

ENVIRONMENTAL HEALTH IMPACTS ASSESSMENT DUE TO BRICK KILNS: A CASE STUDY ON BADARGANJ UPAZILA UNDER RANGPUR DISTRICT IN BANGLADESH

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ABSTRACT

Brick is one of the most important and available construction material in Bangladesh but Brick kilns are orange-A category industry in Bangladesh. Brick kiln operating in northern part of Bangladesh is known as a leading cause of air pollution. The main objective of this study is to assess the effect of brick kilns on human health. This study is conducted at Badargong upozila. This upazila has 80 brick kilns and all brick kilns use low technology. Thus it produces so much CO₂, CO, NO₂, SO₂ and hydrocarbon around the area and some respiratory related diseases are occurred. Different methods were used for data collection, such as Household Environmental Interview Survey (HIS), Focus Group Discussion (FGD) and Health Examination Survey in different primary school. Three schools were selected these from most affected areas (Ghatabil primary school), moderately affected areas (Kalirdanga primary school) and less affected areas (Jugipara primary school). Most of the interviewee replies that smoke related diseases are much more around brick kilns area. People affected 7.5% more during brick kilns operating period than brick kilns not operating period.

Key word: Northern part of Bangladesh, air pollution, human health, brick kiln, Badargonj

1. INTRODUCTION

Recently development works have been increasing day by day so the demand of bricks has also been increasing continuously. Because of increasing demand of bricks people establish much more brick kilns. As a result burning of coal, gas and wood was automatically increased and emission rate of CO₂, CO, N₂O, NO, Hydrocarbon, SO₂ etc. was also increased. When any local area produces so much of CO₂, CO, N₂O, NO, Hydrocarbon, SO₂ etc. then it directly affects to the environment and human health. It creates environmental pollution. It is the exposure of much smoke related disease like asthma, respiratory problem, tonsillitis, acute pharyngitis and even cancer. It is also affected the agricultural production. All brick kilns in these study area are situated at the Centre of the agricultural land. Production from these agricultural lands has decreased during brick kiln operating period than brick kiln not operating period.

In the North Dhaka cluster, brick kilns are the city's main source of fine particulate pollution, accounting for nearly 40 per cent of total emissions (Biswas et al., 2009). The impacts of brick kilns were increased as per the increasing of brick kilns. So this study is conducted to assess the impact of brick kilns on human health. This study may give a clear identification about the impacts on health due to brick kilns. Most of the brick kilns in the Badarganj upazila operate from the month of November till April. Day by day the environmental condition and health condition becomes worse because of unplanned construction of brick kilns. Where one brick kiln has established people want to reconstruct another one on this spot to get agglomeration of

economics. For this reason many brick kilns have established in one location and it causes pollution blooming in that surrounding locality. This pollution is mainly affected human health and environment According to World Bank in 1996, the main contributing sources for total suspend particles (TSP) in the valley are cement factory (36%), brick kilns (31%), domestic fuel combustion (14%), road re-suspension (9%) and vehicle exhaust (3.5%).

This study can help to realize the present situation in analytically & future trend of brick kilns on these area. In Bangladesh many research have been done already about Brick kilns but their work is being held on CO₂ emission, laws of Brick kiln, manufacturing process of brick etc. But the researchers were not concerned about health impacts due to emission from brick kilns. In Bangladesh, there is no research which has mentioned about health impacts due to brick kilns. So, it is the first research which mention about the relation between health impacts due to brick kilns. It may help to the Govt. to take necessary steps in taking decision to permit for construction of brick kilns in rural area.

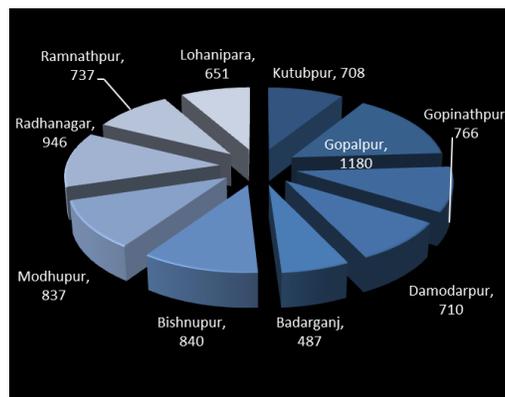
The aim of this research is to assess and analyze health condition due to emission from brick kilns. Badargonj upazila has been selected as study area under Rangpur district. 80 brick kilns were founded in these area and various classes of people were affected due to brick kilns. For this reason these areas have been selected as study area. The study may help to understand the effects of brick kilns on human health. This study also provides the spatial distribution of brick kilns and vulnerable zone of brick kilns which may help to analyze future trends.

The selected objectives of the research are given below-

- To observe the existing situation of brick kilns in the study area.
- To assess the effect on human health due to brick kilns in the study area.
- To provide some guidelines to reduce the negative impacts of the brick kilns in that locality.

2. STUDY AREA PROFILE

Badargonj is located at 25°40'N 89°03'E. It has 44029 households and total area of 301.29 km². As of the 1991 Bangladesh census, Badargonj has a population of 213431. Males constitute 51.28% of the population, and females 48.72%. (Wikipedia, 2017)



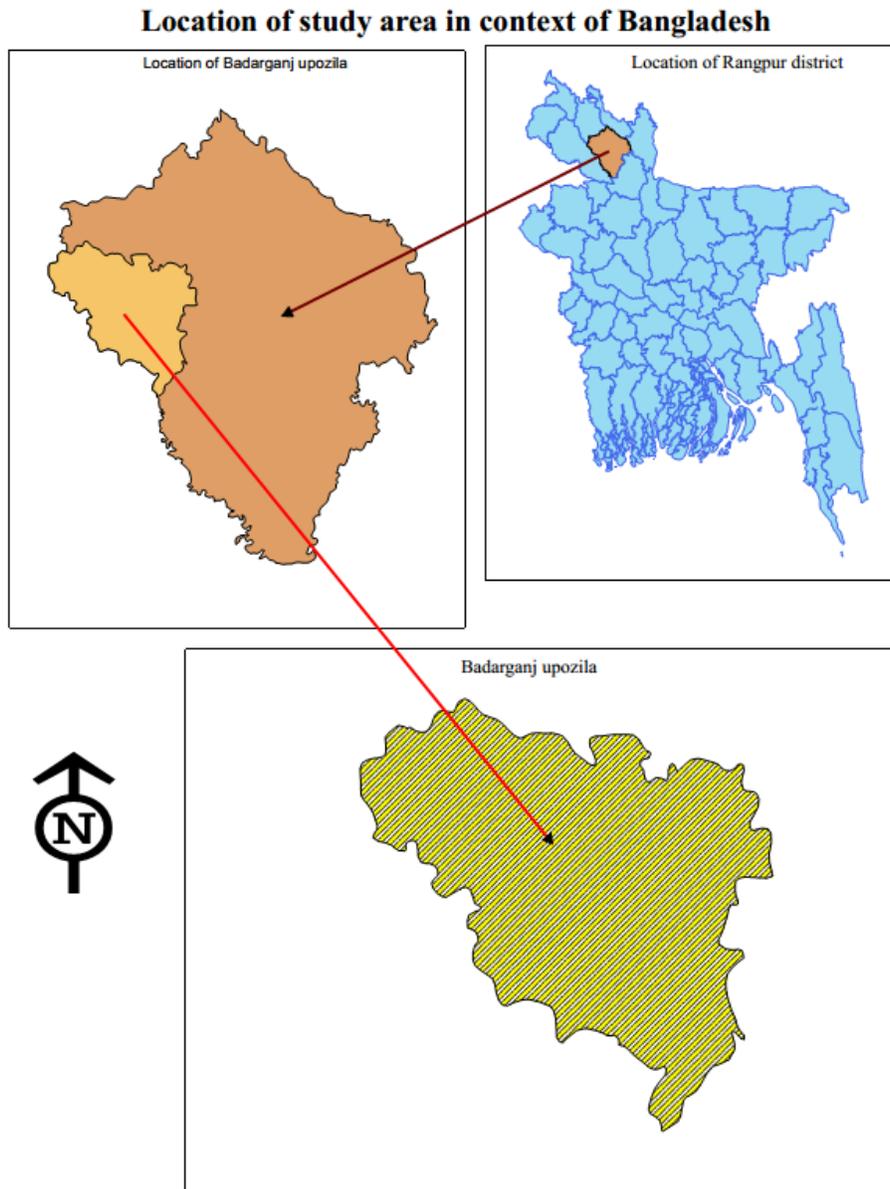
Source: BBS, 2011 and Author

Figure 1: Union wise population density (Per sq. km)

2.1 Economic condition of the study area

Main sources of income of the area are Agriculture 69.54%, non-agricultural laborer 3.32%, industry 0.48%, commerce 13.8%, transport and communication 2.25%, service 4.58%, construction 0.75%, religious service 0.2%, rent and remittance 0.07% and others 5.01%. Ownerships of agricultural land Landowner 41.42%, landless 50.58%. Main crops are Paddy, jute, wheat, potato, mustard seed, tobacco, vegetables etc. (Wikipedia, 2017)

2.2 Location of the study area in context of Bangladesh



Source: Compiled by the Author, 2017

Figure 2: Location of the study area

3. METHODOLOGY OF THE STUDY

This study was conducted at Badarganj upazila. Badarganj upazila has total 80 brick kilns and it is identified that most affected areas are Modhupur union and Ramnathpur union, moderately affected areas are Damodurpur union and Bishnupur union and rest other unions are less affected area. The study uses both primary and secondary data. After collection the data were analyzed using various types of analytical tools like Geographic Information System (GIS 10.3), Microsoft excel, SPSS, Auto cad etc. After that the impacts on health due to brick kilns were identified and recommendations were provided to reduce the negative impacts of brick kilns. The methodological approaches are divided into several parts which are as follows

3.1 Primary sources of data collection

3.1.1 Household Interview Survey (HIS)

Badarganj upazila has total 44029 households among them for the restriction of time and financial cost 2% (880) of total households is sampled for survey. Data were collected from most affected areas (Modhupur union and Ramnathpur union), moderately affected areas (Damodurpur union and Bishnupur union), less affected areas (rest other union) separately. A sequential questionnaire was prepared to gather information from households like how many people live within a family and what are their ages and occupations, smoking habit, asthma, respiratory problem, tonsillitis, acute pharyngitis have or not etc.

3.1.2 School health examination

This survey was conducted at three schools one from most affected areas named as Ghatabil primary school, one from moderately affected areas named as Kalirdanga primary school and another from less affected area which named as Jugipara primary school. The three schools were chosen from same socio-economic conditions. By this survey it is tried to collect attendance sheet of six month (Brick kilns operating period and non-operating period) from the three schools and find out the causes of absent. It is also tried to know how many times a student was sick in a month during Brick kiln operating and non-operating period and by which diseases they were affected?

3.1.3 Focus group discussion (FGD)

Several Focus group discussion has been arranged in the selected sites (i.e. Modhupur union Ramnathpur and Damodurpur union) participation of local political leader, manager of brick kilns, respected person from different professional and social groups like teacher, UP chairman and members, and conscious people who are residing for more than 10-12 years in the study area. It is tried to evaluate the perception of local people through the focus group discussion.

3.1.3.1 Survey Considerations

- ❖ How to reduce the impacts on agricultural production and human health due to Brick kilns?
- ❖ How can be stabilized the increasing rate of Brick kilns in the study area?
- ❖ What initiative should be taken to improve environmental, social and economic conditions?
- ❖ Is it safe for pregnant women and children to live in the most affected area?
- ❖ How many people were affected and what are the initiatives for them?

3.1.4 Physical observation

This survey was conducted at the problem arising point (i.e. Modhupur union, Ramnathpur union, Damodorpur union and Bishnupur union) in the study area to find out the main scenario and causes of existing impacts due to emission from brick kilns. Mainly it is observed that how many brick kilns are situated in the study area and which unions are the most affected which are moderately affected and which are less affected.

3.2 Secondary sources of data collection

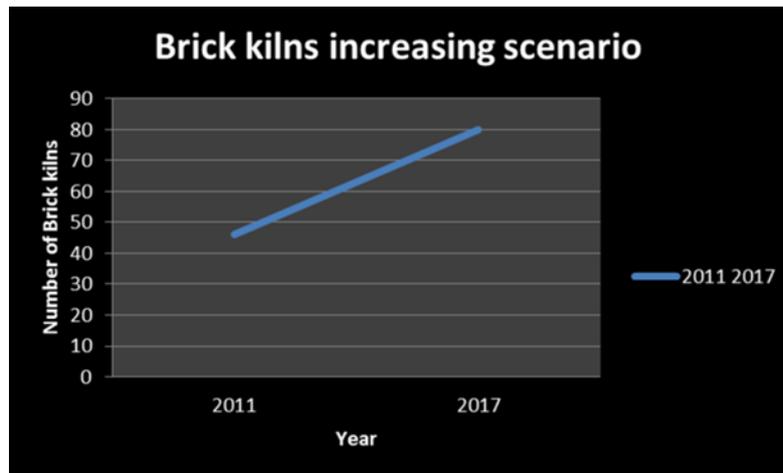
Secondary data were collected from different secondary sources like conference papers, books, journal paper etc.

3.3 Result and discussion

From existing condition analysis and the survey result the impacts on health and agriculture have been identified and some guidelines have been provided to reduce the associated problems due to brick kilns in the study area.

4. RESULT AND DISCUSSION

4.1 Existing condition of Brick kilns in the study area



Source: BBS, 2011 and the Author, 2017

Figure 3: Brick kilns increasing scenario in the study

BBS (2011) reported that Badarganj upozila has total 46 Brick kilns and according to local people it was not more than 10 in 1990 and also not more than 20 in 2000. But in 2017 it reaches at 80 in number it indicates huge change in last 17 years.

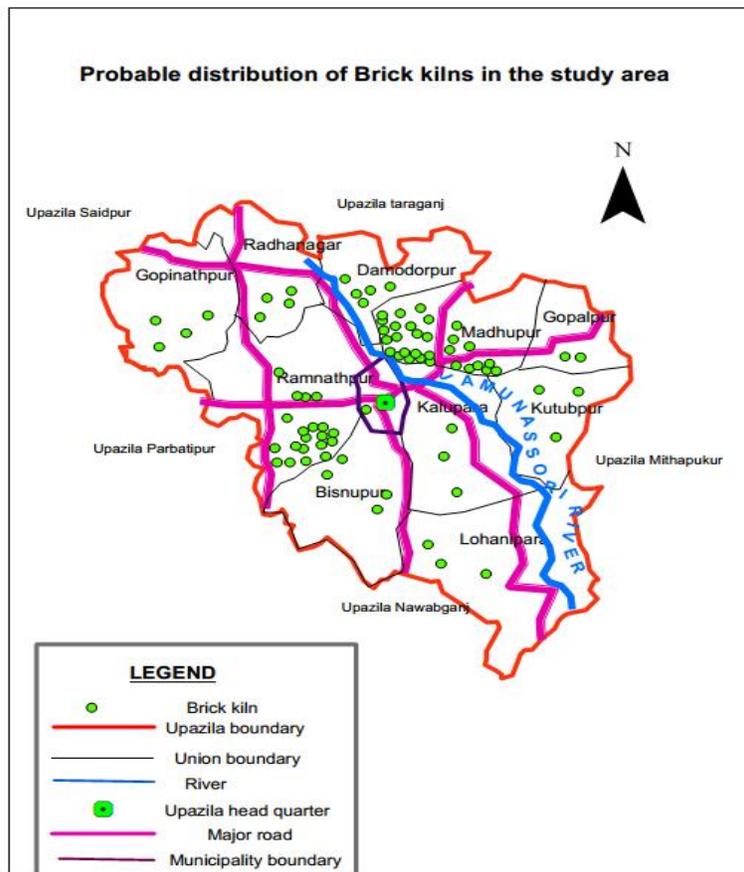
Table 1: Number of brick kilns in the study area

Location (Union under Badarganj Upazila in Rangpur)	Number of Brick kilns
Modhupur	30
Ramnathpur	21

Damodorpur	5
Radhabagar	4
Gopinathpur	4
Gopalpur	2
Kutubpur	3
Bisnupur	5
Kalupara	3
Lohanipara	3

Source: Field survey, 2017

The table shows that the study area has total 10 union among them modhupur union has 30 brick kilns and ramnathpur union has 21 brick kilns. Damodorpur union, Bishnupur union have also 5 brick kilns. Furthermore there was no single union which hasn't more than one brick kilns. Among all union modhupur and ramnathnathpur unions are identified as the most affected unions.



Source: Field survey, 2017

Figure 4: Probable distribution of Brick kilns

4.2 Effects on agriculture

All brick kilns are situated at the center of the agricultural land in the study area. That's why agricultural productivity decreases as brick kilns increases. A small brick kiln needs 10 to 13 acre lands and a large brick kiln needs 16 to 20 acre lands. So every brick kiln needs average 15 acre lands. That's why 1200 acre (15 acre*80) agricultural lands had lost due to establishment of brick kilns. So it is a direct effect on agricultural productivity. Besides 11,000 cubic feet top soil are used to produce every one lakh bricks. Every brick kiln produces average 35 lakh bricks per season (November to April). So 80 brick kilns were used $11,000 \times 35,000 \times 80 = 3,08,00,000$ cubic feet top soil per season. So it is also a direct effect on agricultural productivity. It has also some indirect effects on agriculture through different ways like coal burning, dust producing, decreasing fertility etc.

4.3 The effects on human health

Table 2: Existing situation of brick kilns in the study area

Height of the chimney	Validity license	Certificate from DoE	VAT Certificate
65 Feet=1 (M.M.B)	License had till 2014 35%	Have only 3 these are M.B.C	VAT Certificate had till 2014 35%
100 Feet=1 (R.B.C)	Don't have any license till 2017	(Kutubpur), A.S.B.L (Kutubpur) and M.B.C.2 (Lohanipara)	Don't have any certificate till 2017
85 Feet=1 (U.B.B.L)			
62 Feet=2 (U.B.L, A.U.B)			
129 Feet=1 (S.B.B)			
133 Feet=1 (B.B.L)			
130 Feet=4 (R.B.B, C.B.L, R.B.B and M.B.L)			
120 Feet=69 (Rest other brick kilns in the Badarganj upazila)			

Source: Field survey, 2017

The table shows that the height of the chimney is not satisfactory in the study area. Only 5 Brick kiln's chimney height is environmental friendly. These brick fields are B.B.L, R.B.B, C.B.L, R.B.B and M.B.L. The all 5 brick kilns are situated at Ramnathpur union. So the rest 75 Brick kilns have problem in chimney height it is a main reason for surroundings air pollution that's why respiratory related diseases were increased.

No brick kilns have validity license till 2017 only 35% had license till 2014. Without license these brick kilns runs because they have political power and Govt. is not concerned about it. One brick kiln owner has more than three or more brick kiln in the same area. For example R.B.B, R.B.B.2 and R.B.B.3 are situated in Ramnathur union owned by the same person.

Only three brick kilns have a license from Department of Environment (DoE). They are M.B.C, A.S.B.L and M.B.C.2 among these three Brick kilns 2 are situated at kutubpur union and 1 at

Lohanipara union. Without environmental clearance brick kilns are established at the center of the agricultural land, besides schools and center of the villages. No brick kilns have VAT certificate till 2017 only 35% had till 2014. The students of the selected three school are as follows

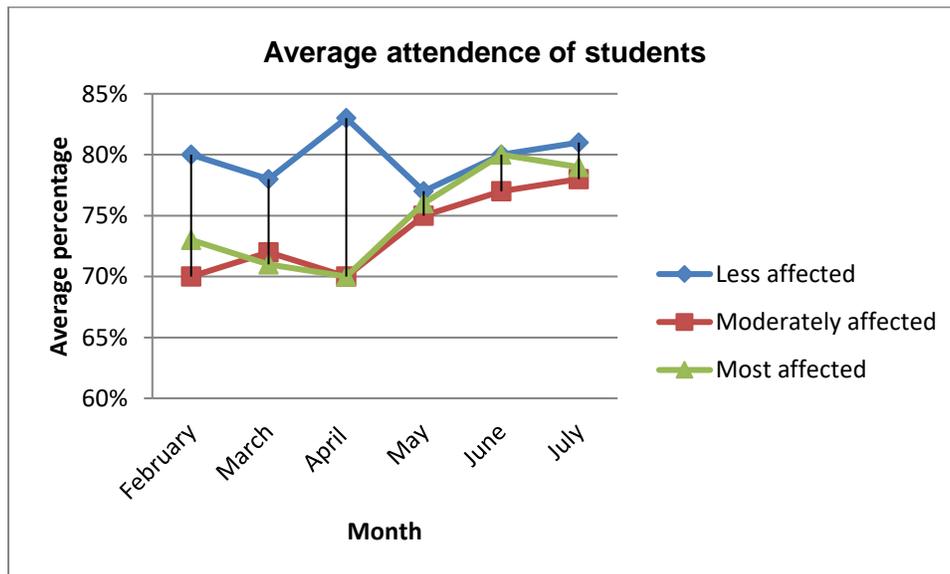
Table 3: School wise male female students

Name of the institution	Male	Female	Total
Ghatabil primary school	52	58	110
Kalirdanga primary school	90	75	165
Jugipara primary school	63	75	138

Source: Collected from school, 2017

From the school health examination survey it is observed that the three school have total 413 students among them 205 male and 208 female. All students from the same socio-economic background and their age range between 5 to 15 years. All students are also non-smokers but they have tonsillitis, asthma and respiratory related diseases.

The average attendance of the students are given below



Source: Collected from school, 2017

Figure 5: Average attendance of selected three schools

The figure shows that students from less affected areas have attended at school more than moderately affected and most affected areas. During Brick kilns operating period (November to April) but during the brick kilns not-operating period less affected, moderately affected and most affected all are same.

The main causes of absence of students in primary schools in the study area are as follows

Table 4: Causes of absent in school

Causes	Average percentage
Unconsciousness of the guardians	20%
Diseases	40%
Child labor at brick kilns operating period	25%
Playing with friends	15%

Source: Field survey, 2017

The table shows that 20% students were absent due to Unconsciousness of the guardians and 40% students were absent due to disease during brick kilns operating period and 25% students were absent due to poverty they work (reverse clay bricks to dry and earned 200 taka per day) during brick kilns operating period. 15% students were also absent due to play with friends at field as schools can't provide proper instrument to play.

From the household interview survey it is found that people affected much more during brick kilns operating period than brick kilns not operating period. This survey was conducted surrounding area of modhupur union and Ramnathpur union where more brick kilns are situated.

The results of household's interview survey are as follows

Total 880 households were sampled and conducted the survey during two period one survey was conducted at operating period and another survey was conducted at non-operating period. During operating period 440 household were surveyed and the result are as follows

Table 5: Result of household interview survey

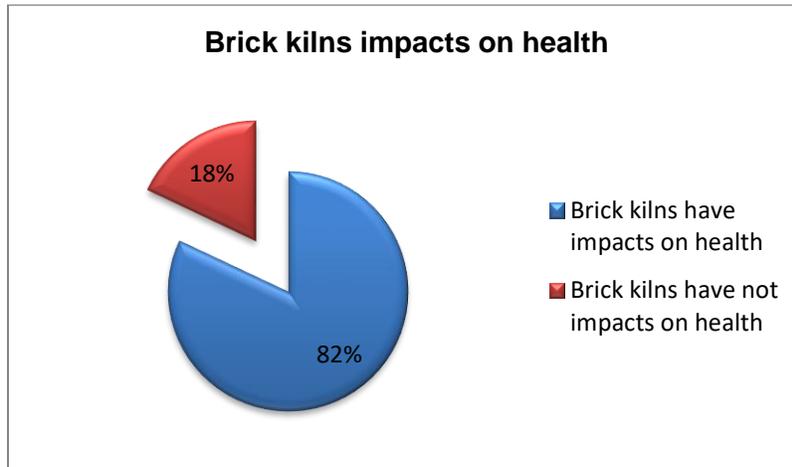
Occupation	Respiratory related diseases for non-smoker (Within 1 month)	Specific problem due to Brick kilns
1. Agriculture=65%	12.5%.(February)	Road condition fatally
2. Driving=15%	Total 55 people affected	destroy and lack of free air
3. Business=8%	among them 35 were	
4. Job=7%	children and 12 women	
5. Others=5%		

Source: Field survey, 2017

The table shows that the main occupation in the study area is agriculture is 65%. From the household interview survey it is found that total 12.5% (55) people have respiratory related diseases who are totally non-smokers among them 35 are children and 12 women.

But at non-operating period, Respiratory related diseases for non-smokers (Within 1 month) are 5% (June). So, it is clear that 7.5% people are affected due to emission from brick kilns.

From household interview survey it was tried to know from local people's perspective wheather Brick kilns have impacts on human health or not, the result are as follows-



Source: Field survey, 2017

Figure 6: Brick kilns impacts on health

From 880 people total 82% (722) replied that Brick kilns have impacts on human health and 18% (158) replied that Brick kilns have not impacts on human health but only destroying our environment.



Source: Field survey, 2017

Figure 7: Happiness due to brick kilns

The above figure shows that 68% people are unhappy due to brick kilns because it is the main contributor of outdoor air pollution, contributor to the respiratory related diseases, destroying

natural environment, degrading top soil, losing land fertility, decreasing agricultural productivity, destroying road network for transporting soil etc.

32% people are happy due to brick kilns because it provides job opportunity (November to April) and availability of bricks.

5. RECOMMENDATION

Some recommendation and guideline are provided to reduce the negative impacts of brick kilns these are as follows

- ▶ Height of the chimney should be 130 feet for every brick kilns because 130 feet chimney height is environmental friendly.
- ▶ Every brick kilns should use CO₂ purifier at top of the chimney.
- ▶ Every brick kilns must have certificate from Department of Environment (DoE).
- ▶ Expired Brick fields should be stopped as soon as possible.
- ▶ Most affected area (Modhupur and ramnathpur union) must be restricted to construct new brick kilns.
- ▶ One brick kiln owner will not be permitted to construct more brick kilns in that locality.
- ▶ Government should take proper steps to control the excessive increasing rate of brick kilns in the study area.
- ▶ Nine brick kilns in Ramnathpur union are situated besides two schools (Ghatabil girls high school and Ghatabil primary school). Among them R.B.B, R.B.B.2 and R.B.B 3 Brick kiln's boundary and school boundary are same. In these two schools the health condition of students result and their attendance is not satisfactory because the students don't get environment to learn. So these schools or brick kilns must be shift to another place

6. CONCLUSIONS

Brick kilns industry is Orange-A category industry its severity is much more than Green categories industry and Orange B categories industry so it has a great impact on human health and environment. After completion of all survey it is found that 7.5% people are affected due to emission from brick kilns. Among them 64% are children 22% are women. 82% (722) people think that Brick kilns have negative impacts on human health and only 18% think that Brick kilns have no adverse impacts on human health. In the study area 65% people are engaged with agriculture. The area provides paddy all over the country (Rangpur, Dinajpur) so 80 Brick kilns in one upazila is impending disaster for the villagers. So Government should take proper steps to control the increasing rate of Brick kilns in Badarganj upazila and it also should be ensured that all brick kilns must have renewable license, VAT certificate, certificate from DoE and adequate height of the chimney.

7. SCOPE FOR FURTHER RESEARCH

- ✓ Causes and consequences of land degradation due to Brick kilns: A case study on Badarganj upozila.
- ✓ Effectiveness of Brick burning law in Bangladesh: A case study on Badarganj upozila.
- ✓ Overuse of soil resources causes poverty: A case study on Modhupur union, Badarganj upozila under Rangpur districts.
- ✓ Correlation between top soil and agricultural productivity: A case study on Badarganj upozila.
- ✓ Is agricultural land perfect place for establishing Brick kilns: Perspective of farmer and Brick kilns owner
- ✓ Brick kilns are the main contributor of outdoor air pollution: A case study on Badarganj upozila.
- ✓ Criteria for selecting location for Brick kilns: A case study on Badarganj upozila.

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