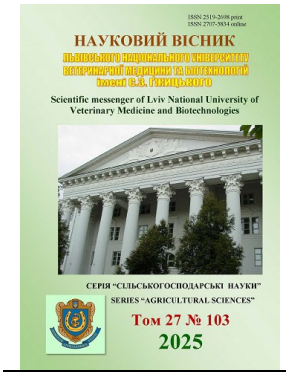

Науковий вісник Львівського національного університету ветеринарної медицини та біотехнологій імені С.З. Ґжицького. Серія: Сільськогосподарські науки

Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnologies. Series: Agricultural sciences

ISSN 2519–2698 print
ISSN 2707-5834 online

doi: 10.32718/nvlvet-a10307
https://nvlvet.com.ua/index.php/agriculture

UDC 636/637:631.1:331.45(477)

Occupational injuries in animal husbandry and crop production as major suppliers of raw materials for the processing industry in Ukraine

R. V. Mylostyvyi[1]✉, T. M. Dubov[1], V. O. Sapronova[1], B. V. Gutyj[2], N. A. Begma[1]

[1]*Dnipro State Agrarian and Economic University, Dnipro, Ukraine*
[2]*Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies, Lviv, Ukraine*

Article info

Received 11.06.2025
Received in revised form 14.07.2025
Accepted 15.07.2025

Dnipro State Agrarian and Economic University, S. Efremov Str., 25, Dnipro, 49600, Ukraine.
Tel.: +38-097-280-88-19
E-mail: mylostyvyi.r.v@dsau.dp.ua

Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies, Pekarska Str., 50, Lviv, 79010, Ukraine.

Mylostyvyi, R. V., Dubov, T. M., Sapronova, V. O., Gutyj, B. V., & Begma, N. A. (2025). Occupational injuries in animal husbandry and crop production as major suppliers of raw materials for the processing industry in Ukraine. Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnologies. Series: Agricultural sciences, 27(103), 68–73. doi: 10.32718/nvlvet-a10307

Occupational injuries in animal husbandry, crop production, and the processing industry remain a significant challenge for the agro-industrial sector of Ukraine. According to the analysis, animal husbandry demonstrates a decreasing share of injuries within the overall structure, reflecting the effects of technical modernization and the implementation of preventive measures. In contrast, crop production, after a period of decline, shows a renewed increase in injury rates, associated with a higher proportion of manual labor, the seasonal nature of work, and war-related risks. The most common causes of occupational accidents in animal husbandry are injuries resulting from direct contact with animals (up to 37 % of cases), technogenic factors (up to 26 %), and safety violations. In crop production, high rates of technogenic injuries (up to 44 %), road traffic accidents, and incidents related to burial or collapse of soil prevail. In the processing industry, the injury structure remains relatively stable, with the predominance of technogenic injuries, electrical traumas, and accidents during the movement of raw materials. The increasing share of injuries linked to military activities highlights the relevance of further improvement of occupational safety systems, strengthening preventive measures, and introducing modern risk monitoring tools. Future research should focus on developing effective risk management algorithms and integrating digital technologies to ensure worker safety in the context of dynamic industry changes.

Keywords: *occupational injuries, animal husbandry, crop production, processing industry, war-related risks, monitoring, prevention.*

Виробничій травматизм у тваринництві та рослинництві як основних постачальників продукції для переробної промисловості України

Р. В. Милостивий[1]✉, Т. М. Дубов[1], В. О. Сапронова[1], Б. В. Гутий[2], Н. А. Бегма[1]

[1]*Дніпровський державний аграрно-економічний університет, м. Дніпро, Україна*
[2]*Львівський національний університет ветеринарної медицини та біотехнологій імені С. З. Ґжицького, м. Львів, Україна*

Виробничий травматизм у тваринництві, рослинництві та переробній промисловості залишається суттєвою проблемою для агропромислового комплексу України. За результатами аналізу, в тваринництві відмічається тенденція до зниження частки травм у загальній структурі, що відображає вплив технічної модернізації та впровадження профілактичних заходів. Водночас у рослинництві, після деякого періоду скорочення, спостерігається повторне зростання рівня травматизму, що пов'язано із підвищенням частки ручної праці, сезонним характером робіт і впливом воєнних ризиків. Найпоширенішими причинами нещасних випадків у тваринництві є травми від прямого контакту з тваринами (до 37 % випадків), техногенні ушкодження (до 26 %) та порушення правил безпеки. Для рослинництва характерні високі показники техногенних травм (до 44 %), дорожньо-транспортних

пригод і аварій, пов'язаних із засипанням чи обвалом ґрунту. У переробній галузі структура травматизму залишається відносно стабільною, із домінуванням техногенних травм, електротравм і випадків під час переміщення сировини. Зростання частки виробничих травм, пов'язаних із воєнними діями, підкреслює актуальність подальшого вдосконалення системи охорони праці, посилення профілактичних заходів і впровадження сучасних інструментів моніторингу виробничих ризиків. Подальші дослідження мають бути спрямовані на розробку ефективних алгоритмів управління ризиками і інтеграцію цифрових технологій для забезпечення безпеки працівників в умовах динамічних змін галузі.

Ключові слова: *виробничий травматизм, тваринництво, рослинництво, переробна промисловість, воєнні ризики, моніторинг, профілактика.*

Introduction

Occupational injuries in animal husbandry and crop production remain among the most pressing challenges for Ukraine's agro-industrial sector, as these fields supply the main volume of raw materials for the processing industry (Horodetskyi et al., 2024). Specific organizational features such as the seasonality of work, predominance of manual labor, physical overload, the use of uncertified equipment, and insufficient staff training significantly increase the risk of accidents (Ekmekci & Yaman, 2024).

In animal husbandry, injuries are most often associated with handling cattle, pigs, or horses, while the most fatal cases are linked to the use of technical equipment (Agnihotri et al., 2024; Nielsen & Norup, 2024). Similarly, in crop production, the leading causes of injuries are violations of safety regulations, operation of agricultural machinery, and neglect of personal protective equipment requirements (Mucci et al., 2020; Noroozi & Taherian, 2023).

Age and occupational characteristics of employees play a significant role in the risk structure. Increased vulnerability is observed among young people, older workers, and employees with chronic diseases (Ouattara et al., 2022; Weichelt et al., 2022). Most injuries affect the upper limbs, and the most severe injuries are associated with operating machines and mechanisms (Das, 2013; Markkanen et al., 2021).

The rising frequency of occupational injuries in the main branches of agriculture directly impacts human resources, production continuity, and the competitiveness of the processing industry (Evtushenko & Siryk, 2019; Michael & Gorucu, 2023). Considering labor market transformation, the effects of military actions, climate change, and socio-economic challenges, there is an urgent need for in-depth analysis of production risks and the implementation of systemic preventive measures (Nadvodniuk, 2023; Tsarenko & Khalin, 2025).

Recent studies emphasize the importance of quantitative risk assessment methods, insurance tools, and the introduction of innovative technologies in occupational safety systems (Mahmoud et al., 2021). The integration of approaches for preventing occupational risks is essential for the sustainable development of the agro-industrial complex.

Aim of the study

The aim of this study is to analyze the dynamics, structure, and causes of occupational injuries in animal husbandry, crop production, and the processing industry as the main sectors of Ukraine's agro-industrial complex, and to identify key areas for improving occupational safety systems in the context of current sectoral challenges.

Materials and Methods

This study is based on official statistical data from the State Labor Service of Ukraine (https://dsp.gov.ua/operatyvna-informatsiia/) that cover the dynamics of occupational injuries, the number of accidents, fatalities, and affected workers across various sectors of the agricultural industry (animal husbandry, crop production, and processing industry) for the period from 2014 to 2025. The data are structured according to the sectoral classification (KVED) with further detail by sub-sectors of the agro-industrial complex.

A comparative analysis was conducted on the dynamics and structure of occupational injuries in the main sectors of the agro-industrial complex, particularly in animal husbandry, crop production, and enterprises involved in agricultural product processing. For greater detail, thematic reports from the State Labor Service, analysis of typical accident cases, as well as results from scientific studies and international reviews were used, especially those addressing the causes and circumstances of occupational injuries and the influence of organizational and social factors.

To describe the most common causes of accidents, generalized information was used regarding the circumstances and mechanisms of injury, including types of activities, level of technical equipment, seasonality, characteristics of the production process, and the human factor.

Data processing, calculation of proportions, and the construction of tables and graphs were performed using Microsoft Excel and Statistica 12, followed by statistical summarization of key indicators.

Results and Discussion

The analysis of the dynamics of occupational injuries in animal husbandry and crop production over the period from 2014 to 2025 (see Table 1) demonstrates a general trend towards a reduction in the proportion of incidents in animal husbandry. This may be attributed to both technical modernization and the implementation of preventive measures. In contrast, after a marked decrease in the number of injuries in crop production during 2019–2021, there has been a renewed increase in indicators in 2022–2025, which is likely related to the impact of military operations, the seasonal nature of work, and a rising share of manual labor.

Table 1
Dynamics of occupational injuries in animal husbandry and crop production in Ukraine (2014–2025)

Period	Animal husbandry (cases / deaths / injured)	Share of APC (%)	Crop production (cases / deaths / injured)	Share of APC (%)
2014–2018	30 / 8 / 36	24.4	56 / 14 / 63	45.5
2019–2021	12 / 3 / 15	16.4	29 / 8 / 34	39.7
2022–2025*	15 / 3 / 17	6.3	45 / 11 / 52	18.9

Note. Data for 2025 are preliminary (as of August). The "Share of APC (%)" refers to the percentage of cases in the respective sector out of the total number of occupational injuries in the agro-industrial complex (APC) for the given period. APC in this context includes animal husbandry, crop production, fisheries, veterinary, and processing industries.

In both animal husbandry and crop production, most injuries are non-fatal, but any increase in the frequency of occupational accidents negatively affects workforce stability and the continuity of production. The reduction of the share of injuries in animal husbandry to a minimum level in the most recent period is considered a positive trend, whereas crop production remains characterized by a high level of risk, which requires further attention and improvement of occupational safety measures.

The main causes of accidents in animal husbandry during 2019–2025 (see Table 2) are primarily associated with direct contact with animals and technogenic factors. Injuries caused by cattle, pigs, or horses remain the most common, while the highest proportion of fatal cases is observed due to technogenic accidents, falls from heights, and road traffic accidents during the transportation of animals or feed. A significant share of incidents is related to violations of safety procedures and the absence or improper use of personal protective equipment.

Table 2
Most common causes of occupational accidents in animal husbandry (2019–2025)

Cause / Circumstance	Cases (%)	Fatalities (%)	Typical examples
Animal contact	~37 %	~19 %	Injuries from cattle, pigs, horses
Technogenic injuries	~26 %	~33 %	Falls from heights, machinery-related injuries, vehicle impact
RTA	~14 %	~17 %	RTAs during animal or feed transportation
Safety violations	~12 %	~15 %	Lack or improper use of PPE, carelessness
Electrical injuries	~5 %	~8 %	Electric shock, contact with faulty equipment
Burial/collapse of soil	~2 %	~3 %	Work in silage pits, storage facilities
Other (poisoning, fires, etc.)	~4 %	~5 %	Poisoning from disinfectant vapors, smoke inhalation, fires

Note. PPE – personal protective equipment; RTA – road traffic accident

Less common but potentially hazardous are electrical injuries, soil collapses during operations in storage facilities and silage pits, as well as cases of poisoning and fires. This structure of risks highlights the necessity of improving safety culture, technical equipment, and targeted accident prevention, especially in high-risk operations.

In crop production, the predominant causes of occupational accidents (see Table 3) are technogenic injuries, particularly those occurring while working with combines, tractors, and other agricultural machinery. These factors most often lead to fatal outcomes. A considerable proportion is also represented by road traffic accidents associated with the transportation of harvest and seeds, as well as cases of burial or collapse of soil in grain storage and pits.

Table 3
Most common causes of occupational accidents in crop production (2019–2025)

Cause / Circumstance	Cases (%)	Fatalities (%)	Typical examples
Technogenic injuries	~44 %	~35 %	Injuries from combines, tractors, falls from machinery
RTA	~19 %	~28 %	RTAs during harvest or seed transport
Burial/collapse of soil	~10 %	~17 %	Collapse of silos, pits, grain storage
Safety violations	~14 %	~13 %	Lack of PPE, carelessness during work
Electrical injuries	~4 %	~4 %	Contact with faulty electrical devices, electric shock
Other (poisoning, fires, etc.)	~9 %	~3 %	Chemical poisoning from crop protection products, fires, drowning during fieldwork

Note. PPE – personal protective equipment; RTA – road traffic accident

Violations of safety protocols are particularly noteworthy, including the lack of or improper use of personal protective equipment and carelessness during operations. Less common but still significant are electrical injuries and cases of poisoning by chemicals or fires, which, despite their lower frequency, may have severe consequences for workers. This risk structure underscores the importance of machinery modernization, strict adherence to occupational safety regulations, and regular staff training.

The dynamics of occupational injuries in the processing sector of the agro-industrial complex (see Table 4) demonstrate a relatively stable but low incidence

rate in both livestock and crop processing sectors. Over the analysed period, the share of injuries in these subsectors remains within the range of 7–12% of the total number of occupational injuries in agriculture.

At the same time, the frequency of occupational injuries in processing enterprises has not decreased as significantly as in primary production. This trend may be attributed to the specific nature of technological processes, the complexity of equipment, and the influence of human factors. Compared to livestock and crop production, the mortality rate in the processing sector remains relatively high, particularly at enterprises with a high concentration of mechanized operations and the use of powerful machinery. This highlights the ongoing need for modernization of production, improvement of safety training, and enhancement of occupational safety control systems at processing facilities.

Within the processing sector of the agro-industrial complex (see Table 5), technogenic injuries predominate and account for the largest share of both total and fatal cases. The main contributing factors are falls from height, injuries sustained while operating equipment, and accidents during the transportation of raw materials or finished products.

Table 4

Occupational injuries in livestock and crop processing (2014–2025) and share of the agro-industrial complex

Period	Livestock processing: cases / fatalities / affected	Share of AIC, %	Crop processing: cases / fatalities / affected	Share of AIC, %
2014–2018	11 / 3 / 13	8.9	15 / 4 / 18	12.2
2019–2021	7 / 2 / 8	9.6	9 / 3 / 11	12.3
2022–2025*	9 / 2 / 10	7.1	13 / 3 / 16	10.2

Note. The share of AIC (%) indicates the percentage of cases in the respective sub-sector out of the total number of occupational injuries in the agro-industrial complex (AIC) for the given period. The AIC figures for each period include the sum of cases across all agricultural domains, including crop production, livestock, fisheries, veterinary medicine, and processing industries. Livestock processing comprises meat processing plants, dairies, etc. Crop processing includes elevators, groat mills, oil-extraction, sugar and bread factories, as well as other agricultural processing enterprises. Data for 2025 are preliminary as of August

Table 5

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

Cause / Circumstance	Cases (%)	Fatal (%)	Typical incidents
Technogenic injuries	~41	~36	Falls from height, injuries during equipment operation, transport
Safety violations	~18	~21	Absence or improper use of PPE, non-compliance with regulations
Electrical injuries	~13	~16	Electric shock, work with faulty electrical installations
Burial or collapse of bulk materials	~8	~12	Burial in grain elevators, silos, or bunkers
Road traffic accidents (RTA)	~8	~6	Accidents during transportation of raw materials or products
Fires and explosions	~6	~7	Fires, explosions due to equipment malfunction or emergencies
Other (poisoning, chemical injuries)	~6	~2	Ammonia vapor poisoning, disinfectant exposure, contact with chemicals

Note. Road traffic accidents (RTA) refer to incidents occurring during the transportation of raw materials or products within the enterprise premises, as well as during logistical operations between individual units of the processing industry

Violations of safety regulations and electrical injuries associated with the operation of faulty electrical installations play a significant role. Additional risk factors include incidents involving bulk materials, particularly burial in elevators and silos, as well as road traffic accidents within the premises of enterprises. Although fires, explosions, and chemical poisoning are less frequent, such incidents can also result in severe consequences for employees. Overall, the structure of occupational injuries in the processing sector highlights the necessity of comprehensive technical safety measures, equipment upgrades, and strict compliance with operational regulations.

In the period from 2022 to 2025, according to operational reports and accident registries, occupational injuries directly related to military activities (such as shelling, mining, armed clashes, and unexploded ordnance) accounted for approximately 7 to 12 percent of all cases across Ukraine. These results are consistent with current trends in occupational injury within the agricultural sector, especially in Ukraine, where the risk profile is significantly exacerbated by the impact of military events (Grigorian, 2023). Resource constraints and an additional background of stress underscore the need to implement adaptive occupational safety management strategies that incorporate both organisational and technological aspects of safety.

The impact of the human factor, deficiencies in training, and organisational shortcomings is confirmed by both international and national studies (Mahmoud et al., 2021; Johnson et al., 2021). A systematic approach to monitoring and analysing production operations, with consideration for the type of equipment, spatial organisation, and the level of staff training, enables the identification of the most hazardous areas and the development of targeted preventive measures (Mylostyvyi, 2023; Qi et al., 2024).

The high rate of occupational injuries in the livestock sector is attributable not only to the use of machinery, but also to a significant proportion of injuries sustained during animal handling, in accordance with the findings of Damroth et al. (2019) and Tulloch et al. (2023). An insuf-

ficient level of staff training, disregard for safety standards, and the absence of regular instruction contribute to serious incidents among both experienced workers and younger employees, as also reflected in the studies by Weichelt et al. (2022).

A similar pattern is observed in crop production, where most injuries occur during the operation of machinery, and fatal incidents are frequently associated with non-compliance with safety instructions, as evidenced by Kim et al. (2016) and Bhattarai et al. (2016). The most vulnerable body parts remain the upper limbs, with negligence, inadequate use of personal protective equipment, and excessive physical workload being dominant risk factors.

In the processing industry, the risk profile is also consistent with global trends: injuries sustained while working with equipment, breaches of technological discipline, insufficient enforcement of standards, and poor instruction remain the main causes of occupational accidents (Prasetyo et al., 2022; Hösükler, 2022). An important contributing factor is the involvement of inexperienced or elderly staff in hazardous work (Ouattara et al., 2022).

According to Kjestveit et al. (2021), effective injury prevention requires a comprehensive sociotechnical approach that takes into account both technological and behavioural factors, in particular the safety culture, regular training, and support at all levels of the organisation.

A significant contribution to contemporary risk management systems is provided by the implementation of insurance (Tsarenko & Khalin, 2025), the continuous monitoring of compliance with instructions, and the multifactorial assessment of the production environment (Davoudi Kakhki et al., 2019). The integration of analytical and digital technologies, risk factor analysis using advanced models (Davoudi Kakhki et al., 2019; Wrzecińska et al., 2023), and increased staff awareness—all these measures contribute to reducing both the frequency and severity of injuries across all segments of the agro-industrial complex.

Finally, systematic analysis and monitoring of the causes of occupational injuries, as emphasised by Horodetskyi et al. (2024), enable the optimisation of risk management systems and the enhancement of personnel awareness, which is a key factor in reducing the overall incidence of injuries and fatalities within the sector.

Conclusion

The analysis of occupational injuries in the livestock and crop production sectors of Ukraine demonstrates an increase in their incidence during 2022–2025. This trend is primarily attributed to a higher proportion of manual labour, the seasonal nature of agricultural work, and the impact of military activities. In livestock production, the leading causes of accidents remain direct contact with animals, technogenic factors, and breaches of safety regulations. In crop production, technogenic injuries during the operation of agricultural machinery, road traffic accidents, and cases of burial or collapse of soil are most prevalent. The processing industry maintains a relatively steady level of occupational injuries, with the structure dominated by technogenic injuries, electrical traumas, accidents involving bulk materials, and incidents during the movement of raw materials and products. The increasing share of injuries related to military risks, particularly in recent years, highlights the necessity for further improvement of occupational safety systems, modernisation of production processes, and the strengthening of preventive and educational measures across all branches of the agro-industrial complex.

Conflict of interest

The authors declare that there is no conflict of interest.

References

Agnihotri, L., Chaudhary, S., & Manu, A. (2024). A Case Series of Cattle-Related Injuries in Northern Hilly Areas. Indian Journal of Surgery, 87(3), 595–601. DOI: 10.1007/s12262-024-04101-1.

Bhattarai, D., Singh, S. B., Baral, D., Sah, R. B., Budhathoki, S. S., & Pokharel, P. K. (2016). Work-related injuries among farmers: a cross-sectional study from rural Nepal. Journal of Occupational Medicine and Toxicology, 11(1), 48. DOI: 10.1186/s12995-016-0137-2.

Damroth, K., Damroth, R., Chaudhary, A., Erickson, A., Heneghan, L., Hellenthal, N., Monie, D., Cooper, S., Anderson, M., & Kaufman, T. (2019). Farm Injuries: Animal Most Common, Machinery Most Lethal: An NTDB Study. The American Surgeon™, 85(7), 752–756. DOI: 10.1177/000313481908500737.

Das, B. (2013). Agricultural work related injuries among the farmers of West Bengal, India. International Journal of Injury Control and Safety Promotion, 21(3), 205–215. DOI: 10.1080/17457300.2013.792287.

Davoudi Kakhki, F., Freeman, S. A., & Mosher, G. A. (2019). Evaluating machine learning performance in predicting injury severity in agribusiness industries. Safety Science, 117, 257–262. DOI: 10.1016/j.ssci.2019.04.026.

Ekmekci, M., & Yaman, S. (2024). Occupational health and safety among farmers: a comprehensive study in Central Anatolia, Turkey. BMC Public Health, 24(1), 2732. DOI: 10.1186/s12889-024-20249-7.

Evtushenko, O., & Siryk, A. (2019). Analysis of cause, consequences and circumstances of manufacturing injury in food industry enterprises. Food Industry, 26, 127. DOI: 10.24263/2225-2916-2019-26-18.

Grigorian, R. (2023). Peculiarities of the manifestation of risks in the activity of agricultural enterprises in modern of conditions. Ekonomìka Ta Upravlìnnâ APK, 1(181), 111–123. DOI: 10.33245/2310-9262-2023-181-1-111-123.

Horodetskyi, I., Tymochko, B., Mahats, M., Mazur, I., Berezovetskyi, A., & Mazurak, M. (2024). Analysis of the state of occupational injury as a prerequisite for managing the processes of dangerous events formation. Bulletin of Lviv National Environmental University. Series Agroengineering Research, 27, 127–137. DOI: 10.31734/agroengineering2023.27.127.

Hösükler, E. (2022). Analysis of Injuries and Deaths by Trauma Scores due to Occupational Accidents. Turk-

ish Journal of Trauma and Emergency Surgery, 28, 1258–1269. DOI: 10.14744/tjtes.2022.22796.

Johnson, A., Baccaglini, L., Haynatzki, G. R., Achutan, C., Loomis, D., & Rautiainen, R. H. (2021). Agricultural Injuries among Farmers and Ranchers in the Central United States during 2011-2015. Journal of Agromedicine, 26(1), 62–72. DOI: 10.1080/1059924x.2020.1845268.

Kim, H., Lee, K., & Räsänen, K. (2016). Agricultural injuries in Korea and errors in systems of safety. Annals of Agricultural and Environmental Medicine, 23(3), 432–436. DOI: 10.5604/12321966.1219182.

Kjestveit, K., Aas, O., & Holte, K. A. (2021). Occupational injury rates among Norwegian farmers: A sociotechnical perspective. Journal of Safety Research, 77, 182–195. DOI: 10.1016/j.jsr.2021.03.001.

Mahmoud, N., Leck Jensen, A., Topp, C. F. E., Sørensen, C. A. G., Nørremark, M., Eory, V., & Hutchings, N. J. (2021). A Method to Quantify the Detailed Risk of Serious Injury in Agricultural Production. Sustainability, 13(7), 3859. DOI: 10.3390/su13073859.

Markkanen, P., Peters, S. E., Grant, M., Dennerlein, J. T., Wagner, G. R., Burke, L., Wallace, L., & Sorensen, G. (2021). Development and application of an innovative instrument to assess work environment factors for injury prevention in the food service industry. Work, 68(3), 641–651. DOI: 10.3233/wor-203399.

Michael, J. H., & Gorucu, S. (2023). Severe injuries from product movement in the U.S. food supply chain. Journal of Safety Research, 85, 234–241. DOI: 10.1016/j.jsr.2023.02.007.

Mucci, N., Traversini, V., Lulli, L. G., Baldassarre, A., Galea, R. P., & Arcangeli, G. (2020). Upper Limb's Injuries in Agriculture: A Systematic Review. International Journal of Environmental Research and Public Health, 17(12), 4501. DOI: 10.3390/ijerph17124501.

Mylostyvyi, R. V. (2023). Veterinary, economic and social aspects of cattle welfare: a review. One Health Journal, 1(IV), 28–36. DOI: 10.31073/onehealthjournal2023-iv-03.

Nadvodniuk, O. (2023). Current state and priorities of sustainable development of agricultural enterprises. Ekonomìka Ta Upravlìnnâ APK, 2(185), 111–123. DOI: 10.33245/2310-9262-2023-185-2-111-123.

Nielsen, K. J., & Norup, M. (2024). Causes and prevention of cattle-handling injuries: An interview study. Safety Science, 170, 106365. DOI: 10.1016/j.ssci.2023.106365.

Noroozi, E., & Taherian, A. R. (2023). Occupational Injury and Its Management in Food and Beverage Industry. Occupational Health and Safety in the Food and Beverage Industry, 165–202. DOI: 10.1201/9781003303152-6.

Ouattara, B. S., Beseler, C. L., & Rautiainen, R. H. (2022). Agricultural Injuries: Risk Factors and Severity by Affected Body Part among US (Midwest) Farmers. Journal of Agromedicine, 28(2), 214–223. DOI: 10.1080/1059924x.2022.2089421.

Prasetyo, Y. T., Garcia, M. M., Dewi, R. S., Chuenyindee, T., Kurata, Y. B., & Widia, M. (2022). Accident patterns and prevention measures for occupational injuries in the Philippine food and beverage manufacturing industry. Work, 73(4), 1307–1324. DOI: 10.3233/wor-210662.

Qi, X., Yao, X., Cong, X., Li, S., Han, M., Tao, Z., Yang, X., Qi, X., Shi, F., & Wang, S. (2024). Profile and risk factors in farmer injuries: a review based on Haddon matrix and 5 E's risk reduction strategy. Frontiers in Public Health, 12. DOI: 10.3389/fpubh.2024.1322884.

Tsarenko, D. H., & Khalin, S. V. (2025). Insurance as a Risk Management Tool in Agribusiness. The Problems of Economy, 1(63), 254–260. DOI: 10.32983/2222-0712-2025-1-254-260.

Tulloch, J. S. P., Fleming, K. M., Pinchbeck, G., Forster, J., Lowe, W., & Westgarth, C. (2023). Audit of animal-related injuries at UK veterinary schools between 2009 and 2018. Veterinary Record, 193(7), e3171. DOI: 10.1002/vetr.3171.

Weichelt, B. P., Gorucu, S., Burke, R. R., Salzwedel, M. A., Murphy, D. J., & Lee, B. C. (2022). Agricultural youth injuries: An updated review of cases from U.S. news media reports, 2016–2021. Frontiers in Public Health, 10. DOI: 10.3389/fpubh.2022.1045858.

Wrzecińska, M., Czerniawska-Piątkowska, E., Kowalewska, I., Kowalczyk, A., Mylostyvyi, R., & Stefaniak, W. (2023). Agriculture in the face of new digitization technologies. Ukrainian black sea region agrarian science, 27(3), 9–17. DOI: 10.56407/bs.agrarian/3.2023.09.