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Dr. Neha Gahlot

Subject Matter Specialist (H.Sc),
Krishi Vigyan Kendra,
Agriculture University Jodhpur,
Rajasthan, India

Dr. Kusum Rana

Principal, Extension Specialist
(H.Sc), Krishi Vigyan Kendra,
Jhajjar, Chaudhary Charan
Singh Haryana Agricultural
University Hisar, Haryana,
India

Dr. Kiran Singh

Head of Department,
Department of Financial Risk
Manager, Chaudhary Charan
Singh Haryana Agricultural
University Hisar, Haryana,
India

Corresponding Author:

Dr. Neha Gahlot

Subject Matter Specialist (H.Sc),
Krishi Vigyan Kendra,
Agriculture University Jodhpur,
Rajasthan, India

Workplace environment assessment of brick kiln units

Dr. Neha Gahlot, Dr. Kusum Rana and Dr. Kiran Singh

Abstract

Majority of the people spend at least one-third and perhaps as much as one-half of their waking hours at workplace. Workplace environment is the key to determine the quality of their work and productivity. All the workers want and deserve a workplace that is physically and emotionally safe, where they can concentrate on their job responsibilities and attain some fulfillment, rather than distressing about basic amenities, the future of their child and uncomfortable conditions. Workers also expect fair pay and respect for their privacy. Workers are happier when they like their workplace and if they do not have to worry about workplace safety, basic amenities, welfare facilities, childcare, health insurance and other factors. Brick production system is mainly based upon manual labour. Brick kiln workers are considered as one of the most susceptible and excluded workers of Indian society. Brick kiln workers constantly linger under intense work demands to work more efficiently for higher production during seasons with limited resources and less management skills. These stressful circumstances get worsened by physical distress at the workplace leading to poor health conditions, physical discomforts and work related problems. The present study was undertaken with the objectives to assess workplace environment and workplace conditions at brick kiln units.

Keywords: Environment assessment, brick kiln units

Introduction

India, next to that of china is second largest brick producer in the globe and accounting for more than 10 percent of global production (Maithel, 2003) ^[8]. An increasing demand for industrial, commercial, public and residential buildings and physical infrastructure is a result of growth in Indian population and economy, coupled with urbanization. Sharma *et al* (2013) ^[12] stated that the brick kiln jobs serve as a source of income for thousands of unskilled laborers from across the country who works in poor conditions with no health and safety at workplace. Ministry of Law and Justice (2008) ^[9] regarding workers in unorganized sectors stated that even though the majority of the workers in their study were employed for more than ten years but still they did not have coverage of social security and had have to meet expenses on all contingencies, like illnesses and children's education, from their meager incomes. None of the provisions under the Unorganized Workers' Social Security Act, 2008 were implemented at their workplace and in their old age they become helpless on this account. The Act contains provisions for life and disability cover, health and maternity benefits, old age protection, and recommends suitable welfare schemes such as provident fund, employment injury benefit, housing, and other benefits for unorganized workers. Government of India firmly believes that without safe, clean environment as well as healthy working conditions, social justice and economic growth cannot be achieved and that safe and healthy working environment is recognized as a fundamental human right. Education, training, consultation and exchange of information and good practices are essential for prevention and promotion of such measures. In the light of these facts, the present study was undertaken to assess the working environmental and workplace conditions at brick kiln units in Haryana.

Methodology

The study was purposively conducted in Hisar and Mewat districts of Haryana state. Three brick kiln units from each district were selected randomly comprising a total of 6 brick kiln units for the first phase of the study. In these units 74 workers were selected from Hisar district and 60 were selected from Mewat district making total sample of 134 workers comprising both males and females. A survey was conducted to study the work profile, working conditions, workplace environment, basic amenities available, heat stress level and felt needs to improve the environmental conditions at brick kiln units. The environmental conditions at the workplace were recorded with the help of the related tools and equipments given below in table A.

Table 1: Environmental parameters and their measurement

Environmental parameters	Tool used
Light intensity (Lux)	Lux meter
Temperature (°C)	Thermometer
Humidity (%)	Hygrometer
Noise	Sound level meter
SPM (µg/m ³)	Air Quality Monitor
CO ₂ level (ppm)	Air Quality Monitor
Heat stress level	Heat Stress Index (NOAA's National weather service)

Heat stress: The heat stress index (NOAA's National weather service) presents general course of action for assessing possible severity of heat stress. (Fig 1)

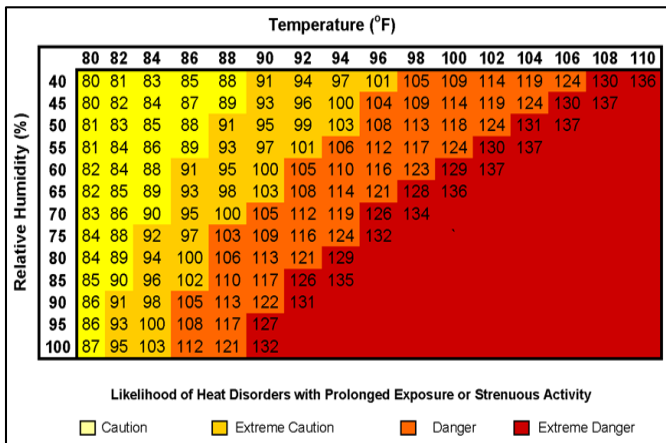


Fig 1: Heat Stress Index (NOAA's National weather service)

Assessment of environmental parameters, viz. temperature, humidity, light intensity, SPM and CO₂ were assessed using appropriate tools and readings were noted down on observation sheet. Readings of environmental parameters were taken during working hours and three replications of each parameter were taken. Heat stress score of the environment was also assessed with the combination of temperature and humidity.

The data was collected individually with the help of a well-prepared and pre-tested, score sheet through personal interview schedule. The data so collected was coded,

tabulated and suitably evaluated to draw meaningful Inferences.

Results and Discussion

Basic amenities for workers at brick kiln units: Results related to availability of basic amenities at the selected brick kiln units of Hisar and Mewat (table 1) demonstrated that all the workers (100%) were living within the area of brick kiln units, in semi *pucca* one room houses provided to them by the owners. Drinking water facility was available at BKUs but overall availability of potable water was reported by only 56.71 percent while availability of water supply for daily activities was reported by 79.85 percent workers. Khattak (2010) conducted a study in Pakistan and reported that there were 7000 brick kilns scattered across the four provinces of the country, employing more than 100,000 people. Majority of them were living on site in *kaccha* houses (made up of mud/brick), with no access to fresh drinking water, toilets and drainage facilities. Worker's access to health and education of their children was negligible.

Unavailability of toilet facility at BKUs was reported by more than half of the workers (56.71%) and 68.65 percent workers reported about availability of bathroom facility but that was very poor and bathrooms were not built properly. Only two 5 inches walls were constructed and remaining two sides were covered by the piece of cloth while bathing. Although all the brick kiln units were having electricity connection limited to the owner's personal use only, there was no electricity facility available for any single brick kiln workers house. Therefore, 52.24 percent workers were using their own solar batteries and panels for electricity and mobile charging at their own expenses.

A similar study was conducted on construction workers by Chawada *et al.* (2012) [2] and reported that workers were residing near or inside the construction site. The workers were living in very unhygienic conditions and toilet and bathroom facility were also not provided at workplace. Majority were not getting leave for health related events and medical treatment because there was no provision for leave with wages to any workers. Results of the study highlighted that owners of brick kilns do not provide basic amenities and therefore, workers live in very adverse and very poor living condition with no other option.

Table 1: Basic amenities for workers at brick kiln units (N=134)

Basic amenities available at workplace		Hisar (74)	Mewat (60)	Total (134)
Type of house	<i>Semi Pucca</i>	74(100)	60(100)	134(100)
Availability of Housing	Within BKU	74(100)	60(100)	134(100)
Drinking water facility	Yes	74 (100)	60 (100)	134(100)
Potable water facility	Yes	42(56.75)	34 (56.67)	76 (56.71)
	No	32(43.24)	26(43.33)	58(43.28)
Water supply for daily activities	Yes	47(63.51)	60(100)	107(79.85)
	No	27(36.49)	-	27(20.15)
Toilet facility	Yes	31(41.89)	27(45.00)	58(43.28)
	No	43(58.10)	33(55.00)	76(56.71)
Built bathroom facility	Yes	54(72.97)	38(63.33)	92(68.65)
	No	20(27.02)	22 (36.66)	42(31.34)
*Availability of electricity facility in BKU		3(100)	3(100)	6(100)
Availability of electricity for workers' houses	No	0.00	0.00	0.00
Use of solar battery/ solar panel		54(72.97)	16(26.67)	70(52.24)

Figures in parenthesis are percentages, *Responses of total brick kiln units N=6

Study conducted by Kumar (2006) [6] reported that 73.80 percent of sites did not have any toilets facilities and only 20.4 percent of construction sites were having provision of

drinking water. A significant percentage of laborers were dependent upon various sources like water tanker (31.4%) and public water supply (13.7%) etc. Owners of the company/site

owner arranged temporary shed to laborer (22.8%) within the site. Majority of laborer (66.0%) were living in self-constructed temporary sheds nearby construction sites. Construction companies (72.2%) do not pay medical cost incurred to the laborers.

Facilities provided by owners in brick kiln units

Table 2 revealed the facilities provided by the owners in the brick kiln units of Hisar and Mewat districts.

- a. Medical facilities at workplace: Results in Table 2 revealed that brick kiln units in Hisar and Mewat had poor facility of first aid kit and kit was not properly equipped. Provision for regular free health check-up was never performed in any of the BKU of both the districts. No availability of medical insurance of workers and no medical leave with payment was granted in case of any accidents or injuries to the workers at workplace. Further, no provision of personal protective equipment was made at workplace for any activity by the workers as well as by the owners of BKUs in both the districts.
- b. Storage and workplace arrangement: Poor arrangement for storage of tools and accessories was found at workplace and also the workplace was not managed properly with any clear pathways for the movement of the respondents.
- c. Welfare facilities: Findings of Table 2 showed that brick kiln units in both districts did not provide transport facility for workers. It was also found that no provision was made for education of the children of the workers and no transport facility was provided to drop the children to school in any BKUs of Hisar and Mewat. Provisions of recreational facilities were also not provided at any brick kiln unit.

The results are in consonance with the findings of (Anonymous, 2008)^[1] which revealed about plight of workers of unorganized sectors and stated that even though majority of the workers in their study were employed for more than ten years but still they did not had coverage of social security and had to spend out of their meagre incomes for all contingencies such as illnesses and children's education.

Table 2: Facilities provided by owners in brick kiln units (N=6)

Medical facilities at workplace	Hisar (3)	Mewat (3)	Total (6)
Availability of first- aid kit	Poor	Poor	Poor
Health check-ups	Never	Never	Never
Medical insurance of workers	No	No	No
Medical leave with payment, if accident occurred at workplace	No	No	No
Provision of personal protective equipment at workplace	No	No	No
Storage and workplace arrangement			
Storage arrangement for tools used	Poor	Poor	Poor
Clear pathways for easy movement	Not clean	Not clean	Not clean
Workplace hygiene	Poor	Poor	Poor
Welfare facilities			
Transport facility for workers	No	No	No
Educational facilities for children	No	No	No
Transport facility for school going children	No	No	No
Recreational facilities	No	No	No

(N=Total no of brick kiln units)



Fig 2: Environmental and living conditions at brick kiln units

Environmental parameters at brick kiln units

Workplace environment is a place where workers devote most of their working time. Therefore, comfortable work environment is the key for the workers to perform their task comfortably, to increase productivity, secure health, safety and to reduce chances of errors. Table 3 elucidates the data regarding the environmental parameters comprising light, temperature, humidity, SPM and CO₂ level at brick kiln units in winter and summer seasons.

Results of environmental conditions revealed that illumination level in winter and summer season in both the districts were found within the recommended levels. In winter season temperature was found within recommended levels while on

the other hand in summer season temperature was found above the recommended level i.e. 48.90 °C in Hisar and 45.44°C in Mewat district which caused heat stress to the workers and excessive temperature also resulted into exertion and headache. Spies *et al.* (2006) [13] concluded that brick kilns are a semi tight environment and the average

temperature in the kilns is too high. Work exposure to the high temperature, high density dust and particulate matter over a long period of time may result in occupational health problems including serious diseases. Level of humidity was found within the recommended range in both the districts in winter and summer seasons.

Table 3: Environmental parameters at brick kiln units (N=6)

Environmental parameters		Measurements				Recommended values
		Hisar		Mewat		
		Inside BKU Mean ± S.D	Outside BKU Mean ± S.D	Inside BKU Mean ± S.D	Outside BKU Mean ± S.D	
Light (lux)	Winter	787.67±13.45	787.67±13.45	767.45±8.45	767.45±8.45	500-1000 lux
	Summer	1120± 8.9	1120± 8.9	1067.65±3.45	1067.65±3.45	
Temperature (°C)	Winter	22.42±10.46	19.45±5.45	22.56±10.46	20.40±5.43	20-25° C
	Summer	48.9±7.34	42.45±5.78	45.44±3.68	39.33±6.45	
Humidity (%)	Winter	48.34±4.20	48.54±4.58	48.64±2.44	50.35±3.49	40-50%
	Summer	53.45±4.45	56.98±3.37	56.45±10.48	57.67±4.76	
SPM (µg/m ³)	Winter	569.44±38.63	265.94±24.74	515.57±30.45	349.87± 48.56	140 µg/m ³
	Summer	704.50±45.67	404.34±37.83	845.45±67.45	456.88±32.55	
CO ₂ level (ppm)	Winter	610.45±43.45	268.44±70.65	660.49±54.30	240.34±29.93	350-450ppm
	Summer	674.56±5.66	282.67±39.67	639.92±43.72	205.67±23.42	

N= Number of brick kiln units

It was revealed that in winter season mean SPM (Suspended particulate matter) within the BKUs in Hisar district was 569.44 (140 ug/m³) and 515.57 (140 ug/m³) in Mewat. In summer season SPM within the BKUs was found 704 and 845.45 in Mewat district. The level of SPM was detected above the recommended level (140ug/m³). Carbon dioxide (CO₂) level in the winter season within BKUs in Hisar was 610.45 ppm and 660.49 ppm in Mewat district. The data of summer season showed that the CO₂ level within BKUs in Hisar was 647.56 ppm and 639.92 ppm in Mewat district. It was also analyzed that CO₂ level was found above the recommended level (350-450 ppm) within the brick kiln units which severely affect the health of workers and their families alike. Oberoi (2008) [10] reported that the environmental parameters like temperature, ventilation, humidity, air quality, lighting, noise etc. in which the workers perform their tasks

may have an effect on health of the workers.

Assessment of heat stress encountered by workers in brick kiln units

Table 4 represents the heat stress encountered by the workers at brick kiln units in summer and winter season.

- Winter season: In winter season heat stress score of 80 was obtained and fell under caution category 80-90, which indicated that the environmental conditions were comfortable but caution should be exercised. The effect of heat stress could cause fatigue with prolonged exposure to the workers with physical activity.
- Summer season: Heat stress score was found to be 137 and fell under extreme danger (132-176) category which pointed out that sun stroke, heat cramps and heat exhaustion were possible with prolonged physical activity due to heat stress.

Table 4: Assessment of heat stress encountered by workers in brick kiln units (N=6)

Brick kiln units	Heat index scores	Interpretation of heat index scores	Effect of heat stress
Winter season			
Hisar	80	80-90 (Caution)	Fatigue possible with prolonged exposure and/or physical activity
Mewat	80	80-90 (Caution)	Fatigue possible with prolonged exposure and/or physical activity
Summer season			
Hisar	137	132-176 (Extreme danger)	Sun stroke, heat cramps and heat exhaustion possible with prolonged physical activity due to heat stress
Mewat	137	132-176 (Extreme danger)	Sun stroke, heat cramps and heat exhaustion possible with prolonged physical activity due to heat stress

N= Number of brick kiln units

The reason behind higher heat stress in summer season was increased environmental temperatures. Besides, temperature within the brick kiln units always gets higher than the outer environment which further contributes to the heat stress within BKUs thereby reducing the efficiency of the workers. Portier *et al.* (2012) [11] pointed that in the summer season when air temperature is high, elevated humidity levels can increase risk for heat-related illnesses for the workers. Symptoms of overheating included heat exhaustion, heat stroke, heat cramps and heat fainting. During extreme summer months, the combination of temperatures of hot air and high humidity levels may put farm workers in danger of heat-

related sickness like heat exhaustion and heat stroke. Further as per a U.S. report, the annual rate of heat-related deaths reported among crop workers was 2.36 deaths per 100,000 workers per year (Luginbuhl *et al.* 2013) [7].

Felt needs of workers for improvement in working and living conditions at brick kiln units:

Table 5 reveals the responses regarding the felt needs of workers at selected brick kiln unit of Hisar and Mewat districts. Responses of felt needs were asked by the workers to improve their working and living condition and overall quality of life at brick kiln units. Responses of brick kiln workers showed that each of their need for “pure drinking

water facilities”, “bathroom and toilet facilities” and “wage increase”, obtained 3.0 mean score and secured I rank. “Educational facility for their children” was also a major concern for the workers (mean score 2.89) followed by electricity for their houses (mean score 2.76), improvement in working conditions (mean score 2.73) and health care facilities (mean score 2.72). Other felt needs of the workers included safety measures at brick kilns, transport facilities, job security, vocational training and informal school for adults. These were some of the felt needs which they wanted

to be fulfilled on priority basis.

In a similar study on construction workers Kumar (2012) [5] revealed that migrated construction workers faced some major problems like arduous working life, inadequate and unequal wage structure, poor housing facilities, poor health condition, harassment, long working hours, atrocities on women workers, lack of safety measures and proper education for children of construction workers. They wish that these problems get solve to lead a good workplace.

Table 5: Felt needs of workers for improvement in working and living conditions at brick kiln units (N=134)

S.N	Responses	Hisar (74) (MS)	Mewat (60) (MS)	Total (134) (MS)	Rank
1	Pure drinking water facilities	3.0	3.0	3.0	I
2	Bathroom and toilet facilities	3.0	3.0	3.0	I
3	Wage increase	3.0	3.0	3.0	I
4	Educational facilities for children	2.78	3.0	2.89	II
5	Electricity facility at workers' houses	2.70	2.83	2.76	III
6	Improvement in working conditions	2.72	2.75	2.73	IV
7	Health care facilities	2.78	2.66	2.72	V
8	Safety measures at brick kilns	2.40	2.81	2.60	VI
9	Transport facilities	2.39	2.5	2.44	VII
10	Job security	2.13	2.48	2.30	VIII
11	Vocational training	1.93	2.4	2.16	IX
12	Informal school for adults	1.67	1.70	1.68	X

*Multiple responses

Conclusion

In selected brick kiln units, 43.28 percent respondents were not getting potable water facility, 56.71 percent were not getting toilet facility. All the respondents were living in semi *pucca* houses within brick kiln units and none of them were getting electricity facility for their houses, while 52.24 percent respondents were using solar battery or solar panel. There was no medical insurance for the workers and no provision of medical leaves with payment. Provision for personal protective clothing was not found at any Brick Kiln Unit. Workplace hygiene was also found to be poor. No educational facility was available for children of brick kiln unit workers. Regarding environmental parameters, light and humidity levels were within the permissible range while temperature was too hot. The level of SPM and CO₂ were also found more than the recommended levels. Scores of Heat stress Index in summers (137) indicated to avoid the extreme heat strokes, heat cramps and heat exhaustion due to prolonged exposure in sun radiations during their working period. There was need of protection from sun heat during working hours.

Implications of the study

The present study is likely to help brick kiln owners and government policy makers to formulate guidelines to provide basic amenities and living conditions at brick kiln units and to provide education facility for the children of brick kiln workers for their overall development.

Recommendations from the present study

- Basic amenities, *viz.* good housing, bathroom, toilet and electricity facilities (on payment basis) at brick kiln units should be provided to improve the overall quality of life of workers at brick kiln units. Provision should also be made for availability of clean drinking water for the workers. Education being the basic requirement for laying the foundation of any society, provision of educational facility made on priority for the children of brick kiln unit workers.

- To safeguard the health and welfare of workers, the Govt. should make it mandatory to cover the medical insurance of the workers by their employers. Provisions should also be made for medical assistance like first aid kits, facilities for treatment of common diseases.
- As prolonged exposure of workers in high temperatures, especially during summer season, leads to heat stress, therefore, every worker should be encouraged to wear some personal protective clothing to avoid the effect of heat stress.

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