

Losses and alternatives measures towards environmental degradation in rural area of Haryana

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Abstract: In India, the globally accepted threats caused by environmental degradation are soil degradation and desertification, pollution, droughts, floods and water scarcity. The study was conducted in two districts of Haryana state namely, Hisar and Kaithal and a total number of one hundred twenty women were selected and interviewed with the help of well structured schedule. The study revealed that majority of the women were of middle age group (36-50 years), educated up to higher education, belonged to nuclear family with 4 members, performed government, private jobs and self employment. Very serious losses due to environment degradation were air pollutant effect on human health, animals and plants (1.47), deeper level of ground water table leads to irrigation scarcity (1.35), quality deterioration of crop produce and fertilizers cause toxicity in food products (1.23), lost of biodiversity and tropical forest, extinction of plant and animal species (0.41) as per their 'Z' score. Least smoky trees should be planted and used, Baval, Neem, Pipal, Bargad, Shisham, Aam, Jamun (94.16%), Installing chimneys to rent smoke from indoor stoves (90.83%) Storage and disposal of farm wastes properly (79.16%), Campaigning for healthy environment (74.16%), enhancing the area under agro and social forestry (69.16), empowerment of women for different development programs (66.66%) were found very effective among the women to making the environment healthy. To reach the results the aggregate total score was calculated to each alternative measure separately, and on the basis of calculated total score, a weighted mean score were obtained which were ranked according to the maximum or minimum mean scores for assessing the effectiveness of alternative measure.

Keywords: Awareness, Climate change, Causes, Greenhouse Gases, Healthy environment

INTRODUCTION

Environment is usually defined as the system of biological and physical resources and their processes of interaction that affect lives and livelihoods. Environment degradation is a situation in which a part of the natural environment is damaged. We can say any damage to the land, water, the air, loss of biodiversity and a loss of natural resources in an area/surrounding and destruction of ecosystem and the extinction of plant and animal species are also the example of environment degradation. It is caused in a variety of ways, predominantly by human actions; however, natural events also cause destruction results in the deterioration of an environment. Gupta and Sharma (2014) studied that women in the rural areas live in close association with the environment in relation to their overall daily activities. Although women can play big roles in the field of environment conservation but their role is often under-valued and ignored. The present study is an attempt to know the present status of women in the area, their activities which affect the environment and to assess the awareness among women about their role in environment protection.

Roychoudhury and Ray (2012) reported that the impact of indoor air pollution (IAP) from biomass fuel burning on the risk of carcinogenesis in the airways has been investigated in 187 pre-menopausal women (median age 34 years) from eastern India who cooked exclusively with biomass and 155 age-matched control women from same locality who cooked with cleaner fuel liquefied petroleum gas. Patle *et al.* (2013) studied that due to increase in demand for food production the farmers have started growing more than one crop a year through repeated tillage operations using conventional agricultural practices. Increase in carbon emission is the major concern, which is well addressed in Kyoto protocol. Nowadays, more emphasis has been given for promotion of conservation agriculture to mitigate the impact of climate change.

Rani and Maragatham *et al.* (2013) stated that at present in the context of climate change, temperature is one of the most important environmental factors influencing the rice crop growth, development, and yield. The duration of each phenological stage is influenced by temperature, which has direct impact on yield. The objective of this study is to provide an overview of the influence of elevated temperature on rice phenology

and accumulated growing degree-days.

MATERIALS AND METHODS

The present study was conducted in Haryana state. Two districts Hisar and Kaithal were selected, purposively. From each district, three blocks were selected randomly. Further, two villages were selected from each block making 12 villages. From each village, ten women were selected randomly, making a total sample of 120 women. Hence, one hundred twenty women were interviewed for the study.

From Hisar, three blocks namely, Hisar I, Hisar II, Barwala and from Kaithal, blocks Kalayat, Pundri, Rajond were selected, randomly. Thus, six blocks were selected for the study. Out of the six selected blocks, two villages from each block were selected, randomly. Thus a total number of twelve villages namely, Dhiranvas and Bhiwani Rohilla from block Hisar I, Ladwa and Kharal from block Hisar II, and Khedar, Gabipur from block Barwala while Ballu and Batta from Kalayat, Pharal and Fatehpur from Pundri block and Khedi and Kithana from Rajond block were selected, randomly also.

Women are primary providers of household food, fuel and water for cooking, heating, drinking and washing. As users, women have direct contact with the natural environment as they collect essential items like fruits, vegetables, medicinal herbs, fuel wood, fodder, water etc. for their every day needs and women are responsible for collecting water and for controlling its use. Mostly rural families depend on nature for their livelihood and women are the key persons in using, managing and protecting the natural resources hence, there is a close linkage between women and natural environment.

Collection of data: For assessing the awareness about environment degradation, causes, losses and alternatives measures data was collected by conducting personal interview with the respondent at their home/working center. The interview of every individual was taken separately so that the others did not influence the answers.

Analysis of data: The information collected through the responses of the respondents, were suitably coded, tabulated and analyzed to draw meaningful inferences by using statistical tools such as frequency distribution, percentages, weighted mean scores, 'Z' score, and rank order.

An inventory was developed containing 33 statements pertaining possible losses to measure the awareness about the losses due to environment degradation. The respondents were asked closed ended questions and were asked to reply as 'very severe', 'severe' and 'not so severe'. Weight ages given to their responses category were 3, 2 and 1, respectively. Aggregate total score was calculated for each cause separately, and based upon this total score obtained, a mean score for each loss was calculated for assessing the seriousness

of losses. On the other hand, after judging the responses of all the respondents for obtaining losses on a three point continuum rating scale, the total score for losses was worked out and this total score was converted into weighted mean score. Finally, a 'Z' score was obtained for judging the seriousness of each loss contained in the schedule by using the formula as under:-

$$Z \text{ score} = \frac{X - \bar{X}}{SD} \quad \text{Eqn (1)}$$

RESULTS AND DISCUSSION

Losses occurred due to environment degradation:

Table I revealed that the 'Air pollutant effect on human health, animals and plants' (Z score = 1.47) and 'Noise disturbs sleep' (Z score = 1.00) were considered as very serious losses for human, animal and plants due to environment degradation by the respondents as per the 'Z' score.

The data revealed that 'The discarded bags block drains and sewage systems' (Z score = 0.76) and 'Hypertension (high blood pressure)' (Z score = 0.70) were found serious losses. 'Cows and dogs may die due to the choking by plastic bags' (Z score = 0.64) was found as serious loss. Due to environment degradation also 'Smoke caused acute respiratory problems, Cough, Sore throat, lungs infection/disorder, Asthma' (Z score = 0.52), 'Motor vehicle exhaust cause irritation in eyes and lungs' (Z score = 0.41), 'Automobile exhaust, burning of wood and coal cause respiratory problems' (Z score = 0.35), 'Leads to irritation' (Z score = 0.17), 'Pollution cause Emphysema in animal' (Z score = 0.08), 'Polluted water cause Minamata disease in human, Pneumonia, Diarrhea' (Z score = 0.05). 'Suffocation and complaint of headache' and 'Loss of temper' (Z score = -0.05), 'Drowsiness and inability to concentrate' (Z score = -0.17) 'Power plants and refineries volcanic eruptions cause respiratory problems' (Z score = -0.41), 'Decrease in work efficiency' (Z score = -0.58), 'Emotional problems such as aggression, mental depression and annoyance.' (Z score = -0.64), 'Air pollution increased susceptibility to infection' (Z score = -0.76 losses according to the respondents' response and 'Loss of hearing in the noise stress continues.' (Z score = -1.41) were considered as not so serious losses due to environment degradation as per the 'Z' score. The present findings can partially be compared with those of Kutub and Falgunee (2015) findings revealed that tobacco cultivation had indeed incurred widespread negative impacts on agro-biodiversity, water and soil quality, biodiversity and traditional agro-practices in the study area. Soil and water in the study area were found to be contaminated with toxic pesticides and chemical components that reduced the soil fertility and increased water pollution. The pH levels of both soil and water was found to be less than the minimum acceptable level. Soil was

Table 1. Losses due to environment degradation.

S.N.	Losses	Total weighted score	Weighted mean score	Z score	Nature of seriousness
1.	Air pollutant effect on human health, animals and plants	358	2.98	1.47	VS
2.	Noise disturbs sleep	348	2.90	1.00	VS
3.	The discarded bags block drains and sewage systems.	344	2.86	0.76	S
4.	Hypertension (high blood pressure)	343	2.85	0.70	S
5.	Cows and dogs may die due to the choking by plastic bags.	341	2.84	0.64	S
6.	Smoke caused acute respiratory problems, Cough, Sore throat, lungs infection/disorder, asthma	339	2.82	0.52	S
7.	Motor vehicle exhaust cause irritation in eyes and lungs	336	2.80	0.41	S
8.	Automobile exhaust, burning of wood and coal cause respiratory problems	335	2.79	0.35	S
9.	Leads to irritation	332	2.76	0.17	S
10.	Pollution cause Emphysema in animal	338	2.81	0.08	S
11.	Polluted water cause Minamata disease in human, Pneumonia, Diarrhea	329	2.74	0.05	S
12.	Suffocation and complaint of headache	327	2.72	-0.05	S
13.	Loss of temper	327	2.72	-0.05	S
14.	Drowsiness and inability to concentrate	324	2.70	-0.17	S
15.	Power plants and refineries volcanic eruptions cause respiratory problems	320	2.66	-0.41	S
16.	Decrease in work efficiency	316	2.63	-0.58	S
17.	Emotional problems such as aggression, mental depression and annoyance.	315	2.62	-0.64	S
18.	Air pollution increased susceptibility to infection	312	2.60	-0.76	S
19.	Loss of hearing in the noise stress continues.	299	2.49	-1.41	NSS

Table 2. Losses based on agriculture.

Sr. No	Losses	Total weighted score	Weighted mean score	Z score	Nature of seriousness
1.	Deeper level of ground water table leads to irrigation scarcity	356	2.96	1.35	VS
2.	Quality deterioration of crop produce	353	2.94	1.23	VS
3.	Fertilizers cause toxicity in food products	353	2.94	1.23	VS
4.	Pesticides/insecticides enter in the body through the consumption of foodgrain, fruits and vegetables etc. and cause health risk	351	2.92	1.11	VS
5.	Loss of chlorophyll in plants (chlorosis)	289	2.40	-1.94	NSS
6.	Green house gases effect	261	2.17	-3.29	NSS

more acidic and water had less dissolved oxygen that indicated severe pollution. Flora and fauna species in the study area were also adversely impacted by the excessive use of agrochemicals in tobacco cultivation. As the drive for profit converted more arable land to tobacco cultivation environmental degradation was enhanced in the study area.

The Table 2 revealed that the 'Deeper level of ground water table leads to irrigation scarcity' (Z score = 1.35) and 'Quality deterioration of crop produce', 'Fertilizers cause toxicity in food products' (Z score = 1.23), 'Pesticides/insecticides enter in the body through the consumption of foodgrain, fruits and vegetables etc. and cause health risk' (Z score = 1.11) were considered as very serious losses due to agricultural activities by the respondents as per the 'Z' score. 'Loss in chlorophyll in plant (chlorosis)' (Z score = -1.94) and 'Green house gases effect' (Z score = -3.29) was found as not so serious loss. The present findings are in conformity with those of Nazia *et al.*, 2012 who

reported that drinking pure water has been a major problem in India because of different types of pollution in the country with more and more Indians becoming aware of the hazards of drinking impure water, the demand for effective water purifiers is growing rapidly.

Table 3 revealed that the 'Lost of biodiversity and tropical forest' and 'The extinction of plant and animal species' (Z score = 0.41) 'Increase temperature cause melting of glaciers and altering weather pattern' (Z score = 0.29), 'Destructives sudden heavy rains' (Z score = 0.11), 'Degradation of forests to barren lands' (Z score = 0.00), 'Repeated climatic shocks depletes resources' (Z score = -0.35) and 'Repeated flooding and drought' (Z score = -0.47) were found as serious losses. 'Intense tropical storms' (Z score = -1.47) was perceived as not so serious loss by the respondents by the respondents as per the 'Z' score. Similar results were also reported by Wang *et al.* (2012) who concluded that bio-char addition to the upland soil

Table 3. Losses due to weather uncertainty.

Sr. No	Losses	Total weighted score	Weighted mean score	Z score	Nature of seriousness
1.	Lost of biodiversity and tropical forests	336	2.80	0.41	S
2.	The extinction of plant and animal species	336	2.80	0.41	S
3.	Increase temperature cause melting of glaciers and altering weather pattern	334	2.78	0.29	S
4.	Destructives sudden heavy rains	330	2.75	0.11	S
5.	Degradation of forests to barren lands	328	2.73	0.00	S
6.	Repeated climatic shocks depletes resources	321	2.67	-0.35	S
7.	Repeated flooding and drought	319	2.65	-0.47	S
8.	Intense tropical storms	298	2.48	-1.47	NSS

X = 2.73, V S = Very Serious, S = Serious, NSS = Not so serious, S.D. = 0.17

increased methane (CH₄) emission by 37 % during the rice season, while it had no effect on CH₄ emission during the wheat season. Bio-char amendment decreased nitrous oxide (N₂O) emission up to 54 % and 53 % during the rice and wheat seasons, respectively, in the aerobic incubation experiment, bio-char addition significantly decreased N₂O emission and increased carbon dioxide (CO₂) emission from the paddy soil without urea nitrogen.

Alternative measures to minimize the environment degradation:

An analysis of the data from the Table 4. revealed that 'Least smoky trees should be planted and used, Baval, Neem, Pipal, Bargad, Shisham, Aam, Jamun' mean score 2.94 was perceived as very effective alternative measure and Ist rank order was given, followed by 'Proper ventilation in kitchen' mean score 2.93, IInd rank order 'Installing chimneys to rent smoke from indoor stoves' mean score 2.90, IIIrd rank order. 'Creating awareness among women to save the environment' and 'Promotion of smokeless chullahas' as per mean score 2.88 with IVth rank order. 'Switch off electricity after use' 2.87 was ranked with a rank order Vth 'Avoid decay of exposed kitchen waste/covering the waste properly', 'Proper management of domestic sewage', 'Proper management of sewage system', 'Refuse or don't use of plastic' mean score 2.86, with rank order VIth, 'Proper toilet facilities in the villages (Sulabh Sochalya)' and 'Use biodegradable plastics' with 2.85 mean score and rank order were, VIIth. 'Use of solar energy', 'But supply of electricity and kerosene is limited' and 'Gardening and landscaping in school, panchyat bhawan, playground' 2.83 was ranked VIIIth as per its mean score.

'Development and maintenance of green belt' has ranked IXth with mean score 2.78 and 'Use biodegradable material like jute or paper bags etc' was ranked Xth with mean score 2.77, 'Use of cleaner fuels such as biogas, kerosene or electricity' 2.73, 'Nutritive herbal and kitchen garden' 2.70, and 'Use eco-friendly, non-hazardous and renewable energy fuels products' 2.66, and 'Indoor plant Vicaronjia, Lantana, Ashoka, Morpankhi, Arjun' 2.65 rank were given XIth, XIIth, XIIIth and XIVth, Conservation of natural resources such as water, soil, biodiversity and vegetation

2.60, 'Promotion of CNG and LPG fuel' 2.55, 'Charcoal is a comparatively cleaner fuel' 1.75, and their rank order were XVth, XVIth, XVIIth, respectively as per mean score and these type of alternative measures were considered as effective alternative measures as per women responses. The present findings are in partial agreement with those of Dwivedi Kumar *et al.* (2012) who reported that India is blessed not only with rich biological diversity but also with the associated indigenous knowledge system of the same. The population burst, industrialization, urbanization, environmental pollution and global climate change are some of the factors that lead to the loss of biological resources.

Table 5. revealed that It was found from the study that 'Enhancing the area under agro and social forestry' 2.89 and 'Storage and disposal of farm waste properly' 2.79 were ranked Ist and IInd, respectively by the respondents. Table 4.15 further reveals that 'Mixed crop or crop rotation' 2.73 and 'Adopting cultivars against drought, pest and diseases resistance' 2.71 were ranked IIIrd and IVth by the respondents perceived as effective alternative measures to minimize the environment degradation.

'Application of compost/FYM/Green manuring' 2.66 and 'Proper water haresting management practices' 2.65 were ranked Vth and VIth, respectively according to their mean score. Table 4.15 reveals that 'Use zero tillage practices' 2.56, and 'Promotion of drip irrigation' 2.54 was ranked VIIth, VIIIth, as per their mean score, respectively. Such type of alternative measures were perceived as effective by the women to mitigate or minimizing the environment degradation and healthy environment.

In the general awareness table the next alternative measures were 'Campaigning for healthy environment' 2.74, 'Empowerment of women for different development programs' 2.66, and 'Advice to agriculture producers and water managers about safe environment' 2.64, and 'Women works as sweepers, clearing drainages, and damping of disposal' 2.61 rank were given Ist, IInd, IIIrd and IVth ranks by the respondents, respectively. The respondents perceived that 'Provide educational programs to local and regional constituents' and

Table 4. Alternatives measures to minimize the environment degradation.

Sr. No	Alternative measures	Level of effectiveness			Total weighted score	Weighted mean score	Rank order
		Very effective (%)	Effective (%)	Not so effective (%)			
1	Least smoky trees should be planted and used such as Baval, Neem, Pipal, Bargad, Shisham, Aam, Jamun etc.	113 (94.16)	7(5.83)	00 (0.00)	353	2.94	I
2	Proper ventilation in kitchen	116 (96.66)	4(3.33)	00 (0.00)	352	2.93	II
3	Installing chimneys to rent smoke from indoor stoves	109 (90.83)	11 (9.16)	00 (0.00)	349	2.90	III
4	Creating awareness among women to save the environment	106 (88.33)	14(11.66)	00 (0.00)	346	2.88	IV
5	Promotion of smokeless chullahas	106 (88.33)	14 (11.66)	00 (0.00)	346	2.88	IV
6	Switch off electricity after use	105 (87.50)	15 (12.50)	00 (0.00)	345	2.87	V
7	Avoid decay of exposed kitchen waste/covering the waste properly	105 (87.50)	14 (11.66)	1(0.83)	344	2.86	VI
8	Proper management of domestic sewage	104 (86.66)	16 (13.33)	00 (0.00)	344	2.86	VI
9	Proper management of drainage system	101 (84.16)	19 (15.83)	00 (0.00)	344	2.86	VI
10	Refuse or don't use of plastics	101 (84.16)	19 (15.83)	00 (0.00)	344	2.86	VI
11	Proper toilet facilities in the villages(Sulabh Sochalya)	102 (85.00)	18 (15.00)	00 (0.00)	342	2.85	VII
12	Use biodegradable plastics	103 (85.83)	17 (14.16)	00 (0.00)	343	2.85	VII
13	Use of solar energy	100 (83.33)	20 (6.66)	00 (0.00)	340	2.83	VIII
14	But supply of electricity and kerosene is limited	100 (83.33)	20 (6.66)	00 (0.00)	340	2.83	VIII
15	Gardening and landscaping in school, panchyat bhawan, playground	100 (83.33)	20 (16.66)	00 (0.00)	340	2.83	VIII
16	Development and maintenance of green belt	85 (70.83)	34 (28.33)	1 (0.83)	334	2.78	IX
17	Use biodegradable material like Jute or paper bags etc.	93 (77.50)	27 (22.50)	00 (0.00)	333	2.77	X
18	Use of cleaner fuels such as biogas, kerosene or electricity.	88 (73.33)	32 (26.66)	00 (0.00)	328	2.73	XI
19	Nutritive herbal and kitchen garden	84 (70.00)	36 (30.00)	00 (0.00)	324	2.70	XII
20	Use eco- friendly, non- hazardous and renewable energy fuels products	80 (66.66)	40 (33.33)	00 (0.00)	320	2.66	XIII
21	Indoor plant vicaronjia, Lantana, Ashoka, Morpankhi, Arjun	79 (65.83)	41 (34.16)	00 (0.00)	319	2.65	XIV
22	Conservation of natural resources such as water, soil, biodiversity and vegetation	75 (62.50)	43 (35.83)	2 (1.66)	313	2.60	XV
23	Promotion of CNG and LPG fuel	69 (57.50)	48 (40.00)	3 (2.50)	306	2.55	XVI
24	Charcoal is a comparatively cleaner fuel	38 (31.66)	48 (40.00)	32 (26.66)	211	1.75	XVII

Table 5. Agricultural alternatives for environment degradation.

S. N.	Alternative Measures	Level of effectiveness			Total weighted score	Weighted mean score	Rank order
		Very effective (%)	Effective (%)	Not so effective (%)			
Agricultural alternatives							
1.	Enhancing the area under agro and social forestry	83 (69.16)	37 (30.83)	00 (0.00)	347	2.89	I
2.	Storage and disposal of farm wastes properly	95 (79.16)	25 (20.83)	00 (0.00)	335	2.79	II
3.	Mixed crops or crop rotation	90 (75.00)	28 (23.33)	2 (1.66)	328	2.73	III
4.	Adopting cultivars against drought, pests and diseases resistance	86 (71.66)	34 (28.33)	00 (0.00)	326	2.71	IV
5.	Application of compost/FYM/Green manuring	80 (66.66)	40 (33.33)	00 (0.00)	320	2.66	V
6.	Proper water harvesting management practices	80 (66.66)	38 (31.66)	2 (1.66)	318	2.65	VI
7.	Use zero tillage practices	69 (57.50)	50 (41.66)	1 (0.83)	308	2.56	VII
8.	Promotion of Drip irrigation	77 (64.16)	31 (25.83)	12 (10)	305	2.54	VIII
General awareness							
9.	Campaigning for healthy environment	89 (74.16)	31 (25.83)	00 (0.00)	329	2.74	I
10.	Empowerment of women for different development programs	80 (66.66)	40 (33.33)	00 (0.00)	320	2.66	II
11.	Advice to agriculture producers and water managers about safe environment	79 (65.83)	39 (32.50)	2 (1.66)	317	2.64	III
12.	Women works as sweepers, clearing drainages, and dumping of disposal	76 (63.33)	42 (35.00)	2 (1.66)	314	2.61	IV
13.	Provide educational programs to local and regional constituents	73 (60.83)	47 (39.16)	00 (0.00)	313	2.60	V
14.	Making women as managers, project designers, planners and policy makers	76 (63.33)	44 (36.66)	00 (0.00)	316	2.60	V
15.	Enhance knowledge, skill and innovativeness for participation in environmental developmental decisions	71 (59.16)	49 (40.83)	00 (0.00)	311	2.59	VI
16.	Increase women participation in environmental decision making process	66 (55.00)	54 (45)	00 (0.00)	306	2.55	VII

‘Making women as managers, projects, designers, planners and policy makers’ 2.60 mean score with Vth rank order. ‘Enhance knowledge skills and innovativeness for participation in environmental developmental decision’ 2.59, ‘Increase women participation in environmental decision making process’ 2.55, and their rank order were VIth, VIIth, respectively as per mean score and this type of alternative measures consider as effective alternative measures as per women response.

Conclusion

It was concluded from the observation that most of the respondents had medium to high level of awareness about the environment degradation in Hisar and Kaithal districts. The study revealed that the ‘Air pollutant effect on human health, animals and plants’ (Z score = 1.47) and ‘Noise disturbs sleep’ (Z score = 1.00), ‘Deeper level of ground water table leads to irrigation scarcity’ (Z score = 1.35) and ‘Quality deterioration of crop produce’, ‘Fertilizers cause toxicity in food products’ (Z score = 1.23), ‘Lost of biodiversity and tropical forest’ and ‘The extinction of plant and animal species’ (Z score = 0.41) ‘Increase temperature cause melting of glaciers and altering weather pattern’ (Z score = 0.29), found the most severe losses. ‘Least smoky trees should be planted and used, Baval, Neem, Pipal, Bargad, Shisham, Aam, Jamun’ mean score 2.94 was perceived as very effective alternative measure and Ist rank order, ‘Enhancing the area under agro and social forestry’ 2.89 and ‘Storage and disposal of farm waste properly’ 2.79 were ranked Ist and IInd, ‘Campaigning for healthy environment’ 2.74, ‘Empowerment of women for different development programs’ 2.66, were given Ist, and IInd, ranks and were found the best alternatives. It was also found that women were interested to know more about the effects of degraded environment on human, animals and plants health because women know that degraded environment causes severe diseases.

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