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Understanding the Impact of Environmental Degradation on Agriculture and Farmer's Suicide: (A Study of State of Punjab)

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ABSTRACT
Agriculture is one such field of existence which has been ardently affected by environmental changes. Environmental degradation has done havoc to agrarian regions and communities as well. Farms and farming largely depend on the nature and its seasons; any change in the environmental fabrics and rubrics of a region has compulsive influence on the agricultural performance and income too. The present paper deals with the impact of environmental degradation on agriculture and farmers in details. The study has been undertaken in the state of Punjab, India. The work is based on primary as well secondary sources of data and information. The study is an inter-disciplinary work focusing more on sociological aspects of the themes and sub themes. The research Design of the present research work is diagnostic and explanatory or Descriptive as well. The discussions planned and organized with the respondents and other officials from the state has emphasized to know and understand the impacts of environmental degradation on the farmers and their life; and also to understand how significantly people understand the link between the two issues challenging the state, i.e. farmers' suicide and environmental degradation. The findings of the paper state that there is a need to focus more on mental health of the farmers to avert back the hitting sword of farmers' suicide and farmers' distress. There is need that the governance focuses on research on improving and maintaining mental health of the farmers so that they are prepared for better and sustainable management of the losses occurring to them and their agrarian income due to environmental degradation. And there is also a need to invest administrative efforts in the state so that the farmers and other communities in the state can be made more sensitive and sensible in terms of environmental protection.
Key Words: *Environmental degradation; Farmers' suicide; climatic change; Commercial Cropping; Scanty rainfall; Agricultural production; Soil fertility; Fertilizers*

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INTRODUCTION

At present, the degradation and the loss of agricultural production are also been attributed to environmental degradation. The Social Development Report [8] states that there is an environmental dimension to agrarian crisis; and main causes are water pollution, overexploitation and soil degradation. The soil fertility is affected with excess use of fertilizers further resulting into decline in soil nutrients and contamination of the underground water to be consumed. The use of this water also contaminates the crops grown with it [4]. According to Srivastava and Kothari, the degradation also extends to marine regions, where in over extraction of the marine resources like overfishing and territorial waters upsets the salinity balance in the coastal regions. All this results "into damage to the farmlands and farmers on the coast; wage loss to farmers; fall in price production and also losses in fishing income". According to the 59th round of NSSO (2005) 'the overall level of indebtedness on farming households was 48.6 percent, but 57.8 percent among medium and large farmers and 50.8 percent among small farmers. In case of sub-marginal, marginal and small farmers, the largest component of outstanding loans was for meeting consumption needs (61 percent, 43 percent and 39 percent respectively)'. Kewlani [3] while giving the findings of her study undertaken in Kandi area of Punjab also sated similar facts. According to the people of Kandi area, earlier the crop production used to cater both the purposes, like commercial as well as household consumption purpose. But due to environmental degradation and changing climatic conditions and temperatures in the area, the crop productivity has reduced to such an extent that some households even cannot fulfill their household consumption needs. Al these circumstances put the farmers in debt trap leading to creating immense mental stress. Not finding any workable solution and not finding hope of improvements in the near times to come they get prone to ending their lives. A study was undertaken under the aegis of the Space and Atmospheric Sciences Division of the department of Space's Ahmedabad based on Physical

Research Laboratory (PRL). The study was conducted by fourteen (14) scientists from various prestigious institutions of research of India and was said to be of its own kind. It is said that 'it was for the time that data from seventeen (17) sites across India has been used for better understanding of the effect of ozone levels and its seasonal variation on crop yields in order to reduce uncertainty in estimations'. The report indicated heavy loss of staple crop in India due to increasing presence of 'surface ozone'; which is mainly produced by photochemical reactions of air pollutants which are usually rather mainly emitted due to human activities like biomass burning, fossil fuel combustion, industrial emissions and the like. Further, it adds that the loss of wheat could be up to 15 %; loss of rice could be upto 6.7 % across the country. As a matter of serious concern, the crop loss in Punjab and Haryana was measured higher than other sites from other states of India. Sharma [15] in an article entitled, "Climate Change can sow agri distress", and the author invokes a serious concern. The author of the story writes that the Economic Survey along with employment and education advocates strongly for 'dramatic' improvements in irrigation, new technologies and replacing untargeted subsidies for sustaining the agricultural sector. According to the Survey, the farm incomes may dip by 15-25 percent due to climate change. The report's findings are serious challenge to the present central government's aim to double the farmers' income by 2022. Shortage of water and land, deterioration in soil quality, and of course climate change-induced temperature increases and rainfall variability, are all going to impact agriculture'. The scene is not much different from that of Punjab's agricultural situation.

Vibha Sharma also states firmly that 'agriculture is a state subject' making the state governments more responsible towards their constitutional obligation. Sharma [5] in her another piece on environmental information states that 'the dry spells and the rising temperatures may adversely impact the rabi crop. She adds that is the Western Disturbances (WDs) persist in same pattern (as in case of Punjab, Rajasthan and Delhi) 'winters could go down among the driest seasons ever'. Punjab's critical situation related to environmental impact is largely realised and made public too. The Economic Survey of Punjab 2016-2017 published that the signs of serious slowdown are shown by the agricultural sector in Punjab. The survey also listed 'environmental problems' as one of the biggest challenges to be combated and resolved by the government of Punjab. To save agriculture from further deterioration, there is an urgent need to work on better management practices focusing on depleting water table and soil degradation. As per survey conducted by PAU, Ludhiana about five thousand farmers and farm labours committed suicide in Punjab during the last ten years. It is mainly due to debt in farmers due to falling real farm income and crop failures. There is a dire need to increase profitability of agriculture which shall act like a strong deterrence against farmers' suicide in the region.

The Economic Survey 2017-2018 (Volume-1) states, 'agriculture matters a lot because it still accounts for a substantial part of GDP (16 per cent) and employment (49 percent). The International Labor Organization (ILO) also estimates the agricultural share of employment at 44.3 percent. The Economic survey adds that a prosperous agriculture and rising productivity in agriculture facilitate good urbanization and also rising productivity in other sectors of economy. Hence, crop loss and decline in agricultural productivity cannot be and ought not to be taken with ease. The survey states, "Extreme temperature shocks reduce farmers' incomes by 4.3 percent and 4.1 percent during Kharif and Rabi respectively, whereas extreme rainfall shock reduces incomes by 13.7 percent and 5.5 percent". Climate change, temperature variations and agricultural productivity have a strong connectivity as proved by many scientists. Swaminathan et al. [12] says that wheat production reduces by 4 to 5 percent with 1 degree Celsius increase in temperature. The findings have been endorsed by the study done by IMF (2017) which states that an increase in temperature with 1 degree Celsius would reduce agricultural growth by 1.7 percent and a 10 millimeters reduction in rain would reduce growth by 0.35 percent. This makes it clear that the losses being faced by the agricultural economies and the farmers are largely attributed to the environmental variations which took place in the recent years in the nation. Being dominantly an agrarian state, Punjab is at big risk and needs to focus more on suitable solutions to the issue/s, since farmers' income losses reflect degradation of the nation's economy also. Greater priority in resource allocation is needed including water management, technologies of drip irrigation etc.[15].

The World Bank Disaster Management and Climate Change Unit prepared a report entitled "India-Diagnostic Assessment of Select Environmental Challenges". This report was referred to by the Minister of State for Health and Family Welfare Anupriya Patel while she gave a written statement to the parliament. The report says that the 'total damage that has occurred due to environmental degradation amount to 3.75 trillion, which is equivalent to around 5.7 percent of the India's GDP'. In addition, serious health consequences resulting due to presence of the particulate matter costs 3 per cent of the India's GDP, according to the Health Ministry statement given in Lok Sabha [1-3].

'Nature is the nurturer' has never been denied and can never even be denied. Nature is a catalyst for physical, economic and psychological wellbeing of mankind. This has been rightly theorized by Karl Marx

while he observed, "The worker can create nothing without nature, without the sensuous external world. It is the material on which his labour is manifested, in which it is active, from which and by means of which it produces [6]. Malthus Environmental Determination has a great relevance in discussion at this point of time. According to Malthus human population has increased to unprecedented levels despite environmental limits. Population needs food to exist. Technological advancements have severely facilitated society to increases production of food; but access to food not only depends on the systems of entitlement but also upon the environmental availability of food. Some resources seem hard to substitute with something else, even with height of technologies [2]. All this has affected the life of farmers to a large extent. Farmers' Suicide is even one of the most serious repercussions of environmental degradation in India and so is the case in Punjab. Through the present paper, attempt has been made to explore the impacts of environmental degradation on the life of farmers. The present paper is a part of the study undertaken in the state of Punjab for understanding the impact of environmental degradation on the agricultural productivity and farmers' life in Punjab. It is an attempt to understand how people of the state perceive environmental degradation and how do they link environmental degradation with issues like decline in agricultural productivity, and farmers' self reliance and farmers' suicide. It also explores what differential effects have environmental degradation in different forms had on life of farmers and what all angles of their life have been affected.

RESEARCH METHODOLOGY

The present study is focused on the Punjab. For the present study districts chosen are (i) Jalandhar District from Doaba region; (ii) Ludhiana District from Malwa; and (iii) Amritsar District from Majha. These districts are also well known in terms of environmental changes, which have been well endorsed by research undertaken by various international as well as national agencies and organizations. 'Gender' and 'Rural-urban dichotomy' have been taken as the bases for making the categories of the Quota Sample used for the study. The sample constitutes of 900 persons out of which 225 will be rural women; 225 rural men; 225 urban women and 225 urban men. In all Quota Sampling has been done in which there are four categories of the respondents from the sample, those are (i) urban males, (ii) urban females, (iii) rural males, (iv) rural females. Seventy five persons each category from each district, making it total of 300 respondents from each city have been taken. Survey method has been used. Interview schedule has been used to obtain responses from the respondents. The present study covers a crucial bulk of the state's population in terms of environmental impact; including the literate and numerically more dominantly the illiterate sections of the demography. Hence Interview Schedule is a more viable, genuine and workable method of data collection. The Interview Schedule has been used as Questionnaire in some cases where the respondents are qualified or literate to the level of understanding the questions and writing the answers themselves. Since the study had a considerable size of the sample, technical support was indeed a foremost need. The software named IBM SPSS Statistic Data Editor has been used for tabulation, analysis of the responses and for statistical analysis.

FARMERS' COMMUNITY AND ENVIRONMENTAL DEGRADATION

Debate and discussion on agriculture and development always encompass the community of the Farmers. Their role in economy, development and growth is very vital in terms of their expertise o producing food and managing meals with seasons. Intentionally or unintentionally farmers interact and correspond to the nature and environment most of all the sections of people. Agriculture and farmers sow and reap food for the citizens of a nation and also manage revenue and income in case the products are exported to other nations too. India being dominantly an agrarian nation, they take a pivotal position in the rows [5].

Farmers in every state celebrate their days of harvesting their products and there are cultural evidences and national and regional holidays meant to celebrate their prosperity. Amidst all this, farmers' suicides and regular strikes by farmers in different states for their rights are big questions to be interpreted and understood. The most eye catching phenomenon linked to farmers life is 'Farmers' suicide' which is challenging the administration and distressing humanity as a whole. Many researchers have done studies on the theme; heavily funded projects have been undertaken by researchers; academicians; and social scientists from almost fields of academics. They have tried to understand the caused behind the farmers' being under stress and farmers' suicide. The issue has got so aggravated that it attracts adequate concern from all around the globe also. Analysis has been done by economists, sociologists, planners and multiple significant theories have been established. Many researchers forwarded workable suggestions to the government/s (both centre as well as state) and their relative works have been appreciated too. An important fact to be expressed at this point of discussion is that only numeric related to farmers' suicide or the financial issues like procurement prices and the like will not be sufficient. There is a need to focus on improvement of the situations which make farmers prone to committing suicide; for sure the main reason

behind which is financial. There is a need that sociological studies are undertaken on this issue. There are different angles to understand a problem or an issue and every subject or discipline has a distinct ability to do the task. One of the main or the surfacing causes behind farmers' suicide is financial distress or economic setbacks to the farmers; but suicide is not in all cases the direct effect. There is a need to understand the causes which finally result into creating suicidal tendencies in a particular community. Financial setback and increased economic disability do result into depression and degrading of the mental health consequently resulting into adhering to suicide by the farmers; but the reasons behind financial setbacks need to be caught and worked upon. Forced inability to produce agricultural goods like ever before; incompetence to do duties related to family and household; family pressure; hopelessness that situation will neither be addressed nor improve; and the like are the factors which play a vital role in the context. Increase in economic burdens and stress is largely linked to environmental degradation; and is obviously an effect of the same in an agrarian state like Punjab. The rainfall patterns have altered making rainfall a very unseasonal and unpredictable occurrence as well.

The soil is the base of agricultural production in terms of their high reserves of weather able minerals. But today the sol productivity and the soil biomass's quality as well as quantity is under threat. The major reasons are environmental basically; like soil erosion due to cutting of forests and other factors; water logging; pollution from agro-chemicals, sewerage and industrial effluents; and the like. The soil fertility has declined resulting into excessive use of fertilizers and pesticides for a good agricultural growth; availability of water for irrigation has reduced making big as well as small farmers forced to opt for new technology; seasonal cropping has shifted to mono cropping patterns in many regions of the state; and the like are such factors which have pushed the farming economy into troubles. For farmers, the cost input has increased multifold but their income has not increased at par, rather decreased to large extent [9, 8]. Pujara's study also states that increase in economic stress is the biggest cause behind farmers' suicide. Farmers today have to spend a lot on buying pesticides, fertilizers to save their crop from being ruined and to increase the crop productivity which has been largely affected due to decreased soil fertility. They also have to spend a lot on irrigation services to arrange water in needed quantum; the depleting ground water scares them more. In general, due to rise in temperature, people pay larger electricity bills now. People have to send more money due to lowering of the water table to avail water needed for household, irrigation and other purposes. Much more like these factors have added economic stress to people's life and a major bulk of it is attributed to environmental degradation.

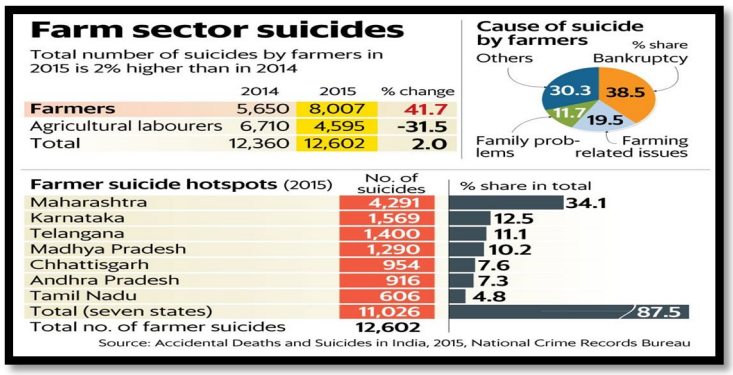
Seasonal as well as commercial cropping has been affected due to the climatic and other environmental changes. All this has certainly influenced the job orientation in the state. Earlier people from the local areas were given contractual appointment/daily wages job while cropping seasons but now with the decrease in the agricultural income and also due to the changes in cropping pattern, employment generation in the regions has been affected. In an article entitled 'Punjab's slowing economy" by [10], it has been mentioned that the Punjab's economy has been widely affected due to the degradation in the natural environment. There has been a steep decline in agricultural as well as industrial output as its result. Punjab has been known for its agricultural worth and its agriculture used to contribute 40% of the India's GDP in mid 70s which has reduced to 16% in 2017. The decline in agricultural status of the state is quite visible from the statistics. Kewlani [3] refers to the scenario of forest job being affected by agricultural changes and with focus on deforestation. Earlier, according to her study forest job was considered to be a status symbol for purposes like wedding and all but due to deforestation and other forms of degradation in environment, forest job and agricultural jobs have reduced affecting almost all communities of the state. Earlier the farm owners had so much work to do that they used to appoint people from their own villages/town for farming on seasonal cropping days but this scenario has suffered a loss.

The present study shows that almost all sections of people have been affected with environmental degradation. The worst impact can be seen on the physical as well as mental health of people. Women and children have suffered a heaviest jolt of degradation of the natural environment [2]. During the discussions held during the present research work, many people expressed that 'farmers' have been one of the biggest victims of the changing environmental scenario. This chapter focuses on effects of environmental degradation on farmers' life and on the issue of farmers' suicide. The discussion undertaken in this very part of the research aim to know and understand what people think about the categorical effects of environmental degradation on farmers' life and survival; how sensitive people are towards the issue of farmers' suicide; do they understand that environmental degradation is one of the main causes behind farmers' suicide; has the government done anything in particular to check farmers' suicide or to sensitize people to preserve environment so that such adverse instances can be controlled and the like.

The report of the National Crime Records Bureau publicized in 2014 the number of suicides by farmers and farm labourers increased to 12, 360 in 2014 against 11, 772 in 2013 (Figure 1). Out of these suicides, 5, 650

were farmers' suicides. Then Indian government did not publish any data on farmers' suicide since 2015. The situation is reflected through the given picture.

Figure 1 Farm Sector Suicides



Source: National Crime Records Bureau, 2015.

The given picture shows how farmers' suicides have come up as a probing question to the administration. Not only in the states shown in the figure above, but in other states also, farmers are distressed; so are in Punjab too. An article entitled 'Farm suicides unabated in Punjab, over 900 in 2 years' published in The Tribune [16] supports the given data. This piece of information says that the studies commissioned by the state government state that 16, 606 agrarian suicides (9, 243 farmers and 7, 363 labourers) took place in the state between the years 2000 to 2015. This article was published on 12th February, 2019 and it opens a disturbing fact that by this date itself there had been 32 farmers' suicides in Punjab. More than 900 agrarian labourers have ended their lives in the last two years in Punjab that is from 1st April to 31st January 2019. Sukhpal Manak, press secretary of the Sunam Block of Bharti Kisan Union says that the actual number is much higher than the stated one as many cases do not go reported. Professor Sucha Singh Gill also states that a scientific study is needed to know the actual number of farmers' suicide. And he adds that 'there is no doubt that agrarian suicide is a continuous phenomenon despite the change in government'. Professor Sukhpal Singh a senior economist from PAU, Ludhiana has been the head of the team which studied farm suicides from 2000 to 2015, says that to curb the issue there is a need to make the terms of trade favorable to agriculture. Prof. Sukhpal adds that at present neither the prices of inputs are regulated nor does the farmer get viable price for the produce. For him 'agrarian suicide is both an economic as well as a social phenomenon', exactly a statement in support of what has been recently been said in the introductory part of this chapter. The Agricultural Secretary K.S. Pannu in this light talks of recommending the cases for compensation as per the government compensation policy and also states that district level panels under the chairmanship of DCs have been formed and have been mandated to study debt related issues [11-16].

Another article entitled "430 farmers' suicide in Punjab in the last one year despite loan waiver" [9] states that despite the government's loan waiver policies, there have been 430 suicides in the state which hailed from Mansa, Sangrur, Bathinda and Barnala. Bhartiya Kisan Uinion opined that even lesser than fifty percent of the farmers have been covered by the scheme of loan waiver since it has been introduced. The skymetweather informs that the 'the government had waived off Rs 1,815 crore of 3.17 lakh farmers in the first phase, followed by Rs 1,689 crore of 1.03 lakh marginal farmers in second phase. In the third phase, the government is planning to waive off Rs 1,009 crore of 1.42 lakh farmers'. Even after doing all this and initiating multiple other policies to check farmers' suicide, the wishful deaths of farmers continued.

Kakodkar [17], while referring to data of 2015 states that farmer's suicide had crossed 300 cases in a month several times in the year 2015. Further in the year 2019, unleashed rains in Maharashtra destroyed the 70 percent of the kharif crops leading to farmers' distress. Figure 2 shows even more recent data in details, which is helpful to have a comparative analysis of various years on context of farm sector suicides. The data has been complied for the state of Maharashtra on the basis of the information gathered though Right to Information (RTI).

Figure 2 Farmer Suicide 2013 to 2018

BusinessToday.In

FARMER SUICIDE DETAILS FROM 2013-2018

Year	Total cases	Eligible cases	Ineligible cases	Pending cases	Ex-gratia payment to farmers
2013	1,296	665	629	2	665
2014	2,039	1,358	674	7	1,358
2015	3,263	2,152	1,081	30	2,150
2016	3,080	1,768	1,292	20	1,768
2017	2,917	1,638	987	292	1,611
2018	2,761	1,330	1,050	381	1,316

The above RTI details show that a total of 15,356 farmers committed suicide between 2013-2018.

Source: Over 15,000 farmers committed suicide in Maharashtra in 6 years, reveals RTI data – Business Today, visited on 22nd September 2022 at 6: 51 pm.

The data shows steep rise in the number of farmers suicides in Maharashtra from the year 2013 (total cases 1,296) to 2018 (total cases 2, 761). In a short span between 1st January to 28th February only, 2019 in total 396 cases had been reported in the state. All best done from the government side; crucial studies undertaken by the research side and efforts made by Non-Governmental Organizations; all together show what a heavy concern is already being dedicated to the issues related to farmers' suicides. The present study is focusing the concern on the effects of environmental degradation on farmers' life and farmers' suicide. In the preceding chapters, it has been discussed at length that the degradation of environment including soil erosion, changing pattern of rainfalls, randomly altering temperatures and the like have altogether affected the agricultural productivity and agrarian produce has declined. This situation gets aggravated by the administrative hassles like non viable prices for the produce and all, resulting into high level of stress in farmers. The mental health gets degraded and they easily get prone to committing suicide. The aim of this part of research is neither to see the number of suicide of farmers nor to suggest measures to compensate the losses they suffer. Experts, researchers and also administrators have found that the major factors behind farmers' suicide are crop failure; damage of the crops resulting out of change in weather related conditions; lack of water for irrigation and the like. Of course market situations are also one of the major factors influencing the farming and the farmers; but environmental issues are more dominant in terms of the impact on farmers' life and earning. Environmental changed are directly related to the issue of agricultural productivity and farmers' suicide; there is a need to watch for how common people including farmers interpret this relationship and Eco systematic situation. A major purpose of the present study herein is to see how aware common people are about the problems being faced by farmers and how do they perceive the interrelationship between farmers' suicide and environmental degradation? A considerable number of respondents say that farmers have been largely affected with environmental degradation. Table 1 reflects the related responses and details. Significant number of the respondents, that is 83.1 percent of the total sample (748 persons out of 900) say that farmers' life is severely affected with to environmental degradation. This group of respondents includes 241 out of the total 300 respondents from Jalandhar; 238 from Amritsar; and 269 from Ludhiana. Out of the 748 respondents opting for this response a higher number is from urban areas. Common people understand this well that degradation of environment has victimized the farmers. Farmers work in fields is in correspondence to nature; the soil responds to factors like rain, air, sunlight, weather, climate and temperature and the like. If the environmental changes are there, they surely leave impact on agriculture. In the recent decades, the agricultural productivity has decreased effecting the farmers' income and financial stability. The seasonal cum commercial cropping has changed to mono-cropping patterns leading to less prosperity of the farmers. Due to changes in climatic conditions; scanty rainfalls; soil erosion due to cutting of the trees and deforestation; the rise in temperature and the like factors, the input cost for farmers has increased. They spend more on producing and earn lesser comparatively than what they used to earn.

Table 1 Impacts of Environmental Degradation on Farmers

District	Options	City								Total	
		Urban				Rural					
		Male		Female		Male		Female			
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	Count	% age
Jalandhar	Yes	69	92.0%	61	81.3%	62	82.7%	49	65.3%	241	80.3
	No	6	8.0%	14	18.7%	13	17.3%	26	34.7%	59	19.6
Amritsar	Yes	60	80.0%	62	82.7%	66	88.0%	50	66.7%	238	79.3
	No	15	20.0%	13	17.3%	9	12.0%	25	33.3%	62	20.6
Ludhiana	Yes	68	90.7%	67	89.3%	68	90.7%	66	88.0%	269	89.6
	No	7	9.3%	8	10.7%	7	9.3%	9	12.0%	31	10.3

Other 16.8 percent respondents of the total sample (152 out of total 900) say that environmental degradation has not had any categorical impact on the life of farmers. These persons say that without any doubt the changing environmental conditions have affected all the sections of society, for example women, men, children, old aged and the like, but there is no such particular effect which farmers had to bear with. Further, Table 2 explores in details the people's views on what are the impacts/consequences of environmental degradation on farmers and their life. There are 13.0 percent respondents out of the total sample (117 out of 900) who say that the major impact of environmental degradation has been climatic changes which have further affected the commercial cropping. According to these persons, earlier the commercial cropping in state was very flourishing. Climatic conditions were favorable for agriculture and the produce uses to be considerable. The agricultural produce used to serve household as well as commercial purposes. But now, climatic conditions have altered to large extent affecting the agricultural productivity also. All this has affected the commercial cropping, income and profit earning of the farmers. Linking to this, there are 19.7 percent of the total respondents (178 out of the total 900) say that the soil fertility has decreased due to the environmental degradation. This group includes 71 out of the total 300 respondents from Jalandhar; followed by 37 from Amritsar; and 70 from Ludhiana. Further, it is said by 19.4 percent respondents of the total sample that input cost on farming has increased. According to them, now farmers have to spend bigger amount on farming since due to environmental factors, the fertility has declined and agricultural productivity has reduced. The farmers now need to spend more money on fertilizers; tube wells and water resources for irrigation and the like unlike past.

In addition to the ongoing details, there are 12.8 percent of the total respondents (116 out of 900) who say that farmers have been affected since there has been an addition on the cost for the use of insecticides and pesticides. This category of persons includes 31 out of the total 300 respondents from Jalandhar; 26 from Amritsar; and 59 from Ludhiana. They say that in order to save the crop from being destroyed by insects, the farmers have to spend more money on buying and using insecticides and pesticides in their farms. Some respondents from this group say that this use of insecticides and pesticides also has serious health related repercussions and has also added to the financial burden in farming households.

Scanty Rainfalls and unpredicted monsoons are another environmental factor which has affecting farming and farmers' economic stability. This has been said by 140 out of the total respondents (constituting 15.5 percent of the total sample). This group includes 57 respondents (out of 300) from Jalandhar; 24 from Amritsar; and 59 from Ludhiana. People in general are very clear about the fact that agriculture and farmers have been affected with environmental degradation and the related factors. A very less number of respondents, that is 45 respondents out of the total 900 (only 5.0 percent of the total sample) say that the lands of many farmers have become infertile and that is why farmers have sold/at the edge of selling their lands to public or private developmental projects being undertaken by companies. These respondents say that selling one's land is the last resort in the hands of farmers to find some money; reflecting a clear evidence to extreme financial and emotional stress in farmers resulting out of the environmental changes.

Table 2 Ways in what Environmental Degradation has affected Farmers?

District	Q13	City								Total	
		Urban				Rural					
		Male		Female		Male		Female			
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	Count	% age
Jalandhar	Decreased commercial Cropping due to climate changes	18	24.0%	19	25.3%	14	18.7%	22	29.7%	73	24.3
	Soil fertility has decreased	14	18.7%	22	29.3%	19	25.3%	16	21.6%	71	23.6
	Input cost on farming has increased	13	17.3%	25	33.3%	21	28.0%	15	20.3%	74	24.6
	Additional cost on use of Pesticide and insecticides	4	5.3%	4	5.3%	17	22.7%	6	8.1%	31	10.3
	Selling of the infertile lands	6	8.0%	7	9.3%	7	9.3%	9	12.2%	29	9.6
	Scanty Rainfalls and unpredicted monsoons	12	16.0%	15	20.0%	16	21.3%	14	18.9%	57	19.0
	All the above	41	54.7%	32	42.7%	30	40.0%	28	37.3%	131	43.6
	Any other	0	0.0%	0	0.0%	0	0.0%	0	0.0%	00	00
	Cannot comment	4	5.3%	5	6.7%	6	8.0%	13	17.6%	28	9.3
Amritsar	Decreased commercial Cropping due to climate changes	3	4.0%	10	13.3%	2	2.7%	4	5.3%	19	6.3
	Soil fertility has decreased	9	12.0%	11	14.7%	4	5.3%	13	17.3%	37	12.3
	Input cost on farming has increased	6	8.0%	2	2.7%	7	9.3%	15	20.0%	30	10.0
	Additional cost on use of Pesticide and insecticides	6	8.0%	3	4.0%	7	9.3%	10	13.3%	26	8.6
	Selling of the infertile lands	2	2.7%	1	1.3%	1	1.3%	0	0.0%	4	1.3
	Scanty Rainfalls and unpredicted monsoons	5	6.7%	6	8.0%	5	6.7%	8	10.7%	24	8.0
	All the above	58	77.3%	51	68.0%	66	88.0%	43	57.3%	218	72.6
	Any other	0	0.0%	0	0.0%	0	0.0%	0	0.0%	00	00
	Cannot comment	3	4.0%	7	9.3%	0	0.0%	16	21.3%	26	8.6
Ludhiana	Decreased commercial Cropping due to climate changes	7	9.3%	8	10.7%	7	9.3%	3	4.0%	25	8.3
	Soil fertility has decreased	20	26.7%	12	16.0%	31	41.3%	7	9.6%	70	23.3
	Input cost on farming has increased	19	25.3%	14	18.7%	30	40.0%	8	11.0%	71	23.6
	Additional cost on use of Pesticide and insecticides	16	21.3%	11	14.7%	28	37.3%	4	5.3%	59	19.6
	Selling of the infertile lands	5	6.7%	2	2.7%	5	6.7%	0	0.0%	12	4.0
	Scanty Rainfalls and unpredicted monsoons	18	24.0%	7	9.3%	31	41.3%	3	4.0%	59	19.6
	All the above	36	48.0%	50	66.7%	24	32.0%	60	80.0%	170	56.6
	Any other	0	0.0%	0	0.0%	0	0.0%	0	0.0%	00	00
	Cannot comment	3	4.0%	3	4.0%	3	4.0%	3	4.0%	12	4.0

Table 3 reflects data related to this linkage between environmental degradation and farmers' suicide. In total, 37.7 percent of the sample (335 out of the total 900 respondents) opines that farmers' suicide and environmental degradation are largely linked. This group includes 130 persons out of the total 300 from Jalandhar; 113 from Amritsar; and 92 from Ludhiana. According to them' people in general understand it well that degradation of the natural environmental along with climatic and temperature changes has affected the farmers' life adversely. In some cases when losses go beyond the capacity of the farmers to compensate, they even end their lives under immense mental stress. At times the social pressure on them is too heavy to be born with in such an economic situation; for example marriage of their daughter/s; settlement of their son/s; medical expenses in home if there is some ailing member/s; household expenses and education expenses of their child/ children and the like. Many of the respondents from this group say that severe decline in agricultural income and productivity due to changes in the natural environment and climatic conditions have made farmers prone to committing suicide.

Another 18.5 percent respondents out of the total sample say that people very 'rarely link' farmers' suicide and environmental degradation with each other. They say that there are very less number of people who express or even understand that there is a link between the two. This response group includes 76 out of the total 300 respondents from Jalandhar; 45 from Amritsar; and 46 from Ludhiana. However, a very small percentage that is 5.5 percent of the total sample (50 out of the total 900) say that the linkage between farmers' suicide and environmental degradation is 'not at all thought for' by people. For common people,

in general, 'environmental degradation' and 'farmers' suicide' are two crucial, popular and administrative concerns but these are not linked at all.

Table 3 Linkage of environmental degradation with farmers' suicide

District	Options	City								Total	
		Urban				Rural					
		Male		Female		Male		Female			
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	Count	% age
Jalandhar	Not at all thought for	4	5.3%	3	4.0%	3	4.0%	12	16.0%	22	7.3
	Largely linked	37	49.3%	32	42.7%	31	41.3%	30	40.0%	130	43.3
	Rarely linked	20	26.7%	24	32.0%	18	24.0%	14	18.7%	76	25.3
	Cannot comment	14	18.7%	16	21.3%	23	30.7%	19	25.3%	72	24
Amritsar	Not at all thought for	9	12.0%	6	8.0%	0	0.0%	1	1.3%	16	5.3
	Largely linked	36	48.0%	47	62.7%	13	17.3%	17	22.7%	113	37.7
	Rarely linked	23	30.7%	15	20.0%	4	5.3%	3	4.0%	45	15.0
	Cannot comment	9	12.0%	7	9.3%	62	82.7%	54	72.0%	132	44.0
Ludhiana	Not at all thought for	5	6.7%	2	2.7%	2	2.7%	3	4.0%	12	4.0
	Largely linked	31	41.3%	11	14.7%	39	52.0%	11	14.7%	92	30.6
	Rarely linked	17	22.7%	4	5.3%	16	21.3%	9	12.0%	46	15.3
	Cannot comment	22	29.3%	58	77.3%	18	24.0%	52	69.3%	144	48.0

However, there are some respondents who could not comment on this linkage. Common people do understand and accept that there is a direct linkage between environmental degradation and farmers' suicide. They understand well that the degradation of the natural environment has affected the agricultural productivity which has resulted into severe financial and social burden on the farmers. This situation is a big threat to the mental as well as physical health of the farmers and hence needs to be addressed.

FINDINGS AND CONCLUSIONS

The findings of the study state that the farmers have been ardent victims of environmental degradation. Their income, their peace of mind, their self-resilience and reliance, their household needs fulfillment, and economic self-sufficiency, all have been very drastically affected. Environmental degradation in form of reduced water availability; cutting of trees, soil erosion, and temperature change has affected the agricultural productivity. The agricultural productivity has decreased further affecting the commercial use of the product and profit making of the farmers. Farmers are becoming poorer and they are also getting financially disabled to cater to the needs of their family members; like education of their children, health maintenance of their family members; treatment of an ailing member if in case there is one; expenses on daily needs and monthly bills of electricity and others; and the like. Commercial cropping has affected and many farmers now resort to mono-cropping, which does not earn them same amount of money as they used to earn earlier. Respondents from the sample and even the other common people from the three districts do not hesitate while they say that farmers' suicide is one of the consequences of environmental degradation. With environmental degradation in form of reduced soil fertility; scanty and unpredicted rainfalls; rise in temperature and the like, agricultural productivity has declined; adding to the financial burden of the farmers. The input cost on farming has increased to avail more and more fertilizers and pesticides; arranging water resources for irrigation; and the like; which further creates stress and proneness to surrender has increased. In many cases, farmers become psychologically very weak to handle

the burden. The sense of hopelessness in them makes them vulnerable to decisions like ending their life; resulting into aggravation of the issues like Farmers' suicides. The community of the farmers is in distress and even cases have reported where farmers committed suicide due to being under heavy burden both financial as well as mental. The input cost on agricultural production has increased multifold. Due to reduction in the soil fertility, more and more fertilizers are to be used; pesticides are to be bought; and due to depleting ground water table the availability of water for irrigation has even become a costly and tedious affair. All this has resulted in farmers' distress and sufferings. The situation cannot be so fast improved. The environmental issues behind the present problems will take time to be resolve and controlled. But what can be done urgently is stress management of the farmers. Sociologists and Psychologists can be given the work by the Department of and Health Agriculture and also by the Ministry of Health and Family Welfare of the state (on contract or regular basis). Teams of such professionals must be sent to educate and train farmers for responding to the situations with intelligence and mental strength. They need to be guided that suicide does not help their family on sustainable basis. To reduce the suicide in farmers must be aimed at along with checking environmental degradation further to check recurrence of such provoking factors. Their mental health needs care, which can further help control the issue of farmers' suicide. The victims in this case are quite identifiable, which can help to protect than to regret over their deaths. There is a need to undertake more research in the field of agriculture and environment in relation to each other. More and more research will pave a way for more and more identification of the problems and solutions as well. On the whole, there is a need to assess environmental concerns and values of people, with the help of which awareness can be increased and the workable solutions to the existing issues can be formulated.

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