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Environmental Impact of Agro-based Industries A case study of Gorakhpur Division (U.P.)

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Abstract

Mushrooming of plenty of small agro-based industries generally neglects the environmental concerns. In the absence of proper waste disposal functioning, these industries practice unsafe dumping of hazardous waste in open areas, which are degrading the environment. But, the impacts of agro-based industries on the environment have been under the recycling capacity of the ecosystem, because pollutants caused by them are decentralized due to their decentralized as well as diversified nature. The trend of such impacts is also prevailing in Gorakhpur division except sugar industry (the only big industry), which is causing environmental problems in their localities. This paper assesses the impact of agro-based industries on local ecology through empirical survey.

Introduction

Industrial development without compromising the native integrity of the environment now constitutes a major challenge (Garba, 2001). Still, developing countries are adopting the industrial development models, which degrade the environment. The threat to wildlife, ecosystem, fauna and flora and indeed the security of the human race has attracted the scientists, thinkers and planners to protect and preserve the environment (Anago, 2002). Agro-based industries generate large quantities of toxic and hazardous waste or by-products and poisonous gases during production process. Since, these are available or produced in dispersed manner their impacts are also dispersed reducing environmental damage but at the same time they are disposed off without any treatment neglecting the environmental concerns (Saith, 2000). In many industries, anti-pollution measures are either commercially non-voidable or are too expensive to be afforded by small-scale entrepreneur (Bhattacharya, 2000). Disposal of these wastes in the environment causes river water pollution, air pollution and also ground water pollution resulting in health hazards in surrounding areas.

Decentralizing and diversifying nature of agro-based industries tends to be eco-friendly but due to suffering from a number of operational handicaps (Chadha, 2003) and lack of proper management, these activities also become responsible for the degradation of environment. Agro-based industries are small and decentralized therefore, environmental degradation is not intense in the study area, but where big industries like sugar, textile and leather are located, concentration of pollution is comparatively centralized. They need proper management of the disposal of waste to maintain the eco-friendly relationship between agro-based industries and environment.

Gorakhpur division (26^0 $06'$ to 27^0 $29'$ N and 83^0 $05'$ to 84^0 $26'$ E) is spread over 11819 km^2 (4% of the area of Uttar Pradesh) in northeastern part of Uttar Pradesh in a quadrilateral shape (Fig.1). The division is delimited by international boundary (Nepal) in the northeast, by state boundary (Bihar) in the east and rest of the parts by district boundaries (Sidharthnagar, Santkabirnagar, Ambedkarnagar, Azamgarh, Mau and Ballia). The study area is the part of middle Gangetic plain made of sediments of fertile new alluvium comprising four districts Gorakhpur, Mahrajganj, Deoria and Kushinagar. The land is drained by Chhoti Gandak and Rapti river systems. Gorakhpur has monsoon climate having three seasons-summer (March to Mid June), rainy (Mid June to October) and winter (November to February). Rivers, lakes and ponds provide good water resource. Forest is extended over 51992 hectare in the division (4.46 percent of the whole land), which provides timber and many minor products. Apart form these forest tracts; orchards of few trees like mango, guava, 'mahua' are also distributed around rural settlements. In 1991-2001 the population growth rate (26.05 percent) was recorded more than Uttar Pradesh (25.80 percent) and India (21.34 percent). Average density of Gorakhpur division is 608 persons per km^2. According to 2001 census, the literacy of the study area is 54.20 percent that is very less than literacy of Uttar Pradesh (57.4 percent) and of India (65.4 percent). The working population is 31.65 percent of which 53.73 percent are farmers, 26.64 percent agricultural labourers, 1.27 percent are in household industries and 18.36 percent are engaged in other works (State Planning Institute, 2008). The division is well connected with the other parts of the country by road and rail transport.

Methodology

This paper is based on qualitative data gathered from the perception of the people about the environment instead of analysing presence of pollutants in atmosphere, hydrosphere and lithosphere (like content of CO_2, SO_2 solid particles, BOD, COD, pH etc.). The sources of data are basically field survey of industries executed in November 2008. Location and extent of the study area as well as sample places and industrial profile are extracted from the data provided by State Planning Institute, Lucknow and Directorate of Industries, Kanpur. To assess the environmental impacts, five different kinds of agro-based industries namely, sugar mill, rice mill, flourmill, sawmill and edible oil mill have been chosen from each districts. Siswa (Mahrajganj), Sardarnagar (Gorakhpur), Gauri bazaar (Deoria) and Padrauna (Kushinagar) are randomly selected for survey of sugar industry, Partawal (Mahrajganj), Pipiganj (Gorakhpur), Bankata (Deoria) and Hata

(Kushinagar) for rice mills, Farenda (Maharajganj), Bargadwa (Gorkahpur), Rudrapur (Deoria) and Sukrauli (Kushinagar) for flour mills; Nautanwa (Mahrajganj), Sahjanwa (Gorakhpur), Garurpar (Deoria) and Narayanpur (Kushinagar) for saw mills and Siswa (Mahrajanj, Khajni (Gorakhpur) Matiamafi (Deoria) and paikoli (Kushinagar) for edible oil mills. Except sugar mill (one unit), five units of all four industries have been taken into account. Thus, the total 84 units of agro-based industries (21 units from every district) have been surveyed. Ten persons from the surrounding (within 200 metres approximately from the factories) of each unit have been asked about impact of smoke and dust emitted by industries, water quality and impact on aquatic flora and fauna. Thus, the total 840 respondents were covered in the survey. This analysis is based on the environmental questions of an interview schedule prepared for industrial survey. The data are generated by enumerating the responses of the interviewee to the above four impacts. Their response 'yes' if problem persists was counted for data.

Observations

Industrial profile of the study area

Basically primary activities are carried out in the form of agriculture in Gorakhpur division. Less developed secondary activities are based on agricultural production. Agro-processing industries record 76.34 percent industrial units, 64.14 percent employment and 65.09 percent capital investment of the total agro-based industries in which rice, flour, oil, pulse mills are prominent. Maximum number of agro-processing industries is established in Deoria district having 26 percent of the whole division followed by Kushinagar (19.09 percent), Gorakhpur (14.31 percent) and Mahrajganj district (3.88 percent). About 5.21 percent foodstuff industries like, bakery, Suji, biscuits etc. are set up with 9.53 percent employment and 12.07 percent capital investment of the total agro-based industries. About 54.94 percent of these industries are in Gorakhpur district followed by Maharajganj (23.95 percent), Kushinagar (11.38 percent) and Deoria (10.18 percent). About 4.29 percent of the capital is invested in 4.43 percent units of hosiery industry in which 5.67 percent workers are employed. About 5.98 percent of the total agro-based industries are wood product industries in which 3.49 percent workers and 3.3 percent capital is credited. More than the half (54.88 percent) of wood products industries is only in Gorakhpur district followed by Deoria (21.88 percent), Kushinagar (21.68 percent) and Mahrajganj (1.56 percent) districts. Sugar industries are only major industry in the division which are distributed at Betalpur, Gauribazar, Bhatni, Pratappur in Deoria district; Kaptanganj, Laxmipur, Ramkola, Padrauna, Kathkuiya, Sevarahi, Khadda, Chhitauni in Kushnagar district; Ghughuli, Siswa, Farenda in Maharajganj district and Sardarnagar, Dhuriapar, Piparaich in Gorakhpur district. There are a number of

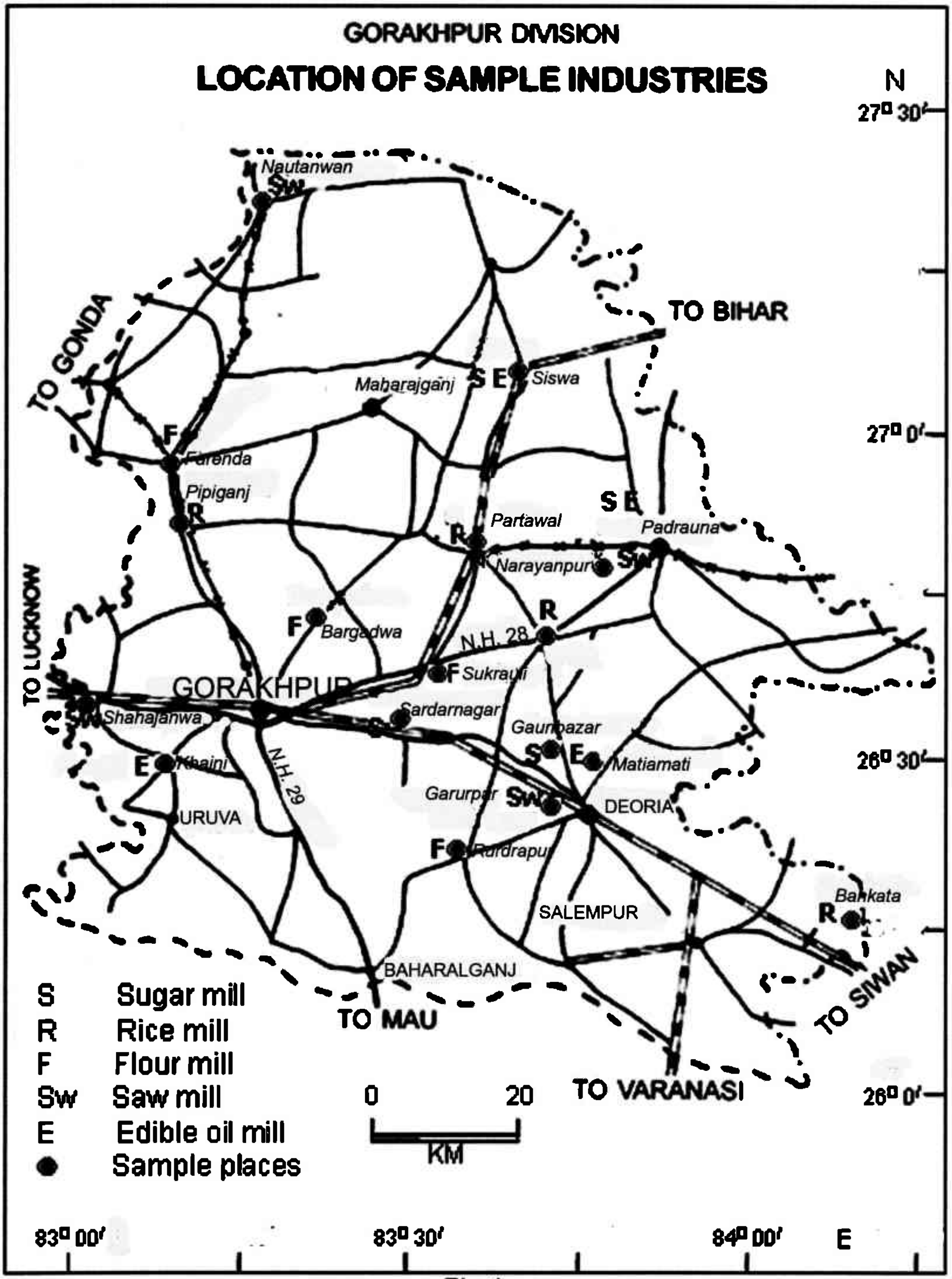
GORAKHPUR DIVISION
LOCATION OF SAMPLE INDUSTRIES
N
27° 30′
27° 0′
26° 30′
26° 0′
TO BIHAR
TO GONDA
TO LUCKNOW
TO MAU
TO VARANASI
TO SIWAN
Nautanwan
Maharajganj
Siswa
Farenda
Pipiganj
Partawal
Padrauna
Narayanpur
Bargadwa
N.H. 28
Sukrauli
GORAKHPUR
Shahajanwa
Sardarnagar
Gaurbazar
Matiamati
Khajni
N.H. 29
URUVA
Garurpar
DEORIA
Rudrapur
SALEMPUR
Bankata
BAHARALGANJ
S Sugar mill
R Rice mill
F Flour mill
Sw Saw mill
E Edible oil mill
Sample places
0
20
KM
83° 00′
83° 30′
84° 00′
E

Fig.1

Table 2: Average Pollution Level (In %) by Different Industries
(Average number of respondents who said 'yes' for the respective problem)

Industry	Atmospheric condition		Hydrological condition		Land degradation	Average
	Smoke	Dust	Drinking Water	Aquatic Flora/Fauna	Fertility	
Sugar	20.00	42.50	70.00	60.00	60.00	50.50
Rice	26.00	32.50	14.50	16.00	0.00	17.80
Flour	14.50	24.50	10.00	16.00	2.50	13.50
Saw	0.00	46.50	0.00	13.00	0.00	11.90
Edible oil	30.00	24.00	61.50	67.50	56.50	47.90
Average	18.10	34.00	31.20	34.50	23.80	28.32

Source: Field Survey, November 2008

kanrsari industries at different places of Gorakhpur division. These industries utilize the locally produced sugarcane. The farmers prefer to give their cane in these small mills because the entrepreneurs give the prices at once to the farmers. These industries are distributed mainly at Nichlaul, Senduria, Kolhui, Partawal, Farenda, Ghughuli, Maharajganj, Bhitauli, Gauribazar, Chitauni Piparaich etc. Animal products industries like, dairy products, meat, poultry, wool, leather, horn etc. are about 6.03 percent of the total agro based industries employing 8.53 percent workers and investing 7.73 percent capital. Handicraft industries (4.62 percent) have also been developed in the study area (Directorate of Industries, 2008). These types of industries have developed mostly at the urban centers. Gorakhpur division is fully an agrarian area where small cottage industries have been developing in a traditional way. Development of agro-based industries occurs slowly due to various social, economic and political factors. In the same way, forest products and animal rearing are also in the primary state. But changes into occupational structure due to technological development and demand, have affected the development and distribution of agro-based industries. This sector is in initial stage in the division but development of infrastructure may boost it at higher pace.

Environmental status near sample industries

Sugar mills

Four units of sugar industries of the division have been surveyed in Siswa (Mahrajganj), Sardarnagar (Gorakhpur), Gouri bazaar (Deoria) and Padrauna (Kushinagar). Pollution level of these industries has been worked out on the basis of the people's response to the questions of interview schedule made for the purpose. Atmospheric condition in the aforesaid districts is not much affected on the whole by sugar industries but it has been seen that pollution by dust (40.75 percent) is more than that caused by smoke (20 percent). On the contrary, these factories have polluted drinking water (70 percent) and affected the aquatic bio reserve (60 percent) of the area. In the same way, these factories have also resulted into land degradation (60 percent) of the adjoining areas as the fertility of the soil is decreased. Gorakhpur has highest pollution level (60 percent) by sugar industry, whereas Maharajganj (50.2 percent) and Kushinagar (50.2 percent) have moderate level. Pollution level is lowest in Deoria (40.2 percent), but the average level of the pollution is moderate (50.15 percent) in the notable division created by sugar mills (Table-1).

Rice mills

Five Rice mills of every place namely, Partawal (Mahrajganj), Pipiganj (Gorakhpur), Bankata (Deoria) and Hata (Kushinagar) have been accounted to find the level of pollution in adjoining areas. These mills do not pose serious problems to local environment as evident from the survey. Atmosphere is not much affected by rice mills but it has been seen that pollution by dust (32. 5 percent) is more than that caused by smoke (26 percent). These factories have equally little impact on drinking water (7.25 percent) and aquatic bio reserve (7.25 percent) of the area but have no impact on land degradation of the adjoining areas as the farmers feel no any negative change in production of crops. Maharajganj and Deoria have highest pollution level (18.4 percent) by rice mills, whereas Kushinagar (17.6 percent) has moderate level. Pollution level is lowest in Gorakhpur (16.8 percent), but the average level of the pollution is very low (17.8 percent)) in the division created by rice mills (Table-1).

Flour mills

The flour mills of Farenda (Mahrajganj), Bargadwa (Gorakhpur), Ruprapur (Deoria) and Sukrauli (Kushinagar) have been taken into consideration. Like rice mills, flour mills have also very low impact on the environment. The people have experienced a little pollution in atmosphere. Pollution by dust (24. 5 percent) is more than that caused by smoke (14.5 percent) where as impact on aquatic flora & fauna (16 percent) is more than that of drinking water (10 percent) in hydrosphere. At the same time, only 2.5 percent farmers feel negative change in production of crops. This situation is found around generator-powered flour mills in Deoria district where residue of mobil oil of generators is drained. Gorakhpur (16.8 percent) has highest pollution level (7.4 percent) followed by Maharajganj (7 percent), Kushinagar (6.4 percent) and Deoria (6.2 percent). The average level of the pollution is very low (6.75 percent)) in the division created by flour mills (Table-1).

Saw mills

To trace out the pollution caused by saw mills twenty units (five from each place) from Nautanwa (Maharajganj), Sahajanwa

Table 3: Regional Distribution of Pollution
(Average number of respondents who said 'yes' for environmental problems)

District	Average number (in %) of respondents in different industries					Average
	Sugar	Rice	Flour	Saw	Edible	Oil
Mahrajganj	52.00	18.40	14.00	14.00	47.20	29.12
Gorakhpur	60.00	16.80	14.80	12.00	48.80	30.48
Deoria	38.00	18.40	12.40	12.40	46.40	25.52
Kushinagar	52.00	17.60	12.80	9.20	49.20	28.16
Average	50.50	17.80	13.50	11.90	47.90	28.32

Source: Field Survey, November 2008

(Gorakhpur), Garurpar (Deoria) and Narayanpur (Kushinagar) have been taken into account. These mills are responsible for polluting atmosphere by dust (46.5 percent) but not by smoke at all. Aquatic flora & fauna (13 percent) is affected by saw mills due to storage of raw wood into the nearby water bodies. Decomposition of raw wood degrades the quality of water. There is no effect on drinking water and fertility of soil in the study area (Table-1).

Edible oil mills

The edible oil mills of Siswa (Mahrajganj), Khajani (Gorakhpur), Mattiamaffi (Deoria) and Paikoli (Kushinagar) have been taken into consideration. These mills are also polluting the environment. Little pollution experienced by the people in atmosphere. Pollution by smoke (30 percent) is more than that caused by dust (24 percent) in atmosphere where as impact on aquatic flora & fauna (67.5 percent) is more than that of drinking water (61.5 percent) in hydrosphere. At the same time, about 56.5 percent farmers feel negative change in production of crops. This situation is found in the nearby farms and water bodies where residue of oil is drained. Kushinagar has highest pollution level (49.2 percent) followed by Gorakhpur (48.8 percent), Maharajganj (47.2 percent), and Deoria (46.4 percent). The average level of the pollution is moderate (47.9 percent)) in the division created by saw mills (Table-1).

Discussion

The above analysis clearly indicates that the sugar industry has the highest impact (50.5 percent) on the environment followed by edible oil mill (47.9 percent), rice mill (17.8 percent), flour mill (13.5 percent) and saw mill (11.9 percent). The data (Table-2) show that mainly dust (34 percent) has degraded the atmosphere and liquid waste degrade the hydrosphere affecting drinking water (31.2 percent) and aquatic flora & fauna (35.5 percent). There is very low variation in the pollution level among four districts (Table-3). The highest level of pollution is in Gorakhpur district (30.48 percent) followed by Maharajganj (29.12 percent), Kushinagar

Table 4: Average Pollution Levels By Different Units

District	Place	Atmospheric condition		Hydrological condition		Land degradation	Mean
		Smoke	Dust	Drinking water	Aquatic Flora / Fauna	Fertility	
		%#	%#	%#	%#	%#	%#
Sugar Mills (10)*							
Mahrajganj	Siswa	20	50	70	60	60	52
Gorakhpur	Sardarnagar	30	40	80	70	70	60
Deoria	Gauri bazar	10	50	60	50	50	38
Kushinagar	Padrauna	20	50	70	60	60	52
Rice Mills (50)*							
Mahrajganj	Partawal	32	30	10	20	0	18.4
Gorakhpur	Pipiganj	20	34	20	10	0	16.8
Deoria	Bankata	20	36	12	24	0	18.4
Kushinagar	Hata	32	30	16	10	0	17.6
Floor Mills (50)*							
Mahrajganj	Farenda	10	30	10	20	0	14
Gorakhpur	Bargadwa	20	20	10	24	0	14.8
Deoria	Rudrapur	12	16	14	10	10	12.4
Kushinagar	Sukrauli	16	32	6	10	0	12.8
Saw Mills (50)*							
Mahrajganj	Nautanwa	0	60	0	10	0	14
Gorakhpur	Sahjanwa	0	40	0	20	0	12
Deoria	Garurpar	0	50	0	12	0	12.4
Kushinagar	Narayanpur	0	36	0	10	0	9.2
Edible oil mills (50)*							
Mahrajganj	Siswa	20	10	70	70	66	66
Gorakhpur	Khajani	40	20	60	50	44	44
Deoria	Matiamafi	20	30	66	60	56	56
Kushinagar	Paikoli	40	36	50	60	60	60
Average		**50.50**	**17.80**	**13.50**	**11.90**	**47.90**	**28.32**

* Total Number of Respondents: # Percentage of respondent giving positive responses

Source: Field Survey, November 2008

(28.16 percent) and Deoria district (25.52 percent). The average pollution level of the division is only 28.32 percent which is bellow fifty percent. It means pollution level is not serious in the study area but it is the time to check its spread. It is also notable that the pollution is observed locally. This data proves that small agro-based industries never create critical environmental problems on a wider area due to its decentralizing and diversifying nature.

Conclusion

It is well known fact that present day environmental problems are the out come of industrialization, but, at the same time, it is very difficult to minimize the luxurious demands of the present and coming generation which activate the unlimited extraction of limited resources for industrial development. Exploitation of resources is low in rural areas in comparison to the urban one but; the rural people are far away from the modern development too. The above analysis shows that small agro-based industries have little impact on environment due to its decentralizing and diversifying nature of development and these industries may be eco-friendly in rural areas in its more diversified and decentralized form. The only need is to develop a hierarchical linkage of industrial activates in rural areas extended from rural to urban centres with fully participation of rural people in these activities.

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