



STATISTICAL ANALYSIS OF ACCIDENTS IN THE FORESTRY SECTOR IN SPAIN

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**Department of business administration and economic management
of natural resources (AEGERN)**

School of Agricultural Engineering (ETSEA)

**University of Lleida - Spain
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1. INTRODUCTION

The forests of Spain, including both wooded and non-wooded areas, cover more than 27.5 million hectares, representing about 53% of the surface area of the country. In the last five years, Spain has had one of the largest increases in Europe in forest area in very good condition.

Ownership of the forests of Spain is mostly private and, as for public ownership, only a small part belongs to the state.

The average size of holding is about 1 hectare, with an average of 5 hectares for publicly owned holdings and 0.75 hectares for private holdings.¹

Forestry is an agricultural subsector in third place, after mining and construction, in terms of the number of accidents occurring during its activities. Among forestry tasks are the extinction of fires, which every year causes serious and fatal accidents, but these are not the object of this study.

Forestry activities by their very nature entail a series of risks: working outdoors, using different kinds of machinery, inappropriate or improvised working techniques, outsourcing and high staff turnover, dispersion of logging sites and seasonality of work, etc., so all forestry activities create hazards, both in extraction and transformation.

The forestry sector has many deficiencies in prevention of occupational risk, due to old and non-specific regulations and lack of safety training for engineers and workers in the forestry sector.

The accident rate has been increasing over time and is now the main cause of sick leave. The accident rate in the forestry sector has been and still is higher than in many other professions. Overall, the forestry sector has a higher accident rate than industrial sectors and a forestry worker is three or four times more likely to suffer an accident than other agricultural workers.

An example is the year 2002 in the Chartered Community of Navarre when the accident rate was highest in the category "Forestry and logging", with almost half of the 164 employees in this category suffering some kind of accident (77 accidents). Very high rates (about 125 accidents per 1000 workers) were also recorded for activities such as construction, and the wood and cork industry.² The accident rate was 286.3 in 2003 and 293.0 in 2004, with a total number of employees of 181 and 175 respectively.³

2. LAW FOR PREVENTION OF OCCUPATIONAL RISK IN SPAIN

Regulations derive from Law 31/1995 for Prevention of Occupational Risk and Regulations for Prevention Services, and Law 54/2003, which amending this Law, put into effect through various regulations, in accordance with Article 6 of the Law, and applicable to forestry, though there is a significant legislative gap in Royal Decree 486/1997, 14 April, which lays down minimum conditions for health and safety in the workplace, but excludes from its scope fields,

¹ Plan Forestal Español (Spanish Forestry Plan), 5 July 2002

² <http://www.navarra.es/NR/rdonlyres/EE5E9365-1150-46FB-B5DF-70040CA9B922/32218/1303sa89.doc>

³ <http://www.navarra.es/NR/rdonlyres/F82D4E65-66BD-4016-8EB0-CF3D7EE39CB4/147065/Siniestralidad2004.pdf>

forests and other land forming part of an agricultural or forestry enterprise or workplace. For these places, Chapters I, II, III, IV, V and VII of Title II of the General Ordinance on Health and Safety at Work, March 1971, are applicable.

3. REGULATION OF THE FORESTRY SECTOR

Forestry activities are regulated in the CNAE 2009 under 02 codes, which cover the whole of the agricultural sector:⁴

- 02 Agriculture (crops and livestock), forestry and fishing
- 0230 Harvesting woodland products other than timber
 - 0210 Forestry and forest activities
 - 0220 Logging of timber
 - 0240 Forestry support services

Agriculture (INE, 2008)⁵

- Agriculture (crops and livestock), hunting and related services: 91%
- Forestry and logging: 4%
- Fishing and fish farming: 5%

Data collection for forestry accident analysis encounters certain key problems.⁶

- The Central Enterprise Directory (DIRCE), prepared by the Spanish National Statistics Institute (INE), does not include any information on agriculture (crops and livestock), fishing, hunting and forestry, and, therefore, this source does not include information on the number of enterprises, their size and geographical distribution.
- In contrast to the Business Tax (IAE) classification, companies are not obliged to register for a CNAE code, so even when data exists it is not a very reliable indicator of the situation in the sector. Nonetheless, this classification will be used for analysis of employment, as it is used by the Occupation Centre of the Spanish National Employment Agency (INEM), which is the main source of information in this regard.
- Accidents go unreported because many workers are self-employed.
- Accidents are grouped together with other agricultural accidents and there are many workers in the Special Agricultural Scheme (REA), which do not always report accidents.

Overall, the total number of jobs in forestry is going down year after year. Within the sector it is possible to differentiate between the primary sector, administrative staff and industrial wood subsectors.

The primary forestry sector includes foresters, forest engineers, foremen, general forest workers, chainsaw operators, cork workers, charcoal workers and manual labourers. Most of the self-employed are registered in forestry and many of these workers belong to the Special Agricultural Scheme (REA).

⁴ CNAE: Código Nacional de Actividades Económicas (Spanish National Classification of Economic Activities)

⁵ INE: Instituto Nacional de Estadística (Spanish National Statistics Institute). <http://www.ine.es>

⁶ *Empleabilidad en el Sector Forestal. Y adecuación de los perfiles formativos*. Asociación de forestales de España 2010. Proyecto Empleafores. Programa Empleaverde 2007-2013 de la Fundación Biodiversidad.

In 2009, the forestry sector in Spain, comprising forestry and environmental agents, forestry patrols and workers, forest lodge staff, etc, generated direct and indirect employment for 300,000 people.⁷

Industrial wood subsectors include the following activities:

- Saw-milling and planing of timber:
- Manufacture of veneer sheets and wooden panels
- Wooden structures and pieces for carpentry and joinery
- Manufacture of wooden packaging
- Production of cork, wickerwork and esparto grass articles and other wooden products

In 2004 the number of employees in these subsectors was 100,326 and in 2008 it was 86,033, which shows the downward tendency of employment in these activities. In terms of the number of enterprises in each subsector, wooden structures, carpentry and furniture manufacture are the biggest groups.⁸

4. FORESTRY MACHINERY

There is no census of the machinery in use, whether portable chainsaws and string trimmers or self-propelled machinery (tractors, skidders, loaders, processors, bulldozers, etc.). This means that there is no information on the age of machinery in general and it is difficult to use machines effectively together, etc., which without doubt is a contributing factor for accidents.

5. ACCIDENTS IN THE SECTOR

The forestry study published by the Agriculture Working Group of the Spanish National Commission on Health and Safety at Work is based on an analysis of workplace accident reports, stored in computer databases by the Ministry of Labour and Social Affairs, for the years 1999, 2000, 2001.⁹

The study analyses forestry workplace accidents leading to Social Security sick leave in Spanish National Classification of Economic Activities (CNAE) 02.0 code activities, according to the degree of injury.

It also takes into account the “Estudio sobre el Análisis de la seguridad y salud laboral en los aprovechamientos forestales de cortas de claras en España” (Analysis of Health and Safety at Work in Forestry Clear Cutting in Spain), of the Universidad Autónoma del Estado de México, published in the Chapingo journal. Forestry and the environment series. 2007.¹⁰

⁷ Source: Sindicato Unión General de Trabajadores (UGT, General Union of Workers)

⁸ Source: INE

⁹ Trabajos forestales. Comisión nacional de seguridad y salud en el trabajo. Grupo de trabajo: sector agrario. Subgrupo: actividad forestal. (Forestry work. Spanish National Commission for Health and Safety at Work. Working group: agriculture. Subgroup: forestry.) 2006. Source: Computerised workplace accident reports MTAS (1999, 2000, 2001).

¹⁰ Chapingo journal. Series on forestry and the environment, year/volume 7, number 001. Universidad Autónoma Chapingo. Chapingo, México pages 55-65. Red de Revistas Científicas de América Latina y el Caribe, España y Portugal (Network of Scientific Journals of Latin America, the Caribbean, Spain and Portugal). Universidad Autónoma del Estado de México. <http://redalyc.uaemex.mx>

5.1 Workplace accidents leading to Social Security sick leave for CNAE 02.0 code activities, according to the degree of injury

2002

CNAE		MINOR		SERIOUS		FATAL		TOTAL	
Forestry, logging and related service activities	General category	1824	98.38%	27	1.45%	3	0.16%	1854	55%
	REA	1498	97.78%	30	1.95%	4	0.26%	1532	45%
	TOTAL	3322	98.10%	57	1.68%	7	0.20%	3386	

Average days of sick leave caused by workplace accidents in CNAE 02.0 activities: 26.51

2001

CNAE		MINOR		SERIOUS		FATAL		TOTAL	
Forestry, logging and related service activities	General category	1726	98.68%	20	1.14%	3	0.17%	1749	47%
	REA	1941	97.73%	41	2.06%	4	0.20%	1986	53%
	TOTAL	3667	98.17%	61	1.63%	7	0.18%	3735	

Average days of sick leave through workplace accidents in CNAE 02.0 activities: 26.20

2000

CNAE		MINOR		SERIOUS		FATAL		TOTAL	
Forestry, logging and related service activities	General category	1827	97.49%	40	2.13%	7	3.37%	1874	42%
	REA	2486	97.87%	48	1.88%	6	0.23%	2540	58%
	TOTAL	4313	97.71%	88	1.99%	13	0.29%	4414	

Average days of sick leave through workplace accidents in CNAE 02.0 activities: 25.46

1999

CNAE		MINOR		SERIOUS		FATAL		TOTAL	
Forestry, logging and related service activities	General category	1787	98.78%	19	1.05%	3	0.16%	1809	36%
	REA	3178	97.87%	61	1.87%	8	0.24%	3247	64%
	TOTAL	4965	98.20%	80	1.58%	11	0.21%	5056	

Average days of sick leave through workplace accidents in CNAE 02.0 activities: 25.32

This study shows that:

- Minor accidents are most common.
- The gravity of accidents has increased over the years, as can be seen in the considerable increase in sick leave.
- Accident rates are extremely high in comparison to other high risk sectors such as construction.

5.2 Analysis of Health and Safety at Work for forestry clear cutting in Spain

Over an eight-year period data has been collected for 34 forestry logging sites in Spain, corresponding to clear cutting of reforested stands. Information was collected on equipment and human resources, risk of accidents and risk to health, safety measures and incidents occurring over a period of 2200 hours of different logging operations and 3000 hours spent in the field.

The study shows the active and passive deficiencies in equipment, particularly for manual labour, where the lack of professionalism, the system of pay, and the lack of genuine dispositions for health and safety at work for forestry land use lead to many accidents.

Risks to health include serious manual labour hazards such as Traumatic Vasospastic Disease, caused by chainsaw vibration, and Lyme disease, caused by ticks, both of which are considered health risks in many European countries, but in Spain there is no recognition of their seriousness.

The data for this study comes from 22 logging sites, divided into 34 forest strata, in eight provinces of the Autonomous Communities of Castilla-León, Aragón, La Rioja and the Basque Country, for thinning of reforested plantations, mainly Scots Pine.

Over the 34 forest strata it was possible to see all systems currently applied in forestry land use in Spain, from fully mechanised systems (15 strata) and semi-mechanised systems (16 strata) to manual felling systems and extraction by horse (3 strata). Similarly, all equipment available on the market was studied, for felling and processing, for extraction, chainsaw operators, stackers, extraction horses and mules, light machinery, haulage machines, heavy and light autoloaders, adapted agricultural tractors, skidders and extraction cables.

With this diversity of methods, in order to present data for workplace health and safety for forestry land use consistently, analysis was carried out according to the methods used:

- a) Felling, processing and timber collection
- b) Extraction

a) Felling, processing and timber collection

a.1) Felling, processing and mechanised collection

Analysis was carried out for 15 forest strata, 5 different machines, 379 hours of direct monitoring and 700 hours presence on site. The safety risks are:

Results of the evaluation of risk of accidents and biological hazards for tractor operators

RISK OF ACCIDENTS				
Workplace hazards	Situation of risk	Coinciding with passive safety measures	Accidents	Consequences
Machines overturning	13.3%	100%	0	
Impact against an immovable object	6.7%	100% **	0	
Impact against movable objects	---	---	0	
Electrocution hazard	---	---	0	
Fire	---	---	0	

HEALTH HAZARDS FOR TRACTOR OPERATORS	
Workplace health hazards	Situations of risk
Weather risk	0
Vibration risk	0
Ergonomic risk (tiredness)	0
Noise risk	High***

* Only the circumstances of this study prevented the ill-advised practice of working alone.

** Although the tractors had safety belts, the workers did not use them.

*** Although the cabin had good acoustic insulation, the windows were often left open.

a.2) Felling, processing and manual collection

Studies were carried out for 19 forest strata, with 77 workers (52 chainsaw operators, the rest stackers), with 958.3 hours of direct monitoring and 1500 hours presence on site. In terms of safety, this method of working presents the following situations of risk:

Results of the evaluation of risk of accidents and biological hazards for manual workers (chainsaw operators and stackers)

RISK OF ACCIDENTS			
Workplace hazards	Situations of risk	Accidents	Consequences
Weather risk (lightning)	Very occasionally	0	-
Biological risk (insect bites)	Often in spring and summer	0	-
Cuts from chainsaws and other tools	Often	2	1 serious ^(a) / 1 minor
Shavings in eyes	Very often	2	Minor
Trees or branches falling	Very often	5	1 serious ^(b) / 4 minor
Overexertion	Often	1	Serious ^(c)
Splinter wounds	Occasionally	0	-
Getting trapped in load manipulation	Occasionally	0	-
Falling over	Very often	Often	Without importance
Fire	Occasionally in summer	0	-

^(a) Cut hand requiring 20 stitches and 2 months of sick leave.

^(b) Tree falling on the head of a worker, who had to go to hospital. One month of sick leave.

^(c) An effort aggravated a hernia, which had to be operated on. Sick leave for over two months.

HEALTH RISKS	
Workplace health risks	Situations of risk
Weather risk (heatstroke, lightning)	Occasionally in summer
Biological risk (Lyme disease and others)	Often in spring and summer
Vibration risk (Traumatic Vasospastic Disease)	High
Ergonomic risk (tiredness)	High
Noise risk	Very high

In terms of passive safety measures, a number of items may be used by chain saw operators and stackers to reduce the same kind of risk:

Percentage of safety devices used by manual workers (chainsaw operators and stackers)

Safety devices		Percentage
Equipment and materials	Chainsaw	96%
	Hooks and axes	21%
	Helmet	4%
	Visor	2%
	Sound protector	5%
Clothing	Gloves	60%
	Boots	32%
	Trousers	15%
	Back belt	1%

b) Extraction

This operation has been divided into animal traction and mechanised traction, and the latter depending on the method, autoloader tractor (including farm tractors), skidders and extraction cables.

b.1) Mechanised extraction with autoloader tractors (including farm tractors)

Direct monitoring was carried out for 22 forest strata, with 13 different machines, for 548.7 hours. In terms of safety, this method of working presents the following situations of risk:

Results of the evaluation of risk of accidents and biological hazards for autoloader operators (including farm tractors with a winch and trailer)

RISK OF ACCIDENTS				
Workplace hazards	Situations	Coinciding with passive safety measures	Accidents	Consequences
Machines overturning	4.6	0%	1	None
Impact against immovable objects	9.1	0%	0	-
Impact against movable objects	—	—	0	-
Electrocution hazard	—	—	0	-
Fire	—	—	0	-

HEALTH RISKS	
Workplace health risks	Situations of risk
Weather risk	23%
Vibration risk	23%
Ergonomic risk (tiredness)	23%
Noise risk	High in all cases*

* Although 77 % of tractors had a closed cabin with good acoustic insulation, workers often left the cabin open.

b.2) Mechanised extraction with a skidder

Direct monitoring was carried out for 22 forest strata, with 13 different machines, for 548.7 hours. In terms of safety, this method of working presents the following situations of risk:

Results of the evaluation of risk of accidents and biological hazards for skidder operators (driver and assistant)

RISK OF ACCIDENTS					
Workplace hazards		Situations	Coinciding with passive safety measures	Accidents	Consequences
Risks for the driver	Overturning	0%	0%	0	None
	Impact against immovable objects	50%	100%	0	
	Fire	-	0	0	
Risks for the hook assistant	Crushing by an overturned machine	Occasionally**		0	
	Cuts from cable strands	Occasionally		0	
	Falling movable loads	Rarely		0	
	Cable snapping	Rarely		0	
	Falling over	Often		0	
Fire	Occasionally in summer		0		

HEALTH RISKS		
Workplace health hazards		Situations of risk
Drivers	Weather risk	Often
	Vibration risk	General
	Ergonomic risk (tiredness)	General
	Noise risk	High in all cases
Assistants	Weather risk (heatstroke)	Occasionally
	Biological risk (Lyme disease)	Often in summer

* The tractor brakes were in bad condition.

** This happened when the assistant climbed on the tractor to change the position of the winch hook.

b.3) Mechanised cable extraction

Direct monitoring was carried out for two forest strata with a single RITTER cable for 81.2 hours.

Results of the evaluation of risk of accidents and biological hazards for cable crane operators and assistants

RISK OF ACCIDENTS					
Workplace hazards		Situations of risk	Accidents	Consequences	
Cable fixing risks	Cuts from cable strands	Very occasionally	0	None	
	Blow from a broken cable	Very occasionally	0		
	Falling down below	Occasionally	0		
	Falling over	Very often	0	-	
Risks for the cable operator	Tower overturning	Very occasionally	0	-	
	Impact against movable objects	Occasionally	0	-	
Risks for hook assistants	Falling movable loads	Occasionally	0	-	
	Cable snapping	Occasionally	0	-	
	Falling over	Very often	0	-	
HEALTH RISKS					
Health hazards		Situations of risk			
Weather risk (heatstroke)		Occasionally			
Biological risk (Lyme disease)		Often			
Noise risk		Only for the cable operator			

* For one of the monitored strata, not during the monitoring period, there was an accident during downward extraction caused by a cable snapping, leading to the death of a worker who suffered a whiplash body blow.

b.4) Extraction with animal traction

Direct monitoring was carried out for three strata with seven different animals for 125.1 hours.

Results of the evaluation of risk of accidents and biological hazards for handlers of extraction mules and horses.

RISK OF ACCIDENTS			
Workplace hazards	Situations of risk	Accidents	Consequences
Falling animal back	Occasionally	0	-
Falling over	Often	0	-
Fire	Occasionally in summer	0	-
HEALTH RISKS			
Health hazards		Situations of risk	
Weather risk (heatstroke)		Occasionally	
Biological risk (Lyme disease)		Often in summer	

6. WORKPLACE ACCIDENTS

The following conclusions may be drawn from the study in the *Chapingo* journal:

An overall analysis of workplace accidents in forestry, in terms of accident *frequency rate* [number of accidents causing sick leave per million hours worked (Obregón, 1990)] gives the following values:

$$\begin{aligned} \text{Frequency rate} &= (\text{Number of accidents} / \text{Number of hours worked}) \cdot 10^6 \\ &= (3 / 3418.2) \cdot 10^6 \\ &= 877.7 \end{aligned}$$

FREQUENCY RATE BY INSHT SECTOR (1998) ¹¹	
Sector	Frequency rate
Agriculture	17.0
Other than agriculture	42.6
Industry	61.1
Construction	99.8
Services	27.0

In comparison to rates for each sector in the INSHT statistics, the rate in forestry is nearly nine times greater than for any other activity, and much higher than the most dangerous other activities such as coal mining and metal product manufacturing, other than machinery, where the rates are 275 and 117.

Such a high value, in disagreement with official statistics, may be influenced by the following factors:

- The sample in the study is not large enough to be significant. Forestry work each year totals about 30 million man hours but this study includes data for just 3418, that is, barely 1/10000.
- Official statistics may not include all accidents. Sometimes workers are registered as agricultural workers and when an accident occurs it is recorded as an agricultural accident rather than a forestry accident; on other occasions the accident is not reported because it has occurred in a small family enterprise; it has also been observed that sometimes business owners prefer to pay all costs associated with sick leave and hospital stays rather than run the risk of an administrative sanction.

To understand the high accident rate, it is therefore necessary to analyse the degree of mechanisation of work tasks.

In manual activities

- Lack of training and the almost total absence of preventive measures, both active and passive, lead to many accidents, three of which caused injuries resulting in sick leave.
- Lack of professionalism and inexperience. Generally speaking, forestry workers are in temporary employment, taking advantage of slack periods in crop and livestock farming activity to obtain extra pay. This kind of worker is not a member of staff of the

¹¹ INSHT: Instituto Nacional de Salud e Higiene en el Trabajo (Spanish National Institute for Health and Safety at Work)

company running the forestry operation and does not know about workplace hazards or safety measures to minimise risks.

- There is little confidence in passive safety measures. Many chainsaw operators considered themselves experienced workers because of previous work in pollarding or cutting down fruit trees and olive trees. In reality, they lacked training in forestry work and this led to numerous situations of risk.
- Age of machinery used: Chainsaws used were between 2 and 5.5 years old, with an average age of 4. The working life of these machines is 2 – 3 years, so in general the machines used were in substandard condition.
- Systems of pay that are not directly linked to the forestry enterprise itself, with self-employed workers and piecework (which accounts for 80% of chainsaw operators and stackers), with the result that workers ignore any preventive measures that might reduce their immediate productivity.
- Lack of workplace health and safety dispositions at forestry enterprises, because of the small size of this kind of enterprise, and the absence of specialists to put such plans into action, along with a shortage of manual labourers, which can mean that enterprise owners do not oblige workers to use appropriate health and safety measures.

In mechanised activities

During 1520.9 hours of mechanised work with 23 machine operators, situations with a risk of accidents accounted for only 20% of the total number of situations, and only 4.9% of all the situations were situations of risk where no passive safety measures were in use to limit the possible gravity of accidents.

There was just one accident, which only led to loss of time, so it would be inappropriate to calculate an accident frequency rate or to affirm that it is zero.

Cases which gave rise to a situation of risk were caused by:

- Use of obsolete forestry machinery or machinery in poor condition, particularly adapted farm tractors and skidders, which were the most obsolete, giving rise to the greatest levels of risk.
- Lack of experience of cable and harvester operators (two means of extraction rarely used in Spain).
- Use of machinery not designed for forestry work (mainly farm tractors, which are used in about one third of extraction tasks), with the aggravating factor that they lack passive safety systems.

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