Original Research Article

Assessment of environmental parameters and occupational health hazards of rural women in post harvest activities of Assam

Abstract. Agriculture is the oldest and most dangerous occupation as compared to other occupations. Agriculture is the major national economic contributor for under-developed nations such as India, Brazil, and South Korea. It was estimated that nearly half of the world labor force involved in agricultural production. An attempt was undertaken to assess the environmental parameters and occupational health hazards in the view point of environmental conditions in post harvest activities. Three blocks were selected randomly from Jorhat sub-division. Two villages from each block were selected randomly and there by all together six villages and 300 farm women were selected proportionately. Both interview and experimental method was considered for collection of data. Personal and demographic characteristics of the respondents showed that 82 per cent belonged to marginal farmers having 1 acre of land. As regards to age of the respondents, 88 per cent falls in the age group of 30-40 years. The mean temperature was found to be 22°C and mean relative humidity (RH) was observed to be 49 per cent. The lighting condition revealed that the illuminance level were ranges from 21 lux to 95 lux. It was found that mean noise level was 110 db which was more than the permissible limit. Hazards faced by farm women in post harvest activities due to the environmental factors are pain or cramps, indigestion, eye strain, watering of eyes, blurred vision or vision problem, loss of hearing capacity, temporary deafness, headaches and faintness due to working under cold, humid, noisy and inadequate lighting conditions. It was apparent that 63 per cent respondents were belonged to 'high' incidence of environmental hazards during the performance of post harvest activities. The angles of average flexion was highest in upper arm (90.62) and extension was in thoracic and it was observed 115.30° indicating deviation of body parts.

Keywords: Occupation, Health Hazards, Environmental Parameters.

Introduction

In Assam, more than 70 per cent of farm women are involved in post harvest activities such as threshing, sun-drying, sieving, winnowing, cleaning, seed selection and storage of grains. Mechanization has made many agricultural activities easier and quicker but unable to decrease the occupational health hazards of the women farmers. Agriculture is very much oriented towards manual labour and agricultural workers are exposed to a tremendous variety of hazards that are harmful to their health and well-being. Occupational health is the promotion and maintenance of the highest degree of physical, mental and social wellbeing of the workers in the occupation, the prevention among workers of departures from the health caused by working condition, the protection of workers in their employment from the risks resulting from factor adverse to health, the placing and maintenance of the worker in an occupational environment adopted to the physiological and psychological equipments (the definition from the first join ILO/who Committee on Occupational Health, 2011).

The occupational health hazards may be of different types such as biological, physical, chemical, accidental and environmental. Human performance, efficiency and productivity of any work are depending on environmental parameters such as temperature, humidity, illumination and noise level. Working under hot or cold and humid conditions, poor illumination, noise, vibration etc are the major causes of occurring environmental hazards. Mehrotra *et al*. (2001) observed that low humidity level relatively causes discomfort due to drying of mucous membrane of nose and throat. Due to continuous performance, workers are exposed to high or low temperature, humidity, improper light or illumination and high level of noise produces from agricultural equipments which deteriorate work performance, reduces work capacity and also suffers from several mental and physical discomfort. If the exposure toward these environmental parameters exists for a long time then these can adversely affect on the efficiency and the health of the workers. The optimum level of indoor room temperature (21^0c) and illumination (1000 lux) has improves the performance and productivity of the office workers (Vimalanathan *et.al.* 2018). The environment is conducive for the women if the temperature is between 21°C (lower limit) and 25°C (upper limit), relative humidity is between 40 – 60 %, lighting is between 250 – 500 lux and noise level should be 80 db (Skyes 1988). Physical health problems

include diseases of musculo skeletal disorders and injuries resulting from poor occupational environment. Knowledge on environmental parameters is very important to reduce health hazards and enhancing comfort and efficiency of the workers. Keeping this in mind the following objectives are undertaken to assess the environmental parameters, to assess occupational health hazards in post harvest activities.

Methodology

This section includes discussions about the selection of site, sampling procedure and data collection procedures as well as data analysis. The present study was conducted on Jorhat subdivision of Jorhat district of Assam. Three blocks were selected randomly from Jorhat sub-division. Two villages from each block were selected randomly and there by all together six villages and 300 farm women were selected proportionately for assessing environmental parameters and occupational health hazards faced by farm women in performing post harvest activities. Both interview and experimental method was considered for collection of data.

Environmental parameters

Observations on the climatic conditions were important parameters. The thermo hygrometer, lux meter, noise level meter were used as a tool for measuring different environmental parameters such as temperature, humidity, illuminance and noise. Measurements on ambient temperature, humidity, illuminance and noise level were recorded by using digital hygrometer and lux meter at the work place. The parameters were taken three times in an interval of 30 minutes during the performance of activity and activity is performed in the household environment.

Occupational health hazards

The summated rating scale which was developed by Likert's was used for assessing occupational health hazards in post harvest activity. Statement were sought in five degrees *viz.* – 'strongly agree', 'agree', 'undecided', 'disagree and 'strongly disagree' and weightage of 5, 4, 3, 2, and 1 respectively. The scale was administered on 300 subjects or respondents to assess hazard proneness. After analysis of collected data, the resultant scores were compared with categories given below.

List 1: Score range of hazard proneness category

Score range	Categories of hazard proneness
15 – 30	Low incidence of hazards
31 – 45	Moderate incidence of hazards
46 – 60	High incidence of hazards
61 – 75	Severe incidence of hazards

Range of Motion

Postural analysis was considered during the performance of post harvest activity with Dual Inclinometer (Dualer IQ^{TM}). The spinal curvature of the subjects in erect standing position at the cervical, thoracic, lumbro sacral and upper extremities (flexion and extension) was observed. The ranges of motion (ROM) in cervical, thoracic, lumbro sacral and upper extremities were recorded for each subject during the paddy storage activity.

Results and discussion

The working conditions of female agricultural workers in India are alarming. The hazards faced by them in agriculture calls for immediate attention of planners and policy makers for remedial measures. According to the International Labour Organization (ILO, 2011), the agricultural sector is one of the most hazardous to health worldwide. Agricultural work possesses several characteristics that are risky for health: exposure to the weather, noise, close contact with animals and plants, extensive use of chemical and biological products, poor working postures and lengthy hours, carrying heavy loads and use of hazardous/defective agricultural tools and machinery.

Findings pertaining to personal and demographic characteristics of farm women revealed that cent per cent respondents were literate. Sixty six per cent respondents belonged to nuclear families. Nearly 38 per cent respondents were from upper caste, which was followed by more other backward castes (35%) and lower castes (27%). Majority of the

respondents (82%) belonged to marginal farmers having 1 acre of land for cultivation. As regards to age of the respondents 88 per cent falls in the age group of 30-40 years. Cent per cent respondents (100%) farm women participated in post harvest activities. Age old technologies were found to be used by farm women in post harvest activities The study revealed that technologies used for ppst harvest activities were plastic bags, serrated sickle (*Kachi*) for harvesting, pointed bamboo stick (*Ukhon*) for separation of straw after threshing, winnower (*Kula*) for winnowing, siever (*Chaloni*) for cleaning, spreading tool (*Kurhuna*) for sun drying, bamboo basket (*Pacchi*) for carrying grains, *bhoral/mer/duly* etc for storing.

Environmental conditions

Physical environmental factors such as unsuitable climatic condition can interact with mechanical load and aggravate the risks of musculoskeletal disorders. Lighting condition is an example of environmental factors influencing the musculo skeletal strain. The most affecting environmental parameter was temperature followed by humidity, lighting and noise (Shobha *et al*., 2012). Working under excessive heat makes the workers tired and sleepy, reduces alertness and increases the tendency to make mistakes or accidents. Low humidity level relatively causes discomfort due to drying of mucous membrane of nose and throat. If lighting and visual conditions are deficient, muscles are strained more intensely, particularly in the shoulder and neck (Jagar and Luttmann., 1989). The environmental parameters also created the adverse affect on the health of the workers as they were suffering from the health problems like eye weakness, body pain, joint problems etc. which may lead to risk like slip and fall injuries etc. Visual discomfort can create the problems of pain in eye and neck. Knowledge on environmental parameters is very important for ergonomic intervention to reduce health hazards and enhancing comfort and efficiency of the workers.

Temperature and Humidity

The temperature and relative humidity were recorded thrice in every 30 minutes during the post harvest activity. An observation of the Table 1 showed that the mean temperature was found to be 22°c and mean relative humidity (RH) was observed to be 49 per cent. According to Mookerjee *et al.* (1953), the comfort zone limits in terms of 'Corrected Effective Temperature' for Indians during summer and winter are 25°C (upper

limit) and 21°C (lower limit) respectively. Skyes (1988) stated that relative humidity less than 40 per cent may increase the risk of respiratory infection. Farm women performed post harvest activity within the acceptable limit or comfort zone of temperature and humidity is due to the fact that in Assam the most of the post harvest activities are performed in winter season only.

Illumination

An assessment of visual comfort of the subjects regarding the lighting condition revealed that the illuminance level were varies from 21 lux to 95 lux (Table 1). This variation of illuminance is due to the fact that some of the post harvest activity was performed inside the house. The work place was found to be non-conducive to farm women, which is below the recommended standards for general work area (150 lx). This is due to the fact that there was no provision of windows for natural lighting in the work area. Similar study was undertaken by Mehrotra *et al.* (2001) and found that the light intensity in between work and after work was 49 lux but in beginning of work it was 48.7 lux and suggested that the work place should have enough light, free from glare and dazzle both for comfort and clarity of vision.

Noise

Noise is not the only source of occupational hearing loss. From the Table 1 it was found that mean noise level was 110 db which was more than the permissible limit. This may be due to the fact that the use of thresher, power tillers, tractors etc in household level for performing pot harvesting activity performed by male counterpart. According to Skyes (1988) the permissible or acceptable noise level is 80 db. The effect of continuous exposure to intense noise is hearing damage which results in deafness and it can be permanent or temporary.

Shobha *et al.* (2012) did a study on environmental parameters and opined that the most affecting parameter were temperature (63.5%) followed by humidity (51.5%), lighting (36.5%) and noise (15.0%) created by the plant of the rice mill. These parameters were creating the adverse affect on the health of the workers as they were suffering from the

health problems like eye weakness, body pain, joint problems etc. these may lead to risk like slip and fall injuries etc.

Occupational health hazards in of farm women in post harvest activities

Occupational health hazards of farm women in post harvest activities were determined in the view point of environmental condition. From the study it was clearly indicated that environmental parameters affect the health of farm women. It was found that more than 67 per cent of the respondent's farm women were suffering from different health problems due to temperature, humidity, illuminance and noise (Table 2). The environment is not congenial to the farm women for performing the post harvest activities.

Hazards faced by farm women in post harvest activities due to the environmental factors are pain or cramps, indigestion, eye strain, watering of eyes, blurred vision or vision problem, loss of hearing capacity, temporary deafness, headaches and faintness due to working under cold, humid, noisy and inadequate lighting conditions.

Mehrotra *et al.* (2001) concluded that inadequate ventilation and lighting caused irritation in eyesight and reduced the output. Humidity and temperature were found high against the acceptable range. Because of poor working condition, most of the worker reported higher level of musculo skeletal problem when inquired. The excessive heat makes the workers tired and sleepy, reduces alertness and increases the tendency to make mistakes or accidents.

Galsiu *et al.* (2006) found that artificial lighting is luminance and adequate visual environments to carry on the task when natural light is inadequate or not available. Inadequate light leads to problems like lack of interest, failure to concentrate, sleepiness and apparent laziness. Further eye strain, headache, indigestion and irritability are the problem due to inadequate light.

Hazard proneness of farm women in post harvest activities

From the Fig. 1 it was apparent that 63 per cent respondents belonged to 'high' incidence of hazards followed by 27 per cent 'moderate' and 10 per cent 'low' incidences of health hazards due to environmental conditions during post harvest operation. Occurrences

of health hazards for environmental conditions were due to working under hot, humid, poor lighting and noisy environment. Similar findings was observed by Vyas and Singh (2005) who concluded that working in hot climate with extreme temperature also created problems to approximately 80 per cent of the respondents of agricultural workers.

Thus agricultural workers involved in post harvest activities confronted environmental hazards in performing post harvest activities.

Ranges of motions (ROM)

The ranges of motions (ROM) were recorded with the help of dual inclinometer. Both static and dynamic movements were adopted during post harvest activity. The postures assumed by the farm women in post harvest activity were standing in forward bending position. The range of motion (ROM) in cervical, thoracic and lumbro scaral showed that the angle of average flexion was 30.60° and average extension was 38.00^0 in cervical, while it was observed to be 62.50° and 115.30° for thoracic and in lumbro scaral region average flexion was 32.33° and extension was 28.83°. The angles of average flexion were 90.62°, 35.09°, 57.80° and average extensions were 77.12°, 68.20°, 48.58° in upper extremities indicating deviation in the different body parts.

Conclusion

On the basis of the findings it was observed that there is a strong need to motivate and aware the farm women towards environmental conditions and occupational health hazards in post harvest activities and its alleviation. Occupational health hazards in agricultural activities in general and occupational health hazards in post harvest activities in particular, are in innovative stage in India and moreover, development of health and well being of farm women depends on adoption of best practices which in turn depends upon the attitude of farm women. The health problems caused by occupational and environmental hazards are particularly acute in developing countries, where well established methods of hazard control are less likely to be applied because of limited awareness of the hazards, low political priority of health and environment matters, limited resources or lack of appropriate occupational and environmental health management systems. It is now well recognized that the scientific knowledge and training required to assess and control environmental health

hazards are, for the most part, the same skills and knowledge required to address health hazards within the workplace.

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Table 1. Assessment of environmental parameters in the study area.

Sl. no	Environmental parameters	Observed value
1	Temperature (°C)	22
2	Humidity (%)	49

3	Illuminance (Lux)	95
4	Noise (db)	110

Table 2. Distribution of respondents according to occupational health hazards

Sl. no	Environmental Hazards	Frequency	Percentage
1	Pain and cramps while working in winter season.	250	83.33
2	Problems of indigestion due to working in cool conditions.	203	67.66
3	Problem of sleepiness/watering of eyes due to long hours of post harvest operations at hot sun.	256	85.33
4	Watering of eyes due to long hours of post harvest operations at hot sun.	265	88.33
5	Headaches due to working in the hot and humid conditions.	284	94.66
6	Sun burn for working in hot sun.	250	83.33
7	Drying of mucous membrane of nose and throat.	210	70.00
8	Problem of faintness due to heat and humidity.	245	81.66
9	Eye strain due to inadequate indoor lighting.	221	73.66
10	Slip and fall injuries due to poor lighting	205	68.33
11	Irritation in the body due to poor lighting	286	95.33
12	Irritation in eyesight and reduced the output	213	71.00
13	Hearing capacity is reduced due to working near vibrating condition	220	73.33
14	Blurred vision/vision problem due to long hours of post harvest operations in sunny days.	226	75.33
15	Temporary deafness due to prolonged exposure to noisy environment (noise of threshers, tractors etc).	156	85.33

Table 3**.** Average flexion and extension in body parts of farm women in post harvest activity

Body parts	Flexion	Extension
Cervical	30.60°	38.00°
Thoracic	62.85°	115.30°
Lumbro Scaral	32.33°	28.83°
Upper extremities		
Upper arm	90.62°	77.12°
Lower arm	35.09°	68.20°
Wrist	57.80°	48.58°

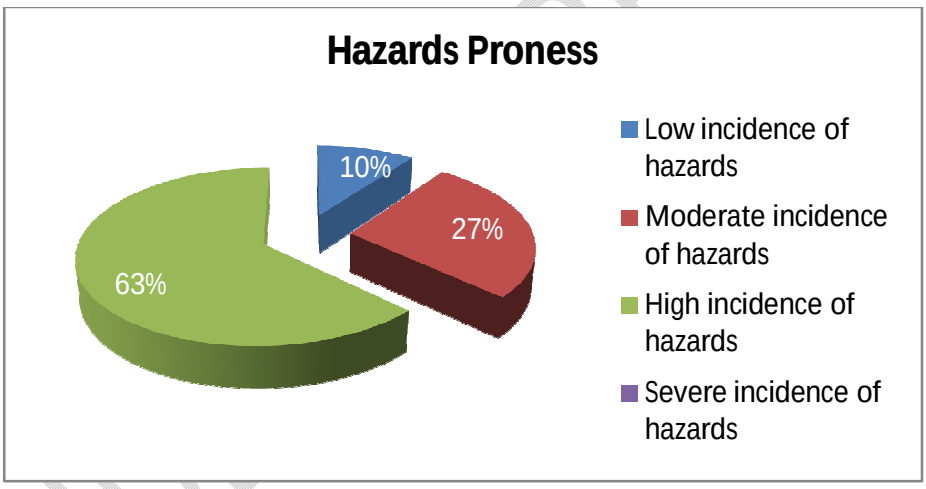

Fig. 1 Distribution of the respondent's according to hazard proneness in post harvest activities