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Dr. Naima Umar
Department of Geography,
Aligarh Muslim University,
Aligarh, Uttar Pradesh, India.

Correspondence
Dr. Naima Umar
Department of Geography,
Aligarh Muslim University,
Aligarh, Uttar Pradesh, India.

Environmental implication of new agricultural technology in Uttar Pradesh

Dr. Naima Umar

Abstract
Adoption of HYV of wheat, rice, maize and bajra, have ultimately play a key role in agricultural development. The introduction of modern agricultural technology since 1960s shown a positive impact on crop production. Inpite of the fact that as the new agricultural technology flourished by the use of assured irrigation, chemical fertilizers, pesticides and insecticides, advanced agricultural machineries and soil conservation measures it also creates some environmental problems such as the reduction of area under forests and pasture lands, salinization, lowering of underground water table soil, water and air pollution, reduction in biodiversity, decline in soil fertility, silting of rivers and emergence of several diseases and health hazards. For these ananlysis, 1996-2000 and 2001-2005 data have been considered based on secondary sources and my Ph.D thesis work. To compute the crop productivity indices there are Crop Yield Index, and Standard Nutrition Unit (SNU) have been applied. The influence of agricultural inputs was examined by applying *Karl Pearson's coefficient of correlation* techniques in an attempt to establish the causative factors to ascertain variations in the districts of the state.

Keywords: Environment implication, agriculture technology, silting of rivers, pollution, health hazards.

Introduction
Environment provides a base for human life on earth. It also controls the existence and all activities of mankind. Environment is inseparable part of the earth, which surrounds man and man is one of the important adoptable organisms on the surface of the earth. Introduction of new agricultural technology has created certain environmental implications with the use of inputs in which have adversely affected human health. This phase of agricultural development has saved us from hunger and starvation and made the peasants more confident than ever before, but the excessive use of chemical fertilizers, water for irrigation mismanagement of canals, excessive extraction of water from aquifers with the installation of tube-wells for purpose, use of insecticides, pesticides weedicides and farm machines have created a number of environmental implications, which effect human health and health of soil. Quite a large number of studies have reported adverse impact of inputs most commonly used in different farming systems. Christman (1973) observed that, organisms interact with their chemical and physical environment or interact with their biotic and aboitic environments. Daubernmire (1974) is of the opinion that, any external force, substance or condition which affect organisms becomes a factor of the environment. Mishra and Puri (1995) have pointed out that, Green Revolution propagated the use of inputs like irrigation, fertilizers, new high yielding varieties seeds and pesticides, which have caused an adverse effect on soil nutrients and human health. Khullar (2006) observed that, a majority of components cannot be considered isolation; rather they are closely inter-related and dependent upon one another. He has outlined 12 components of Green Revolution and all of these have direct or indirect effect on the environment.

Objectives
1. To find out the environmental factor of new agricultural technology.
2. To identify the impact of new agricultural technology on environment.

Methodology
The entire amount of data were collected from secondary sources which spreads over two

periods of time 1996-2000 and 2001-2005. The following techniques were applied for computation and the results obtained. To compute the crop productivity indices there are Crop Yield Index, and Standard Nutrition Unit (SNU) have been applied. The influence of agricultural inputs was examined by applying Karl Pearson's coefficient of correlation techniques in an attempt to establish the causative factors to ascertain variations in the districts of the state.

Discussion

Introduction and diffusion of HYV of wheat, rice, maize and bajra (bulrush millet), have undoubtedly stimulated agricultural development. As a matter of fact area, production and productivity per hectare of wheat and rice have shown a substantial increase during the last three decades. The introduction of new agricultural technology incorporated in the state since sixties made a positive impact on crop production. The components of green revolution led a great change in agriculture with assured irrigation, use of chemical fertilizers, pesticides and insecticides, advanced agricultural machineries and soil conservation measures.

In the state of U.P during 1996-2000, area under forest was 15.69 per cent which declined to 6.97 per cent during 2001-2005. Area under forests has mostly declined in the districts of Saharanpur, Bulandshahar, Pilibhit, Mirzapur, Sonbhadra, Maharajganj, Gonda and Bahraich. Similarly, pasture lands declined from 0.88 per cent during 1996-2000 to 0.28 per cent during 2001-2005 mostly in the districts of Ghaziabad, Etah, Budaun, Farrukhabad, Etawah and (Kanpur urban), but net sown area increased from 60.53 per cent during 1996-2000 to 69.14 per cent during 2001-2005. Due to the expansion of area under forest cultivation forest and pasture lands are highly susceptible to soil erosion.

The HYV of wheat and rice require a number of waterings as per their moisture requirement. Many times the farmers over irrigate their crops. Extent of net irrigated area has been increased from 70.19 per cent during 1996-2000 to 77.81 per cent during 2001-2005 in the state. During 2001-2005, districts of Saharanpur, Muzaffarnagar, Baghpat, Meerut, Ghaziabad, J. P. Nagar, Rampur, Pilibhit, Aligarh, Mathura, Hathras, Etah, Firozabad, Mainpuri, Ambedkar Nagar and Chandauli recorded very high above 91.66 per cent area under net irrigation. A continuous supply of moisture to soil during summer and winter seasons changed soil chemistry. Owing to capillary action, the soils have become either saline or alkaline in character, locally known as *reh*.

Another problem associated with irrigation is water logging. In all canal irrigated areas water logging is a serious problem. There are 6 major canals which serve as the means of irrigation in the state namely, the Upper Ganga canal, lower Ganga canal, Sharda canal, Eastern Yamuna canal and Betwa canal.

The Sharda canal is one of the longest canal systems and the Lower Ganga canal command area is the recent example along which water-logging is a serious problem and coveres larger areas in the districts of Bulandshahar, Farrukhabad, Mainpuri, Aligarh, Etah, Etawah, Fatehpur, and Allahabad.

The Ganga is considered to be a secred and most polluted. The Yamuna is as an important tributary of the Ganga, which is also most polluted. Sewage and runoff of waste from industries and towns emptied into the Yamuna river (Fig. 1.1 and 1.2).

Table 1: Estimated Pollution Generation along the Yamuna river in Some Districts of Uttar Pradesh

Name of district	Waste water flow (Mld)	BOD Load (tonnes/day)
Saharanpur	45	6.75
Muzaffarnagar	35	2.25
Ghaziabad	180	27.00
Mathura	31	4.65
Agra	90	13.50
Etawah	15	2.25

BOD: *Biochemical Oxygen Demand; MLD: Million Liters Per Day.*

Source: *Citizens Fifth Report,* Centre for Science and Environment, Ccntral Pollution Control Board, Delhi, (October, 2002), P. 71.

Dikshit, Scientist working with the Indian Agriculture Research Institute (IARI), New Delhi are of the opinion that, when fertilizers and pesticides are used more than the recommended doses, they pollute water, land and air.

Soil is very important because it supports all kinds of plant life and growth on land, but it becomes polluted. Important factors responsible for soil pollution are soil erosion, excessive use of chemical fertilizers, solid waste added from urban and industrial units and water logging.

Continuous lifting of water almost throughout the year causes lowering underground water table. Most of large and medium holding farmers have installed private tube wells for irrigation.

Area under tube well irrigation has increased from 67.97 per cent during 1996-2000 to 71.57 per cent during 2001-2005 in the state. Irrigated areas with tube well irrigation above 85.15 per cent are mostly found in districts of Moradabad, Rampur, Budaun, Hathras, Firozabad, Farrukhbad, Kannauj, Kheri, Shrawasti, S. K. Nagar, Gorakhpur, Ambedkar Nagar and Mau. In tube well irrigated areas, underground water table has gone down 4 to 6 feet. Many of the farmers are bound to geh redrilled the tube wells owing to lowering of water table. If the tubewell irrigation continues to supply water to crops like rice and vegetables, there are apprehensions that underground water table may not sustain recharge.

HYV of seeds demand a lot of use of fertilizers considerably increased in areas where green revolution benefits are to be realised. In the state consumption of chemical fertilizers (NPK) has exceeded from 98 Kg. /ha. during 1996-2000 to 127.8 Kg./ha during 2001-2005. The highest amount of chemical fertilizers is mostly consumed to the tune of above 168.03 Kg./ha. by the districts of Muzaffarnagar, Meerut, Ghaziabad, Bijnor, Moradabad, Farrukhabad, Gorakhpur, Deoria and Varanasi. Heavy doses of fertilizers have changed chemical and biological properties of soil and have created health hazards.

Application of insecticides and pesticides has slightly increased from 114.59 Kg. /000 ha. in 2000-01 to 115.96 Kg. /000 ha. in 2004-05. Use of high amount of insecticides and pesticides is seen mostly in the districts of Baghpat, Ghaziabad, Bulandshahar, Kanpur (urban), Basti and Varanasi.

Use of HYV of seeds demand water through irrigation at regular intervals and the energy input in the form of chemical fertilizers. Moreover, the crop needs to be sprayed with plant protection chemicals to reduce the danger posed by insects and pests. Heavy amount of irrigation water applied to fields and large doses of chemical fertilizers and

plant protection chemicals have changed the chemical and biochemical properties of soils.

Decay destruction of micro organisms under the impact of these inputs is a serious problem as the natural fertility of soil is declining fast and in the absence of compost and green manures humous content and nitrogen in the soil can not be adequately replenished.

HYV's of wheat and rice seeds need adequate irrigation and heavy doses of chemical fertilizers and plant protection chemicals. High amount of energy use in fields in the form of fertilizers is conducive or the luxurious use of water in crop cultivation are also ideally suited and thus controlled by plant protection chemicals for fast growth of insects and pests. These insects and pests can be controlled by plant protection chemical.

The Indian Council of Medical Research (ICMR) conducted a survey and revealed the existence of excessive residue of DDT and other pesticides in bovine milk. Traces of lead, copper zinc, cadmium and arsenic were also detected in rice, wheat maize, mustard, cotton, sesame, fruits and vegetables. These contaminations in food with chemicals are major health hazards. Moreover, the use of ganochlorine such as gamyxince and DDT have made ill effects on wildlife. Environmental pollution also health hazards and there are increased number of cancer cases, asthma and breathing problems, can be attributed to the new diffusion of innovations in agriculture.

Adoption of HYV of seeds has thus brought environmental changes which are detrimental to soil fertility, deleterious to environmental sustainability and also injurious to human health. Reduction in biodiversity in areas benifitted during the green revolution period may have long term serious ecological consequences.

Frequently watering of HYV of crops, application of chemical fertilizers, heavy doses of insecticides, and stress on cultivation of only few crops stimulate physiological changes in soil. Micro organisms, so essential for the maintenance of soil fertility, are destroyed with the application of persistent poisons and plant protecting chemicals. All of these inputs reduce the fertility of soil in long run. Moreover, the use of synthetic insecticides and pesticides, like DDT, BHC (benzene, hexachloride, dieldrin, endrin, carbonates, organophosphates, etc.) on crops exposes human beings to compounds, which have health hazards and risks for life.

Inter-Correlation among Selected Variables of Environmental Implication

In statistical terms, the relationship and association with two variables either independent or with dependent is known as correlation. The degree of relationship can be measured with the help of quantitative data. Identification of causal relationship among different characteristics of any data is an essential concern in a scientific investigation. A causal relationship between the two variables can be examined only when one of them may logically be considered as the cause for the. A factor which is supposed to be a cause is known as independent variable, and the other which is supposed to be affected is known as dependent variable. In case a causal relationship exists, both values of independent and dependent variables will vary together. This property of co-variation is also termed as correlation. In a bivariate analysis, if any increase in the independent variable will also tend to cause an increase in dependent variables, the correlation is said to be 'positive', and if an increase in the independent variable tends to cause a decrease in values of the dependent variables, the correlation is said to be 'negative'. In case, if there is no logical basis for correlation between variables, it is not to be considered as a causal relationship. Such relationship is faulty and should not be incorporated in the analysis.

Linear Correlation- Method of Measurement

There are various methods on the basis of calculations be done, but a precise quantitative measurement to determine the degree and direction of a linear correlation can be measured was propounded by Karl Pearson which is considered to be more reliable and acceptable which takes the following equation form:

$$r = \frac{XY - \frac{X \times Y}{N}}{\sqrt{x^2 - \frac{(X)^2}{N}}\sqrt{y^2 - \frac{(Y)^2}{N}}}$$

This measurement is known as the product moment correlation coefficient. By symmetry it is clear that: rxy = ryx = r.

Characteristics of Correlation Coefficient

a) If the sign 'r' is positive the variables x and y are positively related and if sign 'r ' is negative, they are negatively correlated.
b) The value of 'r' varies between -1 and +1. The value +1 or -1 indicates a perfect positive or negative correlation. As the extent of correlation decreases the value of r approaches to zero.

Test of Significance of Correlation Coefficient

Based on smaller number of observations, coefficient of correlation is considered to be a simple correlation. Using the test of significance of r, it is possible to consider whether the correlation coefficient of the bivariate is normal population (the correlation between the same variables but based on fairly large number of observations) will be zero or not. Under the null hypothesis, the population correlation will be zero, the expression as given below will be followed by't' distribution with (n-2) degree of freedom.

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$

Where,

n = the number of variables

t = the calculated value

2 = the constant

r = the value of correlation coefficient

If, any computed value of 't' is less than the corresponding tabulated value, the correlation coefficient is said to be insignificant and if the computed value of 't' is greater than the tabulated 't' the correlation coefficient is said to be significant. In present study in order to establish a causal relationship between two variables pertaining to environmental implication of green revolution in the state of Uttar Pradesh. The level of significance for these variables was calculated at 1 percent and 5 percent based on student's't' test technique considering the period of 2001-2005. Table 1.2 shows the explanations of selected variables

incorporated in the analysis. Table 1.4 shows that *variable* x_1 is insignificant but positively correlated to x_2, x_3, x_7, x_{10}, and x_{14} and negatively correlated to variables x_8 and x_{11} at 1 percent level of significance. Variable x_1 is positively correlated with variable x_{12} at 5 percent level of significance and remaining other variables are also insignificant. It is observed that, variable x_2 positively correlated with variables x_3, x_7, and x_9, and negatively correlated with variables x_{13} at 1 percent level of significance. Variable x_2, is positively correlated with variables x_3, x_7 and x_9 at 1 percent level of significance and x_{10}, x_{11} and x_{12} at 5 percent level of significance but negatively correlated with x_4 (at 5 percent level of significance) and x_{13} (at 1 percent level of significance).

Table 2: Variables selected for environmental implications on agricultural land use in the districts of Uttar Pradesh

Variable	Variable Explained
X1	Crop Productivity based on Yang's Crop Yield Index
X2	Cropping Intensity (in per cent)
X3	Net irrigated area to the net cropped area (in per cent)
X4	Canal Irrigated area to the net irrigated area (in per cent)
X5	Tube-well Irrigated area to net the irrigated area (in per cent)
X6	Irrigated area by other sources to the net irrigated area (in per cent)
X7	Consumption of chemical fertilizers (NPK) Kg. /ha. to the total cropped area
X8	Number of wooden plough per 1000 ha. of total cropped area
X9	Number of iron plough per 1000 ha. of total cropped area
X10	Number of harrows and cultivators per 1000 ha. of total cropped area
X11	Number of thresher machines per 1000 ha. of total cropped area
X12	Number of sprayers per 1000 ha. of total cropped area
X13	Number of sowing instruments per 1000 ha. of total cropped area
X14	Number of tractors per 1000 ha. of total cropped area
X15	Consumption of insecticides and pesticides (in Kg. /000 ha.)

Table 3: Values of the selected indicators in Uttar Pradesh

Districts	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	13	X14	X15
Saharanpur	106.26	155.44	91.66	18.68	81.3	0.02	184.03	8	129	117	21	40	16	126	80.28
Muzaffarnagar	120.06	147.76	97.89	24.77	75.1	0.01	215.99	65	140	222	22	43	56	119	85.55
Meerut	120.28	154.04	94.51	19.45	93.8	0.02	203.54	108	174	180	5	26	25	88	224.2
Bagpat	120.54	158.39	96.25	6.14	80.5	0.08	202.6	119	187	205	16	34	58	110	292.52
Bulandshahar	125.13	169.16	89.16	12.21	67.7	0.05	163.74	88	51	80	12	13	14	47	356.2
Ghaziabad	119.16	159.81	92.86	15.33	66	4.57	203.9	38	67	136	4	24	62	85	424.13
G.B. Nagar	120.09	112.63	71.57	12.86	94.6	0.07	104.5	8	6	75	2	0	10	50	84.94
Aligarh	117.24	165.71	98.11	11.03	91.1	0.59	109.11	50	42	84	1	9	17	61	53.52
Hatharas	118.31	158.76	99.02	9.30	80.8	4.09	133.07	169	148	286	21	5	54	24	31.65
Mathura	114.49	151.25	98.09	38.74	68.2	0.6	93.43	11	13	107	1	55	43	76	32.68
Agra	121.34	143.3	84.08	10.41	92.6	0.07	124.81	19	17	58	1	20	50	45	27.42
Firozabad	109.95	156.43	96.51	10.54	85.9	0.31	144.51	62	46	101	5	36	43	36	21.77
Mainpuri	111.69	160.93	97.73	26.31	86.5	0.64	139.66	19	119	185	8	9	23	26	58.15
Etah	106.81	161.33	95.02	11.85	88.8	4.28	105.05	86	57	99	3	4	23	15	132.62
Bareilly	98.35	161.74	89.94	13.34	85.1	5.38	161.4	119	160	249	41	21	64	46	79.78
Budaun	104.17	164.08	90.50	0.02	75.5	7.46	112.74	213	181	254	14	4	115	36	61.35
Shahjahanpur	111.51	162.38	88.27	5.09	78.2	2.34	175.04	95	145	208	6	12	28	37	96.27
Pilibhit	120.78	167.09	96.43	23.54	52.3	1.78	190.74	32	186	244	18	30	66	62	93.75
Bijnor	111.4	131.45	82.87	3.67	82.3	0.06	145.75	143	227	121	8	13	27	66	20.13
Moradabad	109.32	170.69	84.03	3.79	79.7	0.03	168.57	254	138	229	3	3	42	70	53.62
J. P. Nagar	106.83	154.44	95.04	0.00	76.7	0.01	206.8	298	148	173	3	9	40	82	23.35
Rampur	116.88	184.77	93.60	1.40	12.8	1.97	136.59	159	197	294	53	46	179	59	36.14
Farrukhabad	117.19	142.19	82.28	2.74	0.3	7.43	231.48	168	158	235	3	31	61	35	222.73
Kannauj	113.41	158.81	90.52	10.86	21.3	8.38	148.15	274	173	347	11	37	47	46	150.64
Etawah	113.87	159.42	81.98	49.60	45.7	2.21	96.4	129	114	143	17	7	35	22	162.27
Auraiya	115.04	158.94	81.44	43.76	25.6	19.5	86.11	221	193	373	28	7	70	32	59.15
Kanpur (urban)	106.77	143.69	68.54	24.01	25.8	4.79	145.4	132	95	205	25	18	21	32	239.24
Kanpur (rural)	120.29	139.58	73.29	40.44	1.41	20	109.6	159	87	224	26	25	41	37	205.15
Fatehpur	100.64	138.52	64.06	22.73	4.15	7.93	129.93	274	138	291	21	10	32	23	175.67
Allahabad	88.55	150.76	71.67	49.90	17.3	2.14	161.98	340	120	53	73	29	108	41	122.74
Kaushambi	97.29	133.72	68.99	16.10	56	0.22	141.67	422	137	118	31	4	26	18	46.08
Pratapgarh	89.82	149.42	85.76	43.25	50	0.2	117.09	293	104	35	106	18	6	32	128.27
Jhansi	91.59	125.29	61.26	42.71	88.4	0.33	57.58	114	11	44	11	4	118	36	69.79
Lalitpur	80.94	138.48	80.13	32.17	61.2	0.05	36.73	214	11	40	1	2	94	30	71.15
Jalaun	112.51	115.71	53.24	74.42	88.7	0.04	65.38	54	21	61	5	7	76	45	53.98
Hamirpur	83.71	113.35	33.66	34.71	45.7	0.61	31.62	103	24	37	41	3	73	39	85.08
Mahoba	70.58	115.7	44.11	30.26	88	0.09	30.84	149	18	39	21	3	125	30	88.57
Banda	75.21	121.95	34.28	62.43	94.4	1.08	21.9	235	101	46	54	1	182	15	72.65
Chitrakut	79.85	111.33	27.59	34.55	86	0.67	37.51	294	63	28	20	1	276	16	63.09
Varanasi	92.25	144.43	84.66	11.48	97.8	1.17	319.04	106	80	16	146	32	27	39	336.06
Chandauli	94.82	173.77	92.84	84.25	85.7	0.02	145.2	96	62	25	85	4	4	44	78.23

Ghazipur	87.14	160.1	82.91	23.14	80.1	0.1	130.86	147	192	17	60	10	40	37	69.27
Jaunpur	93.73	155.72	86.76	27.94	86.2	0.13	105.82	300	89	34	95	4	34	34	89.7
Mirzapur	83.62	143.93	56.51	63.11	80.2	0.03	74.82	282	48	39	64	16	82	41	95.86
Sonbhadra	65.19	140.2	24.06	85.95	72	0.05	44.82	604	32	33	59	14	106	31	103.04
S.R. Nagar	87.27	144.13	79.75	18.85	72.3	0.06	180.42	145	39	15	114	5	6	36	184.59
Azamgarh	84.69	165.9	90.35	19.67	56.6	0.08	93.01	310	322	47	170	8	24	41	77.05
Mau	89.55	165.71	88.13	11.64	83.6	0.17	127.23	194	257	41	125	8	23	36	217.85
Ballia	82.19	160.82	78.10	17.25	97.8	0.44	105.04	58	53	15	35	8	36	21	56.02
Gorakhpur	86.45	151.2	80.37	3.65	84	0.12	155.41	101	87	103	200	21	5	39	147.06
Maharajganj	107.91	178.16	79.89	18.04	67.3	0.1	137.74	155	116	218	199	30	64	48	70.69
Deoria	93.44	161.16	84.42	13.29	53.8	0.06	222.76	69	72	75	91	4	2	19	106.31
Kushi Nagar	106.83	152.3	74.85	36.00	76.8	0.43	143.51	10	16	63	39	2	24	57	166.56
Basti	87.57	145.1	63.19	0.00	35.9	4.58	249.13	123	58	75	51	4	11	45	349.59
Siddharth Nagar	78.37	142.41	66.05	15.97	85.6	0.75	112.24	284	85	133	67	33	53	35	157.61
S. K. Nagar	89.55	168.71	83.05	2.30	82.3	0.22	103.81	241	131	102	136	5	12	36	198.18
Lucknow	88.54	154.07	89.41	20.55	78.9	0.32	137.33	236	107	152	38	62	80	34	197.69
Unnao	88.32	149.81	89.53	25.69	73.3	0.44	104.81	251	187	297	19	31	8	37	206.61
Raebareli	87.99	150.83	84.65	46.18	74.9	0.3	105.36	363	214	216	61	5	35	45	181.66
Sitapur	84.98	145.22	78.03	7.97	59	0.1	128.94	334	146	225	14	9	6	33	115.09
Hardoi	97.77	151.81	87.93	16.35	92.9	0.08	75.54	215	78	287	13	3	18	18	116.64
Kheri	100.82	147.22	77.66	6.68	88.5	0.08	138.41	194	82	38	35	9	1	19	112.23
Faizabad	101.03	153.59	84.34	15.80	73.7	0.01	215.26	470	184	112	102	29	3	61	129.07
Ambedkar Nagar	105.88	168.9	94.08	14.27	89.1	0.05	157.28	306	55	97	177	27	23	71	29.3
Sultanpur	101.76	151.44	80.64	27.62	90.7	0	99.33	317	116	424	56	17	2	33	160.61
Barabanki	105.46	178.07	88.31	32.30	60.7	2.15	157.25	190	36	72	11	13	9	8	125.41
Gonda	86.77	155.85	67.70	0.81	88.5	3.59	92.67	86	62	134	16	12	14	21	106.03
Balrampur	79.25	151.34	37.80	6.16	81.4	0.48	61.84	245	47	93	14	17	11	10	111.63
Bahraich	87.36	152.8	48.94	5.06	78.1	0.01	76.75	158	30	60	9	11	7	6	101.54
Shravasti	81.42	151.51	39.74	1.01	10.9	22.9	62.56	184	132	286	34	25	29	45	46.14

Variable x_3 is positively correlated with variables x_7, x_9, x_{12} and x_{14} at 1 percent level of significance, and variable x_{10} significant at 5 percent but negatively correlated with variables x_4, and x_{13} at 1 percent level of significance and x_8 5 percent level of significance. *Variable* x_4 is negatively correlated with variable x_7 having r value of -.411 at 1 percent level of significance and variables x_9 and x_{10} negatively correlated at 5 percent level of significance but positively correlated with x_{13} having r- value of .299 at 5 percent level of significance. *Variable* x_5 is negatively correlated with x_6 (r value -.647) and x_{10} (r value -.395) at 1 percent level of significance and variable x_9 at 5 percent level of significance. *Variable* x_6 is positively correlated with only one variable of x_{10} having r-value 488 at 1 percent level of significance. and. *Variable* x_7 is positively correlated with variable x_{12}, x_{14} and x_{15} at 1 percent level of significance and variable x_7 is negatively but significantly correlated with variable x_{13} at 1 percent level of significance. and remaining other variables are insignificant, except the variable x_9, which is significant at 5 percent. Variable x_8 is positively correlated with variables x_9 and x_{11} and negatively correlated with x_{14} at 5 percent level of significance. *Variable* x_9 is positively correlated with one variable of x_{10}, having r value of .479 at 1 percent level of significance. *Variable* x_{10} is negatively correlated with variable x_{11} and positively correlated with x_{12} which is significant at 5 per cent. Variable x_{11} is positively correlated with variables x_{12}, and x_{15} and negatively correlated with x_{13} and x_{14} but all variables are insignificant. *Variable* x_{12} is positively correlated with variable x_{14}, which is significant at 1 percent.

Table 4: Correlation Matrix Showing of Environmental Implication on Agricultural Land Use in Uttar Pradesh

Variables	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
X1	1														
X2	.309**	1													
X3	.631**	.660**	1												
X4	-0.234	-.291*	-.341**	1											
X5	-0.138	-0.054	0.088	-0.002	1										
X6	0.16	0.031	-0.111	-0.061	-.647**	1									
X7	.443**	.380**	.575**	-.411**	-0.095	-0.061	1								
X8	-.477**	-0.066	-.298*	0.202	-0.159	-0.008	-0.205	1							
X9	0.14	.359**	.377**	-.254*	-.244*	0.167	.263*	.285*	1						
X10	.413**	.271*	.294*	-.264*	-.385**	.488**	0.114	0.092	.479**	1					
X11	-.342**	.241*	0.04	0.033	0.065	-0.17	0.156	.266*	0.185	-.244*	1				
X12	.270*	.249*	.319**	-0.141	-0.203	0.071	.357**	-0.078	0.167	.281*	0.044	1			
X13	-0.18	-.342**	-.411**	.299*	-0.071	0.044	-.373**	0.143	-0.042	-0.047	-0.14	0.028	1		
X14	.474**	0.157	.413**	-0.118	0.059	-0.097	.454**	-.249*	0.229	0.151	-0.045	.475**	-0.05	1	
X15	0.076	0.06	0.086	-0.116	-0.166	0.064	.446**	-0.063	0.027	0.019	0.083	0.136	-0.225	0.095	1

** Correlation significant at 0.01 level

* Correlation significant at 0.05 levels

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