increasing the use of fertilizers in most of the states of the country would be a significant option for increasing the production of food grains (Sharma and Sharma,2012).

Agriculture plays a very important role in the economy of Haryana and predominantly it is an agriculture economy. The consumption of fertilizers has also increased rapidly as it was 70060 tonnes in 1970-71 and 1303903 tonnes in 2014-15 but the increase is not identical across the districts of the state.

Hence, an effort has been made in this paper to examine the growth pattern and variations in the growth of fertilizer consumption across districts of Haryana.

Objectives: - There are two main objectives of the study.

1. To elucidate/explain the pattern and growth of fertilizers consumption in Haryana.
2. To observe the disparities in the pattern of fertilizers consumption between the districts of Haryana.

Review of Literature: -

Review of literature is an important exercise in research because it helps the researcher to find out the research gap. A number of research studies have been undertaken by different researchers in the field of fertilizer consumption in India.

Jaga and Patel (2012) has examined the consumption of fertilizers in India. The main objective of the study was to examine the growth pattern of fertilizers in the country. Secondary sources of data have been used for fulfilling the above said objectives. The study revealed that the fertilizer consumption in the country was 65.6 thousand tonnes in 1951-52 which had increased up to 2649 million tonnes in 2009-10. Similarly, per hectare consumption was less than one kg in 1951-52 which was 135 kg per hectare in 2009-10.

Sharma and Thaker (2011) has highlighted the determinants of fertilizer consumption and outlook for 2020 in their study. The researchers used secondary sources of data for their study and analyzed the data by using ACGR and simple regression model. The study revealed that the area under high yielding varieties, gross irrigated area, fertilizer price, procurement price of wheat and rice (as these are the main users of fertilizers) and credit facilities were the main determinants of fertilizer consumption. The researchers also revealed that the demand for fertilizers would be about 41 million tonnes by the year 2020.

Mala (2013) has examined the trends in fertilizer growth in India in his study. The researcher used secondary sources of data such as Economic Survey, FAI Fertilizer Statistics for his study. The researcher used simple statistical tools for the analysis of data. The study revealed that the irrigation is the prime condition for the application of fertilizers. But in the country almost 70 per cent of cultivated area was dependent on rain which consumed only 20 per cent of total fertilizers that's why despite being the second largest consumer of fertilizers per hectare consumption of fertilizers in India was quite low as compared to most of other developing countries.

Shamrao (2011) highlighted the subsidies on fertilizers in India in his study. The main objective of the study was to examined the effects of subsidies on the economy of the country. The researcher used secondary sources of data in his study. The researcher revealed that the subsidies

on fertilizers had increased from 5.05 billion rupees in 1981-82 to 43.89 billion rupees in 1990-91 and this was the pivotal point of argument on economic reforms and fiscal deficit of the country since 1991.

Research Methodology: -

To fulfill the above said objectives secondary data for the period 1966-67 to 2014-15 has been collected from Statistical Abstract of Haryana (2014-15 and 2015-16), Economic Survey of Haryana (2015-16 and 2002-03), Agricultural Statistics at a Glance (2015) and Economic Survey of India 2013-14 on fertilizer consumption (NPK) district-wise and; on production and productivity of Wheat, Rice and Sugarcane.

For calculating the growth rates in consumption of fertilizers and in production and productivity of wheat, rice and sugarcane for the period 1966-67 to 2014-15 ACGR has been used. Similarly, Z Score method and Composite Standard Score(CSS) has been used in the study for examining the disparities in the consumption of fertilizers across districts in Haryana for the period 2014-15.

Pattern and Growth of Fertilizer Consumption in Haryana

In this part pattern and growth of fertilizer consumption expressed in terms of total quantities consumed, intensity of fertilizer use (i.e., kg per hectare of gross cropped area) and; growth rates in fertilizer consumption, in production and yield of wheat, rice and sugarcane has been discussed.

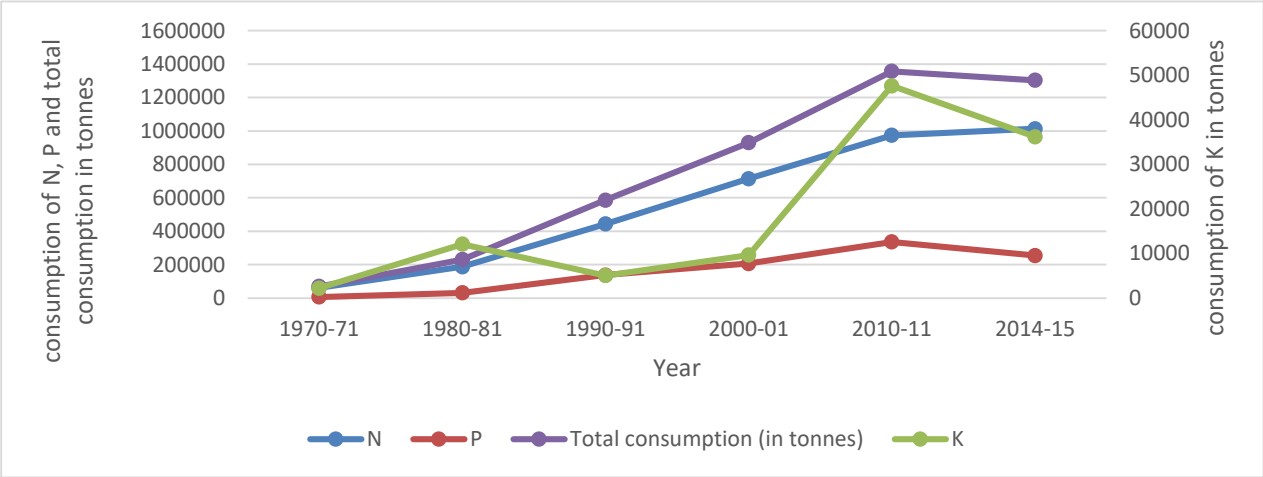
(1) Fertilizer Consumption in Haryana: -

Pattern of fertilizer consumption in terms of NPK and total quantities in Haryana is presented in table no. 1 and figure 1. Consumption of fertilizers was around 13 thousand tonnes in 1966-67 and it picked up very fast after 1970s as an effect of green revolution. In 1970-71, consumption of total fertilizers was increased to 70 thousand tonnes which was further increased up to 1304 thousand tonnes in 2014-15. During the study period from 1970-71 to 2014-15 fertilizer consumption was highest in 2010-11 i.e., around 1358 thousand tonnes. The growth and consumption pattern of nitrogen, phosphorus and potash was also increased sustainably. The rapid growth of irrigation system, increasing total cropped area continuously, availability of fertilizers easily and at subsidized rates and last but not least introduction of HYV seeds after green revolution were the main reasons for boosting the consumption of fertilizers during 1970 to 2015.

Table No. 1
Consumption of Total Fertilizers in Haryana

Year	N	P	K	Total consumption (in tonnes)
1970-71	60972	6860	2228	70060
1980-81	187385	31340	12098	230823
1990-91	443245	138005	5042	586292
2000-01	714308	206319	9668	930295
2010-11	974045	335950	47627	1357622
2014-15	1013267	254437	36199	1303903

Source: Statistical Abstract Haryana, 2014-15
Figure-1



Source: Statistical Abstract Haryana, 2014-15

(2) Intensity of fertilizer use in Haryana: -

Looking only at the consumption of fertilizers estimated in terms of total quantity consumed is not the sufficient or good indicator. Examining the pattern of fertilizer consumption per hectare of total cropped area would be more appropriate. Per hectare consumption of fertilizers is given in table no. 2 and in figure 2 simultaneously.

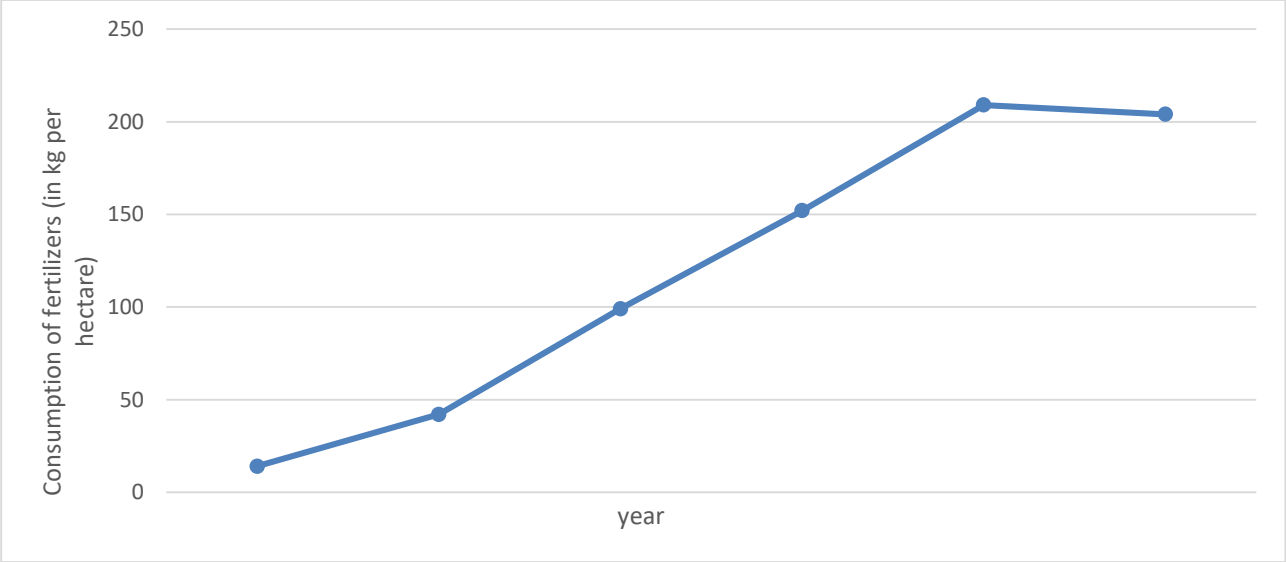
Fertilizer consumption was around 3 kg per hectare in 1966-67 but after green revolution there was a rapid increase in the intensity of use of fertilizers almost more than four times in the five years from 1966-67 to 1970-71. Fertilizer consumption was further increased continuously and reached at a level of 42 kg in 1980-81. The fertilizer consumption crossed 100 kg per hectare before 1995 and reached at a record level of consumption 209 kg per hectare in 2010-11. Till 2010-11 consumption of fertilizers was continuously increased in every decade but after 2010-11 consumption of fertilizers per hectare fell slightly in 2014-15 at a level of 204 kg per hectare.

Table No. 2
Consumption of Fertilizers Per Hectare in Haryana

Year	Consumption of fertilizers (in kg per hectare)
1970-71	14
1980-81	42
1990-91	99
2000-01	152
2010-11	209
2014-15	204

Source: Economic Survey of Haryana

Figure-2



Source: Economic Survey of Haryana

(3) Growth Rates in Fertilizer Consumption and in production and yield of wheat, rice and sugarcane: -

The growth rates in fertilizer consumption and in the production and yield of wheat, rice and sugarcane are presented in table no. 4. Three crops wheat, rice and sugarcane has been taken for analysis as these crops are consuming more fertilizer as compared to other food grains and nonfood grains. The table shows that the growth rates in consumption of fertilizers in terms of total or per hectare as well as growth rates in production and yield of wheat, rice and sugarcane was highest from 1966-67 to 1970-71 just after the introduction of green revolution. The table shows that the consumption of total fertilizer increased by more than 39 per cent during this time period and this major increase in total consumption of fertilizers increased the intensity of use from 3 kg per hectare in 1966-67 to 14 kg per hectare in 1970-71. Increase in use of fertilizer along with increasing irrigation facilities and HYV seeds increased the production of these crops

manifold. The production and productivity of wheat and rice increased at a faster growth rate from 1966-67 to 1990-91 and at a slow growth rate from 1990-91 to 2010-11. Growth rate of wheat is negative during 2010-11 to 2014-15 but that of rice is positive during the same time period.

Table No. 3
Growth rates in Consumption of Fertilizers and in P and Y of Wheat Rice and Sugarcane

Year	Growth rate in consumption of fertilizers		Growth rate in production and yield of wheat		Growth rate in production and yield of rice		Growth rate in production and yield of sugarcane	
	Total	Per ha	P	Y	P	Y	P	Y
1966-67 to 1970-71	39.32	36.80	17.20	7.80	15.58	7.89	6.75	5.78
1970-71 to 1980-81	12.66	11.61	4.07	1.30	10.59	4.38	-4.21	-1.02
1980-81 to 1990-91	9.77	8.95	6.31	3.96	3.83	0.63	5.42	2.63
1990-91 to 2000-01	4.73	4.38	4.15	1.67	3.92	-0.81	0.46	0.80
2000-01 to 2010-11	3.85	3.24	1.82	1.20	2.54	0.87	-2.98	2.21
2010-11 to 2014-15	-0.40	-0.24	-0.78	-1.49	1.46	1.11	1.63	0.39

P is Production; Y is Yield
Values in per cent

Production and productivity of sugarcane has positive and negative growth rates but it was highest for the period from 1966-67 to 1970-71. The remarkable growth of fertilizer consumption after green revolution has increased the production of wheat from 1059 thousand tonnes in 1966-67 to 10707 thousand tonnes in 2014-15 that of wheat has increased from 223 thousand tonnes in 1966-67 to 4007 tonnes in 2014-15 but the production of sugarcane has increased marginally from 510 thousand tonnes in 1966-67 to 710 thousand tonnes in 2014-15.

Disparities in the Pattern of Fertilizer Consumption

In this part disparities in the consumption of fertilizers has been explained with the help of Z values and Composite Standard Score(CSS) of N, P and K for all the districts of Haryana for the year 2014-15.

Table No. 4

District wise Consumption of Nitrogen, Phosphorus, and Potash in Haryana

(Based on 2014-15)

Districts	**Z1**	**Z2**	**Z3**	**CSS**
Ambala	0.0163	-0.4843	-0.4577	-0.926
Panchkula	-1.4037	-1.4504	-1.4662	-4.320
Yamunanagar	1.3500	-0.0244	0.1312	1.457
Kurukshetra	0.8995	0.3426	0.7584	2.000
Kaithal	-0.1012	0.3391	0.9739	1.212
				Cont..
Karnal	0.9899	1.1453	1.3462	3.481
Panipat	-0.8813	-0.7238	-0.2018	-1.807
Sonipat	-0.0074	0.2379	0.3947	0.625
Rohtak	-0.9963	-0.4286	-0.4051	-1.830
Jhajjar	-1.1391	-0.8040	-0.9971	-2.940
Faridabad	-1.3403	-1.4115	-1.3634	-4.115
Palwal	0.7795	0.4061	-0.1616	1.024
Gurgaon	-1.0783	-1.0403	-1.2723	-3.391
Mewat	-0.7022	-1.0576	-1.0618	-2.822
Rewari	-0.4410	-0.2657	-0.5103	-1.217
Mahendragarh	-0.7258	-0.7832	-0.7738	-2.283
Bhiwani	-0.2398	0.5137	0.0673	0.341
Jind	1.5511	0.7069	1.1299	3.388
Hissar	0.9840	1.3359	0.7782	3.098
Fatehabad	1.1049	0.9558	0.9220	2.983
Sirsa	1.3812	2.4905	2.1693	6.041

Source: Statistical Abstract Haryana, 2014-15

Z_1 is Nitrogen, Z_2 is Phosphorus and Z_3 is Potash

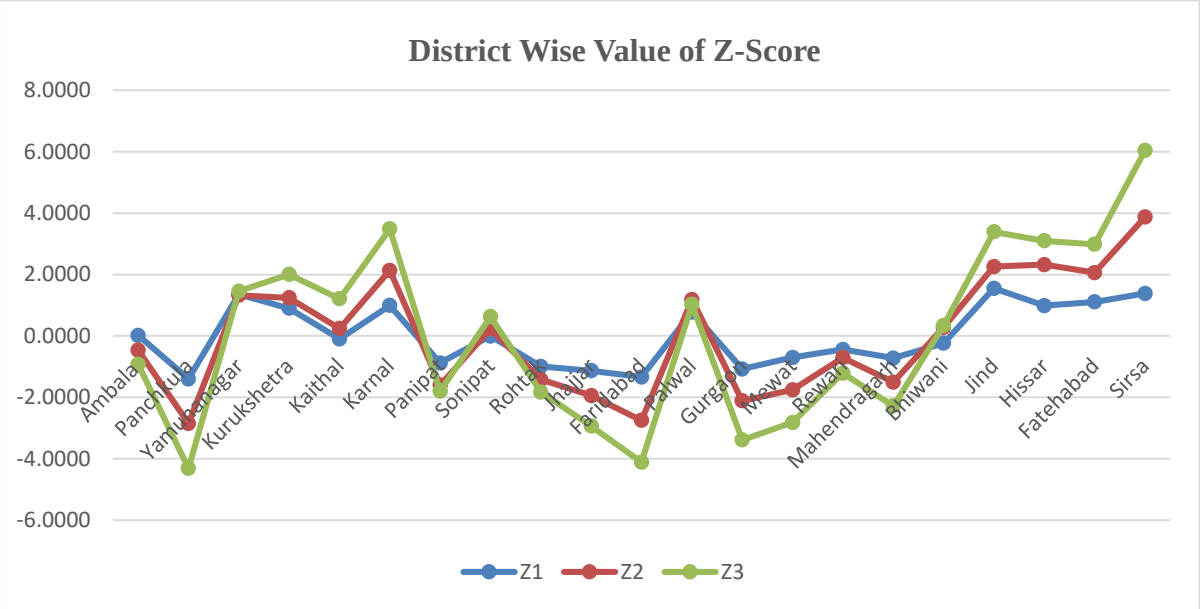
Table No. 5

District Wise Pattern According to the Consumption of NPK in Haryana (2014-15)

CSS Value	Category	No. of Districts	Name of Districts
Below -2.552	Low	5	Panchkula, Jhajjar, Faridabad, Gurgaon, Mewat
-2.552 to 0.341	Low Middle	5	Panipat, Rohtak, Rewari, Mahendragarh, Bhiwani
0.341 to 2.492	Upper Middle	6	Ambala, Yamunanagar, Kurukshetra, Kaithal, Sonipat, Palwal
Above 2.492	High	5	Karnal, Jind, Hissar, Fatehabad, Sirsa

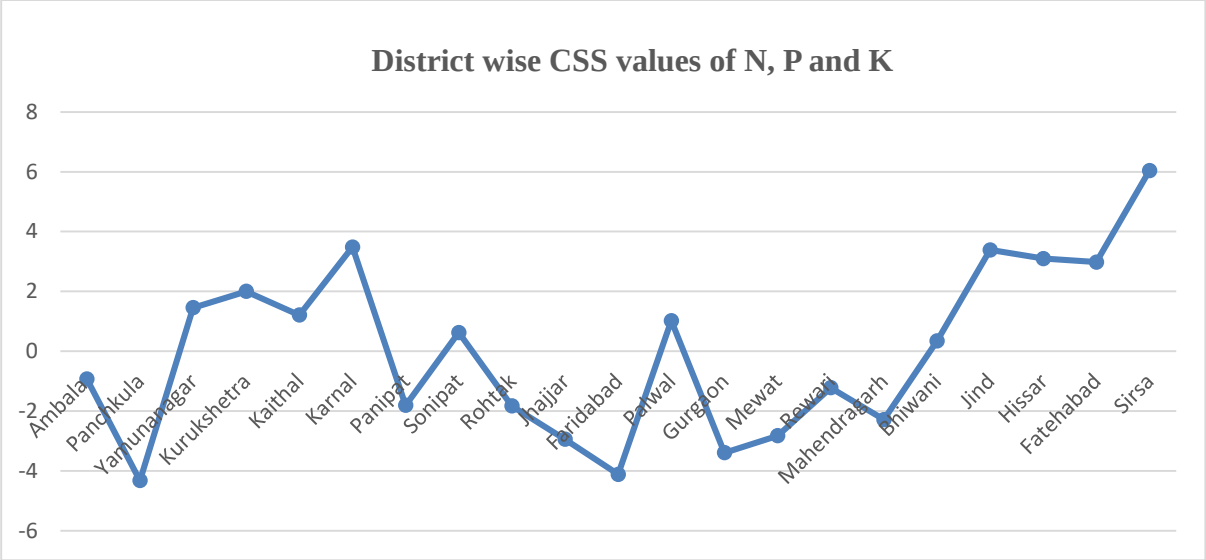
Source: Statistical Abstract Haryana, 2014-15

Figure-3



Source: Statistical Abstract Haryana, 2014-15

Figure-4



Source: Statistical Abstract Haryana, 2014-15

In order to explain the disparities in the consumption of fertilizers among the districts of Haryana the CSS values have been calculated with the help of SPSS and the values have been categorized into four parts – low, low middle, upper middle and high level of fertilizer consumption. On this basis the CSS values explained that Panchkula, Jhajjar, Faridabad, Gurgaon and Mewat districts have low level of fertilizer consumption; Panipat, Rohtak, Rewari, Mahendragarh and Bhiwani districts have low middle level of consumption of fertilizers. Six districts out of 21, Ambala, Yamunanagar, Kurukshetra, Kaithal, Sonipat, and Palwal have upper middle level of fertilizer consumption while Karnal, Jind, Hissar, Fatehabad, and Sirsa have high level of consumption of fertilizers. The CSS values varies from -4.320 to 6.041 for the year 2014-15. The maximum CSS value has been recorded for Sirsa and the lowest for Panchkula for the same year.

Conclusion: -

Haryana has made tremendous progress in the production of food grains. Use of fertilizer has increased rapidly in the state after the introduction of green revolution. The green revolution introduces hybrid and high yielding variety seeds which are responsive to fertilizers has increased the production of food grains manifold. As a result, consumption of fertilizers has increased from 70060 tonnes in 1970-71 to 1303903 tonnes in 2014-15. Similarly, total consumption of fertilizers also boosts the intensity of fertilizer use (kg per hectare of total cropped area) from 14 kg per hectare in 1970-71 to 204 kg per hectare in 2014-15. The growth rates in consumption of fertilizers per hectare and in total consumption was highest in 1966-67 to 1970-71 as a result of green revolution and lowest in 2010-11 to 2014-15. District wise Z score and CSS values explains the disparities in the consumption of fertilizers for the year 2014-15. The values show that Sirsa and Karnal consume maximum fertilizer while Panchkula and Faridabad consume minimum fertilizers.

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Appendix

Table No. 6

Production and Yield of Wheat, Rice and Sugarcane

Year	Wheat		Rice		Sugarcane	
	P	Y	P	Y	P	Y
1966-67	1059	1425	223	1161	510	3400
1970-71	2342	2074	460	1697	707	4504
1980-81	3490	2360	1259	2606	460	4067
1990-91	6436	3479	1834	2775	780	5273
2000-01	9669	4106	2695	2557	817	5713
2010-11	11578	4624	3465	2788	604	7108
2014-15(P)	10707	3981	4007	3113	710	7390

Source: Statistical Abstract Haryana, 2015-16

P is Production; Y is Yield

Production in 000 tonnes and Yield in kgs. Per hectare

Table No. 7

District wise Consumption of Nitrogen, Phosphorus, and Potash in Haryana in Tonnes (Based on 2014-15)

Districts	N	P	K
Ambala	34277	8367	1743
Panchkula	3486	888	63
Yamunanagar	52256	11927	3321
Kurukshetra	71404	14768	2788
Kaithal	77984	14741	1604
Karnal	89352	20982	2895
Panipat	42091	6513	681
Sonipat	60301	13958	1715
Rohtak	35883	8798	545
Jhajjar	17809	5892	376
Faridabad	6626	1189	138
Palwal	43318	15260	2646
Gurgaon	9406	4063	448
Mewat	15833	3929	893
Rewari	32670	10059	1202
Mahendragarh	24625	6053	865
			Cont..
Bhiwani	50306	16093	1440
Jind	82749	17588	3559
Hissar	72009	22458	2888
Fatehabad	76401	19515	3031
Sirsa	114481	31396	3358

Source: Statistical Abstract Haryana, 2014-15