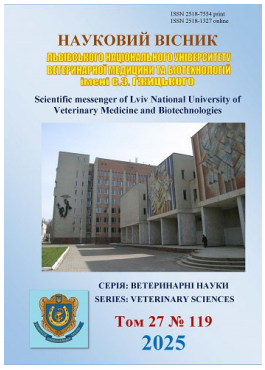

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Occupational safety in Ukraine's agricultural sector: veterinary medicine, animal husbandry and fisheries in the context of contemporary risks

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Occupational injuries in animal husbandry, veterinary medicine and fisheries remain among the most pressing challenges for Ukraine's agricultural sector, as workplace safety is a key condition for safeguarding life, health and the sustainable development of the industry. This article presents the results of an analysis of the dynamics of occupational injuries in animal husbandry, veterinary medicine and fisheries in Ukraine from 2019 to 2025. It was found that the proportion of accidents in the agro-industrial complex increased from 3.5 per cent (73 cases) in 2019–2021 to 10.0 per cent (218 cases) in 2022–2025, which represents a threefold rise against the background of only a 5 per cent increase in the overall number of occupational accidents across all sectors of the economy. Animal husbandry accounted for the highest share of injuries (16.4 per cent of cases and 20.0 per cent of deaths in 2019–2021; 6.3 per cent and 7.9 per cent, respectively, in 2022–2024), whereas the indicators for veterinary medicine and fisheries remained minimal, though potentially underestimated due to low reporting levels. The main causes of injuries in the agro-industrial complex included technological accidents (32 per cent), animal-related incidents (18 per cent), road traffic accidents (15 per cent) and breaches of safety regulations (14 per cent). It was recorded that in 2022–2025, the proportion of occupational injuries directly related to military activities (shelling, mining, unexploded ordnance, armed clashes and similar events) ranged from 7 to 12 per cent of all cases in Ukraine. For the agro-industrial complex, this indicator was approximately 12 to 16 per cent of all injuries in the sector, meaning that in 2022–2025, at least every eighth or ninth occupational injury in the agricultural sector was directly or indirectly associated with war-related risks. The findings emphasise the need for further research aimed at improving injury prevention systems, enhancing the quality of statistical reporting, analysing hidden risks and developing adaptive approaches to occupational safety under wartime conditions.

Key words: *occupational injury; agro-industrial complex; animal husbandry; veterinary medicine; fisheries; causes of accidents; war-related risks.*

Introduction

Occupational safety in the agricultural sector is a key prerequisite for preserving workers' lives and health as well as for the stable operation of enterprises. Special attention should be given to a comprehensive approach to the analysis of occupational risks, particularly in animal husbandry, veterinary medicine and fisheries, since these fields are closely interconnected both technologically and organisationally. Together, they form a single chain within the agro-industrial complex, which ensures the production, processing and preservation of animal products as well as control over their quality and safety. An integrated analysis allows both the specifics of each sector and the common challenges driven by contemporary risks, characteristic of the entire agricultural industry, to be taken into account (Grigorian, 2023).

In animal husbandry, the analysis of occupational injuries is regarded as a key prerequisite for effective risk management and the implementation of safety measures at enterprises. Careful examination of the causes and dynamics of hazardous situations enables the timely identification of the main risk factors threatening the life and health of workers in modern production conditions, and provides the basis for developing targeted prevention strategies (Horodetskyi et al., 2024). Occupational safety largely depends on appropriate technological solutions and the behaviour of personnel when working with animals. Research by Nielsen and Norup (2024) showed that most injury cases in animal husbandry are associated with errors in handling cattle. In countries where manual labour predominates, workers often face increased risks due to physical overload, uncertified equipment and a lack of adequate training (Bhattarai et al., 2016). The most common causes of injury remain animal contact, whereas fatal incidents are mainly related to machinery and technical equipment (Agnihotri et al., 2024). Occupational risks in the agricultural sector remain extremely high, especially in relation to injuries involving animals and agricultural machinery, which determines the ongoing relevance of systemic prevention and modern occupational safety standards (Ekmekci & Yaman, 2024).

The sustainable development of the agricultural sector requires the integration of occupational safety issues into strategies of social responsibility and minimisation of occupational risks (Nadvodniuk, 2023). Growing uncertainty, climate challenges and crisis situations, particularly military conflicts, call for the implementation of effective risk management mechanisms, among which insurance tools play a special role (Boyko et al., 2024; Tsarenko & Khalin, 2025). International practice demonstrates that agricultural work remains one of the most hazardous types of activity, even in highly developed countries (Johnson et al., 2021).

The veterinary profession is characterised by a high share of professional risks, which include both physical and biological hazards, particularly the risk of injury, zoonotic infection and exposure to chemical substances (Al-Harbi et al., 2023). The increase in injuries related to animal handling is an alarming trend, and the frequency of such incidents continues to grow in veterinary practice, both among experienced professionals and students just starting their careers (Johnson & Fritschi, 2024). The issues of pain, psychological discomfort and the social context of work are becoming new criteria for the assessment of occupational injuries in this field (Furtado et al., 2024), which necessitates a revision of approaches to occupational safety management and systematic staff training (Mishra & Palkhade, 2020; Figueiredo et al., 2021).

Aquaculture and fisheries are industries characterised by a high frequency of injuries and occupational diseases due to the specifics of technological processes, climatic conditions and interaction with the aquatic environment (Holen & Holmen, 2025). The relevance of occupational safety in the fish processing sector is confirmed by studies from different countries and by the higher proportion of accidents in fish farming compared with other agricultural fields (Barrow et al., 2022). Preventive measures are of particular importance at modern aquaculture and fishery enterprises, since, even with a high level of organisation, workplace safety issues remain relevant (Olapade et al., 2021).

Thus, the analysis of occupational safety in animal husbandry, veterinary medicine and fisheries makes it possible to identify characteristic risks and determine the main directions for the prevention of occupational injuries.

Aim of the study

The aim of this article is to analyse the particular features of occupational safety in these branches of the agricultural sector, to identify the main trends and causes of occupational injuries, and to substantiate modern approaches to risk management and prevention, taking into account international experience.

Materials and Methods

This study utilised official statistical data from the State Labour Service of Ukraine (https://dsp.gov.ua/operatyvna-informatsiia/), covering the dynamics of occupational injuries and the number of casualties in various branches of the agricultural sector (animal husbandry, veterinary medicine, fisheries) for the period from 2014 to 2025. The dataset includes annual aggregated figures for accidents, fatal cases and the number of casualties, broken down by industry according to the Classification of Economic Activities (KVED).

A comparative analysis was conducted of the structure of occupational injuries across the main branches of the agro-industrial complex, with separate assessment for animal husbandry, veterinary medicine and fisheries/aquaculture, and comparison with other sectors of the economy. To provide a more detailed picture of the causes of accidents and the specific features of occupational injuries, thematic summary reports from the State Labour Service, case analyses and publications of scientific research and international reviews were used.

Data processing, calculation of proportions, preparation of summary tables and graphical materials were carried out in Microsoft Excel, followed by statistical summarisation of the key indicators.

Results and Discussion

Dynamics of Occupational Injuries in Major Sectors

Table 1 presents the dynamics of occupational injuries across the key sectors of Ukraine's economy for the period 2019–2025. Analysis of the data shows a significant increase in the proportion of accidents within the agro-industrial complex (AIC), rising from 3.5 per cent (73 cases) in 2019–2021 to 10.0 per cent (218 cases) in 2022–2025. In absolute terms, this represents a threefold increase, while the total number of occupational injuries across all sectors grew by only 5 per cent.

Table 1
Occupational injuries by sector in 2019–2021 and 2022–2025 (number and percentage)

Sector	2019–2021 (cases)	2019–2021 (%)	2022–2025 (cases)	2022–2025 (%)
Socio-cultural sphere	322	15.5	490	22.4
Transport	204	9.8	273	12.5
AIC	73	3.5	218	10.0
Mechanical engineering	103	5.0	134	6.1
Construction	79	3.8	123	5.6
Energy	48	2.3	101	4.6
Housing and communal services	54	2.6	72	3.3
Coal industry	38	1.8	64	2.9
Gas industry	18	0.9	40	1.8
Metallurgical industry	25	1.2	38	1.7
Chemical industry	17	0.8	35	1.6
Boiler supervision	11	0.5	21	1.0

Note. The agro-industrial complex (AIC) includes animal husbandry (cattle, pig, and poultry breeding), veterinary activities, fisheries/aquaculture, agriculture and related services. Percentages are calculated from the total number of occupational injuries in the relevant period (2019–2021: 2,081 cases; 2022–2025: 2,187 cases). Data for 2025 are preliminary (as of August)

Alongside the increase in occupational injuries in the AIC, a rise is also observed in the socio-cultural sphere, transport, energy and construction. However, the agricultural sector demonstrates the most dynamic growth in its share within the overall structure, which highlights the particular vulnerability of this sector against the background of military events, reduced mechanisation, the seasonal nature of work and workforce instability (Grigorian, 2023; Nadvodniuk, 2023).

Causes of Occupational Injuries in the Agricultural Sector

A detailed analysis of the typical causes of occupational accidents is provided in Table 2. The largest proportion is accounted for by technological injuries (32 per cent), animal-related incidents (18 per cent), road traffic accidents during the transportation of products and livestock (15 per cent), and breaches of safety regulations (14 per cent).

Table 2
The most common causes of occupational accidents in the agro-industrial complex (2019–2025)

Cause / Circumstance	Cases, %	Fatalities, %	Typical Examples
Technological injuries	~32	~27	Falls from height, injuries by machinery, collisions with vehicles
Animal-related incidents	~18	~10	Attacks by bulls or horses, injuries from cattle
Road traffic accidents (RTAs)	~15	~21	Accidents during the transport of animals or agricultural products
Breaches of safety regulations	~14	~17	Absence or improper use of PPE, carelessness
Electrical injuries	~6	~8	Contact with faulty equipment, electric shock
Burial or collapse of soil	~4	~7	During work in silage pits or trenches
Other (poisoning, fires, drowning)	~11	~10	Smoke in premises, accidents with toxic substances, drowning

Note. Data for 2025 are preliminary and include only cases registered up to and including August

Fatal cases are more often associated with road traffic accidents, collapses, electrical injuries and injuries sustained while working with animals. Similar trends are confirmed by international studies: in animal husbandry, farming and agricultural processing, the majority of injuries are caused by hazardous working conditions, insufficient training and non-compliance with instructions (Bhattarai et al., 2016; Damroth et al., 2019; Qi et al., 2024).

Internal Structure of Injuries in Animal Husbandry, Veterinary Medicine and Fisheries

Table 3 shows the distribution of injuries, fatalities and casualties across the main sub-sectors of the agro-industrial complex.

The data indicate that animal husbandry has traditionally accounted for the largest share of injuries in the agro-industrial complex: from 16.4 to 6.3 per cent of cases and from 20.0 to 7.9 per cent of fatalities in different years.

Table 3
Proportion of cases, fatalities and casualties in veterinary medicine, animal husbandry and fisheries among all occupational injuries in the agricultural sector (% in each group by period)

Period	Veterinary, % (cases / fatalities / casualties)	Animal husbandry, % (cases / fatalities / casualties)	Fisheries, % (cases / fatalities / casualties)
2019–2021	0 / 0 / 0	16.4 / 20.0 / 20.5	1.4 / 3.3 / 1.4
2022–2024	0.4 / 0 / 0.4	6.3 / 7.9 / 7.1	0 / 0 / 0

The proportion of veterinary medicine and fisheries in the overall structure of occupational injuries remains low. However, this is partly explained by the insufficient level of reporting and reflects hidden risks (Furtado et al., 2024; Tulloch et al., 2025).

Analysis of Risks and Factors of Occupational Injuries

In 2022–2025, according to operational reports and accident registries, occupational injuries directly related to military actions (shelling, landmines, remnants of explosives, combat engagements and similar hazards) accounted for approximately 7–12 percent of all cases in Ukraine. For AIC, this figure reached 12–16 percent, especially in frontline and de-occupied regions. Thus, in 2022–2025, at least every eighth or ninth occupational accident in agriculture was directly or indirectly associated with war-related risks.

According to our statistical data, in 2022–2025, animal husbandry remained the leader in the share of severe occupational injuries within the AIC (6.3 percent of cases and 7.9 percent of fatalities). At the same time, more than 14 percent of all injuries in animal husbandry were caused by actions related to herd relocation, working in mined fields, farm accidents after shelling or as a result of power outages. These figures are consistent with spikes in risks recorded in international sources in crisis regions (Bhattarai et al., 2016; Damroth et al., 2019).

According to Mahmoud et al. (2021), on average up to 28 occupational injuries are registered per 1,000 employees of a livestock farm annually, of which 3–5 cases are severe. Similar frequencies are confirmed by the data of Tulloch et al. (2023): more than 70 percent of injuries in veterinary schools and animal husbandry are associated with contact with cattle, horses or pigs.

Our own analysis confirms that approximately 16 percent of injuries in animal husbandry are due to safety violations, in particular failure to maintain a safe distance, lack of regular staff training, neglect of standard procedures and insufficient provision of personal protective equipment. For comparison, Nielsen & Norup (2024) in their surveys report that up to 23 percent of injuries on Danish farms are linked to non-compliance with instructions.

Seasonal analysis indicates that during periods of intensive work (spring turnout to pasture, summer forage harvest, autumn regrouping of herds), the proportion of injuries increases by 1.5–2 times, which is consistent with the data of Johnson et al. (2021), who noted an increase in the number of severe incidents during peak work seasons to 21 percent of the annual total.

In the period 2022–2024, the share of registered cases of occupational injuries in the veterinary sector amounted to 0.4 percent (see Table 3). However, according to our surveys and the data of Tulloch et al. (2025), over 92 percent of veterinary professionals indicate that they sustained at least one occupational injury per year and 35 percent experienced multiple incidents.

More than 53 percent of injuries in veterinary practice remain unreported in internal documentation, which is consistent with the findings of Furtado et al. (2024): only one in three cases is officially recorded, while the rest are concealed due to fear of reputational damage or administrative difficulties (Mylostyvyi, 2023; Voss et al., 2024).

The main types of injuries include bites (up to 48 percent, according to Al-Harbi et al., 2023), sharp instrument injuries (up to 26 percent), and zoonotic infections (up to 12 percent). Young professionals and students are a particular risk group: Johnson & Fritschi (2024) reported that in the group of veterinary nurses, the injury rate is 30 percent higher than among experienced veterinarians.

Fisheries are characterised by the highest specific frequency of occupational injuries among all AIC sectors. For example, analysis for 2000–2022 revealed 12.7 injuries per 1,000 workers per year and 4.2 fatalities per 100,000 workers (Holen & Holmen, 2025). The most dangerous tasks are those performed on floating facilities and wharves, where more than 40 percent of injuries are caused by falls or mechanical equipment failures.

In Ukraine, according to our data, in 2019–2021, the share of fisheries in the injury structure was 1.4 percent (and 3.3 percent of fatalities), while in 2022–2024, this figure was essentially zero, but this is due to lack of reporting from frontline and temporarily occupied territories.

According to Olapade et al. (2021), more than 57 percent of fish processing workers have sustained injuries at work, and the incidence of injuries in fish farming reaches 76.2 cases per 1,000 workers, with 23 percent of incidents resulting in long-term disability (Kaustell et al., 2019; Kjestveit et al., 2021).

An additional factor in 2022–2025 was the impact of hostilities, leading to risks of mine explosions, drowning during evacuations, and injuries from remnants of explosive devices. Expert estimates suggest that more than 35 percent of fisheries enterprises in southern and eastern Ukraine are at risk.

Thus, the results of a comprehensive analysis of statistical data and recent literature indicate a significant complication of the situation with occupational injuries in agriculture, veterinary medicine and fisheries in Ukraine in 2022–2025. The key contributing factors were the impact of military actions, insufficient prevention and training, seasonal work peaks, low provision of personal protective equipment, and inadequate safety culture in many enterprises. Comparisons with international experience show that a significant share of incidents results from systemic organisational problems requiring multilevel responses, from regular training and the implementation of modern standards to the development of targeted prevention programmes for specific subsectors. The issue of unrecorded (latent) injuries in veterinary medicine and fisheries, as well as the emergence of new war-related risks for the agricultural sector, is particularly relevant. Addressing these challenges requires the integration of efforts by state bodies, enterprise owners, trade unions and the scientific community to develop a modern and effective occupational safety management system.

Conclusions

As a result of the comprehensive analysis, it was established that occupational injuries in animal husbandry, veterinary medicine and fisheries in Ukraine increased

significantly during 2022–2025 against the background of military actions, insufficient prevention, seasonal workload peaks and a low level of provision of personal protective equipment. For the agricultural sector, the emergence of new specific risks related to landmines, shelling and disruption of infrastructure is particularly critical. Animal husbandry remains the leading sector in terms of the proportion of injuries and fatalities, while the highest level of latent injuries is observed in veterinary medicine and fisheries are distinguished by the highest relative frequency of injuries and risk of fatal incidents.

The results obtained indicate the need for a systematic approach to the prevention of occupational risks, taking into account sectoral specificities, the active implementation of modern occupational safety standards, regular staff training, technical modernisation and the development of a culture of safety in enterprises. The formation of an effective occupational safety management system under current challenges is impossible without the integration of efforts by state authorities, employers, employees and the scientific community.

Conflict of Interest Statement

The authors declare that there is no conflict of interest.

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