



FERTILIZER'S CONSUMPTION IN HARYANA: AN ANALYLITAL STUDY

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ABSTRACT

Chemical fertilizers are key element of modern technology and have played an important role in agricultural production in India as well as Haryana. Haryana is a small state which is relatively backward area for the farming in comparison to well develop state of Punjab. It made rapid progress in the field of agriculture development since its existence in 1966 and after it has achieved a prestigious position in comparison to other advanced states of the Indian with 1.4% of the total geographical areas of the country. It contributes more than 5% of the total food grains in the country pool.

Haryana is one of those states which has repeated the benefit of "Green Revolution" and has attained a very high rate of agricultural production. Since 1947 the scope for bringing more area under cultivation that was limited before green revolution. Efforts were intensified towards increasing the yields per unit of area, through an increase in irrigation facilities and cropping intensity. Due to use of farm machinery, chemical fertilizers and high yielding varieties of seeds need high credit in agriculture sector that is increasing day by day. All these efforts resulted in boosting agricultural production. As a result the production of food-grain of the state has increased from 25.92 lakh tones in 1966-67 to 162.41 lakh tones in 2014-15 i.e. more than six time increase over the year 1966-67. While consumption of fertilizer has increased from 0.13 lakh tones in 1966-67 to 13.58 lakh tones in 2012-13. It has increased more than 104 times during the above said time period. Contribution of agriculture in Haryana's economy has declined 14.1 percent in 2014-15.

Key word: Price Index, agriculture growth rate, Chemical fertilizers, agricultural production,

Green Revolution, crop yields, nutrients, tones, use of machine, food grains, fertilizer consumption etc.

Introduction

The role of chemical fertilizers is increasing in agricultural production, particularly in developing countries. Fertilizer were as important as seed in the Green Revolution (Tomich et. al. 1995), that contributing as much as 50 percent of the yield growth in Asia (Hopper 1993 and FAO 1998). We found that one-third of the cereal production world-wide is due to the use of more fertilizer and related factors of production (Bumb 1995). During the last three decades, India has relied on increasing crop yields to supply an ever increasing demand for food. During last decades, India lost about 2.5 million hectares of net sown area. The options for increasing food production are limited by availability of land as well as water. Increasing population, among other factors, limits any significant expansion of arable land. Fertilizer consumption in India has been increasing over the years and today India is one of the largest producer and consumer of fertilizers in the world. By 2009-10, total fertilizer consumption in the country was 26.49 million tones. Importance of fertilizers in yield improvement, which is essential for achieving increased agricultural production, further increases because there is little scope for bringing more area under cultivation as well as majority of Indian as well as Haryana. Soils are deficient in India as well as Haryana by many macro and micro nutrients. The application of essential plant nutrients, particularly major and micronutrients in optimum quantity and right proportion, through correct method and time of application, is the key to increased and sustained crop production. Therefore it is important to understand fertilizer use behavior in the country as well as Haryana over time as well as role of factors influencing fertilizer consumption at the national and regional/state level because intensity of fertilizer use varies from state to state and area to area.

India's soil though varied and rich is deficient in nitrogen and phosphorus and this efficiency can be made good by an increased use of fertilizers. The possibilities of extensive cultivation are extremely limited because most of the cultivable area in Haryana is already being cultivated. There is no option to increase area but we extend extensive cultivation due to using large quantities of fertilizers to augment our food grain production. Since the production of high yielding varieties, the consumption of chemical fertilizers in the state has increased from 0.13 lakh tones in 1966-67 to 13.58 lakh tones in 2012-13. The consumption of fertilizer in Haryana has increased from 42 kg per hectare in 1980-81 to 213 kg per hectare in 2014-15. The consumption of fertilizer is fluctuating during the study period. The structural composition of

State economy has witnessed significant changes since the formation of Haryana State. Agriculture Sector still continues to occupy a significant position in State economy, although, the share of this sector in the Gross State Domestic Product is continuously declining. The predominance of Agriculture Sector is also responsible for instability in the growth rate of economy due to fluctuations in agricultural production. Natural calamities and fluctuation in rainfall often cause substantial loss in crop production which eventually results in fluctuation and instability in growth rate of State economy. Moreover, rapidly increasing share of Service Sector is also responsible for decline in the share of Agriculture Sector. The composition of Gross State Domestic Product at constant (1999-2000) prices reveals that the share of Primary Sector which includes. Agriculture and Allied Sectors has declined from 32.0 percent during 1999-2000 to 14.10 percent during 2014 -15.

Agriculture continues to occupy a prominent position in State economy. Despite the decline in the share of Agriculture Sector in the Gross State Domestic Product to 14.1 percent in 2014-15 from 21.2 percent in 2006-07, about two third population (65.12%) of the State still depends upon agriculture for their livelihood. The total area of the State under cultivation has already reached at a saturation level and thus there is hardly any scope to bring more area under cultivation. The agriculture production can only be increased through enhanced cropping intensity, change in cropping pattern, improvement in seeds of high yielding varieties, better cultivation practices and development of post-harvest technology etc. State Government is trying to reorient agriculture through various policy measures for increasing the production.

In Haryana percentage share of total population depends on agriculture is about 65 percent. Thus, it may be said that agriculture is the backbone of Indian economy. So the prosperity of agriculture is the prosperity of entire Indian economy. The Rostow stages theory of growth has observed that, agriculture plays a distinct but multiple and converging role in the transitional process of the “take off” into self-sustained growth.

There is no option to increase area but we extend extensive cultivation due to using large quantities of fertilizers and pesticides consumption to augment our food grain production. Since the production of high yielding varieties, the consumption of chemical fertilizers and pesticides in the state has increased.

Objectives of the Study

- Trends in food grains production & Area under Food grain in Haryana.
- Growth rate in fertilizer consumption and food grains production.

- Fertilizer use intensity and growth in fertilizer use intensity.

Research Methodology

Present study based on secondary data. Data has been collected through various resources as like CMIE of Agriculture, Statistical abstract, Economic survey, Fertilizer Association of India etc. Present study is exploratory in nature.

Analysis of Data

Various statistical tools such as tabulation, percentage, mean, ratio analysis, average growth rate, graphs and diagrams have been used for the purpose of analyzing the financial data in present study.

Area under Crops in Haryana

The table 1 shows the gross area sown was 45.99 lakh hectares during 1966-67 and has increased to 62.43 lakh hectares during 2014-15. Though, the efforts have been made to break the dominance of the Wheat-Paddy rotation, yet no significant achievement has been made in this regard so far.

Table 1 Area Sown Under Principal Crops in Haryana (in Lakhs)

Year	Wheat	Paddy	Total/F/ grains	Sugarcane	Cotton (bales)	Oilseeds	Gross Area
1966-67	7.43	1.92	35.20	1.50	1.83	2.12	45.99
1970-71	11.29	2.69	38.68	1.56	1.93	1.43	49.57
1980-81	14.79	4.84	39.63	1.13	3.16	3.11	54.62
1990-91	18.50	6.61	40.79	1.48	4.91	4.89	59.19
2000-01	23.55	10.54	43.40	1.43	5.55	4.14	61.15
2004-05	23.17	10.24	42.18	1.33	6.21	7.15	64.25
2005-06	23.03	10.47	43.11	1.29	5.84	7.36	65.09
2006-07	23.76	10.42	43.48	1.41	5.27	6.22	64.07
2007-08	24.61	10.73	44.77	1.40	4.82	5.11	64.58
2008-09	24.62	12.11	46.21	0.91	4.56	5.28	65.00
2009-10	24.88	12.06	45.41	0.79	5.05	5.23	64.19
2010-11	25.04	12.43	47.00	0.85	4.93	5.15	64.99
2011-12	25.31	12.34	45.81	0.95	6.02	5.46	64.89
2012-13	24.97	12.06	43.02	1.01	5.93	5.68	63.76
2013-14	24.99	12.28	43.57	1.02	5.64	5.49	62.43
2014-15*	24.78	11.83	43.90	1.13	6.38	5.50	62.43
Mean	21.32	9.60	42.89	1.20	4.88	4.96	61.01

Source:- Statistical Abstract of Haryana 2000-11& Economic survey of Haryana 2014-15.

Note : bales= 170 kg.

*Provisional data

Land Utilisation

The present table 2 shows that total cropped area in Haryana has increased from 45.99 lakh hectares in 1966-67 to 63.76 lakh hectares in 2012-13. Area sown more than once also has increased from 11.76 lakh hectares to 28.63 lakh hectares in the same time period.

Table 2- Land Utilisation in Haryana (Lakh hectares)

Classification	1966-67	1989-90	2004-05	2009-10	2012-13	Mean
Aria under forest	0.91	0.68	0.44	0.40	0.40	0.57
Land not available for cultivation	4.89	4.17	5.25	5.79	5.42	5.10
Follow Land	2.59	1.75	2.12	1.42	1.03	1.78
Other uncultivable land	1.37	0.83	0.66	0.71	1.01	0.92
Cultivable land	38.19	38.21	38.26	38.08	36.64	37.88
Net Area sown	34.23	35.93	35.98	35.90	35.13	35.43
Area sown more than once	11.76	20.58	28.97	28.01	28.63	23.59
Total cropped area	45.99	56.51	64.25	63.51	63.76	58.80

Source: - Statistical Abstract of Haryana 2000 to 2014-15

The area classified other uncultivable land i.e. the area not properly utilised, has been gradually declining whereas the area under forests, that land not available for cultivation (utilized for re-habitation and industrial purposes) and cultivable area had been continuously increasing.

Irrigation

The secret of rapid agricultural development in backward country like India is to be found much more in new seeds, fertilizers, pesticides and water supplies. Irrigation is a important factor for the use of these complementary inputs. Without proper irrigation facility cultivation is almost impossible. Irrigation plays a vital role in the agricultural development particularly a state as like Haryana, where rainfall is scanty and inadequate. The state is being served by the excellent network to irrigation facilities, Canals and tube-wells are the main source of irrigation in the state. The status of irrigation facilities available in the state is given in the table 3.

Table 3- Irrigated Area in Haryana (lakh hectares)

Year	Total Cultivated Area	Net Area Irrigated				Irrigation Ratio to total area
		Canals	Well & tube-well	Other	Total	Net
1966-67	34.23	9.91 (76.60)	2.89 (22.40)	0.13 (1)	12.93	0.37
1970-71	35.65	9.52 (62.14)	N.A.	0.05	15.32	0.42
1975-76	36.24	N.A.	N.A.	N.A.	N.A.	N.A.
1980-81	36.02	11.61 (52.29)	9.41 (44.09)	0.06	21.34	0.59
1985-86	36.13	11.91 (52.98)	10.42 (46.35)	0.04	22.48	0.62
1990-91	35.75	13.37 (51.42)	12.48 (48.00)	0.14	26.00	0.72
1995-96	35.86	13.75 (49.81)	13.52 (48.98)	0.32	27.60	0.76
2000-01	35.26	14.76 (49.90)	14.67 (49.59)	0.14	29.58	0.83
2003-04	35.34	13.96 (47.01)	15.61 (52.57)	0.12	29.69	0.84
2004-05	35.28	14.26 (48.27)	15.14 (51.25)	0.14	29.54	0.83
2008-09	35.90	12.74 (44.28)	16.00 (55.61)	0.03	28.77	0.80
2009-10	35.90	12.82 (41.77)	17.83 (58.10)	0.04	30.69	0.85
Mean	35.63	11.55	10.66	0.10	22.83	0.64

Source:- Economic Survey of Haryana 2000 to2012

N.A.- Not Available, Note:- figures in brackets indicate percentage of total.

The Table shows that net irrigated area has increased from 12.93 lakh hectares in 1966-67 to 30.69 lakh hectares in 2009-10. Net irrigation area ratio has increased from 0.37 in 1966 -67 to 0.85 in 2009-10. The table also shows that the canals are the major source of irrigation followed by tube-wells. Tube-wells have played major role in the development of irrigation facilities in the state. The other sources such as ponds, tanks and drainage etc. are the major contributor in irrigation. In this period they showed a fluctuating trend.

Fertilizers

India's soil though varied and rich is deficient in nitrogen and phosphorus and this efficiency can be made good by an high use of fertilizers. The possibilities of extensive cultivation are extremely limited because most of the cultivable area in Haryana is already being cultivated.

There is no option to increase area but we extend extensive cultivation due to using large quantities of fertilizers to augment our food grain production. Since the production of high yielding varieties, the consumption of chemical fertilizers in the state has increased.

This study uses causal model because time series data on fertilizer consumption as well as variables influencing fertilizer use are available. We estimated fertilizer demand model using annual time series data, from 1976-77 to 2009-10 using simple linear regression model using ordinary least squares (OLS) method. We hypothesized that the demand for fertilizer is a function of prices (specifically price of fertilizers and food grains), subsidy, as well as non-price factors such as irrigated area, coverage of high yielding varieties, area under food grains and non-food grains, cropping intensity, rainfall, capital availability, etc. Among a large number of factors considered in the study, the following variables were finally used in the model based on their statistical significance and stability of the functional relationship to estimate demand for the period 2010-11 to 2020-21.

The fertilizer requirement forecasts shown in Table 4 that is generated by an estimated model using historical fertilizer consumption. The total demand for fertilizers (N+P+K) is projected to increase to about 35 million tones by 2015-16 and 41.6 million tones by 2020-21. The demand for N is expected to increase to about 19.9 million tones and 23 million tones during the corresponding period. In case of P fertilizer demand is projected 9.6 million tones in 2015-16 and 11.5 million tones in 2020-21. For K fertilizer the demand is projected to reach about 5.5 & 7.1 million tones by 2015-16 and 2020-21, respectively. It shows the increasing trends.

Table 4. Annual fertiliser nutrient projections in India for 2015-16 and 2020-21

Year	N	P	K	N+P+K	Total
2010-11	16.5	7.6	3.9	28.0	28.2
2011-12	17.2	8.0	4.2	29.5	29.6
2012-13	17.9	8.4	4.6	30.9	31.0
2013-14	18.6	8.8	4.9	32.3	32.5
2014-15	19.3	9.2	5.2	33.7	33.8
2015-16	19.9	9.6	5.5	35.1	35.2
2016-17	20.6	10.0	5.8	36.4	36.6
2017-18	21.2	10.4	6.2	37.8	37.9
2018-19	21.8	10.8	6.5	39.1	39.2
2019-20	22.4	11.1	6.8	40.4	40.5
2020-21	23.0	11.5	7.1	41.6	41.7
Mean	19.85	9.58	5.52	34.98	35.11

Source: Fertiliser Association of India

Projections for total nutrients demand is based on regression equation estimated for total fertiliser nutrient consumption while demand forecasts for N+P+K are sum of demand for N, P and K estimated by regression equations for N, P and K separately. Therefore there is a marginal difference between two estimates.

State-level Trends

Table no. 5 shows fertilizer use trends in different states in the country. The states are subdivided by row into those with lower versus higher fertilizer use intensity (defined as using less than national average of 126.5 kg per hectare of fertilizer nutrients during the 2009-10 versus using more than national average during that period), and they are subdivided by column into those with low versus high growth in fertilizer use intensity (defined as having recorded less than or more than national average of 40.5 per cent increase in mean levels of fertilizer use between 1999-00 and 2009-10. Out of 28 state 10 states are using higher than national average fertilizer use intensity during the 2009-10, six of them displayed significant growth (>national average of 40.5%) in fertilizer consumption between 1999-00 and 2009-10, while four states (Punjab, Tamil Nadu, Uttar Pradesh and West Bengal) achieved less than national average growth. Per hectare fertilizer use in Bihar achieved the highest growth (83.4%), followed by Pondicherry (80.1%), Gujarat (50.96%) and Andhra Pradesh (43.4%). While 14 states having less than national average fertilizer intensity, 8 recorded moderate increases while three north-eastern states, Manipur, Meghalaya and Nagaland recorded negative growth. Out of total 11 states having positive growth, 8 performed well and average fertilizer use increased more than national average and remaining three states (Kerala, Rajasthan and Arunachal Pradesh) recorded lower than national growth.

Table 5: Fertilizer use intensity and growth in fertilizer use intensity, by states

Intensity of fertilizer % use (kg/ha)	% growth in fertilizer use intensity	
	≥ National average (40.5%)	< National average
≥ National average during 2009-10 (≥126.5)	Puducherry (903.2, 80.1%) Andhra Pradesh (217.2, 43.4%) Haryana (199.0, 40.6%) Bihar (166.7, 83.4%) Gujarat (143.8, 50.9%) Karnataka (139.2, 41.7%)	Punjab (223.9, 27.9%) Tamil Nadu (200.6, 31.3%) Uttar Pradesh (160.8, 34.3%) West Bengal (156.2, 29.6%)
<National average during 2009-10	Maharashtra (117.2, 46.2%) Jammu & Kashmir (87.7, 46.4%)	Kerala (86.7, 28.2%) Manipur (72.3, -12.2%)

(<126.5)	Madhya Pradesh (72.5, 52.7%)	Rajasthan (47.1, 26.2%)
	Assam (59.3, 172.0%)	Meghalaya (13.9, -10.9%)
	Orissa (56.2, 55.9%)	Arunachal Pradesh (2.9, 0.8%)
	Himachal Pradesh (55.7, 45.2%)	Nagaland (2.3, -24.2%)
	Mizoram (47.4, 341.6%)	
	Tripura (45.8, 110.3%)	

Note: Growth in fertilizer use is defined as the per cent increase in mean fertilizer use intensity between the 1999-00 and the 2009-10. Numbers in parentheses are the mean fertilizer use intensity for 2009-10, and the per cent increase in fertilizer use intensity as defined above.

Source: *Fertilizer Association of India*

Table 6- Fertilizer consumption in Haryana

Year	Consumption of Fertilizer (Kgs per hectare)
1980-81	42
1990-91	99
1997-98	136
1998-99	133
1999-00	150
2000-01	152
2001-02	156
2002-03	163
2003-04	158
2004-05	174
2005-06	173
2006-07	173
2007-08	187
2008-09	199
2009-10	209
2010-11	209
2011-12	224
2012-13	209
2013-14	212
2014-15 (tentative)	213
Mean	168.55

Source: Economic survey of Haryana 2000 to 2014-15.

The table 6 clearly shows that the consumption of fertilizer in Haryana has increased from 42 kg per hectare in 1980-81 to 213 kg per hectare in 2014-15. The consumption of fertilizer is fluctuating during the study period. During the study period on an average consumption of fertilizer is calculated 168.55 kg. per hectare.

There is no option to increase area but we extend extensive cultivation due to using large quantities of fertilizer to augment our food grain production. Since the production of high yielding varieties, the consumption of chemical fertilizer in the state has increased that depicted in Table 7. The table clearly shows that the consumption of fertilizer in Haryana has increased from 0.13 lakh tones in 1966-67 to 13.53 lakh tones in 2012-13. The table also shows that consumption of fertilizer N, P &K has increased from 0.13, 0.006 & 0.002 lakh tones in 1966-67 to 10.24, 3.12 & 0.17 lakh tones in 2012-13 respectively. During the study period on an average consumption of total fertilizer, N, P & K is calculated 7.22, 5.50, 1.56, & 0.16 lakh tones respectively. It shows that consumption of fertilizer is fluctuating during the study period.

Table 7: Fertilizer consumption in Haryana (in Lakh tones)

Year	N	P	K	Total
1966-67	0.13	0.006	0.002	0.13
1970-71	0.61	0.07	0.02	0.70
1975-76	0.86	0.08	0.02	0.97
1980-81	1.87	0.31	0.12	2.31
1985-86	2.96	0.70	0.06	3.72
1990-91	4.43	1.38	0.05	5.86
1995-96	5.87	1.34	0.03	7.24
2000-01	7.14	2.06	0.01	9.30
2005-06	8.47	2.53	0.29	11.29
2009-10	9.62	3.33	0.61	13.56
2010-11	9.74	3.36	0.48	13.58
2012-13	10.24	3.12	0.17	13.53
2013-14	9.51	1.98	0.16	11.65
Mean	5.50	1.56	0.16	7.22

Source: Economic survey of Haryana 2000 to 2014-15.

Plant protection (pesticides)

Intensive cultivation, introduction of high yielding varieties of seeds, fertilizer consumption has increased, frequent irrigation and changes in cropping pattern have been accompanied by increased pest problems. The consumption of pesticides in Haryana has increased from 273 tones in 1966-67 to 4080 tones in 2013-14. During the study period on an average consumption of pesticides, total area and consumption of pesticides per hector is calculated 4392.29 tones, 76.18 lakh hectare and 5.58 K.g per hector respectively.

Table 8- Consumption of pesticides in Haryana

Year	Quantity (in tones)	Area (lakh hectare)	K.g./per hector
1966-67	273	19.17	1.4
1994-95	5102	73.96	6.9
1995-96	5100	78.80	6.5
1996-97	5045	81.60	6.3
1997-98	5040	87.91	5.7
1998-99	5035	87.94	5.7
1999-00	5030	88.02	5.7
2000-01	5025	87.98	5.7
2003-04	4730	86.05	5.5
2004-05	4700	85.65	5.5
2005-06	4650	84.95	5.5
2007-08	4391	75.55	5.8
2008-09	4288	72.90	5.9
2009-10	4070	71.19	5.7
2010-11	4060	71.10	5.7
2012-13	4050	71.10	5.7
2013-14	4080	71.16	5.73
Mean	4392.29	76.18	5.58

Source: Statistical abstract of Haryana 2000 to 2013-14.

The table 8 shows that pesticides consumption in the state has increased from 273 tones in 1966-67 to its highest level of 5102 tones in 1994-95 but after that it start to decline due to its adverse effects of human being and it come down 4080 tones in 2013-14. The coverage area of pesticides has increased from 19.17 lakh hectare in 1966-67 to 71.16 lakh hectares in 2013-14, it counted about 3.71 times hike in the area covered by pesticides, 14.95 times hike the use of pesticides and 4.09 times hike in use of pesticides per hectares over the entire study period.

Agricultural Production

There is a remarkable hike in the production of major food-grain crops like wheat and rice since the partician of Haryana in 1966. The Agricultural production has reached highest and that supported by backward and forward linkage of agriculture. The state achieved a record production 169.44 lakh tones of food grain in 2013-14. It happened due to maximum use of fertilizer, pesticides and modern equipment in agriculture sector in India as well as Haryana after the green revolution.

The table 9 clearly explains that the production of total food grains in Haryana has increased from 25.92 lakh tones in 1966-67 to 169.44 lakh tones in 2013-14; it is showing an increase about 6.54 times in above said period.

Table 9- Agriculture production under major crops in Haryana (lakh tones)

Year	Wheat	Paddy	Total F/ grains	Oilseeds	Cotton Bales)	Sugarcane
1966-67	10.59	2.23	25.92	0.92	2.88	51.00
1970-71	23.42	4.60	47.71	0.99	3.73	70.70
1980-81	34.90	12.59	60.36	1.88	6.43	46.00
1990-91	64.36	18.34	95.59	6.38	11.55	78.00
2000-01	96.69	26.95	132.95	5.63	13.83	81.70
2004-05	90.43	30.10	130.57	8.36	20.75	82.30
2005-06	88.53	31.94	130.06	8.30	15.02	83.10
2006-07	100.59	33.71	147.59	8.37	18.05	96.51
2007-08	102.36	36.13	152.94	6.17	18.82	88.50
2008-09	105.40	33.01	161.78	9.11	18.62	52.60
2009-10	104.88	36.28	153.46	8.62	19.19	57.07
2010-11	115.78	34.65	165.68	9.65	17.47	60.42
2011-12	131.19	37.57	183.70	7.58	26.16	69.53
2012-13	111.17	39.41	161.50	9.68	23.78	75.00
2013-14	118.00	39.98	169.44	8.99	20.17	75.00
2014-15*	113.99	37.53	162.41	10.02	18.76	84.18
Mean	89.52	28.44	130.10	6.92	15.95	71.98

Source: Economic Survey of Haryana 2000 to 2014-15.

Note : one bale= 170kg.

*Provisional Data.

The table 10 clearly explains the comparative analysis of average yield per hectare production of wheat and rice in Haryana as well as India. It shows that production of wheat and rice in Haryana is highest in comparison to India in whole study period. It shows the advancement of Haryana in food grains production in comparison to other states. It also shows the high contribution of Haryana (Haryana gives 5 percent of total food grain in whole country production) in the production of food grain in India and advancement of Haryana in adaptation of fertilizer, pesticides and new technology.

Table 10 Average Yield of Wheat and Rice in Haryana and India (kgs. per hectare)

Year	Haryana		India	
	Wheat	Rice	Wheat	Rice
1990-91	3479	2775	2281	1740
1995-96	3697	2225	2483	1797
2000-01	4106	2557	2708	1901
2004-05	3901	2939	2718	2026
2005-06	3844	3051	2619	2102
2006-07	4232	3238	2708	2131
2007-08	4158	3361	2785	2203
2008-09	4614	2724	2907	2178

2009-10	4215	3008	2839	2125
2010-11	4624	2788	2988	2239
2011-12	5183	3044	3177	2393
2012-13	4452	3268	3118	2462
2013-14	4722	3256	NA	NA
2014-15*	4600	3172	-	-
Mean	4273.36	2957.57	2777.58	2108.08

Sources:- Economic Survey of Haryana 2000 to2014-15.

*Provisional data.

The growth of agriculture in a region takes place as a result of (i) increase in gross cropped areas (ii) increase in productivity and (iii) increase in production. It shows that the indices of agriculture production, area and productivity showed unsteady and zigzag type of movements. However, on the whole they had a rising trend.

Conclusion:

With the limited arable land resources, and burden of increasing population, development of new technologies and efficient use of available technologies and inputs will continue to play an important role in sustaining food security in India. It is expected that India's available arable land might drop below the current level of about 140 million hectares, if the use of farmland for commercial/non-agricultural purpose is not restricted in the near future. Therefore, the only way to improve food production is to increase crop yields through the scientific use of fertilizers along with other inputs like high yielding variety seeds, irrigation, etc. using the limited arable land, with an emphasis on protecting the environment. The Government of India has been consistently pursuing policies conducive to increased availability and consumption of fertilizers in the country. Over the last four and half decades, production and consumption of fertilizers has increased significantly.

Therefore, there is a need of two pronged strategy, (i) to monitor states with high intensity of consumption and take corrective actions to reduce environmental degradation and (ii) to promote fertilizer consumption in low-use states to improve crop productivity. While examining major determinants of fertilizer use, it was found that non-price factors such as irrigation, high yielding varieties, were more important in influencing demand for fertilizers. There are two price policy instruments; affordable fertilizer prices and higher agricultural commodity prices, first policy is more powerful to influencing fertilizer consumption. Therefore, in order to ensure self-sufficiency in food grains production in the country, and availability of fertilizers at affordable prices to the producers is the utmost important. The government should give importance to non-price factors like better seeds, irrigation, credit, etc. to increase fertilizer use in the country. For

this, more investment in irrigation, agricultural research and development, extension services and infrastructure are indispensable in the context of a country. The results also suggest fertilizer subsidy to be more appropriate means to achieve the stated objectives compared with price support policy. Farmers need an appropriate system of counselling, particularly for diversification of their crops and economic activities.

Government should increase R&D in seeds, Fertiliser, pesticides etc.

Government should increase Organic farming to maintain the fertility of land.

Government should increase the irrigation facility in Haryana.

Farmer's should adopt co-operative and organic farming to reduce the production cost and to increase the production with protection of land fertility.

A major factor contributing to agrarian distress is the collapse of R&D and extension systems. The Expert Group recommends that major efforts should be made to intensify agricultural research in frontier areas like bio-technology through increased investment.

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