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ASSESSMENT OF NOISE EXPOSURE OF FORESTRY WORKERS: A CASE STUDY OF THE UNIVERSITY OF IBADAN TREE MANAGEMENT COMMITTEE

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ABSTRACT

Timber harvesting is an important agricultural operation as it provides materials for construction. Recent improvements in its harvesting with the development of the power saw have attracted more people into the profession with many working over extended period. It is known that a lot of noise is generated in this operation which may be harmful to the health of the forestry workers and requires remedial measures. Measurements of the levels of noise generated and periods over which machine was operated were undertaken among forestry workers at the University of Ibadan. The average noise generated ranged from 83 to 116db with machine operation period at a location ranging from 65 to 165 minutes. In some instances, the team works in more than one location per day which implies that the duration for which they may be exposed to noise is much more than just that recorded for one location. These are of potential danger and forest workers need to be protected. Forest workers should as a matter of compulsion use protective devices and regularly visit the audiologist to ensure that their hearing ability is not being impaired.

Keywords: harvesting, timber, noise level, climbers, pruning.

INTRODUCTION

The movement of and communication between people and animals, machine operations and contacts between objects create pressure waves in the air which at certain ranges of frequencies can be interpreted by the human ear as sound and when either the level or content of the sound becomes unpleasant to the individual exposed to it, it is described as noise. Noise has therefore often been described as unwanted sound. The origin of noise depends on the location considered and in an agricultural environment; the common sources are from the various agricultural operations both stationary and in motion, livestock and wild life (Anonymous, 2012, Evans, *et al*., 2004).

Noise is measured in decibel, the louder the noise the higher the decibel but within the noise level permissible for human health, the tolerance of noise level is relative. While a low level noise may be repulsive to an individual sleeping or reading, a higher level may not be repulsive to people in a house of worship. Over a period of time, the variation in noise level depends on the trend in the noise generating activities. This explains why noise levels are higher during the day when there are more human, industrial and vehicular activities than the night when the activities are drastically reduced. This also explains why the noise in a hitherto rural area increases as it gets urbanized.

Noise is an environmental pollutant but unlike other pollutants such as water and air pollution, it does not stay long in the environment but disappears fast but yet could cause a lot of damage within its short duration. Noise hazards are both physiological and psychological and include annoying the individual exposed to it, awaken and frustrate people. It disrupts communication and individual thoughts; and affects performance capability. Among the workers who generate the noise, it is even a major hazard as it prevents them from hearing other sounds creating dangerous situations since they may not be able to hear warnings during emergency periods. Besides warning signals, noise prevents operators from detecting machine sound which may indicate malfunctioning. In extreme cases, it could lead to hearing impairment in which the ability of the individual to hear and participate in conversations is greatly reduced. These noise effects reduce productivity and make life uninteresting. (Baker, 1997; WHO, 2001; Baryeh *et al.*, 2003; Gordon, 2006; Godson, *et al*., 2009).

In practice, the resultant negative effect of noise is a combination of the level and duration of exposure. While an individual exposed to a high level of noise for a short period may not suffer any harm, another one exposed to a lower level of noise for a longer period may suffer some injury. It is for this reason that the various codes on noise specify the noise level and duration for which an individual may be exposed. In general, the permissible exposure period reduces as the level of noise increases and a common borderline is 85dB for 8- hour exposure per day which is even hardly achieved in many agricultural operations as revealed by many field studies (Mehmet and IIker, 2004; Mijinyawa and Akinyemi, 2012; Mijinyawa *et al*., 2012). Where workers are expected to work for longer periods or in an environment with higher noise level, precautions must be taken to protect such workers from damage from noise effect (Occupational Safety and Health, OSHA, 1993; Jones, 2003).

The level and resultant effect of excessive noise exposure has been studied in many fields including agricultural environments and activities. These studies have revealed that agricultural workers are at great risk from noise induced hearing loss from farming tasks and activities. In a study carried out on 182 dairy farmers to determine the effects of noise on their health, 92% of the

population were found to have significantly lost their hearing ability while in another study, 31% of 1, 418 farmers had early signs of hearing loss induced by their routine activities (Broeste *et al*., 1989; Winters *et. al*., 2005). Mijinyawa and Akinyemi (2012), Mijinyawa and Alege (2012) and Mijinyawa *et al.* (2012), investigated the level of noise generated during land preparation, in feed mills and piggery which are all activities in agricultural environment and found that in all cases, the noise generated and to which the workers were exposed for long periods were far above the permissible limits and a number of employees were already showing signs of hearing losses. The situations were aggravated by the reluctance of the workers to use hearing protection devices in the rare cases where they were provided.

Desirous to minimize the negative impact of occupational noise, various efforts have been made to limit the level of noise to a tolerable limit. Methods adopted include legislation such as the Environment Conservation Act (1989) and the Road Traffic Act (1996) which aim at limiting the amount of noise allowed in various work places and other activities, reduction of noise level at its source with methods which include the reduction of vibration of the engine, proper maintenance and reduced sound propagation by use of barriers, damping, isolation, muffling, noise absorption, mechanical isolation, variations in force, pressure or driving speed, and the use of personal protective devices such as earmuffs and earplugs.

The harvesting of forest products is a major activity in agricultural environment and the harvesting equipment have all over the years developed from simple axes and manual saws to the modern power saw. While the development in harvesting technology has reduced the physical stress, the technology has come with increased noise. Because of the reduced fatigue in the use of modern equipment; the trade has attracted many people and working for longer duration possibly unaware of the danger to which the workers are exposing themselves. It is known that the level of noise generated in many agricultural operations including timber harvesting are beyond the permissible levels thus requiring precautionary measures to be taken to protect the health of workers.

Effective noise attenuation programmes can only be designed with adequate information on the level of noise generated and there is a dearth of this information for many agricultural operations in Nigeria at present. There is need to establish the level of noise generated and to compare with standards so that appropriate measures aimed at promoting the welfare of the farm workers can be taken. The generation of this information motivated this work.

MATERIALS AND METHOD

Study location

This study was carried out within the University of Ibadan Campus, Nigeria. The University is located within the Southwestern part of Nigeria between longitudes 3^o and 4^o E and latitudes 7^o and 8^o N. The area lies within the rainforest region and has two distinct seasons, the rainy season from April to October with an August break and dry season from November to March. Timber contracting is a major activity in the area employing a large number of people. The University of Ibadan which was established in 1948, occupies an area of 1, 032 hectares accommodating both academic and residential areas. At inception and all over the years, tree planting both for beauty and environmental conservation has always been done by both individuals and management. Most of these trees have matured and become a threat through unpredicted falling especially during the rainy season and causing a lot of damage to human beings and properties. In an attempt to address the situation, the University set up a Tree Management Committee (UITMC), which among other functions is to identify and remove trees that are of potential danger. As a result of the tree population, the committee is continuously engaged in tree felling and clearing. This justifies the selection of the campus for this study.

Committee operation

Workers of the Committee comprise feller operators, who operator the power saw used for felling trees, felling assistants who clear cross-cuts from site and tree climbers who climb the trees to remove branches when it is not desired to fell a whole tree. Individuals within whose premises trees are identified to pose a threat report to the committee and request for the removal of such trees. The committee also carries out general inspections to identify trees that are of potential danger even when those living in the neighborhood do not make a report. Whichever is the case, the committee then assesses the situation and decides whether such a tree should be pruned or the whole tree removed. Depending on the judgment, the whole tree may either be removed or the branches pruned. During this study, the researcher was in constant touch with the committee in order to have information ahead as to where work was to be done on any day and to be at the worksite.

Equipment

The major equipment used in this study were a power saw shown in Figure-1 which is used for felling and cross-cutting the tree, and Extech 407768 Noise Level Meter for recording the noise level. The noise level meter consists of a microphone, electronic circuits and a readout display with a measuring range from 35-130dB. The meter was calibrated before usage.

Figure-1. Power saw.

Site activities

The activities of the committee can be broken into three. These are pre-felling, felling and post-felling activities.

i) Pre-felling activies

When a tree is to be felled, the safety of the workers and properties around such as houses and economic trees must be taken into account. If it is envisaged that the tree may fall on a property, precautions must be taken to control the direction of fall of the tree. Where this is deirable, the tree is winched onto another tree that is of adequate strength to support the tree to be felled. Figure-2 shows a tree that is being winched to protect a house.

ii) Felling

The felling of the tree entails putting the cutting tool at a little distance above the ground level and cutting the tree but taking care to ensure that the power saw operator is not on the side where it would fall. Figure-3 shows tree felling in progress.

iii) Post-felling activities

These include cross- cutting the felled tree into logs and prunes and carting away to appropriate places. While the logs are conveyed to the sawmill, the prunes are conveyed to where they are used to produce charcoal. Figure-4 shows a feeled tree being cross-cut.

Figure-2. Winching a tree to prevent it from falling onto and destroying a house.

Figure-3. Tree felling in process.

Data collection

The data for this study were collected through personal communication with the workers while the study lasted and physical measurement of noise level made with the noise level meter. The measurements of noise were carried out in accordance with the guidelines of the Canadian Centre for Occupational Health and Safety (CCOHS) and National Institute for Occupational Health and Safety (NIOHS). It was observed that although the workers are supposed to be on duty for eight hours per day by virtue of their conditions of appointment, they as a matter of fact are only exposed to excessive noise during that period when the power saw which is the major equipment is in operation. It was therefore decided that in addition to the level of noise generated at any worksite, the time period during which the machine is operated should also be recorded.

Figure-4. Cross-cutting a felled tree to clear the site.

RESULTS AND DISCUSSIONS

Level of noise generated

The results of the study are summarized in Table-1. The average noise generated ranged from 83 to 116db with machine operation period at a location ranging from 65 to 165 minutes. In some instances, the team works in more than one location per day which implies that the duration for which they may be exposed to noise is much more than just that recorded for one location. Using the various noise standards such as the Occupational Safety and Health Administration, OSHA (1993), the level of noise to which the workers are exposed is unsafe especially when they do not use any noise protective device.

The location of worksite was observed to influence the level of noise generated. While the noise levels in residential areas which are normally quiet were low, those in academic and administrative areas that are usually beehives of activities including large volume of traffic were high. Tree girth, age and hardness were also observed to influence the level of noise.

Table-1. Summary of machine operation time and noise levels.

Worksite No.	Average period of machine operation (Minutes)	Noise level in dB
1	150	109.6 ± 5.5
2	130	109.3 ± 3.2
3	98	107.9 ± 5.0
4	75	105.6 ± 3.4
5	65	104.9 ± 4.3
6	95	100.0 ± 11.0
7	150	103.7 ± 3.5
8	105	103 ± 7.0
9	120	99.5 ± 6.5
10	105	99.3 ± 5.4
11	120	86.7 ± 5.0
12	75	83.3 ± 6.3
13	95	89.8 ± 3.5
15	115	94.9 ± 6.2
16	85	95.7 ± 5.5
17	98	99.3 ± 3.5
18	100	82.6 ± 5.5
19	165	102.1± 6.0
20	160	93.2 ± 4.5
21	145	113.6 ± 3.5
22	98	115.6 ± 5.0
22	120	110.5 ± 3.5
23	75	110.5 ± 4.3
24	115	110.4 ± 5.4
25	115	108.7 ± 3.5

There is no doubt that the level of noise generated in timber harvesting is dangerous as one of its hazards which is making it difficult for people to hear communication was observed during the field work. In at least two of the worksites, some staff narrowly escaped the tree falling on them because they could not hear on time the warning call or shouts from their colleagues on sighting that a tree was on the verge of falling.

Operators' working conditions

Some of the workers expressed dissatisfaction with the level of noise to which they are exposed during work. To this group of workers, they have tolerated the situation because they have no other alternative of survival. It would therefore be good if this menace can be addressed especially as they cannot predict how long they will remain in the industry.

It was observed that the workers were not using any noise protective device. While some were aware of these devices such as ear plugs and muffs, others have not but nearly all of them expressed readiness to use these devices if they could be provided.

Some also reported that they have heard of other cutting machines which generate less noise but have not used it. They believed that if such equipment could be provided for them, the level of noise could be drastically reduced and make their job more interesting.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The noise levels generated during timber harvesting and to which the operators are exposed range from 83 to 109dB, and the exposure period range from 65 to 165 minutes.

Considering the levels and exposure period, the staff are at a marginal risk but would be safer for precautions to be taken.

The workers though aware of noise protective devices and better equipment that generate less noise, do not use them because they are not provided but however expressed willingness to use them if provided.

Recommendations

a) Towards ensuring a safe working environment, noise control devices should be provided for all the workers as everyone within the worksite is exposed to the high level of noise.

b) In the study carried out, it was observed that these workers are not only subjected to noise, but are also exposed to saw dust arising from cutting especially during the post felling operation. To solve these problems, workers should be provided with nose masks and ear plugs.

c) The University of Ibadan is sufficiently enlightened to know the role that hearing plays in human life. It should be mandatory for the workers to regularly visit the audiologist to ensure that they are not suffering from hearing loss due to their routine jobs.

REFERENCES

Anonymous. 2012. Noise. http://www.thefreedictionary.com/noise (Accessed 28/03/2012).

Baker D E. 1997. Noise: The Invisible Hazard. Department of Agricultural Engineering, University of Missouri Columbia. (Accessed from http://www.nasdonline.org/document, March 20, 2011).

Baryeh E.A., J.P. Mazwiduma, O.A. Koloka and E.A. Ampofo. 2003. Hazard Assessment of Tractor Operators Engaged in Food Production in Botswana. Food Agriculture and Environment. 1(3 and 4): 295-299. www.world-food.net.

Broeste S.K., D.A. Hansen, R.L. Strand and D.T. Stueland. 1989. Hearing Loss among High School Farm Students. Am. J. Pub. Health. pp. 619-622.

Evans J.P., Whyte R.T., Price J.S., Bacon J.M., Semple D.A. and Scarlet A.J. 2004. Practical Solutions to Noise Problems in Agriculture. Health and Safety Executive (HSE) Research Report. 212: 7-12.

Godson R.E.E, Derek G.S., Brown G.E. and Sridhar M.K.C. 2009. Assessment of Noise and Associated Health Impacts at selected Secondary Schools in Ibadan, Nigeria. Journal of Environmental and Public Health. Vol. 2009. Doi:10.1155/2009/739502.

Gordon Whitehead. 2006. Sound Level Measurement and Analysis, and Acoustical Recommendations Report. Lower West Pubnico, Nova Scotia, Canada.

Jones D. 2003. Noise Hazards in Forestry Operations and Selection of Personal Protective Equipment. Forestry Commission Technical Notes. www.forestry.gov.uk.

Mehmet R.D. and H.C. IIker. 2004. Noise Levels of Various Agricultural Machineries. Pakistan Journal of Biological Sciences. 7(6): 895-901.

Mijinyawa Y., C.R. Ogbue and O.E. Arosoye. 2012. Assessment of Noise Levels Generated in Some Feed Mills in Ibadan, Nigeria. Research in Engineering and Applied Sciences 1(3): 156-159.

Mijinyawa Y. and F. P. Alege. 2012. Assessment of Noise Levels Generated in Swine Production Units in Ibadan, Nigeria. ARPN Journal of Agricultural and Biological Science. 7(8): 645-649.

Mijinyawa Y and B.A. Akinyemi. 2012. Assessment of the Noise Level Generated During Ploughing and Harrowing Operations in Ibadan Nigeria. ARPN Journal of Agricultural and Biological Science. 7(8): 650-653.

Occupational Safety and Health Administration, OSHA. 1993. Permissible Noise Level recommended for eight hours of work per day. http://www.osha.gov/SLTC/noisehearingconservation/Accessed February 10, 2011.

The Environment Conservation Act. 1989. http://www.capetown.gov.za/en/CityHealth/Documents/Legislation/Act%20-%20Environment%20Conservation%20Act%20-%2073%20of%201989.pdf.Accessed March 1, 2012.

The Road Traffic Act. 1996. http://www.info.gov.za/view/DownloadFileAction?id=70930. Accessed February 24, 2012,

Winters M., E. MacIntyre and C. Peters. 2005. Noise and Hearing Loss in Farming, Published by Farm and Ranch Safety and Health Association British Colombia, Canada. pp. 6-1.

World Health Organization (WHO). 2001. Occupational and Community Noise. WHO Fact sheet, No. 258.