OCCUPATIONAL SAFETY AND HEALTH IN LOGGING OPERATIONS AT ONDO STATE AFFORESTATION PROJECT

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ABSTRACT

Assessment of the various types of hazards exposed to by logging crews in a Nigerian Forest Reserve was carried in this study. The study site was the Ondo State Afforestation Project (OSAP) South West Nigeria. Data collection involved the use of ergonomic checklist, participatory approach, on-the-spot assessment and oral interviews .Data collected were subjected to statistical analysis. The results showed that the commonest hazards exposed to by log felling crews were vibrations, noise, stress and mental workload. Accident rate during felling was very low as 10% of the workers claimed to have being involved in logging accident but accidents during log loading recorded the highest frequency. All the crew members were exposed to a long duration (about 6hrs) of intense noise daily but only 30% could note the effect of noise on their health while 20% reported the effect of noise on their efficiency. None of the crew members has ever gone for audiometry test in the last five years. Fifty five percent of the workers were exposed to vibrations, of these, 30% are exposed to whole body vibration, 10% to hand-arm vibration while 15% were exposed to both hand-arm and whole body vibration. The affected workers reported on the negative effect of vibration on their health. A standard working time was observed, but slight variation still exist as break time were not being observed in the study area. Although there is provision of safety rules and protective gadgets, the workers were not using them as they claimed that it could affect their safety and efficiency. Workers carelessness, ignorance and lack of proper training and not adhering to the instruction manuals were some of the factors responsible for the high rate of hazard on the job.

Keywords: Hazards, logging, ergonomics, accidents, noise, vibration, safety

INTRODUCTION

Occupational safety and health are of concern in forestry operations because of their associated high injury and death rates. In comparison with other industries, accident rates and health risk during logging activities are extremely high, resulting in heavy loss of capital, lives and properties. In most developing countries like Nigeria, little attentions are paid to logging accidents. This is due to lack of adherence to safety regulations and logging workers are generally not trained. As a result, logging accident rates are several times higher than in developed countries. In addition, terrain and weather conditions, inadequate tools and machines, lack of skills, poor planning, organization and supervision are some of the identified factors contributing to incessant logging accidents (Johansson and Ponten 1990, Axelsson, 1995 and Omole 2000).

Due to the health risk and high energy demand in logging operations, logging activities are physically tasking, requiring healthy, well-fed male adults for efficient operations. In countries where wood harvesting has been mechanized, reported accidents rate have declined significantly (Engsas,1993) Even when the job is mechanized, musculo-skeletal health complaints may become apparent if work is done in an ergonomically unfavourable postures for a long duration of time (Ponten, 1998; Omole, 2008 and Omole *et al.*, 2010). Many forest workers employed in manual or motor-manual operations suffers from back, neck, chest and stomach pains due to whole body vibration which are main reasons for early retirement. Other serious sources of health risk of importance in logging operations are exposure to noise, lubricants, gasoline and exhaust fumes and sometimes dangerous wild animals. The negative effects of these on workers health and productivity were reported in the works of Axelsson, (1975), ILO (1991), BLS (2002) and Ponten (1998).

Between 1982 and 1986, seminars organized by the international labour organization (ILO) in Netherlands on Promotion of Ergonomics in the Tropics (PET) have led to increased interests in studies on the safety and health of workers in forestry and the wood industries. There is therefore a growing awareness now that, with relatively modest inputs, the application of the findings from such studies can be an important means of improving both operational

efficiency and stability of the workforce. Findings and statistics on these are documented in the works of Bostrand (1989) Axelsson and Ponten (1990) and Ponten 1998). Forest accident statistics are necessary for the industries and their workers to acknowledge the seriousness of the situation and understand the magnitude of the hazards in order to react accordingly. In Nigeria there is dearth of information on accidents statistics and where available at all, they are grossly under reported (Omole 2000).

This study is therefore carried out to evaluate and document the occupational hazards, safety and health of workers in logging operations in Nigerian Plantation forest. The specific objectives are; to assess and determine the various types of hazards exposed to by the logging crews in Nigeria, document the magnitude of the hazards and the effect on the safety and health of the workers and to determine the effect of the hazards on the efficiency and productivity of logging crews.

MATERIALS AND METHODOLOGY

STUDY AREA

This study was carried out at the Ondo State Afforestation Project (OSAP), located at Oluwa Forest Reserve, Epamakinde, in Odigbo Local Government Area, Ondo State. The project was established in 1979 as part of a long term plantation development programme in Nigeria. The objective of the project includes to increase round wood production development to meet part of the Nigeria's increasing demand for utility grade timbers and provision of short fibre pulpwood thinning of these plantations for a Federal Government owned pulp and paper mill located at Iwopin, Ogun State. The forest reserve is located approximately on latitude $06^{0}52^{1}$ and $7^{0}20^{1}$ North and longitude $3^{0}45^{1}$ and $04^{0}33^{1}$ East. The reserve is well drained in the north by Oni River and in the east by river Oluwa River. The pattern of rainfall in the area is bimodal in nature and characterized with heavy down pour late in September and October month of the year. The average annual rainfall is about 1500mm.

Data Collection

The data for the study were collected from the twenty (20) logging crew members of Ondo State Afforestation project using ergonomic checklist designed inform of interview schedule. The checklist was administered individually on the 20 members and each interview was conducted in privacy to avoid the workers influencing one another and to encourage individual worker to respond freely and fairly to the questions. The interview schedule was designed to gather information on the workers background, working time, general safety and health aspect, vibration, noise, stress and mental workload. The checklist was interpreted in the local languages to accommodate the language preferences of the respondents

Method of data analyses

Data collected were analyzed using a combination of descriptive statistic (percentages and frequencies) and Chi-square to present the responses and observation from the checklist.

RESULTS AND DISCUSSION

A total number of 18 workers (90% of the total respondents) reported that they have been rarely involved in an accident while only two (2) of the crew members (10%) reported to have been involved in accident during logging operations (Table 1). From table 2, it was observed that the 75% of the total respondents have been involved in an accident through various sources with the highest sources of accident being through felling that involved about 35% of the respondents. This is followed by accidents during log loading (15%). Forty five percent (45%) of the permanent workers claimed to have had accident through different sources. But of this category of logging crew, the highest source of accident occurred during felling. The statistical analyses revealed that employment status of the crew members was associated with the sources of accident. On the rate of accident in the study area as presented on table 3, it was observed that 90% of the permanent and casual workers rarely involve in an accident while 10% reported to have had frequent accident. The education level of the crew members was also discovered to affect the accident rate of the loggers. Fifty five percent among those that were educated reported to have been rarely involved in an accident while the rest 5% reported frequent accident rate. For those without formal education, 35% reported rare accident rate while 65% reported on their frequent accident rate. On individual accident rate according to educational status, 20% of those without formal education claimed that they have never been involved in personal accident, while 20% reported on their involvement in personal accident. Also, 25% of those with formal education reported no personal accident while 35% reported personal accident. Statistical analyses revealed that employment status and literacy level have no significant effect on accident rate and fatality in the study area.

Table 1: Location and Accident rate

Location	Accident rate rare	Accident rate often	Row Total
Site I	60	0	60
Site II	30	10	40
Total	90	10	100

($X^2 = 3.333$, df 1, $P = 0.067$)

Table 2: Employment and Education status of the respondents and the Sources of accidents.

Location	Sources of accidents							Row total %
	Felling	Driving	Loading of logs	Clearing of felling areas	Carrying of chainsaw	Dragging of logs	Other logging operations	
Employment status								
Permanent	46.8	6.6	0	0	0	0	6.6	60.0
Casual	0	0	20	6.6	6.6	6.6	0	40.0
Total	46.8	6.6	20	6.6	6.6	6.6	6.6	100%
Level of education								
None	13.2	0	6.6	0	0	0	6.6	26.40
Primary	19.8	6.6	0	0	6.6	0	0	33.00
Nursery	0	0	6.6	6.6	0	0	0	13.20
Secondary	6.6	0	0	0	0	6.6	0	13.20
Tertiary	6.6	0	6.6	0	0	0	0	13.20
Total	46.2	6.6	19.8	6.6	6.6	6.6	6.6	100%

Table 3: Rates and fatality of accident in the study area as affected by employment status and level of education of the respondents

Employment status	Accident rate		Row total (%)
	Rare (%)	Frequent (%)	
Permanent	55	10	65.0
Casual	35	0	35.0
Total	90	10	100.%
Literacy Level and Rate of Accident			
Literacy level	Accident rate (Rare)(%)	Accident rate (Often)(%)	Row Total (%)
Formal education	55	5	60.%
No formal education	35	5	40.%
Total	90	10	100%
Employment status and personal accident rate			
Permanent	30	35	65.0
Casual	15	20	35.0
Total	45	55	100%
Level of Education and Accident fatality			
None	20	5	25.0
Primary	30	0	30.0
Nursery	15	0	15.0
Secondary	10	5	15.0
Tertiary	15	0	15.0
Total	90	10	100%

Table 4 shows that 45% who reported that instruction manuals were not available had no record of fatal accident, 10% in this category recorded fatal accident while 45% who had access to instruction manuals had no record of fatal accident. Also, it was observed that only 15% of the total respondents believed that instruction manual was necessary to avoid fatal accident while majority (85%) of the respondents did not align with this position. Therefore, necessity of instruction manual is independent on accident fatality.

Results as shown from table 5 revealed that 20% of the total respondents in site I have been involved in an accident while 35% of the total respondent in site II reported to have been involved in an accident also. The table equally showed that 50% of the respondents with health complain had had personal accident. The statistical analysis showed that the relationship among location, personal accident rates and health complaints are not significant.

INSTRUCTION MANUALAND ACCIDENTS

Table 4: Respondents' response on access to Instruction Manuals and its effects on accident fatality

Variables	Accident fatality		Row Total %
	No %	Yes %	
Availability of manual Respondent	45	10	55
Not Available			
Available	45	0	45
Total	90	10	100
Type of Instruction manual			
Verbal	15	15	30
Personal experience	5	5	10
Pre-lecture	10	0	10
Seminar	45	5	50
Total	75	25	100
Necessity of instruction manual			
Not necessary	75	10	85
Necessary	15	0	15
Total	90	10	100
Accessibility of instruction manual			
No	85	10	9
Yes	5	0	5
Total	90	10	100

Table 5: Personal accident rate and awareness of health risks of the respondents as affected by on –the-job training

Basic training Basic training	P. accident rate (No) (%)	P. accident rate (Yes) (%)	Row Total (%)
No basic training	40	35	75
Received basic training	5	20	25
Total	45	55	100
awareness of health risk			
Not aware of any health risk	40	20	60
Aware of health risk	5	35	40
Total	45	55	100
Health complains			
Never complained of bad health	25	5	30
Have complained before	20	50	70
Total	45	55	100

Table 6 shows that 10% of the respondents who had never complaints were at least exposed to vibration while 45% of the respondents with health complaints were also exposed to vibration. Furthermore, 70% of them believed that their health complaints was caused by noise and of this group, 30% believed that noise had no direct effect on their health while 40% reported that the noise had direct effect on their health.

The workers are exposed to stress due to the long duration of work. Most often, the workers were unable to observe any official break time during the period of working as shown in table 7. From this table, 75% of the respondents with health complaints were not used to observing break during working hours, 65% were unable to take short break and only 10% could determine when to observe the break. The Logit regression analysis shows that personal accident rate and the observant of necessary initial instruction were dependent on health complains (Table 8).

Table 6: Health Complains and Exposure to Vibration by the loggers in the study area

	No Exposure to Vibration %	Exposure to Vibration %	*Row Total %*	
No Health complaints	20	10	30	
Health complaints	25	45	70	
Total	45	55	100	
Types of Vibrations and Health Complains				
		Vibration types (%)		
	Whole body	Arm vibration	Hand vibration	Row total
No Health complaints	0	5	5	10
Health complaints	30	0	15	45
Total	30	5	20	55
Health Complaints and Noise Effect on Health %				
	No effect	Effect	Row Total	
No Health complaints	30	0	30	
Health complaints	40	30	70	
Total	70	30	100	
Health complaints and noise effect on hearing				
	No effect (%)	Effect (%)	Row Total (%)	
No Health complaints	30	0	30	
Health complaints	40	30	70	
Total	70	30	100	
Health complaints and noise effect on efficiency %				
Health complaints	No effect	Effect	Row Total	
No Health complaints	30	0	30	
Health complaints	40	30	70	
Total	70	30	100	

The result therefore showed that personal accident experience and basic training were dependent on health complaints. Hence, Personal accident rate = $-1.466_{0.23} - 1.251_{0.29}$ in MA $NE_{13.15} + 2.592$ HC

DISCUSSIONS

The study assessed and determined the various types of hazards exposed to by logging crews in the study area, in terms of health risk and accident, vibrations, noise, stress and mental workload. The results indicated that the majority of the workers were permanent staffs and very few were engaged as casual workers. Also, most of them were without formal education.

In term of training, highest proportion of the workers did not have the basic training in wood harvesting before taking up the job. But they claimed to have acquired enough personal experience on how to carry out their duty. This is a confirmation of the observations made by ILO (1997) and Omole (2000) that there is a considerable influx of unprofessional fortune seekers in forestry activities in most developing countries. Some of the workers believed that initial instruction at the start of work was

Table 7: Health Complaints and Work Stress of the respondents in the study area

Health complains and work pace control	**No effect**	**effect**	**Row Total**
No Health complaints	30	0	30
Health complaints	40	30	70
Total	70	30	100
Health complains and machine work pace control	Machine work pace control {No}	Machine work pace control {Yes}	Row Total
No Health complaints	15	15	30
Health complaints	45	25	70
Total	60	40	100
Health complains and determination of short break	Short break determination {No}	Short break . determination {Yes}	Row Total
No Health complaints	30	0	30
Health complaints	60	10	70
Total	90	10	100
Health complains and rotation of task	No Task Rotation	Task Rotation	Row Total
No Health complaints	30	0	30
Health complaints	65	5	70
Total	95	5	100

Table 8: Personal accident experience, Basic training and health complaints

	Constraint	Basic training	Health Complaint
Estimate	-1.99959	1.6098	2.5766
Odds ratio	0.13539	5.0018	13.1522
Personal accident rate, necessity of initial instruction manual and health complaints			
	Constraint	Necessity of initial manual	
Health complains			
Estimate	-1.46571	-1.25057	2.5921
Odds ratio	0.23091	0.28634	2.5921

Therefore, Personal accident experience = $-2.00_{0.13} + 1.6105_{5.0}$ BT + $2.577_{13.15}$ HC
where BT = basic training and HC = health complaints

necessary while most of them did not support this claim and thus could not determine their ability to carry out their jobs successfully. The inference drawn from this is that there is low awareness on the importance of instruction manuals for the workers.

Result on the assessment of working time revealed that working time is eight hours per day, five days a week. The log loaders have no specified time, but work seven days a week. This situation is contrary to ILO (1962 and 1995) recommendations on working time. It was also noted that sometimes daily work may not be up to eight hours and at other times, it could exceed. Observed was the absence of scheduled breaks during working period and the rotation of tasks among the workers was not being practiced as their job is fixed and permanent. Going on break is subjective, depending on work stress and volume of work at hand. This is at variance with ILO (1998) position that working hours should be developed so as to provide adequate periods of rest which include short break during working hours and sufficient break for meal. In terms of work pace, while of the respondents could determine how their work should be done, the greatest proportion claimed that their work pace is controlled by the felling machines (chainsaw) and the operators. Another factor that determined work pace for the loaders was the availability of already felled logs. On tools and techniques, investigation showed that 90%

were free to determine the kind of tools and techniques to be employed in their job while just 10% reported that they were not to determine what tools or techniques to be used.

In terms of accident 55% of the workers reported being involved in work related accidents, but unfortunately, they could not remember how many accidents they had been involved in. For those who reported to have being involved in accidents, they noted that the accidents affected their work schedule, citing instances were they had to stop work for a period of time until after their fully recovery. Workers' carelessness was discovered to be the major course of accidents in the study area. This confirmed the findings of Zander (1980) that men at work are liable to make mistakes. The common types of accidents in the area was classified as non fatal, while the most common source of accident was identified as branches falling on the workers, causing injury for the felling crew which are generally not fatal. This was also reported in the work of Poschen (1993) that loose branches falling down are dangerous and can cause serious accidents. For the loaders, jacking of the log on the truck or tractor was identified as the most common source of accident. This could have been minimized through the wearing of protective apparel like simple helmets.

The most dangerous of accident was reported during felling operation and these findings agree with Dickson (1987) Omole (2000) Omole *et al* (2005). These authors identified this stage as the most hazardous in wood harvesting operations. This placed the chain saw operators at most risk, as he is directly involved in felling. Concerning avoidance of accident only very few of the workers felt that the accidents could be avoided through workers' carefulness, the adoption of protective equipments such as ear and nose protector, jungle booth, hand gloves, safety helmet etc and the proper maintenance of machines and equipment. There were some of the workers, on the contrary, who felt that the accident were unavoidable and thus a part of the job. Accident rates and statistics were however grossly under-reported in the study area.

Majority of the workers (55%) are exposed to vibrations. Those exposed to vibration reported that the exposure was continuous throughout the working period. The chain saw operators were exposed to both hand-arm and whole body vibration while tractor drivers were exposed to whole-body vibration. The identified sources of vibration were chainsaw and tractors. This vibration could be disturbing and the effect ranged from finger stiffness and also pain in the arms to general body pain and discomfort. It is obvious that vibrations cannot be totally eliminated but they could be designed to reduce vibration by the manufacturers.

Almost all the workers were exposed to noise and this exposure was continuous over the working period. The primary sources of the noise as identified by the workers are the chainsaw and tractors. ILO (1992) had already classified logging equipment as producers of high noise level. The effect of noise on health of workers has been reported. Such health hazards include headache, hearing and communication impairment and body stiffness. This is comparable with the findings of Kryter (1985), who noted that these effects are related to stress. Majority of the crew members claimed that noise had no noticeable effect on their health. This may not be valid as further investigations showed that none of the workers has ever gone for audiometric examination and as a result they may not be in a position to confirm their health status. Also, it has been reported by Bostrand (1989) that the effects of noise on man are not noticeable until much as 10-15 years after.

Relating to work efficiency, there was the effect of noise on efficiency due to reduction of hearing capacity while working which could result in communication impairment, ultimately being a potential cause of reduction in work progress. This is in line with the view of Bostrand (1989) who noted that high level of noise can reduce production. Noise usually results in a variety of circumstances such as a decrease in co-ordination and concentration after a long term exposure, thus increasing the chances of accident occurring during logging. . The proportion of those who were aware of protective measures against noise was less than those who claimed that not to have ever heard of protective measure against noise. It should be noted however that none of the workers had ever used protective measure because of poor working condition and indifference working habit in developing countries. Nigerian workers are used to working without caution and most often, protective wears are not provided by the management. Workers therefore suggested a review of their welfare structure and medical care, preferably by providing free medical service, particularly for injured workers.

CONCLUSIONS AND RECOMMENDATION

This study was on the assessment and determination of the various types of hazards exposed to by logging crews. All the forest workers are exposed to long duration of noise from machines and tractors and the resultant effects of noise on health and working efficiency are very great. Noise can reduce the working efficiency of the loggers and lead to poor health

condition. Even though there was no record of previous accident involving the loggers, the workers are liable to be involved in work related accidents which might have affected their work. The major cause of accidents was identified to be due to the workers carelessness. Also, there is a low level of awareness on the importance of instruction manual. Consequently, it is recommended that logging crews should be provided with personal protective equipment to minimize or where possible eliminate the occurrence of occupational hazards and diseases.

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