

PREVENTING WORKPLACE ACCIDENTS IN FORESTRY OPERATIONS BY IDENTIFYING THE MOST FREQUENT RISK FACTORS

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RESEARCH ARTICLE

Abstract

Health and safety at work represent essential aspects that both the employer and the employee must take into account. The main goal is to protect employees against the risks and hazards that may arise during professional activities. This article presents the most frequent risk factors identified in forestry operations and the main causes of workplace accidents in this sector. These risk factors can lead to minor accidents up to extreme situations that can endanger lives. The harsh working conditions in forestry operations have classified this sector among the top three most dangerous fields of activity. Additionally, measures for preventing workplace accidents in this sector have been outlined. Identifying and managing risk factors in forestry operations are fundamental to ensuring a safe and healthy working environment. Moreover, it is essential for employers to implement appropriate policies and procedures to prevent workplace accidents.

Keywords: risk factors, forestry operations, workplace accidents, workplace safety, preventive measures
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INTRODUCTION

Forestry operations constitute an essential economic activity within the timber industry and for the national economy as a whole, involving the management and utilization of forest resources to obtain various products such as timber, paper, pulpwood, firewood, and other wood materials. This activity encompasses a series of operations including logging, transportation, processing, and in certain situations, delivering the products to end-users. These operations involve various specific professions (such as mechanical sawyers, assistant sawyers, tractor operators, binders, cableway operators, drivers, etc.) which, in some instances, come with significant risks to the health and safety of the workers involved.

In specialized literature (Garland et al, 2020), it is noted that the human, technical, and material resources required for forestry operations (referred to as the "3Ms") pose unique challenges of their own. The physical resources consist of people (manual laborers, machine operators, supervisors), machinery (mechanical saws, forestry tractors), and materials (diesel, oils, spare parts, and small hand tools). In developed countries, the 3Ms in

the forestry sector commonly exhibit the following generalized aspects (Garland et al, 2020):

➤ Human resources: employees and operators in forestry operations are frequently well-educated and trained. They receive guidance from seasoned supervisors, managers, and contractors who bring their experience to the workforce.

➤ Machinery: the introduction of modern machinery in forestry operations allows operators to work safely from the machine's cabin (Lewark, 2005). However, even modern machinery used in forestry operations still faces challenging conditions (rain, strong winds, steep slopes, varying tree sizes). While the physical conditions in the forest remain unchanged, working from within a machine has allowed operators to work more comfortably and has reduced the risk of exposure to traditional hazards.

➤ Materials: material management is usually well understood, and only safe and environmentally acceptable materials are used.

In developing countries, the following generalizations can be made regarding the 3Ms in the forestry sector (Garland et al, 2020):

➤ Human resources: typically, workers and operators are poorly educated and trained,

often led by inexperienced and poorly educated supervisors and managers.

➤ Machinery: the presence of modern equipment for forestry operations is usually limited. Instead, the sector relies on manual labor, operations carried out with basic engines and machines, typically employing simple and low-level technology.

➤ Materials: material management is relatively inadequate, with the use of many materials that are harmful to both people and the environment.

Therefore, forestry operations in many developing countries take place under challenging working conditions (outdoor work conditioned by terrain relief and weather factors), carried out by poorly trained individuals using machinery and materials that are not adequately equipped to meet the safety

challenges imposed by these harsh working conditions. Additionally, in many instances, personal protective equipment is not worn, and companies impose heavy workloads on employees within short periods (Iftime & Muşat, 2022). In numerous cases, forestry workers are required to operate heavy equipment such as cableway carriages, front loaders, forklifts, and trucks. Workers may also be exposed to adverse or extreme weather conditions. Repetitive activities and prolonged work in a single position, such as operating machinery, are major sources of strain and musculoskeletal injuries. Consequently, all these challenging working conditions have classified the forestry sector among the top three most dangerous, alongside construction and transportation (Iftime & Muşat, 2022).

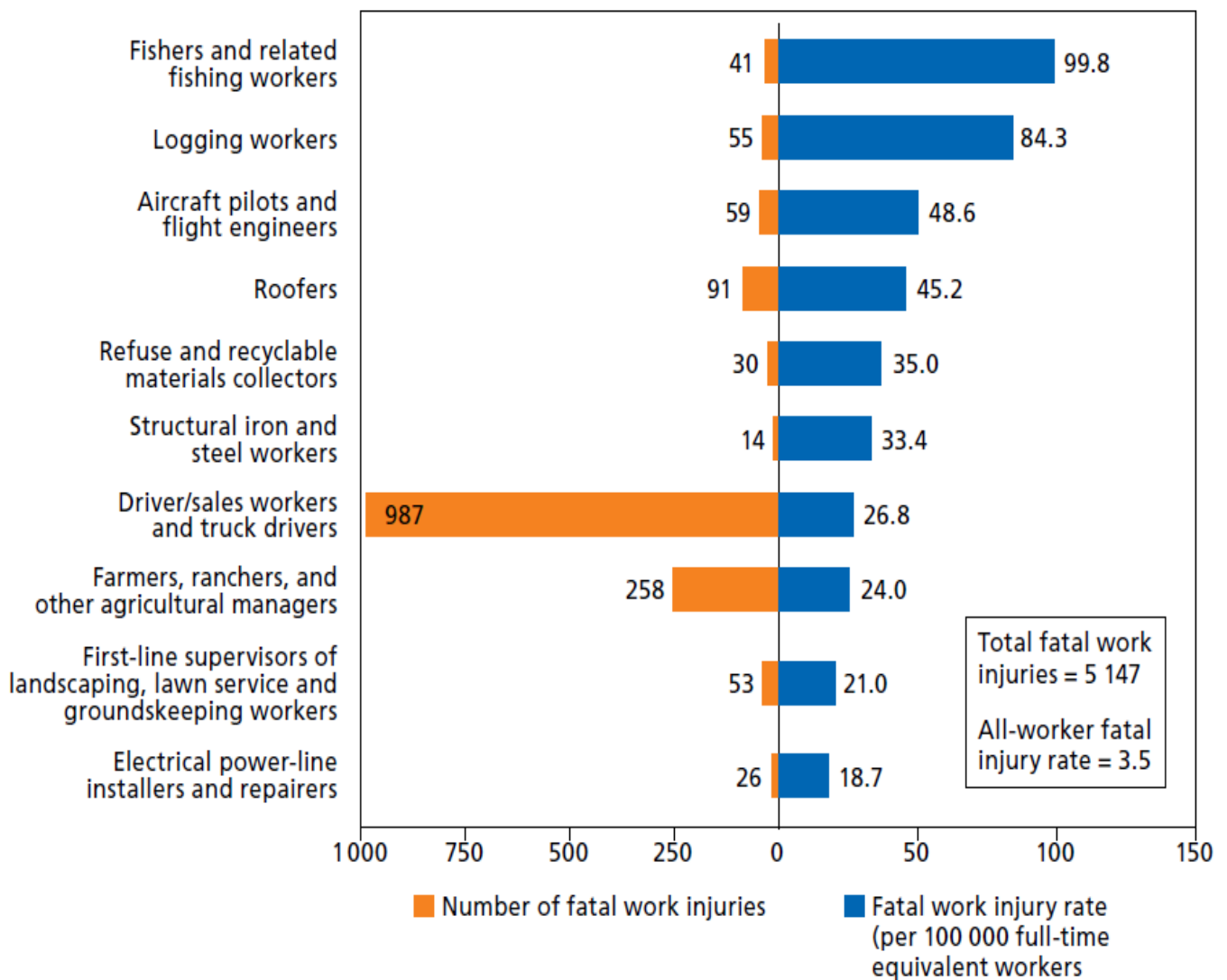


Figure 1 Work-related accident rate in the civilian sector in the USA for the year 2017 (Garland et al, 2020, source Bureau of Labour Statistics, 2018)

Under these circumstances, globally, forestry operations are often considered one of the most hazardous fields of activity, with a high risk of accidents. In the United States of America (USA), for instance, accident insurance accounts for 40% of total wages (Poschen, 2011). A significant portion of forestry work involves manual labor, such as felling large, potentially decayed trees using potentially dangerous tools and bearing substantial physical weight. Limited training, poor safety practices, and long workdays all contribute to unsafe working conditions. For example, in the USA in 2017, the number of fatalities among forestry workers was 55 (Figure 1) (Garland et al, 2020).

The European Agency for Safety and Health at Work (EU-OSHA) also indicates that the number of accidents and occupational diseases among forestry workers far exceeds those in other sectors (**, 2020; Iftime, 2020). The high rate of physical injuries, occupational diseases, and fatal accidents results from repeated exposure to an unfavorable environment (Tsioras et al, 2014; Laschi et al, 2016).

In Romania, concerning the total number of recorded fatal accidents in 2021, at the national level, in forestry and logging, the percentage of fatal accidents was 9.8% out of 153, meaning 15 fatal accidents, which is 28.6% less than in 2020 when there were 21 fatal accidents (**, 2022). Referring to sector statistics, it has been noted that about 40% of accidents are caused by trunks, branches, and

logs; 30% are due to chainsaw cutting and other tools; 20% result from falls, and the remaining 10% are linked to the use of tractors and other machinery (Direzione Economia Montana e Foreste, 2007). The chainsaw represents the most dangerous equipment forestry workers have to deal with, and inattention is the main cause of accidents (Direzione Economia Montana e Foreste, 2007).

Considering the strenuous work, conditions, and factors to which forestry workers are exposed, preventing workplace accidents is an absolute priority in this field. This can be achieved by identifying and eliminating the most common risk factors. The primary objective of this study was to identify and analyze the most frequent risk factors among forestry workers to prevent workplace accidents. Additionally, the main causes of accidents in Romanian forestry operations and preventive measures were presented as a secondary focus.

FREQUENT RISK FACTORS IN FORESTRY OPERATIONS

At the international level, Kantola and Virtanen (1986) summarized the factors that contribute to a higher risk of accidents in forestry operations, which are presented in Table 1. In Romania, the risk factors in forestry operations are similar to those identified by Kantola and Virtanen (1986) and continue to be prevalent.

Table 1

Internationally identified factors significantly contributing to the risk of accidents in forestry operations

Factors	Description
The working environment	Extreme temperatures and humidity, the characteristics of tree stands and individual trees, the presence of dense undergrowth and brush, along with various plants that present clear obstacles, the presence of insects and animals, as well as rugged terrain with steep slopes and abrupt elevations.
Lack of professional training	The absence of technical training for workers and the lack of guidance on accident prevention.
Low motivation	The hiring process is unstable, low wages are allocated, there is a lack of rewards, and professional appreciation.
Social conditions	Poor diet and clothing, inadequate housing, and insufficient medical care.
Absence of a permanent workforce	Primarily composed of seasonal laborers with limited skills.
Absence of government services and protection	Poor labor laws and regulations, minimal efforts in labor science education, incomplete or lacking accident statistics, and weak law enforcement capacity.
Inadequate supervision, weak organization, and poor health services	Unsafe work techniques, lack of proper clothing and personal protective equipment, deficient facilities for rest, meals, and medical training, inadequate medical services in providing first aid.

The improper use of tree-cutting equipment stands as one of the most frequent risk factors in forestry operations. Utilizing defective or improperly maintained equipment

can lead to serious accidents. Operators of tree-cutting equipment must receive proper training and always adhere to safety regulations. Additionally, workers need to wear appropriate

protective gear, including helmets, goggles, protective gloves, and ear protection.

Felling trees and handling logs represent another common risk factor in forestry operations. Tree felling is the most dangerous phase, both in terms of frequency and severity of accidents. However, the highest number of accidents is typically confirmed during log processing, which requires workers to assume positions in which the chainsaw blade is in close proximity to their legs. In skidding operations, there might be fewer accidents, but they often carry high severity (Direzione Economia Montana e Foreste, 2007). Workers must be cautious of unstable trees and avoid areas at risk of falling. Furthermore, specialized teams should be trained to handle tree felling, and appropriate cutting and lifting equipment should be used to minimize risks during felling.

Unfavorable weather conditions such as storms and strong winds can pose an additional risk in forestry operations. Workers need to be trained on how to behave in such situations and receive regular warnings and updates regarding weather conditions. In the event of storm or strong wind warnings, workers should seek shelter in safe spaces and ensure that equipment is in good condition to withstand the extreme conditions.

Rough terrains encountered in mountainous areas may involve uneven, steep, or slippery surfaces, increasing the risk of slips, falls, or injuries.

Exposure to hazardous substances like oils, fuels, or various materials resulting from forestry operations may have adverse effects on their health.

Fatigue and physical overexertion pose risks due to extended work schedules and the physical effort required for handling timber and operating machinery. Activities in forestry operations often involve intense physical labor, and physical overexertion can lead to decreased attention and coordination, increasing the risk of accidents.

The use of hazardous equipment can lead to workplace accidents if not used properly or regularly maintained. Mechanical saws, log conveyors, and other heavy equipment essential in forestry operations fall into this category.

The main causes of workplace accidents in Romanian forestry operations are further elaborated. Regarding log yards and technological wood transport, the following

factors may be listed (Meridiane forestiere, 2019):

- Employment of mechanical saw operators by logging companies without the required qualifications;
- Poor organization and inadequate supervision of logging teams;
- Abusive usage and failure to secure logging machinery from uncontrolled start-ups;
- Failure to remove hazardous trees before commencing the actual exploitation;
- Lack of work safety authorization for logging yards;
- Performance of activities in primary platforms within logging yards that do not align with the technological process, such as cutting wood directly from stacks, improper stacking and loading of timber onto transport vehicles, and blocking access and circulation routes within the timber yard;
- Blocking access routes within the timber yard.

In the case of timber harvesting, the following causes can be highlighted (Meridiane Forestiere, 2019):

- During tree felling operations in logging yards, geometric elements of the faller's notch are generally not adhered to, particularly in winter, leading to quite frequent accidents;
- Absence of technical projects for works in logging site;
- Forestry exploitation works lack work safety authorization and preparatory work before the commencement of logging;
- Inadequate equipment of tractors and forestry tractors (TAFs) used in forestry operations with protective devices and systems (metal grids and supports to protect cabin windows, audible warning systems, clamps for attaching hooks to traction cables, safety systems for doors);
- Mechanical saws are often left unsecured, leading to occasional theft and abusive use during periods when they are not in operation.

In light of these highlighted aspects, it becomes essential to pay particular attention to implementing effective policies and measures to prevent workplace accidents in forestry operations. It is crucial for logging companies to provide adequate training and hire qualified personnel for the use of equipment and machinery. Strict organization of work teams, adherence to safety rules, and proper authorization of activities in the forestry sector are also imperative to minimize risks.

MEASURES FOR PREVENTING WORKPLACE ACCIDENTS

The work of a forestry operator is recognized as one of the most strenuous and hazardous, constantly exposed to various risks and consequently, a high probability of accidents. Therefore, safety in forestry operations must be organized and managed at multiple levels: from identifying and evaluating risks to planning and organizing activities, adopting suitable working techniques, and implementing necessary safety devices. All parties are involved in this activity: the worker and the employer, the team leader or operation manager, and the individual worker, according to the responsibilities clearly expressed by law. The main measures to prevent workplace accidents consider the various aspects related to the risks they may pose (Direzione Economia Montana e Foreste, 2007).

Proper training and education provided by employers should offer adequate instruction to workers regarding equipment usage, safe work procedures, risk identification, and management.

The use of personal protective equipment such as helmets, fall protection gear, and respiratory protection is essential in reducing the risk of injury.

Implementing safety measures through clear work procedures, overseeing and regularly inspecting equipment and the work environment, can significantly contribute to accident prevention.

Monitoring the health status of workers involves providing all employees access to regular medical evaluations and offering information on preventing occupational diseases or work-related ailments in forestry operations.

Continuous and appropriate supervision of workers is crucial to ensure compliance with safety regulations and prompt identification of risky situations. Supervisors need to be trained and possess the necessary skills to efficiently manage all operations within forestry operations.

CONCLUSIONS

Preventing workplace accidents in forestry requires a comprehensive approach and close cooperation between employers, workers, and authorities. Identifying and

managing risk factors are fundamental to ensuring a safe and healthy working environment for all involved in this vital activity, thereby reducing the number of accidents and safeguarding the health of forestry industry workers. Additionally, implementing clear procedures and strict standards for handling machinery and timber materials can significantly contribute to reducing incidents. Properly equipping equipment with protective devices and systems, along with adequate access management, are essential steps in maintaining a safe working environment and preventing accidents in Romanian forestry operations.

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