

IMPACT OF AGRICULTURAL DEVELOPMENT ON LONG TERM SUSTAINABILITY OF RESOURCES IN HARYANA

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ABSTRACT:-Agriculture is an important phenomena occurring on land. For increasing food production, emphasis was laid on increasing land productivity and thus various fertilizers, pesticides and insecticides were added to land. The green revolution has also created the problem of environment degradation in this state. For this, researcher gathered the information in perspective issues of agricultural development and depletion of land, soil and water resources, soil degradation and water contamination, reasons for this degradation and depletion and its impact on environment and human beings. To examine the impact of present cropping pattern on agricultural productivity, soil fertility, water resources and health of well-being in Haryana. The study has been based on primary data. Primary sources have been used to acquire the necessary information from respondents by survey method. The finding of the study indicates that majority of respondents in all three selected districts are not much aware about the hazards caused by the fertilizers and pesticides. For higher production the farmers use the heavy amount of chemicals resulting increase in production but decrease in soil and water health, which create the problems of land, water and soil degradation in farm agriculture. There is need of a second green revolution to maintain the productivity and environment which should be more sustainable as well as inclusive.

Key Words- Agriculture, Sustainability, Environment, Chemical Fertilisers

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INTRODUCTION: Sustainability is evaluated in terms of its impact on selected parameters of environment and trend in long term productivity growth in agriculture. Agriculture is an important phenomena occurring on land. Human survival is based on good environment as well as on agriculture as it provides food and livelihood to a major portion of population (Chalotra, 2013). After introduction of Green Revolution and modern technology e.g agro-chemicals, farm practices have undergone revolutionary changes leading to incredible possibility that hunger can be vanished from earth. The increase in food production was dramatic enough to be heralded as the ‘Green Revolution’ (Hayami and Ruttan, 1985) and the technology facilitating its widespread adoption is coined as the ‘Green Revolution Technologies’. But the movement is widely criticized because it failed to place enough emphasis on the sustainability of increased productivity, the environment, and on human health and wellbeing. These agricultural activities had a definite impact upon the surrounding environment. Impacts that have been noticed include water, soil, and air pollution. In turn, indirect impacts upon animal and even human life have been observed. For increasing food production, emphasis was laid on increasing land productivity and thus various fertilizers, pesticides and insecticides were added to land. Though they gave good results as the production had increased greatly, yet their continuous and excessive use has declined soil fertility. the green revolution has also created the problem of environment degradation in this state. For this, researcher gathered the information in perspective issues of agricultural development and depletion of land, soil and water resources, soil degradation and water contamination, reasons for this degradation and depletion and its impact on environment and human beings. To analysis the impact of agricultural development on environment various points are covered which are as below:

- Farmer’s Responses on Agricultural Development and its Impact on Productivity and Environment
- Farmer’s Responses on Impact of Chemical i.e Fertilizers and Pesticides on Human Health

OBJECTIVE OF THE STUDY: To examine the impact of present cropping pattern on agricultural productivity, soil fertility, water resources and health of well-being in Haryana.

RESEARCH METHODOLOGY: The study has been based on primary data. Primary sources have been used to acquire the necessary information from respondents by survey method. The primary data of the study has collected from farmer’s survey method. In order to find out the empirical result, field survey has been carried out. Sample for the primary

survey has been drawn by adopting multistage sampling procedure for selecting districts, blocks, villages and sample farmers. From each agro-ecological zone of Haryana three districts will be selected at purposively. In the final stage complete list of the cultivating households has been prepared for the selected sample village. The major analysis of the study is based on primary data collected through personal interview method from the sample cultivating farmers.. Therefore, the subjects under the present study hail from the villages of the districts Karnal, Sirsa and Bhiwani from the state of Haryana. Keeping in view the limitations of time and financial resources, a sample of 400 farmers from the three selected districts of Haryana were drawn on the basis of proportionate sampling. The data has been tabulated, analyzed and interpreted with the help of some necessary and statistical tools simple percentage.

IMPACT OF (LAND, WATER AND AGRO-CHEMICALS) RESOURCES ON LONG TERM AGRICULTURAL SUSTAINABILITY IN HARYANA:-

The Green Revolution is associated with introduction of input-responsive varieties that results a drastic increase in the use of fertilizer, expansion in irrigation, higher cropping intensity and increased use of pesticides. But in Haryana monotonous (mono crop) cropping systems of rice-wheat was adopted by the farmers to increase the large income benefits. But on the other hand, monoculture cropping pattern increase the over-exploitation of natural resources poses serious threats to the sustainability (Jha.B, Kumar.N and Mohanty.B,2009). In this era of change, several second generation problems particularly depletion of soil and water resources has cropped-up. The problems like low organic carbon in soils, deficiency of various major and micro-nutrients, declining water table in rice-wheat cropping areas, decreasing availability of good quality water for irrigation, disposal of raw sewer water into agricultural fields, climate change and pests & diseases are posing serious challenge in agriculture. It is necessary to take some steps to reduce the misuse of natural resources and maintained the agricultural sustainability through protect the environment.

FARMER'S RESPONSES ON AGRICULTURAL DEVELOPMENT AND ITS IMPACT ON PRODUCTIVITY AND ENVIRONMENT:-

Green revolution, which was ushered in 1966, has considerably changed the scenario of Indian agriculture involving the use of HYVS, chemicals inputs and irrigations facilities. Green revolution increased the productivity of agriculture output and achieve self-sufficient in food production and had

helped the farmers to increase cultivated area, net sown area, area sown more than once, changes in cropping pattern etc. Impressive growth in productivity and output of food grain crops shows farmers only adopted the monoculture cropping pattern. This monocultures crops pattern has increases the productivity of rice wheat crops but also created the environmental imbalance because the only two staple crops are plough in the field which requires the lot of fertilizer and irrigation facilities. Monoculture can lead to wide spread of diseases and affects the soil fertility since the continuous depletion one a particular nutrients from the soil without change. Continuous mono cropping has also led to reduction in the rate of yield growth and created the problems of land degradation, salinization, sodification, and ground water depletion, loss of soil fertility. The widespread use of pesticides and other agro-chemicals has lead to severe environmental degradation and endangered public health. The worldwide use of chemicals fertilizers has degraded the soil which results to loss of humus; the soil becomes cracked sand the water retaining capacity decreases. Thus to sustains the productivity of different crops with rational use of natural resources increase the productivity and to protect the environment Intercropping/mixed cropping and inclusion of legumes in different cropping system improve the soil fertility maintain the environment conditions. There is need of a second green revolution to maintain the productivity and environment which should be more sustainable as well as inclusive. The following table shows farmer's responses on agricultural development and its impact on productivity and environment in villages of Haryana.

Table 6.1
Farmer's Responses on Agricultural Development and its Impact on Productivity and Environment in sample villages of Haryana

State/ Districts	Karnal				Sirsa				Bhiwani				Total	
	Nilokheri		Assandh		Nathusari Chopta		Baragudha		Tosham		Bwani Khera			
Blocks/ Villages	Pakhana		Ranrutti Khera		Rupana		Bhurj Bhangu		Miran		Talu			
Responses	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age
Yes	10	83.33	9	69.2	32	80	28	80	97	80.8	159	88.3	335	83.8
No	2	16.67	4	30.8	8	20	7	20	23	19.2	21	11.7	65	16.3
Total	12	100	13	100	40	100	35	100	120	100	180	100	400	100
If yes, specify														
Responses	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age
Loss of soil fertility	4	40	3	33.3	13	40.6	2	7.1	22	22.7	35	22.0	79	23.6
Loss of water table	0	0	0	0	1	3.125	1	3.6	3	3.09	7	4.4	12	3.58
Decline in productivity	2	20	2	22.2	7	21.9	4	14.3	17	17.5	41	25.8	73	21.8
Loss of biodiversity	0	0	1	11.1	2	6.25	3	10.7	14	14.4	8	5.0	28	8.36
All the above	4	40	3	33.3	9	28.1	18	64.3	41	42.3	68	42.8	143	42.7
Total	10	100	9	100	32	100	28	100	97	100	159	100	335	100

Source: Field Survey

The table shows that majority of respondents agreed that use of chemical causes hazard to environment. The finding of the study indicates that majority of respondents in all three selected districts are not much aware about the hazards caused by the fertilizers and pesticides. After Green Revolution the use of chemical in farming in state has increase manifolds. For higher production the farmers use the heavy amount of chemicals resulting increase in production but decrease in soil and water health, which create the problems of land, water and soil degradation in farm agriculture.

6.2-FARMER'S RESPONSES ON IMPACT OF CHEMICAL I.E FERTILISERS AND PESTICIDES ON HUMAN HEALTH:-

Agro-chemicals have played a significant role in producing more and better quality food to raise agricultural production, to control pests, diseases, weeds, and other plant pathogens, to eliminate yield losses and maintain high quality product. The use of chemicals has increased to a large extent in recent years and reason behind it is very clear i.e. balancing demand and supply of food. A significant portion of applied agrochemicals may be lost to the surrounding environment, where they can adversely affect human and environmental health (Chatla,S, 2011). Researchers have shown that agro-chemical residues are continuously persisting and accumulating in human, animal body and environment causing harmful diseases. Some agro-chemicals are highly toxic to human, only a few drops in the mouth or on the skin can cause extremely harmful effects. Other pesticides are less toxic but too much exposure to them also will cause harmful effects (Ranjana,2012). In Haryana fertilizers and pesticides are used on large scale. After introduction of green revolution there is drastically increase in the use of fertilizers and pesticides. This help the farmers to increase their production on a huge level but on the other hand it put negative effect on human health. A number of diseases are causes by the fertilizers and pesticides. The result revealed some common diseases found in the study area were gastroenteritis, diarrhoea, vomiting, kidney, skin problems cancer, diabetes, heart attacks, hyper tension and infertility etc. The following table explain the farmer's responses on impact of chemical i.e fertilisers and pesticides on human health on sample village of Haryana.

Table 6.2**Farmer's Responses on Impact of Chemical i.e Fertilizers and Pesticides on Human Health in Sample Villages of Haryana**

Blocks/ Villages	Nilokheri		Assandh		Nathusari Chopta		Baragudha		Tosham		Bwani Khera		Total	
	Pakhana		Ranrutti Khera		Rupana		Bhurj Bhangu		Miran		Talu			
Responses	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age
Yes	9	75	8	61.5	27	67.5	20	57.1	89	74.2	112	62.22	265	66.3
No	3	25	5	38.5	13	32.5	15	42.9	31	25.8	68	37.78	135	33.8
Total	12	100	13	100	40	100	35	100	120	100	180	100	400	100
If yes, specify														
Responses	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age
Respiratory Problem	2	22.2	0	0	2	7.4	3	15	11	12	14	13	32	12.1
Skin Problem	3	33.3	0	0	5	18.5	4	20	20	22	28	25	60	22.6
Eye irritation	2	22.2	3	38	5	18.5	2	10	14	16	18	16	44	16.6
Nausea	0	0.0	0	0	1	3.7	0	0	3	3	2	2	6	2.3
Giddiness	1	11.1	1	13	3	11.1	3	15	8	9	9	8	25	9.4
Vomiting/ dehydration	0	0.0	2	25	2	7.4	4	20	14	16	18	16	40	15.1
Cancer	1	11.1	0	0	2	7.4	1	5	0	0	0	0	4	1.5
Burning sensation	0	0.0	2	25	4	14.8	2	10	12	13	15	13	35	13.2
Diarrhea	0	0.0	0	0	3	11.1	1	5	7	8	8	7	19	7.2
Total	9	100	8	100	27	100	20	100	89	100	112	100	265	100

Source: Field Survey

The table shows that In aggregate 22.6 percent respondent face the problem of skin and 16.6 percent face eye problem. Some farmers reported Cancer also. But they were sure that fertilizers and pesticides are the reason for Cancer. This it is clear from the table that huge amount of fertilizers and pesticides, huge the risk to human health. So we should minimise the use of fertilizers and pesticides and adopt Bio- pesticides to avoid these problems.

AGRONOMIC PROBLEM IN AGRICULTURE:-

The adoption of new agrarian technology has resulted in a number of agronomic problems. These are soil salinity, alkalinity and water logging. Irrigation and fertilizers are critical components of the Green Revolution that maintained relatively consistent food production to meet the ever growing demands for food. Water logging and salinization are major impediment to the sustainability of irrigated lands and livelihoods of the farmers, especially the smallholders, in the affected areas in some of the basins in the country. These problems are the result of a multitude of factors, including seepage from unlined earthen canals system, inadequate provision of surface and subsurface drainage, poor water management practices, insufficient water supplies and use of poor quality groundwater for irrigation. The dominant cropping pattern of wheat and paddy rotation has led to a manifold increase in irrigation water demand. It is believed that the water table in the state is falling by up to one metre per year (Singh, 2004). While groundwater is declining at an alarming rate in fresh water regions, in Haryana are facing problems of severe water logging and salinization. The state can in fact be characterized by two distinct topographical and hydro-geological settings: high yielding fresh groundwater regions in northern and central districts and the saline groundwater regions in south western districts. Groundwater depletion on one side and water logging on the other, are perhaps two sides of the same coin; however, these two extreme scenarios in close proximity to one another are probably a unique case of extreme ecosystem vulnerabilities that require intensive, extensive and sustained solutions. It is important to note that the problem of waterlogging and salinization is observed across other states of India, too (Mohan, M, 2000).

FARMER'S RESPONSES ON WATER-LOGGING IN SAMPLE VILLAGE OF HARYANA - Water logging causes depletion of oxygen and increase of carbon dioxide in the root zone of crops which causes loss of plant nutrients and the loss of useful microorganisms at the expense of the growth of harmful ones. It also causes chemical degradation due to accumulation of salts at the soil surface leading to an ecological

imbalance. It invariably becomes difficult to carry out agricultural activities in the areas affected by water logging. All these factors result in reduced or near zero productivity. The Working Group of Ministry of Water Resources on “Water logging, Soil Salinity and Alkalinity (1991)” prescribed the norms for defining waterlogged, saline and alkaline areas. According to these norms, an area is said to be water logged (due to rise in water table) if the water table lies within 2 meters of land surface. An area is said to be potentially water logged if water table is between 2 and 3 meters of land surface (Report Of The High Level Expert Group On Water Logging In Punjab’ 2013). There is great cause for alarm of how the finer dynamics of canal seepage, water logging, soil salinity and groundwater dynamics is playing out at a local level – say at the village or panchayat level. In the absence of sufficient local level information on groundwater levels and the time-slot over which this rapid appraisal was undertaken, a quick representative monitoring of salinity – in canal water, so-called natural ponds, tube wells, soil-water and artificial drainage systems. Thus the sustainability of irrigated agriculture depends on better management of irrigated lands. In order to delve on issues relating to sustainable management of irrigated agriculture and getting an increased understanding of water logging and soil salinity mechanisms. In Karnal district this problem declined time to time due to Rice Wheat cropping pattern because both these crops are highly intensive for water. Now there is arising the problem of groundwater depletion in agriculture. Sirsa district major contributor of cotton and wheat, but now the farmers grow Rice also. The depth of water table is 3-5 meter. Due to water logged area the farmers are suffered because the farmers does not grow any crop in their farms. Nearly 83 percent farmers reported that their land is badly suffered from water logging. In Sirsa district only 28.6 percent respondent reported the problem of water logging where as 40 percent of respondents who have large land holding suffering from the water logged problem because the area of Gagger River. In Bhiwani districts very few respondents said that water logging exists in their lands .Small land holders are not much affected by water logging. In Bhiwani district 40.74% respondents among large land holdings stated that a small part of farms are affected by the water logging problem. The main cause of water logging is changes in cropping pattern have led to water-logging problem because the excessive use of canal irrigation in area where sub-soil water is brackish and unfit for irrigational purposes. The aquifers of sub-soil water table have risen in the study region where sandy soils are predominant and wheat-cotton and wheat-rice-cotton dominant cropping pattern has emerged owing to the cultivation of these crops which require frequent watering because of the use of agro-chemicals and HYVs. The each watering added to percolation water to sub-surface and resulted into rise in water table which ultimately leads

to water-logging. Water-logging has taken place in areas along particularly canals due to seepages. Rivers have also added to problem of water-logging. Recently Government of India has given special grant dealing with the drain out of water-logged areas. All this is largely the result of high crop diversification to low crop diversification as well as the changing cropping pattern of Haryana.

FARMER'S RESPONSES ON SOIL SALINITY:- Soil salinity has become a serious phenomenon in modern agricultural landscapes, resulting in declining of crop yield and soil fertility. Hundreds of hectares of land in Punjab, Haryana, Western Uttar Pradesh and other places are recorded and made useless for cultivation. Soils salinisation is an important determinant of environmental degradation in India. It occurs mainly due to two factors viz. physical and chemical. The physical factors affect the fertility of the top soil through wind and water, whereas the chemical factors affects the nutrients of the soil due to deforestation, poor cultivation practices and intensive/repeated irrigation, excess chemical fertilizers, pesticides. Consequently, these have changed the physical and chemical properties of soil and led deterioration. Agricultural productivity is considered as a good measure and indicator of optimum use or misuse of land. The nature of cropping pattern indicates the status of farming in areas. The dominance of cash crop, commercialization of crops etc. are usually associated with intensification and excessive inputs application and indicates utilization of the land.

(Agarwal R. R., Yadav J. S. P. and Gupta R. N, 1979). The application of modern inputs increase land use intensity and the quest for more and more production, which leads to excessive use of inputs. Moreover, intensive cultivation, excessive input consumption, continuous mono-cropping without crop rotation, dominance of single cash crop etc. have led to disturb the physical and chemical composition and properties of soils, exposing them to the hazards of land degradation. In addition, human intrusion through overgrazing, deforestation and cultivation among the steep slopes have given rise to erosion of soil cover and further aggravated the magnitude of land degradation. Soil salinity is a phenomena caused by the deposition of excess mineral salts in the soil from the water. Soil salinity develops due to continuous use of brackish ground water irrigation. The evolution of alkaline soil from the saline soils is a continuous process. The salt of the saline soils dissolve during rains or by irrigation water. The table 6.4 reveals that, on an average, the soil salinity problem was found in few land area of Karnal where as the sample villages of Sirsa, was found that 80 percent of the area was affected from agronomic problems. In aggregate the 31.6 percent of (8 < 12), 37.7 percent of < 12 land is affected by soil salinity. Increase in agricultural production, improvement in yield largely depends on availability of agricultural inputs. Agricultural

inputs include use of HYV seeds, manures, chemical fertilizers, pesticides, micronutrients, irrigation etc. But the main cause of soil salinity is Overdose of irrigation and fertilizer due to spreading methods of fertilizers application led to salinity problems. It leads to excess use of chemical fertilisers for various crops. After salinity problem farmers used excess fertiliser because productivity of land reduced by salinity. Hence, they used more chemical fertilisers for more production.

SOIL ALKALINITY:- The soil becomes an alkaline soil, as it contains both soluble salts and exchangeable sodium. This type of chemical reaction also takes place in soils in which the salts rise from ground-water irrigation. In this process, large tracts of arable land are rendered un-cultivable because of alkalinity. The saline and alkaline soils owe their distinctive character to the fact that they contain excessive concentrations of either soluble salts or exchangeable sodium or both (USSLS, 1954) (Kumar,K, 2005). The 'alkali soil' is defined in term of productivity as influenced by exchangeable sodium. The alkalinity of water is a measure of how much acid it can neutralize. If any changes are made to the water that could raise or lower the pH value, alkalinity acts as a buffer, protecting the water and its life forms from sudden shifts in Ph (Shrivastava, P & Kumar, R, 2015). The soil alkalinity problem was found in some land area of Karnal district. But Payanchyat of Pakhana Village do regular soil testing. The report of Central soil salinity Research Institute, Karnal shows that the PH value of water is high, that create the problem of alkalinity. Whereas in Sirsa district among the sample villages, the land degradation by such agronomic problems were found in Rupana village which lies the magnitude of soil alkalinity 22.22 percent. The result of the study reveals the fact that among different sizes of land holding the large holding groups are badly affected by the soil alkalinity problem. In Bhiwani District the village Miran is affected from the soil alkalinity problem. Increase in agricultural production and improvement in yield largely depends on availability of agricultural inputs. Agricultural inputs include use of HYV seeds, manures, chemical fertilizers, pesticides, micronutrients, irrigation etc. But the main cause of soil alkalinity is overdose of irrigation and fertilizer in monoculture cropping pattern. It leads to excess use of chemical fertilisers for various crops and reduces productivity of land in agriculture.

The conclusion of present study revealed that after introduction of Green Revolution and modern technology e.g agro-chemicals, farm practices have undergone revolutionary changes. But the movement is widely criticized because it failed to place enough emphasis on the sustainability of increased productivity, the environment, and on human health and wellbeing. These agricultural activities had a definite impact upon the surrounding

environment. Impacts that have been noticed include water, soil, and air pollution. In turn, indirect impacts upon animal and even human life have been observed. These impacts have resulted in a reduction of environmental quality. The farmers exploited the resources for higher production which threatened the water and land resources and leave their impact on human and environment. After the Green Revolution the problem of degradation of land started to expand because of excessive pressure on land resources followed by HYVs and irrigation facilities. But the production of only two crops rice and wheat create the imbalance in environment. Another cause of land degradation is the process of industrialisation and urbanisation, which fastly declining biological productivity of land resources. Hence there is a need of a serious reassessment of production system constraints and technological options to chalk out strategic entry points for new conservation agriculture practices. Fertilizers and pesticides play a vital role as most important ingredient for intensive agricultural system and increasing the agricultural production. But the excessive use of these inputs has been causing serious threat to the environment. Imbalance fertilizers use not only affects the growth of agricultural production but also. It has been observed that heavy use of chemical fertilizers and pesticides has left their negative impact on soil fertility, human health, biodiversity and environment, this affected the agricultural sustainability. There is need of a second green revolution to maintain the productivity and environment which should be more sustainable as well as inclusive.

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