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An Economic Analysis of the Impact on Agricultural Productivity due to the Use of Chemical pesticides in the Agricultural Sector in India

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ABSTRACT

India is the largest producer of fruits and vegetables in the world as well as of fulfilling the needs of the Indians' people. According to the data Department of Economics and Statistical Haryana (DES) production of food grains for the year 2013-2014 is 264 million tons which increased when compared to (2012-2013) 257million tons.(Source: Department of Economics and Statistical 2012-13) (DES). The National Food Security Mission (NFSM) is the main objective production to increase major crops wheat, rice, pulse, coarse cereals as well as to increase the farmer's income. The main objectives of the mission are to increase the production in the agriculture sector because this scheme was implemented after agriculture production increased. After the green revolution came in the agriculture Sector chemical and fertilizer use in the agriculture sector increased due to the use of chemicals and fertilizers. According to British environment Norman Myers, the cutting of forest is 5% due to cattle ranching, 19% due to over-heavy logging, 22% due to the growing sector, and 54% for farms. Deforestation also causes climate change. Pesticide residues are found in soil and air, and in surface and groundwater across the countries, and urban pesticide uses contribute to the problem. Pesticide contamination poses significant risks to the environment and non-target organisms ranging from beneficial soil microorganisms to insects, plants, fish, and birds. Contrary to common misconceptions, even herbicides can cause harm to the environment.There is a need to convey the message that prevention of adverse health effects and promotion of health are profitable investments for employers and employees as a support to a sustainable development of economics.

Key Words : Economic analysis, Impact on agricultural productivity, Use of chemical pesticides

INTRODUCTION

The agricultural sector is the most important role in Indian's economy. The Agricultural sector accounts for 18 percent of India's gross domestic product (GDP) while providing employment opportunities 50% workforce population engage in agricultural sector in the country. India is the world's largest producer of major crops like wheat, pulse, rice, sugarcane, and other spice produce in India. Furthermore, a few sectors indirectly depend on the agriculture sector as likely dairy, farming meat, poultry, farming fisheries, food grains, etc. India is the largest producer of fruits and vegetables in the world as well as of fulfilling the needs of the Indians' people. According to the data Department of Economics and Statistical Haryana (DES) production of food grains for the year 2013-2014 is 264 million tons which increased when compared to (2012-2013) 257 million tons (Source: Department of Economics and Statistical 2012-13) (DES). Haryana is a situated state in the north of India with its capital of Chandigarh. It is established on 1 Nov 1966 as the newly created 17th state of the India. It is surrounded by Uttar Pradesh in the east, Punjab in the west, Himachal Pradesh in the north and Rajasthan. Haryana is a land -

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locked state in northern India, is located between 27.39 to 30.35 degrees North latitude and between 74.28 degree and 77.36 degrees longitude. The altitude of Haryana varies between 700 to 3600 feet (200 meters to 1200 meters above sea level). But with the passage of time, the agriculture sector declined day by day it is estimated 2001-2002 the agriculture sectors share in 26 % declined. Furthermore, in 2017-18 the agricultural sector contributes 14 percent of Indians' national gross domestic product in the agriculture sector. There are many for some reasons best known as for declining productivity in the agriculture sector. Firstly, agricultural farm size is fragmented, while land acquisition act implemented in India because of large land acquired for industrialization, big project, road construction purpose, etc. According to the fourth Advance Estimates, of Production of food grains, in 2013-14, aggregate food grain production is assessed to be 264.77 million tons (MT). The export of spices from India is relied upon to reach US$ 3 billion by 2016-17. Indians' favorite business is pegged at Rs 40,000 crore (US$ 6.42 billion) every year, of which the marked portion represents, 15, %. The National Food Security Mission (NFSM) was launched from the first *Rabi*, 2007-08. The National Food Security Mission (NFSM) is the main objective production to increase major crops wheat, rice, pulse, coarse cereals as well as to increase the farmer's income. The main objectives of the mission are to increase the production in the agriculture sector because this scheme was implemented after agriculture production increased. The green revolution started in 1960 in India the reason come to green revolution in India to use high-yield yielding verities seeds while use of technology in the agriculture sector. Furthermore, the population increase agricultural commodities demand in India. Further, to fulfill the demand for agriculture's commodities to use chemical and fertilizer. Fertilizer used to increase the production of soils and plant tissues to supply one or more plants with more plant as well as nutrients essential to the growth of plants or to overcome the plant nutrient deficiency. Many sources of fertilizer exist, both natural and industrially produced. Any natural or manufactured material that contains at least 5% of one or more of the three primary nutrients – nitrogen (N), phosphorous (P), or potassium (K) – can be considered a fertilizer. Industrially manufactured fertilizers are sometimes referred to as "mineral" fertilizers. Fertilizers contain varying proportions of plant essential major (N, P, K, etc.) and minor (Zn, Mn, Fe, etc.) elements, as well as impurities and other non-essential elements. In 1950, fertilizer was used in the agricultural sector to maintain the nutrients as well as soil fertility and increase production. Furthermore day to day use of fertilizer in the agriculture sector is continuously used to enhance production. According to "Keekeeney" estimated in 1997 as the population increased in the world's approximately 2.3 billion by in the way of year 2050. In the developed countries,' the grain and nutrient food increases are expected to triple.

METHODOLOGY

This data has been collected from Statistical Abstract of Haryana (2014-15 and 2015-16) Agricultural Statistics at a Glance (2015) and Economic Survey of India 2013-14 on fertilizer consumption (NPK) production in India. I have collected the data from statistical abstract of Haryana while the research papers and magazine published the report from time to time. In this papers I have used for calculating the annual growth rates in consumption of fertilizers chemical and pesticides production in India. I have used the statistical tools and technique compound annual growth rate in this paper. Furthermore and productivity of fertilizer, chemical and pesticides for the period 2005-06 to 2018-19 ACGR has been used (Table A).

Table A : All–India Area Under Cultivation and Under Use of Chemical and Bio-Pesticides

Area (in thousand hectares)						
		Pesticides				
Year	Cultivation	Chemical	Bio	Both chem. and Bio	Total	Not under use of pesticides
2014-15	96628	53141	5405	9836	68382	28245
2015-16	126957	69058	6478	10180	85717	41241
2016-17	120798	71645	7267	25125	104037	28621
2017-18	132011	82189	7738	10268	100195	36052
2018-19	141555	81120	7119	10572	98812	45628
2019-20	198552	108035	14636	45213	167884	52874

Source: states/UTs/ Zonal conferences on inputs (plant protection)

RESULTS AND DISCUSSION

Fertilizers chemical and pesticides effects on the agriculture:

Chemical and Fertilizers used to increase agriculture production as well as soil fertility. After the green revolution came in the agriculture Sector chemical and fertilizer use in the agriculture sector increased due to the use of chemicals and fertilizers. Meanwhile, soil fertility decline and environmental problems arises the soil erosion as well as the water crisis's problem faced in Haryana.

Fertilizer and chemical affect on agricultural sector:

The effect of pesticide the environmental consists in the fact that while the non-target species are killed while over 98% of insecticides and 95% of herbicides kill the non-target species, These problems arise day by day in underdevelopment Countries' but the problem of

Table 1 : Production of selected major chemicals (Figures in'000MT)

Year	Alkali chemicals	Inorganic chemicals	Organic chemicals	Pesticides tech	Dyes and dyestuffs	Total major chemicals	Synthetic fibres	Polymers	Elastomers (S. Rubber)
2005-06	5475	544	1545	82	30	7676	3124	7509	96
2006-07	5269	602	1545	85	33	7534	3144	7876	105
2007-08	5443	609	1552	83	44	7731	3527	7558	172
2008-09	5442	512	1254	85	32	7325	3532	7558	172
2009-10	5602	518	1280	82	42	7524	3532	7558	242
2010-11	5981	572	1342	82	47	8024	3558	8839	285
2011-12	6113	574	1396	120	171	8374	3599	9163	308
2012-13	6487	891	1686	155	240	9459	3625	9276	351
2013-14	6481	906	1792	179	284	9643	3601	1040	411
2014-15	6625	944	1619	186	285	9660	3532	7558	172
2015-16	6802	1002	1589	188	304	9884	3558	8839	242
2016-17	7009	1053	1638	214	320	10234	3599	9163	285
2017-18	7631	1058	1799	213	367	11068	3625	9276	308
2018-19	8043	1064	1884	217	370	11578	3601	10040	351
CAGR	148.8	101.0	114.8	69.0	78.6	151.1	133.1	158.2	73.0

	Synth. swtergent intermediates	Performance plastic	Total Basic Major petrochemicals	Total Basic Major chemicals and petrochemicals
2014-15	596	1591	13448	23108
2015-16	566	1700	14905	24789
2016-17	664	1799	15510	25744
2017-18	743	1719	15670	26738
2018-19	687	1589	16269	27847
CAGR	73.0	158.2	133.1	151.1

Table 2 : Export and import- chemical and petrochemicals **(Figures in Rs. Crore)**

Years	A: Total National export which chemical	Chemicals	Petrochemicals	Total chemical and petrochemicals	Share of total chem. and petro chemicals in total national exports (%)
2005-06	456418	33462	17268	50730	11.11
2006-07	571779	39351	21801	61152	10.70
2007-08	655864	43482	22199	65681	10.01
2008-09	840755	53738	24226	77964	9.27
2009-10	845534	54948	29272	84220	9.96
2010-11 upto December	781178	51425	25908	77333	6.58
CAGR	2165.2%	1109.5%	933.5%	1229.5%	65.3%

Table 3 : All India demand of fertilizer products (Thousands Tones) 2012-13 to 2016-17

(Consumption in pesticides and chemicals)

Year	Urea	DAP	NP/NPKs	SSP	MOP
2013-14	31192	11784	10577	4682	4343
2014-15	32029	12002	10861	5091	4492
2015-16	32858	12212	11142	5513	4643
2016-17	33677	12413	11420	5948	4793
2017-18	33754	12764	11841	6476	4934
CAGR	1260.4%	866.7%	811.0%	776.5%	356.9%

Source: for direct consumption

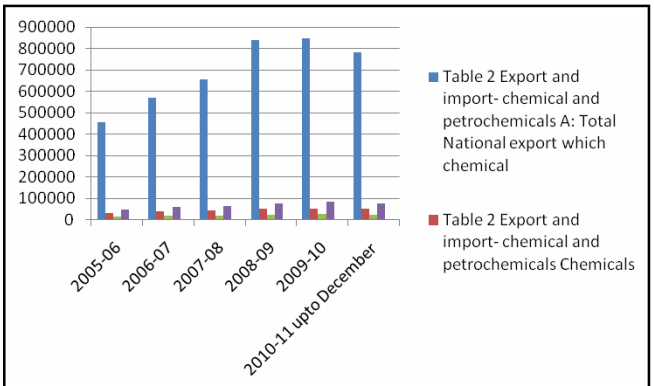
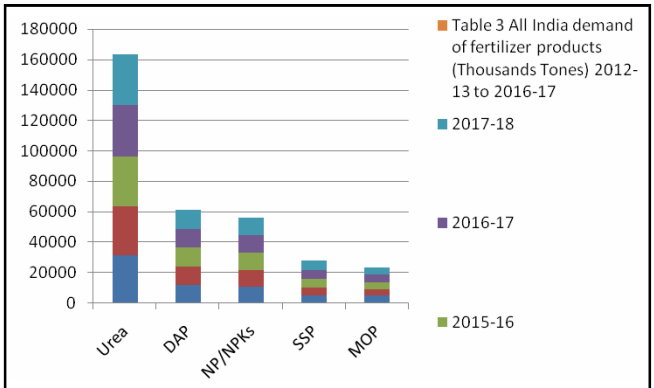


Fig. 1 : Export and import- chemical and petrochemicals



Source: for direct consumption

Fig. 2 : All India demand of fertilizer products

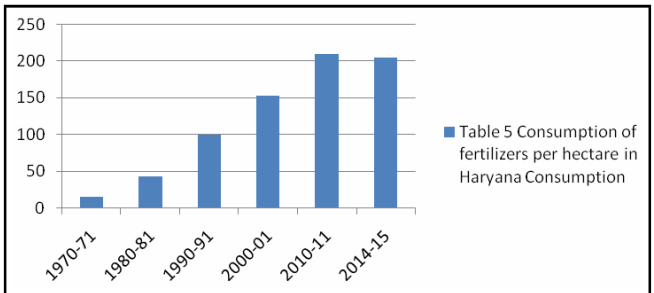
Table 4 : Production Turnover net profit and loss

Year	Production (MT)	Turnover (Rs. in crore)	Net profit/loss (Rs. Crore)
2006-07	207110	591.25	(+)17.04
2007-08	242013	666.59	(+)13.61
2008-09	245192	620.90	(-)25.27
2009-10	221249	520.71	(-)83.07
2010-11	238684	738.03	(+)25.71

Table 5 : Consumption of fertilizers per hectare in Haryana

Year	Consumption
1970-71	14
1980-81	42
1990-91	99
2000-01	152
2010-11	209
2014-15	204

Source: Economic Survey of Haryana



Source: for direct consumption

Fig. 3 : Consumption of fertilizers per hectare in Haryana consumption

agriculture's Transportation, and storage facilities in Haryana. The absence of herbicides, species, and insects because of agricultural productivity came down. Meanwhile, population increase accommodation for population the agricultural land size scramble as well as population increased pressure on land.

Effects on fertilizers and pesticides:

The environmental problem increased day by day India faced the problem of the environment, but it is alarming the problem all over the world. Because of the environmental problem negative impact on vegetable and horticulture crops to use of fertilizer and chemical in agriculture sector. Meanwhile to be up to full strength the demand of agricultural commodities to use of huge chemical in agriculture sector. Furthermore we use fertilizer and pesticide in the agricultural sector because of many health problems arises. There is some of 8.2

Table 6 : Production of selected major chemicals **(Figures in'000MT)**

Year	Alkali chemicals	Inorganic chemicals	Organic chemicals	Pesticides tech	Dyes and dyestuffs and pigments
2014-15	6625	944	1619	186	285
2015-16	6802	1002	1589	188	304
2016-17	7009	1053	1638	214	320
2017-18	7631	1058	1799	213	367
2018-19	8043	1064	1884	217	370

Year	Total major chemicals	Synthetic fibres	Polymers	Elastomers (S. Rubber)	Synth. swtergent intermediates
2014-15	9660	3532	7558	172	596
2015-16	9884	3558	8839	242	566
2016-17	10234	3599	9163	285	664
2017-18	11068	3625	9276	308	743
2018-19	11578	3601	10040	351	687
CAGR	1037.7%	565.6%	636.6%	329.4%	391.5%

Year	Performance plastics	Total Basic Major petrochemicals	Synthetic fibres	Polymers	Elastomers(S. Rubber)
2014-15	1591	13448	3532	7558	172
2015-16	1700	14905	3558	8839	242
2016-17	1799	15510	3599	9163	285
2017-18	1719	15670	3625	9276	308
2018-19	1589	16269	3601	10040	351
CAGR	1158.9%	832.8%	1109.1%	371.6%	490.5

Table 7 : Production of selected major chemicals **(Figures in'000MT)**

			Production			
Year	Alkali chemicals	Inorganic chemicals	Organic chemicals	Pesticides tech	Dyes and dyestuffs and pigments	Total major chemicals
2014-15	6625	944	1619	186	285	9660
2015-16	6802	1002	1589	188	304	9884
2016-17	7009	1053	1638	214	320	10234
2017-18	7631	1058	1799	213	367	11068
2018-19	8043	1064	1884	217	370	11578
	Synthetic fibres	Polymers	Elastomers (S. Rubber)			
2014-15	3532	7558	172			
2015-16	3558	8839	242			
2016-17	3599	9163	285			
2017-18	3625	9276	308			
2018-19	3601	10040	351			

million out of the 12.6 million deaths caused by the environmental problem in the world. Because of the environmental problem, there is a rise in many diseases stock, heart disease, unintentional, injuries, cancers and chronic respiratory infections, lung cancer, etc.

The agricultural effect on the environment included a variety of elements from the soil to water, air, people, and animal diversity and plants. Further Climate change, deforestation, irrigation system, soil degradation, waste are environmental problems in agriculture. Global warming, temperature, precipitation, glacial runoff are also included. Deforestation is the cutting of forest for the use of land for other purposes. According to British environment Norman Myers, the cutting of forest is 5% due to cattle ranching, 19% due to over-heavy logging, 22% due to the growing sector, and 54% for farms.

Deforestation also causes climate change. Trees act as a carbon sink as they absorbed carbon dioxide and unwanted greenhouse gasses out of the atmosphere and by clearing trees carbon dioxide releases into the environment. Furthermore, the disadvantage of deforestation is that soil fertility decreased as cutting down trees water problems increased. A disease carried by animals and can transfer to humans is called zoon tic disease. The runoff from animal farms through seeping or precipitation runoff mixed groundwater and causes disease in humans and the addition of heavy metals in groundwater causes water pollution (Source:www. alliedacademies.org/articles/health-effects-of-agricultural-pesticides.html)

Consumption of fertilizers:

The use of fertilizers consumption along within the agriculture sector increases. Agricultural production increased from 83 million tons in the 1960s to 252 million tons in 2014-15. The use of chemical fertilizers such as those containing nitrogen, phosphorus, and potassium increased from one million tons to 25.6 million tons in the same period.

Availability of fertilizers:

Furthermore consumption of chemical fertilizers in the country has increased from 17.4 million tons in 2001-02 to 25.5 million tons in 2012-13; domestic availability has only increased from 14.5 million tons to 16.1 million tons. This is also indicates that there has been an increase in the import of fertilizers.

Excessive in the use of fertilizers:

Excessive use of fertilizers because of the negative effect on production time to time productivity decline huge use in agricultural sector. The Committee estimated that currently, 292 out of the 525 districts (56%) in the country account for 85% of its fertilizer use. In addition, the ratio of consumption of fertilizer has been skewed towards nitrogen. The ratio of usage of nitrogen, phosphorus, and potassium fertilizers is 6.7:2.4:1, as compared to the recommended usage ratio of 4:2:1. The Committee recommended that a strategy should be initiated to promote the balanced use of fertilizers agricultural sector.

Over- use of pesticides:

Due to the gain of high production we use of excessive pesticides agricultural sector. The Committee submitted the report consumption of chemical pesticides in the country increased from 55,540 tons in 2010-11 to 57,353 tons in 2014-15, Furthermore imports increased from 53,996 tons to 77,376 tons in the same period. The Committee noted that excessive use of pesticides may have a deteriorating effect on the health of both human's beings and animals.

Promoted bio-fertilizers and organic farming:

The Committee noted that there is a need to increase the use of bio-fertilizers and move towards organic farming. It recommended that a Policy should be put in place to incentivize the use of bio-fertilizers. Farmers should be provided with financial and technical support to enable them to switch to organic farming on a large scale.

Fertilizer consumption in Haryana:

Fertilizer consumption in Haryana 11th position in India; Further the total consumption in Haryana 1347.4 thousand tones of fertilizers in 2015-16. Out of total fertilizer consumption, 77 percent is nitrogenous fertilizers, 21.5 percent in phosphoric fertilizer while potassium 1.5 percent in Haryana: Regulating authorities for fertilizers: The Committee observed that the present system of certifying new fertilizers is time-consuming. It recommended that a Fertilizer Development and Regulating Authority should be established to streamline the process of certification, quality checks, innovations, and fixing prices of fertilizers.

Conclusion:

The environmental problem is increasing day by day while the environmental problem effect in our' health as well as natural resources. As the population increased in 1968 to 1985 the environmental problem increased as well as the food problem crisis. Further, the agricultural sector to use in pesticide and fertilizer to be increased in production. India used the pesticide in 1985 in the agriculture sector. While the use fertilizer and pesticide in agriculture sector human being contained in many diseases. Because of the extensive benefits which man accrues from pesticides, these chemicals provide the best opportunity to those who juggle with the risk-benefit equations. The economic impact of pesticides in non-target species (including humans) has been estimated at approximately $8 billion annually in developing countries. What is required is to weigh all the risks against the

benefits to ensure a maximum margin of safety. The total cost-benefit picture from pesticide use differs appreciably between developed and developing countries. For developing countries, it is imperative to use pesticides, as no one would prefer famine and communicable diseases like malaria. It may thus be expedient to accept a reasonable degree of risk. Our approach to the use of pesticides should be pragmatic. In other words, all activities concerning pesticides should be based on scientific judgment and not on commercial considerations. There are some inherent difficulties in fully evaluating the risks to human health due to pesticides. For example, there is a large number of human variables such as age, sex, race, socio-economic status, diet, state of health, etc. – all of which affect human exposure to pesticides. But practically little is known about the effects of these variables. The long-term effects of low-level exposure to one pesticide are greatly influenced by concomitant exposure to other pesticides as well as to pollutants present in air, water, food, and drugs. Pesticides are often considered a quick, easy, and inexpensive solution for controlling weeds and insect pests in urban landscapes. However, pesticide use comes at a significant cost. Pesticides have contaminated almost every part of our environment. Pesticide residues are found in soil and air, and in surface and groundwater across the countries, and urban pesticide uses contribute to the problem. Pesticide contamination poses significant risks to the environment and non-target organisms ranging from beneficial soil microorganisms to insects, plants, fish, and birds. Contrary to common misconceptions, even herbicides can cause harm to the environment. In fact, weed killers can be especially problematic because they are used in relatively large volumes. The best way to reduce pesticide contamination (and the harm it causes) in our environment is for all of us to do our part to use safer, non-chemical pest control (including weed control) methods. The exercise of analyzing the range and nature of benefits arising from pesticide use has been a mixture of delving, dreaming, and distillation. There have been blind alleys, but also positive surprises. The general picture is as we suspected: their rise publicity is, ideological kudos, and scientific opportunity associated with 'knocking' pesticides while praising them brings accusations of vested interests. At the national level, the benefits are principally economic, with some social benefits and one or two issues of environmental benefits. It is only at a global level that the environmental benefits really come into play. There is a need to convey the message that prevention of adverse health effects and promotion of health are profitable investments for employers and employees as a support to a sustainable development of economics. To sum up, based on our limited knowledge of direct and/or inferential information, the domain of pesticides illustrates a certain ambiguity in situations in which people are undergoing life-long exposure. There is thus every reason to develop health education packages based on knowledge, aptitude and practices and to disseminate them within the community in order to minimize human exposure to pesticides in the agriculture sector.

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