

Work Environment and Environmental Pollutions in Rice Mills of Bangladesh

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Abstract

This paper presents the findings of a research project completed in June 2002. The working environment and environmental pollution in rice mills were investigated. Lots of problems related to physical, socio-economic, health and gender-related work environments have been identified. Environmental pollution was found to exist in the rice mills. The work environment was not found conducive and favourable for workers' health. There was lack of knowledge and awareness regarding environmental pollution and safety of the workers in the rice mills. Practical measures are suggested for improvement of work environment, minimizing the environmental pollution and thus increasing the working efficiency and reducing health hazards of the workers.

Keywords: Rice mill, Environment, Pollution

1. Introduction

Rice is the first important cereal crop grown in Bangladesh and occupies about 80% of the total cultivated area giving a total production of about 26.2 million metric tonnes of rough rice and about 17.3 million metric tonnes of milled rice (BBS, 2004). Production of rough rice has increased significantly due to use of HYV and increased cropping intensity, but the status of rice processing technology did not change so much. Rice processing operations include parboiling (soaking and steaming), drying and milling. All operations except milling are done manually using hand tools. More than 30,000 commercial rice processing mills of different capacities (small, medium and large; traditional, semi-automatic and automatic) are available all over the country employing thousands of workers.

Both male and female wage earners of landless households work in commercial rice mills. This study revealed that the average number of labourers employed in rice mills of capacities from 1.8 to 14 metric tonnes/day was 15 including about one-third female.

Generally the labourers want to work in any production process in a good environment. Work environment is the pre-requisite for increased working efficiency of the labourers, increased technical efficiency of the rice mill systems, good relationship between the mill owners and the workers, workers' mental satisfaction and good health.

1.1 Environmental Issues Associated with Rice Milling

There are several important environmental concerns associated with rice milling (EPA, 2000; Zaman and Farouk, 2002). Some of the main issues are discussed below.

1.2 Hygiene

Hygiene standards are critical in the rice milling process because the product is for human consumption. Hygiene standards should be addressed at all stages of the production process especially in the following areas:

- Paddy, rice and other products may be subjected to pest infestation or contamination in handling and storage.
- Quality control procedures should be in place to test the products entering and leaving the mill.
- Regular hygiene checks should be carried out at all stages of the milling process.
- Good hygiene standards should be implemented in the handling and storage of rice and other by-products.
- Parboiled paddy must not be soaked with arsenic contaminated water.

1.3 Water and Effluent Management

Parboiled rice production generally requires large amount of water for soaking of the paddy. This water if not properly treated could result in water

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pollution and odour nuisance to residents. Water pollution can be caused by surface water runoff, which may contain high levels of organic material. Also effluent produced during cleaning of equipment may cause water pollution. Treatment of water and effluent before discharge is necessary. Arsenic contaminated water must not be used for soaking.

1.4 Air Emissions-Dust, Noise and Odour Management

Rice mills may present a significant source of air pollution both on site and in the surrounding locality. Local air pollution may result from:

- Release of dust to the atmosphere from handling or processing of the paddy or its by-products. This is the major environmental concern for rice mills.
- High internal or external noise levels, which may generate a health hazard to employees or a nuisance to the local community.
- Odour generated from the soaking reservoirs in the parboiling process.
- Mechanical devices, if not maintained properly, may cause severe noise.

High noise and dust levels may endanger rice mill workers and employees' health and safety. The Karnataka State Pollution Control Board (KSPCB) prescribed limit of 55 decibel of noise limit in the rice mills (Deccan Herald, 2005). Bangladesh has no such standard.

A study conducted by Desai and Ghosh (2005) indicated that the rice mill workers are occupationally exposed to airborne aflatoxin producing strains of *A. flavus*. Thus, they require protective mask for their safety.

1.5 Solid Waste Disposal and Management

The disposal of solid waste, which includes the husk from the paddy as well as other waste generated from the cleaning process, is another major environmental problem associated with rice milling. Pollution risks to water and soil may arise from spillage and leakage of solid fuels and burnt husks stored on the mill site.

1.6 Other Potential Environmental Issues

There are other potential environmental issues that may be associated with rice milling activities. These issues may include:

- There is a high risk of accidents from locally made low cost drum boilers.

- There is a high risk of fire especially in the storage areas.
- Where raw materials or products are held in sacks, manual handling of heavy sacks may present a risk to workers health.

The present study was undertaken to investigate the work environment and environmental pollution in the rice mills and health hazards of the rice mill workers. A total of 60 rice mills in two different areas of the country were investigated during the period from July 2001 to June 2002. PRA, group discussions and personal interview methods were used for data collection in the field survey (Zaman and Farouk, 2002).

2. Methodology

A field survey was conducted to investigate the work environment and environmental pollution of the rice mills. A draft questionnaire was prepared and then short PRA was conducted at two selected sites of Gopalpur (Tangail district) and Parbatipur (Dinajpur district) to prepare the final questionnaire for the field survey. Two field enumerators posted in two sites collected data and two scientific officers supervised the data collection. Research team also visited the sites to monitor the survey activities and held group meetings with the rice mill owners and workers. After analysing the collected data, a survey report was prepared. In course of the field surveys, many problems have been identified related to work environment prevailing in the rice mills and environmental pollution. The possible solutions to these problems have been suggested.

3. Results and Discussion

3.1 Work Environment

Work environments in rice mills have been studied in terms of physical, socio-economic, health and gender perspectives. A total of 448 respondents were interrogated. A number of problems have been identified against each category of work environment and the problems were ranked by the total number of respondents reported yes (more than 50%) for the problem (Table 1).

3.2 Physical Work Environment

Fifteen physical work environmental problems were identified and ranked as shown in Table 1. Working in the mill house was difficult, because of excessive dusts in the mill house, inadequate aeration facility, and warm atmosphere in the mill house due to closed windows and lighting bulbs (releasing heat). The windows were kept closed on security reason.

Moreover, there was noise pollution from huller and separating units as well as the moving belts. Moving belts were not covered, for which severe accident could happen.

Outside atmosphere surrounding the mills remained warm as because no trees were planted in the mill premises. There was no shed built for temporary resting of the workers engaged in sun drying of parboiled paddy and the workers found no place to take rest during the scorching sun.

Boilers made of oil drums were used in most of the rice mills, which could pose threat to lives of the mill workers. The mill workers reported many cases of deaths due to explosion of drum boilers.

In most of the mills, facilities for disposal of soaking water and other wastes was inadequate. Soaking water created bad smell in the mill premise. It was observed that the physical environment existing in the rice mills were not at all satisfactory and conducive to health.

3.3 Socio-Economic Environment

As shown in Table 1, the first ranking economic environment problems were – the absence of society of workers to protect their rights and no allowances were paid other than the salary. Second ranking problems were – no salary/wage when in leave, no security for the job, no over time, no insurance for casualties during work, and no

financial help for sick worker. Other problems include – no loan and no bonus for festivals; very low salary/wages compared to wages in other occupations and no advance against salary/wage given to the workers. Monthly wages of male labourers ranged from 900 to 3000 Taka (US\$ 15 to 50) and of female labourers from 600 to 1200 Taka (US\$ 10 to 20). The wage earners particularly the females were unable to maintain their livelihood with this small amount of money; they were always in extreme poverty and mentally disturbed.

3.4 Health-related Work Environment

The health-related work environment problems were – no health checkup facility provided by the mill; no physician appointed for medical advice to workers; huller driver was over stressed due to restless work even in the night; excessive workload for other workers; no shifting duty; no recreation facilities; no sanitary latrines; no protective device against dusts and other pollutants and no first-aid box available in the mills for instantaneous first hand treatment for injuries.

3.5 Gender-related Work Environment

Gender-related work environment problems include – female workers were paid lesser wages than male workers, no maternity leave with salary/wage was granted for female workers, and no separate latrines were available for women workers.

Table 1. Work environments in rice mills

Physical work environment	Rank
Unhealthy environment	1
Moving belt has no protective cover	1
No plantation in the mill premise	2
No sanitary latrine	2
No shed for temporary resting	2
Lighting of mill house is not appropriate	3
Frequent load shedding	3
Excessive dusts in the mill house	3
Socio-economic work environment problems	
Aeration facility in the mill house inadequate	4
Soaking water smells bad	5
Inadequate facility for disposal of soaking water and other wastes	5
Windows kept closed in the mill house	6
Insufficient light	6
Sound pollution due to belt movement	6
Risk of accident in using drum boilers	6
No society of workers to protect their rights	1

No allowances other than salary	1
No salary/wage during leave	1
No security of job	1
No overtime	1
No insurance for accidents/ casualties during work	1
No financial help for sick worker	1
No loan given to workers	2
No bonus for festivals	3
Low salary and wage	3
No advance against salary/wage given to workers	4
Health-related work environment	
No health checkup facility provided by the mill	1
No physician appointed for medical advice to workers	1
Single operator for continuous driving of the huller	1
No protective device for dusts	1
No shifting duty	1
No sanitary latrines	1
No recreation facilities	1
Excessive workload	1
No first aid box kept	2
Gender-related work environment	
Female workers paid lesser wages than male workers	1
No maternity leave with salary/wage granted for female worker	1
No separate latrine for women workers	1

3.6 Mitigating the Work Environment Issues

The following measures are suggested to mitigate the problems related to work environment in the rice mills.

- Rice mills should be given the status of industries with facilities and privileges given to other industries.
- East Bengal Rice mill control order-1943, the boiler act and the environmental pollution control act should be updated to cope up with the present need and to modernise the rice milling system.
- Rice millers should be given financial support through bank loans and technical guidelines by the Government
- Rice mill workers should be given service and social securities under the employment and wage rules for the industries.
- Better co-ordination of concerned departments and institutions such as Ministry of Food, Ministry of Environment, Ministry of Public Health, Bangladesh Rice Research Institute (BRRl), Bangladesh Agricultural University (BAU) and NGOs.
- Rice mill owners should have associations at the local and national level for coordinated effort in the overall improvement of the rice mills.
- Engelburg type steel hullers and the drum boilers must be phased out (and ultimately banned); rubber roll huller with polisher and standard boilers should be introduced.
- Use of chimney of more than 12.2 m (40 feet) must be mandatory for the rice mills.
- Government approval of the mill layout including waste dumping arrangement must be made mandatory before construction.
- Rice mill owners should abide by the government rules and laws to ensure safety of the workers, to improve the work environment and to reduce probable causes of occupational diseases.
- The use of appropriate procedures and personal protective equipment, for example, to reduce risk of product contamination or reduce employee inhalation of dust.

- The millers should be advised to introduce mask or some other things like a thin piece of cloth for the workers. The workers should be motivated to realize the consequence of inhaling dusts and therefore, to use mask or thin layer of cloth to protect their nose and mouth.
- Adequate ventilation including windows, vents or fans should be provided so as to reduce the heat as well as the dust in the operations area. However, precautions should be taken to prevent dust pollution.
- The site should have good drainage and must be adequately maintained to facilitate run-off and minimize the likelihood of flooding.
- Potable water supply should be readily available.
- Washrooms and rest rooms should be provided for staff.

4. Environmental Pollution

A total of 60 rice mills in two different areas (Gopalpur, Tangail and Parbatipur, Dinajpur) were investigated. In each and every rice mill, environmental pollution was found to exist. These are discussed in the following paragraphs.

4.1 Sources of Environmental Pollution

The sources of pollution were identified as follows:

- Dusts from mill house and drying floor
- Exhaust gases, black smoke and fire from chimney.
- Ash from furnace and chimney.
- Rice mill wastes – ashes and burnt husks.
- Soaking water with bad odour.
- Sound of moving belt of huller and the mechanical separator

4.2 Dusts from Mill House and Drying Floor

Dusts from mill house and drying floor and rice bran from mill house polluted air (Fig. 1). The mill houses were not, in general, adequately ventilated and as a result the air in the mill houses contained fine particles of dusts and bran. These dusts are very dangerous for the workers' health. Dusts inhaled by the workers might affect the lungs and lung cancer might be developed due to prolonged exposure.

4.3 Mill Wastes: Ashes and Burnt husks

Mill wastes such as ashes and burnt husk polluted the surrounding environment, land and waterbeds (Fig. 2). These wastes were dumped extravagantly on the mill premises and lot of spaces was wasted which

could otherwise be utilized for productive purposes. (MPCB, 2005) reported closing down of some rice mills for keeping rice husk in open area giving rise to pollution nuisance for nearby residents and violating norms and regulations; these mills have no closed shed for rice husk storage.

4.4 Ashes, Black Smoke and Fire

Ashes, black smoke and gases polluted the atmosphere affecting trees, people and livestock of surrounding houses and homes. Ashes were mixed and blown with air and made the trees and houses dirty. Some rice mills having short-length chimney were found to emit fire along with black smoke (Fig. 3); the fire heated the atmospheric air and damaged the trees nearby.

4.5 Soaking Water with Bad Smell

Most of the rice mills did not have adequate provision for disposal of soaking water. As such it made the mill premise very damp and dirty. Due to fermentation the water emitted bad smell and hampered the working environment of the workers.

4.6 Sound Pollution

The engine or the moving belts of the power transmission system and the mechanical separator in the mill house were found to produce irritating noise. The noise level could not be measured due to lack of instrument.

Vasdev (2005) reported air and water pollution caused by a rice mill in Punjab, India. The mill used rice husk as fuel, which released smoke and fly ash in the air. The fly ash dumped on the roadside was carried by winds and deposited in the houses of the nearby villages. The dirty water was getting into underground water and polluting it. Besides giving out foul smell, it was causing respiratory and gastric diseases to the villagers.



Fig. 1. Rice milling house

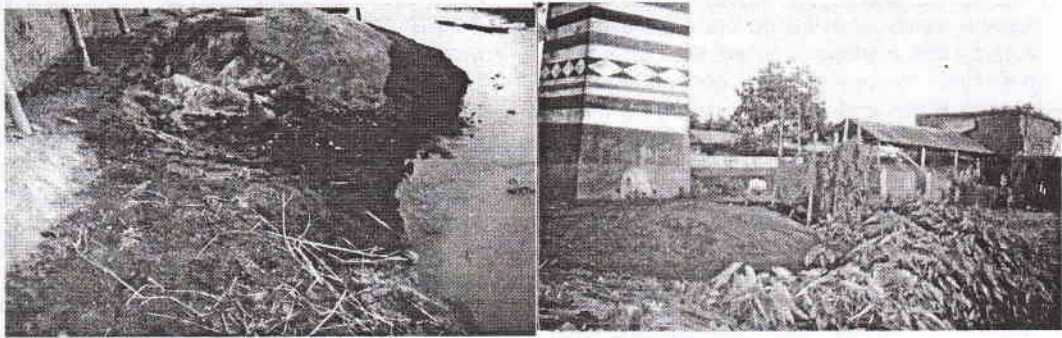


Fig. 2. Mill wastes pollute the environment

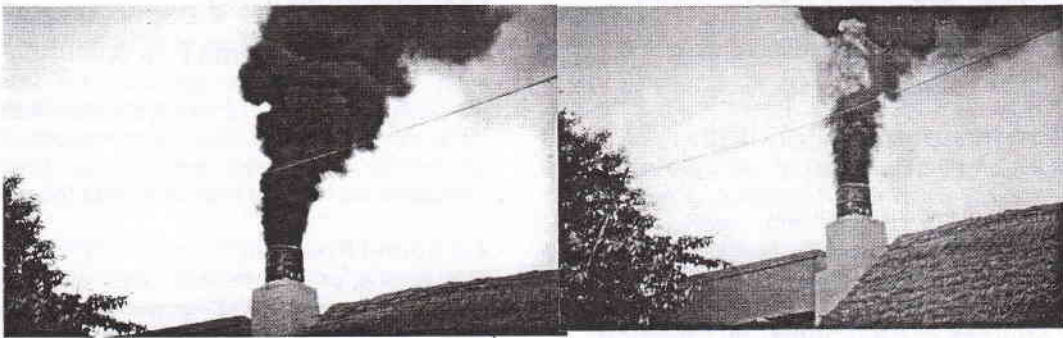


Fig. 3. Short chimney emitting black smoke and fire

Minimizing Environmental Pollution

In order to reduce the environmental pollution, the following measures are suggested.

- Design of chimney and vents of sufficient height and appropriate technology to avoid causing local nuisance through dust and smoke emissions. Long chimney of more than 12.2 m (40 ft) height is to be installed to control the black smoke and fire (Fig. 4). The Government of Bangladesh must make the provision of installing long chimney mandatory in the rice mill control rules/acts.
- Dumping of mill wastes into pits. Drains to dispose of wastewater are necessary.
- Rice husks generated should be stored in an enclosed area, the contents of which shall either be burnt or land filled at a suitable location that will not cause a public nuisance. A long-term solution for the disposal of this waste should be considered.
- If the rice husk has to be transported to a landfill site then it should be covered during transportation.
- Exhaust fans may be installed in the mill house to expel air carrying fine particles of dust and rice bran.
- The noise could be reduced to a safe level by maintaining the mechanical devices on regular basis.

The government should have an Environmental Management Plan for the rice mills. The Environmental Management Plan should include the following:

- Financial plan or budget for environmental management and performance improvement;
- Training of the mill staff on environmental management;
- Clear roles and responsibilities for hygiene and environmental management among staff;
- Knowledge, information and monitoring of hygiene and environmental performance;
- Setting of environmental performance targets to meet regulations and best practice;
- Programme for environmental performance improvement to meet targets;

- Plans and procedures for managing environmental issues, including water abstraction, waste water discharge and waste management;
- An emergency response plan; Schedule for revising and updating the Environmental Management Plan.

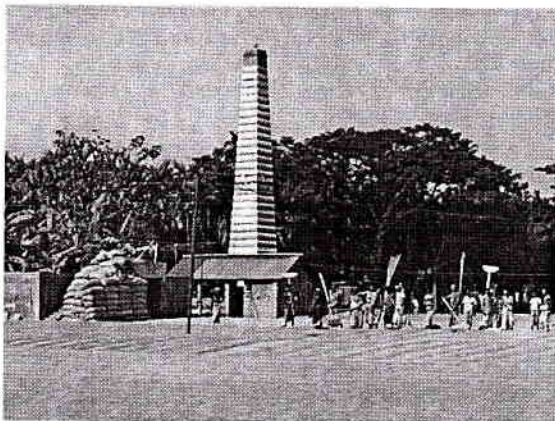


Fig. 4. Standard chimney 21.34 m (70 ft) high

Acknowledgement

Thanks to the Research and Extension on Farm Power Issues (REFPI) project management team, DFID, the Department of Farm Power and Machinery of Bangladesh Agricultural University, the NGOs, rice mill owners and workers and many others who helped directly or indirectly to complete this study.

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