

Fatal accidents in forestry in some European countries

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Abstract – Nacrtak

Forest work is considered one of the most dangerous occupations in the world. The present article compares fatal accidents occurring at professional and non-professional work in terms of the amount of removals. The data covering the years from 1980 to 2004 are dealt with by 5-year periods. For Slovenia and Austria, all five periods are compared, for Switzerland four, whereas for Germany, Finland, Sweden and Croatia fewer periods are dealt with. The accident frequency is expressed in the number of fatalities per 1 million m³ of gross removals. Absolutely the highest frequency (9.52) was established at non-professional work in Slovenia during the period 1990–1994, the lowest (0.03) at professional work in Sweden (2000–2004) and Finland (1995–1999). In the last period (2000–2004), the highest number of fatal accidents at professional work was recorded in Switzerland (1.00). At non-professional work, on the other hand, the highest number of fatalities occurred in Slovenia (7.27), which is almost five times as many as in Austria and Switzerland. In all countries, however, a downward trend of fatal accident frequency has been noted. The most successful, as far as total number of fatalities is concerned, is Sweden. In Switzerland and Austria, the accident frequency has been cut by half, whereas in Slovenia no progress has been noted in this respect. The number of fatalities is an important indicator of mastering the risks during forest work as well as of the efficiency and integrity of measures implemented by separate countries in their attempts to provide for safety at forest work.

Keywords: forest work, fatal accident, European countries

1. Introduction – Uvod

In the last twenty-five years, the development of work safety has also been reflected in the data on most serious forest work accidents. The data on fatal deaths are not tedious numbers, but indicate the role of education, training, protection and improvement of personal safety equipment, technological development, organisation and implementation of forest work. In spite of the great progress of techniques and information technology, the forest activities remain one of the most hazardous professional and particularly non-professionals activities in the majority of the countries worldwide. Forest work is not only carried out by trained professional workers, but also by professionally less qualified forest owners, their relatives and acquaintances. Fatal accidents are registered and filed with greater accuracy than other work accident. The statistics of accidents occurring in the sphere of non-professional implementation of

forest work are more incomplete than those occurring during professional work.

Monitoring of accidents in forestry and comparisons between separate countries are very complex tasks owing to the differences in their domestic legislations, organisation in the sphere of the workers' social and health security, as well as different methodologies and manners of accident reports. Even more incomplete are registers of work accidents involving non-professional workers. On the basis of the data supplied by separate countries, forestry accounts for a relatively high share of fatal accidents, with the frequency characteristic of mining and building industries, owing to the length of workday, seasonal and meteorologically conditioned work, distant and isolated work places.

Monitoring and analysing accidents in the same branch of industry and in a longer period of time indicate certain trends of increasing safety in professional and non-professional implementation of work.

The consequences of accidents are also a significant item in the national economic accounts. Joint European statistics enables comparisons to be made for individual countries as to their success in the introduction of new approaches, since forest work safety and health protection is one of the social aspects of sustainable forest management. Social protection of the forestry sector workforce is one of the indicators of sustainability in the sixth criterion for sustainable forest management, as stipulated by the Ministerial Conference on the Protection of Forests in Europe (Mcpfe 2003).

In the past, the International Labour Organization established that forest workers were involved in accidents three to four times more frequently than agricultural workers (ILO). The conclusion that forest work is amongst the most risky and dangerous occupations was drawn in the 1980s in Finland (National Board of Labour Protection 1988) and in the United States (Leigh 1987) on the basis of death rate for forest workers in comparison with other professions. In the 1990s, the situation did not change in the States, for the accident death rate amounted to 4.5 on average per 100,000 employed for all professions (Herbert and Landrigan 2000). On the basis of similar studies and international comparisons from the late 1970s to 1990s some countries developed various systems of protection, training, work process organisation, personal protective equipment and motivation approaches, which in a relatively short time contributed to a reduced number of accidents at professional and, with certain adjustments, non-professional forest work.

The objective of the research of fatal accidents at professional and non-professional forest work is to identify the sources and quality of data as well as to establish, on their basis, the differences between the selected countries in their number and occurrence in view of the conducted work. We presuppose that the differences between the countries are the result of different approaches in the provision of safety and health protection as well as of the earnestness in dealing with statistical data on accidents occurring at forest work. We presume that due to the differences in the manner of forest management and introduction of modern technologies in wood production, the number of fatal accidents during forest work is falling. The third hypothesis is that the collected data on fatal forest work accidents during a longer period of time indicate trends of accidental safety in the professional and non-professional conduct of work.

2. Work method – *Metoda rada*

Comparison has been made between accidents occurring at professional and non-professional work. We assumed that the implementation of forest work in forests owned by the state, companies and big proprietors is within the domain of professional forest workers, whereas the production in smaller privately owned forests is in most cases carried out as non-professional work. On this basis, we compared accidental safety in individual countries at professional and non-professional work as well as the amount of work carried out.

Table 1 Forest and human resources in forestry sector in the countries selected for comparison (Gfra 2005)

Tablica 1. Šumski i ljudski resursi u šumarskom sektoru odabranih zemalja (Gfra 2005)

| State <i>Država</i> | Total land area <i>Ukupna površina</i> | Forests and woodland <i>Šume i šumsko zemljište</i> | Private forests <i>Privatne šume</i> | Employees in forestry sector <i>Zaposleni u šumarskom sektoru</i> | Removals <i>Godišnji etat</i> |
|---------------------------------|---|--|---|--|----------------------------------|
| | 1000 ha | | | 10 ³ employees – 10 ³ zaposlenika | 1000 m ³ |
| Slovenia <i>Slovenija</i> | 2,014 | 1,309 | 938 | 3 | 3,153 |
| Switzerland <i>Švicarska</i> | 3,955 | 1,288 | 397 | 7 | 6,958 |
| Austria <i>Austrija</i> | 8,273 | 3,980 | 3,189 | 8 | 20,127 |
| Germany <i>Njemačka</i> | 34,895 | 11,076 | 5,230 | 70 | 60,770 |
| Sweden <i>Švedska</i> | 41,162 | 30,785 | 23,492 | 17 | 76,980 |
| Finland <i>Finska</i> | 30,447 | 23,302 | 15,487 | 24 | 64,300 |
| Croatia <i>Hrvatska</i> | 5,592 | 2,481 | 462 | 10 | 4,950 |

Table 2 Available data for accidents and removals by periods**Tablica 2.** Dostupnost podataka o nesrećama i obujmu sječe prema vremenskom razdoblju

| Country Država | Available data Professional forest work Dostupnost podataka Profesionalni šumski rad | | Available data Non-professional forest work Dostupnost podataka Neprofesionalni šumski rad | |
|--------------------------|---|------------------|---|------------------|
| | Accidents Nesreće | Removals Etat | Accidents Nesreće | Removals Etat |
| | Slovenia Slovenija | 1980-2004 | 1980-2004 | 1981-2004 |
| Switzerland Švicarska | 1984-2004 | 1984-2004 | 1984-2004 | 1980-2004 |
| Austria Austrija | 1980-2004 | 1980-2004 | 1980-2003 | 1980-2004 |
| Germany Njemačka | 1999-2004 | 1993-2004 | 1980-2004 | 1990-2004 |
| Sweden Švedska | 1985-2004 | 1980-2004 | 1989-2004 | 1980-2004 |
| Finland Finska | 1980-2003 | 1980-2004 | 1983-2004 | 1983-2004 |
| Croatia Hrvatska | 1996-2004 | 1994-2004 | Not available Nedostupni | 1994-2004 |

The selection of countries, whose statistics of accidents at work is here compared, was not random. As the frequency of accidents occurring during forest work is influenced by numerous natural and social factors, we selected the countries with very different development of forest management. In Table 1, some basic statistical data are presented for forestry sectors of the countries compared in our research: Austria, Switzerland and Slovenia, which are geographically connected by the Alps, the neighbouring Croatia with a minor share of privately owned forests, Germany, which spreads from the Alps to the North Sea, and Scandinavian countries Finland and Sweden.

The data were analysed on fatal accidents occurring during professional and non-professional work. For comparison, official data were used of national statistics, statistics of insurance companies for farmers and forest proprietors, and data of insurance companies for workers. The sources of data differ between the studied countries in terms of the organisational arrangement of the national statistics and the existence of specialised insurance and interoperational organisations. In defining fatalities occurring at forest work, we followed the ESAW-Eurostat methodology of the European Statistical Office (Eurostat 2001). Fatal accident at work is defined as an accident owing

to which the victim of the accident died within a year of the event (in Germany, the acknowledgement of fatalities is limited to 30 days after the accident, whereas Austria and Sweden do not deal with fatalities, if the victim was recognised as permanently incapable of work prior to death). Only accidents as direct events in a working process at forest work are taken into account. Comparative analyses of the total number of accidents in a country were only made if all data were available to us (Table 2).

Owing to the possible seasonal impacts of meteorological or socio-economic conditions and in order to get a clearer idea of the matter, the accidents that occurred in individual countries were compared by 5-year periods. All 5-year periods from 1980 to 2004, where data on accident safety and removals were obtained, were taken into consideration. Roundwood removals were dealt with for all countries in gross values published by the official statistics. As far as data for Slovenia are concerned, 40% share of the production in state-owned forests was taken into account for the years 1992 and 1993. The sources of data on fatalities occurring during professional forest work were the statistical yearbooks for the period 1996–2006. Concerning non-professional work in Slovenia, average number of fatalities in the period 1981–1992 was taken into consideration.

3. Results – Rezultati

Initially, the results show collation for professional workers, followed by accidents occurring at non-professional work and, finally, by joint collation of all fatalities by individual countries and periods.

3.1 Fatalities at professional forest work – Smrtni slučajevi pri profesionalnom šumskom radu

The number of accidents occurring at professional work has been reduced in all countries under consideration. In view of the first period, the number of fatalities among professionally trained forest workers was reduced by half at the least. The most distinct decrease was recorded in Sweden and particularly in Finland. An exception is Croatia, where more accidents were recorded in the last period than in the period prior to it. In Slovenia, too, fewer accidents occurred in the period 1990–1994 than after 1995. Figure 1 shows average annual number of fatalities in separate 5-year periods by individual countries.

In all the countries compared here, the roundwood removals are increasing. The number of fatalities among professional forest workers in Croatia

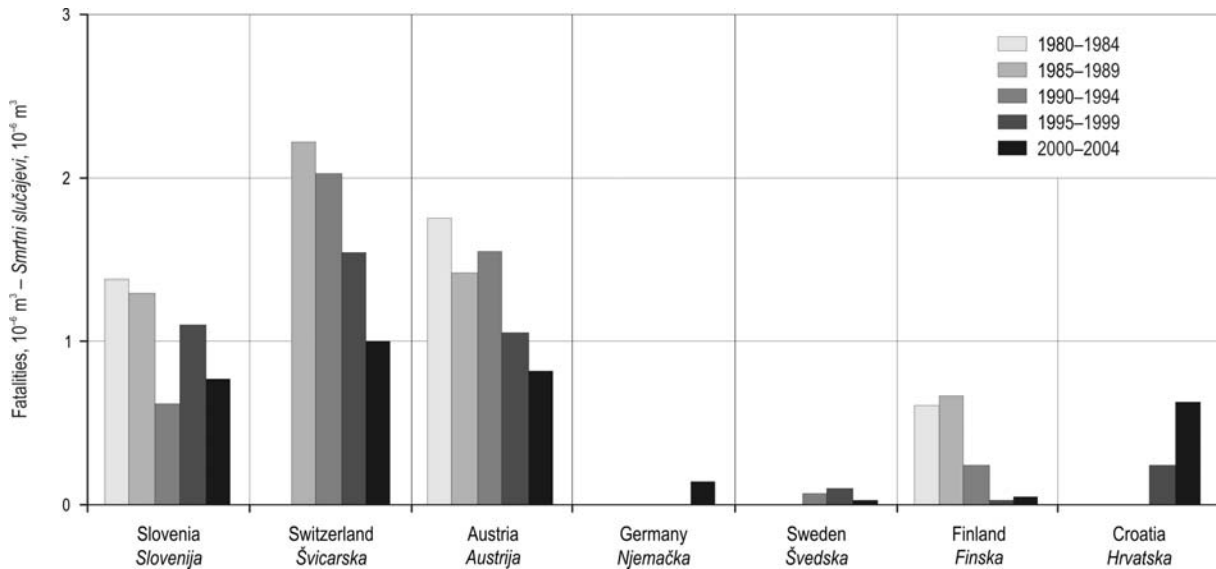


Fig. 1 Average number of fatalities at professional forest work
Slika 1. Prosječan broj smrtnih slučajeva pri profesionalnom šumskom radu

increased as well, i.e. by more than twice, while the number of fatalities among professional forest workers in Scandinavian countries in the last two 5-year periods was lower than 0.1 fatality per 1 million m³ of roundwood removals.

In view of the results concerning the frequency of fatal accidents in the last period, the following countries can be classified in the same group: Slovenia, Austria, Switzerland and Croatia. Much better safety has been achieved in Germany, and the best in Scandinavia (Sweden and Finland). In the first group, one

fatality occurred per a little more than 1 million m³ of gross removals, in Germany per 7 million, and in Scandinavia per more than 30 million m³ of roundwood removals.

3.2 Fatalities at non-professional forest work – Smrtni slučajevi pri neprofesionalnom šumskom radu

Figure 2 shows the frequency of fatalities occurring at non-professional forest work. In this respect, the safety is constantly improving as well. In the

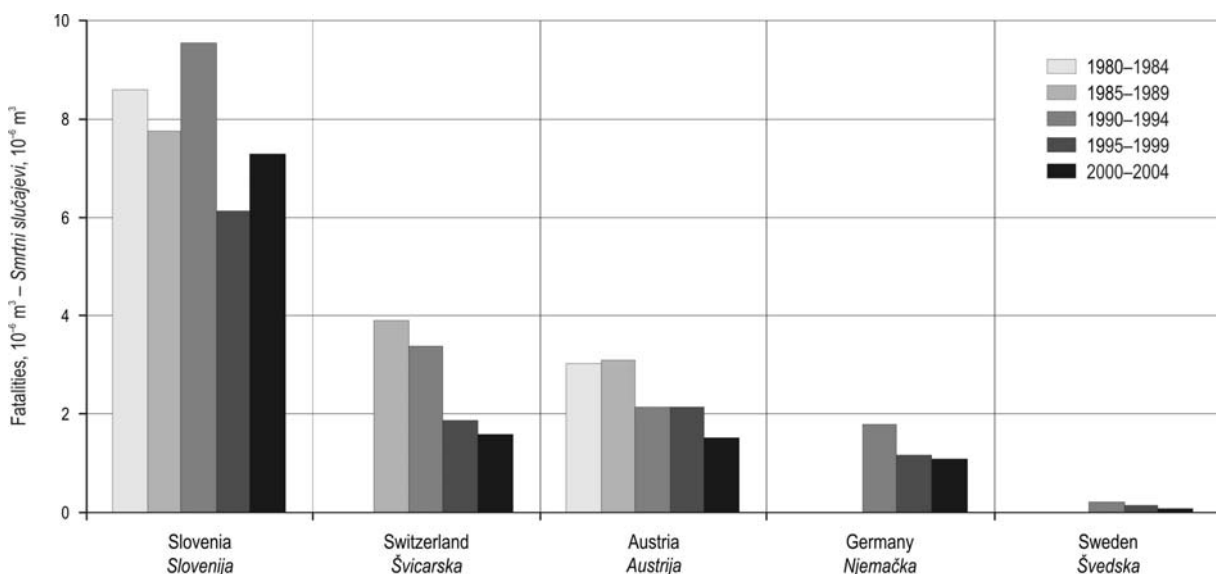


Fig. 2 Average number of fatalities at non-professional forest work
Slika 2. Prosječan broj smrtnih slučajeva pri neprofesionalnom šumskom radu

period 2000–2004, the number of fatal accidents at non-professional work only increased in Slovenia.

In the group of five countries, the non-professional work accidents are distinctly characteristic of Slovenia. Apart from our country, data for the entire period 1980–2004 are only available for Austria. Here, the accident frequency was cut by half from the initial 3 to 1.5 fatalities per 1 million m³ of gross removals. In Slovenia, the number of fatalities was reduced from 8.6 to 7.3. Compared with Austria, we had 2.8 times higher frequency a quarter of a century ago, in the last period 4.8 fatalities more than Austria. In Switzerland, the frequency has been reduced by 2.5 times in the last twenty years. Quite successful in the last 15 years were also in Germany and Sweden, where the frequency has been reduced by 1.7 and 3.3 times, respectively.

3.3 Total amount of fatalities per separate countries – *Ukupan broj smrtnih slučajeva po zemljama*

Data on fatalities at professional and non-professional forest work were integrated in 5-year periods and the frequency of accident occurrence calculated in view of the amount of gross removals. Comparisons between individual countries are shown in Figure 3. For Sweden, we even have a datum more in the series, as a total number of accidents was available to us for the period 1985–1989.

Apart from Slovenia and Croatia (the latter is not included in Figure 3, as we have no data for non-professional work there), the compared countries

had falling trends as far as the number of fatalities is concerned. At the end of the studied periods, Austria, Switzerland and Germany reduced the number of fatal accidents to less than 1.2 per 1 million m³ of gross removals. In the 5-year period, Slovenia remained, with ca. 5 dead per 1 million gross removals, at the same level as a quarter of a century ago. In the studied period, the average values of the fatal deaths frequency per 1 million m³ gross removals were 1.84 for Austria, 4.90 for Slovenia and 1.94 for Switzerland, whereas in Sweden the value was 0.11 fatalities per 1 million m³ during the 15-year period after 1988. In the period 1999–2004, Germany had on average 0.67 fatalities per 1 million m³ of gross removals.

4. Discussion and conclusion – *Rasprava i zaključci*

In the present article, a comparison is made between the number of fatalities that occurred during professional and non-professional forest work in a longer period of time, in which major organisational and technological changes in wood production took place. Statistical data for the period after 1980 in Slovenia, Austria, Switzerland, Germany, Finland, Sweden and Croatia are also analysed.

While comparing the numbers of accidents and fatal accidents occurring at professional and non-professional forest work between different countries, we unavoidably stumble upon various limitations that reduce the accuracy of the compared data. The reasons are to be looked for in the legislation con-

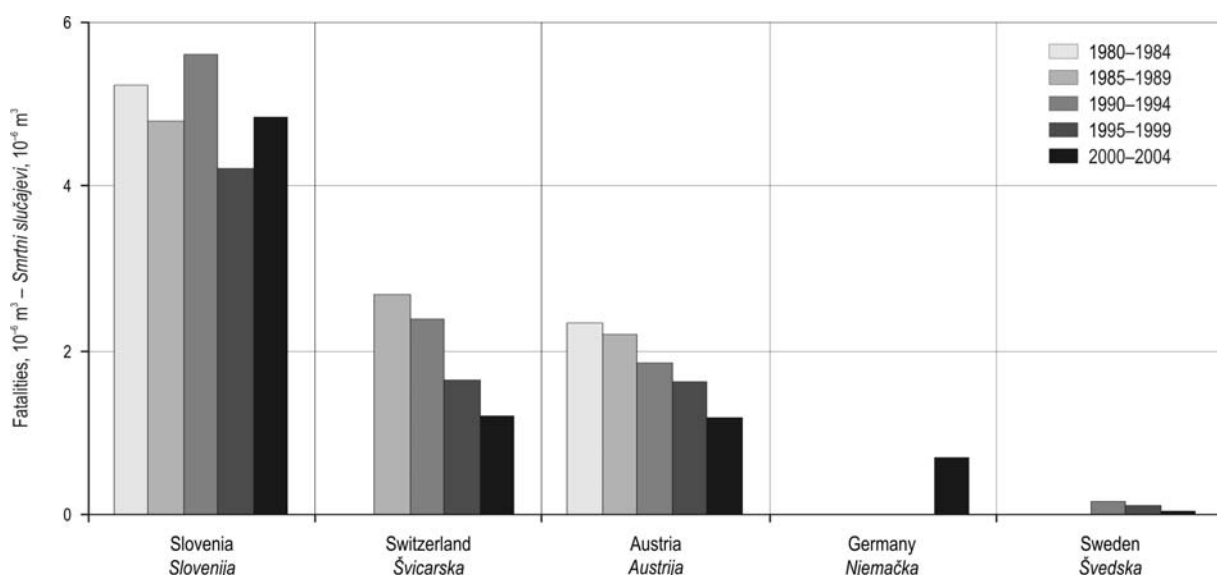


Fig. 3 Average number of fatalities regarding gross roundwood removals by separate periods and countries

Slika 3. Prosječan broj smrtnih slučajeva prema razdobljima i zemljama

cerning social security and the manner of keeping accident records in individual countries, as well as in their publishing in publicly accessible reports. As data for a relatively long period are compared, we can follow, in spite of possible incomplete data, the trends in safety and health protection development as far as forest work is concerned. The data on accidents were linked with data on work effects, which is probably the only acceptable way of showing the differences from the aspect of international comparisons (Poschen 1993).

With the selection of the countries in our research we have limited ourselves to certain EU members, which are liable to respect the increasingly uniform methodology of collecting and passing on the data. On the same methodological basis, the comparisons will be increasingly easier. We also included Croatia as a candidate country to join the EU and Switzerland, which elaborately records and processes the data on forest work accidents in the compared countries. The second characteristic feature of the selection of the countries compared herewith is their natural diversity and different manners of forest management as well as their development of wood production technologies.

Rapid and economically significant development of wood production is characteristic of Austria, as well as introduction of machine logging in difficult conditions and a solid organisational arrangement by forest owners and forestry services. Switzerland has reached a similar development in forestry doctrine and the manner of conducting forest work, except that it has a quite different social and political history and a different strategy concerning the reduction of forest work accidents than Slovenia. Owing to its geographical size, the level of decision-making in the sphere of forestry at the level of federal provinces and the process of uniting, Germany expresses a great diversity of natural conditions, forest management as well as monitoring forestry statistics in the sphere of accidents. Characteristics of Finland and Sweden are their highly developed forestry systems, high share of machine logging and skidding, entrepreneurially organised forest proprietors, high degree of safety and health protection at forest work and multinational forestry companies. Croatia, on the other hand, is still preparing to join the EU and has retained a high share of state forests as well as centrally organised forest management.

The increased numbers of accidents and fatalities as the result of disastrous damages caused by weather, including powerful snow- and wind-breaks are quite characteristic of certain years. In Germany and Switzerland, a 10% increase in fatalities was recorded in 1990 due to the storms »Wiebke« and »Vivian«, and in 2000 due to »Lothar« (Ammann et al. 2002,

Strack 2006). Sweden, which had three fatalities on average at non-professional forest work and one fatality at professional work in the period 2000–2004, was in 2005 hit by the storm »Gudrun«. During the production of wood from the affected stands, 141 accidents were reported, claiming more than three days of sick leave. As a result of accidents, seven non-professional and three professional forest workers lost their lives (Blom 2006). These salient data are somewhat levelled in comparisons by 5-year periods. The events after 2004, however, have not been included in our comparisons.

Fatal accidents that occur at forest work are the most reliable data in the collected and processed accident statistics and good indicators of trends in development of forest work safety. Their number fall most obviously with the speed of introduction and share of machine logging and skidding, which is confirmed by the introduction of machine logging and hauling in view of the situation of accident safety in Scandinavian countries (Axelsson 1998). The last 5-year period has been marked in Austria (Pröll 2003, Pröll 2005) and Germany (Nick 2005) with increasingly higher share of machine logging and increase in the number of logging machines. In this period, the downward trend in the number of accidents and fatalities continues.

As far as professional forest work is concerned, a downward trend in the number of accidents and fatalities and an upward trend in the effects of work at the same time has been noted in all the countries compared here. For Slovenia, the data show a considerable reduction in the number of fatalities among professional workers during the transition of our economic system from 1990 to 1994. In this period, the number of forestry employees was greatly reduced, and there was also a setback in felling control. In Croatia, the number of deaths at professional work increased in the last period.

Concerning non-professional forest work, the effects of measurements as part of the preventive accident policy show themselves in the long run. The last 5-year period in our study (2000–2004) puts Slovenia, with its more than 7.5 deaths per 1 million m³ of gross removals, in the first place. Austria, Germany and Switzerland have less than 2.5 deaths and Sweden less than 0.1 deaths per 1 million m³ of gross removals. For Croatia, we have no data on accidents and fatalities occurring at forest work.

Although the frequency of all accidents (including both professional and non-professional) was diminished in view of the amount of removals, the trend differs a great deal for individual countries. Differences in absolute values can be seen between the countries with predominant machine logging and hauling and the countries with predominant

long logs technology. With its high number of fatalities, Slovenia lags well behind other countries, and on the basis of these comparisons it can be concluded that in Slovenia we should begin to monitor the actual state of accident safety occurring during non-professional forest work and to establish, on this basis, a strategy to reduce the number of accidents. Apart from recording and analysing the state of affairs especially in the sphere of forest-work training and organisation of special accident and social insurance, the measures to achieve this goal also include encouraging entrepreneurship and integration of privately owned forests within larger complexes. A decrease in the number of work-related accidents and deaths in forests is only possible with an integral approach to suitable training and use of appropriate organisational and technological solutions. The present attitude of the society and the State towards monitoring safety in view of almost 80% of privately owned forests is directly reflected in the trend of accident deaths occurring during work in these forests in comparison with other countries within the Alpine area and Europe in general.

The number of fatalities is an important indicator of mastering the risks and shows the effectiveness as well as integrity of measures taken by individual countries in their attempts to provide for safety at forest work. The analysis shows that investments in human resources and humanisation of forest work are critical in Slovenia and several times worse than in other European countries.

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Sažetak

Smrtne nesreće u šumarstvu u nekim europskim zemaljama

Razvoj sigurnosti pri radu vidi se posljednjih 25 godina također i u podacima o najozbiljnijim nesrećama pri šumskom radu. Podaci o smrtnim nesrećama nisu pritom tek mučni brojevi, već odražavaju ulogu izobrazbe, osposobljavanja, zaštite i unapređenja osobne sigurnosti radnika, zaštitne opreme, tehnološkoga razvoja, organizacije i provođenja šumskoga rada. Unatoč značajnomu razvoju tehnika i informacijskih tehnologija šumarski se posao još uvijek smatra jednim od najopasnijih zanimanja na svijetu.

U članku se uspoređuju smrtno nesreće koje se s obzirom na obujam posječenoga drva događaju pri profesionalnom i neprofesionalnom šumskom radu. Šumske radove ne izvode samo osposobljeni profesionalni radnici, već i vlasnici šuma, njihovi rođaci i poznanici koji nisu dovoljno kvalificirani za obavljanje šumskih radova. Pretpostavka je pritom da radove u šumama koje su u vlasništvu države, poduzeća ili velikih posjednika izvode profesionalni šumski radnici, dok radove u malim privatnim šumama najčešće provode nekvalificirani izvođači, što je u ovom radu uzeto za neprofesionalni šumski rad.

Cilj je istraživanja smrtnih nesreća pri profesionalnom i neprofesionalnom šumskom radu da se ustanove izvori i vrstnoća podataka te na temelju njih da se utvrde razlike između odabranih zemalja u učestalosti nesreća s obzirom na obujam obavljenoga rada. Smatra se da se smrtno nesreće bilježe točnije i pažljivije od ostalih ozljeda pri radu. Pritom su podaci o nesrećama pri profesionalnom šumskom radu potpuniji od onih pri neprofesionalnom šumskom radu.

U radu su prema petogodišnjim razdobljima analizirani podaci za razdoblje od 1980. do 2004. godine. Za Sloveniju i Austriju analizirano je svih pet razdoblja, za Švicarsku četiri, dok su podaci za Njemačku, Finsku, Švedsku i Hrvatsku obuhvatili manji broj promatranih razdoblja. Učestalost smrtnih slučajeva iskazana je brojem nesreća na 1 milijun m³ posječenoga drva.

Broj smrtnih nesreća pri profesionalnom šumskom radu znatno je smanjen u promatranom vremenu gotovo u svim zemljama. U usporedbi s prvom petogodišnjim razdobljem broj nesreća među profesionalnim šumskim radnicima uglavnom je prepolovljen. Posebno su dojmivi podaci zabilježeni za Švedsku i Finsku gdje je u zadnjih deset godina broj smrtnih slučajeva bio manji od 0,1 nesreće na 1 milijun m³ posječenoga drva. U Hrvatskoj je zabilježen porast broja smrtnih slučajeva. U Sloveniji je također zabilježeno manje smrtnih slučajeva u razdoblju 1990–1994. nego nakon 1995. godine.

Smrtni slučajevi pri neprofesionalnom šumskom radu najbrojniji su u Sloveniji. Osim za Sloveniju podaci za cijelo razdoblje 1980–2004. dostupni su još samo za Austriju u kojoj je broj nesreća s početnih 3 smanjen na 1,5 slučajeva na 1 milijun m³ posječenoga drva. U Sloveniji je broj smrtnih slučajeva smanjen sa 8,6 na 7,3. U Švicarskoj je u posljednjih 25 godina učestalost nesreća smanjena 2,5 puta. Prilično su uspješne i Njemačka i Švedska u kojima je broj nesreća smanjen 1,7 odnosno 3,3 puta.

Apsolutno najveća učestalost nesreća (9,52) zabilježena je pri neprofesionalnom radu u Sloveniji u razdoblju od 1990. do 1994. godine. Najmanja je učestalost nesreća (0,03) utvrđena pri profesionalnom šumskom radu u Švedskoj (2000–2004) i Finskoj (1995–1999). U posljednjem razdoblju (2000–2004) najviše je smrtnih slučajeva zabilježeno pri profesionalnom radu u Švicarskoj (1,00). Što se tiče trenda smanjenja ukupnoga broja nesreća, najuspješnija je Švedska. U Švicarskoj i Austriji njihova je učestalost prepolovljena, dok u Sloveniji u tom pogledu nije zabilježen značajniji napredak.

Razlike između promatranih zemalja uzrokovane su različitim pristupima u pružanju sigurnosti i zaštite zdravlja, kao i ozbiljnosti obrade statističkih podataka o nesrećama pri šumskom radu. Broj smrtnih nesreća važan je pokazatelj razine prevladavanja opasnosti pri šumskom radu, te učinkovitosti i obuhvatnosti mjera koje pojedine zemlje provode u nastojanjima da osiguraju sigurnost pri šumskom radu.

Ključne riječi: šumski rad, smrtno nesreće, europske zemlje

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