Labour safety culture as a value orientation in the agro-specialist's professional profile

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Abstract. The article substantiates the relevance of labour safety issues in modern agricultural production and its importance in the value orientations and professional competencies of agricultural specialists. A review of scientific articles is carried out to determine the key tracks of the discourse and analyze approaches to understanding labour safety by the professional community of agricultural specialists and scientists representing various subject areas of knowledge. We show the data of a survey of agricultural specialists in the south of Russia in the areas of agro-engineering, agronomy, plant protection, veterinary medicine and animal science, as well as a survey of employees of enterprises of the Stavropol Territory in rural and urban areas. The culture of labour safety as the value orientation of agricultural specialists is formed in the process of developing professional competence in the system of agricultural education and is supported in the production activities of agricultural enterprises through institutional mechanisms, corporate culture, requirements of technological processes.

1 Introduction

Labour safety issues in the agricultural sector are related to the peculiarities of the object and subject of labour of workers and require attention from the heads of production departments: foremen of field-raising brigades, heads of farms, poultry complexes, repair shops and other structural units of agricultural enterprises, in whose direct control are ordinary workers of different qualifications. Since young specialists in the agricultural sector come to enterprises, as a rule, as middle managers, it is precisely on them that the highest burden falls in ensuring labour safety in production processes. The organization and coordination of work related to safety and labour protection in manufacturing enterprises, as a rule, is ensured by the allocation of the functionality of a full-time employee. Researchers C. Madigan, K. Way, M. Capra, K. Johnstone in their publication show the experience of occupational safety workers in a modern organization based on a survey of

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385 expert professionals [1]. The authors formulated the tactics of proactive influence of persons in charge of labour protection, used in interaction with the management of enterprises. The set of factors influencing the development of tactics for ensuring occupational safety was represented by two channels: through the personal characteristics of the management, influencing the attitude towards occupational safety and through the organizational conditions (organizational safety culture, the size of the organization, the effectiveness of organizational mechanisms). For our study, this is an important conclusion that determines the high importance of maintaining a safety culture up to date and modern tactics of this process.

P. Manu, A. Poghosyan, A.M. Mahamadu, M. Behm, O.O. Akinade on the example of the construction industry, they propose a comprehensive model of organizational capabilities that ensure labour safety [2]. Based on the use of the Delphi expert assessment method, 18 model attributes were identified, grouped into six subsystems:

- competencies of personnel that ensure a culture of safety at work;
- strategy focused on occupational safety and management responsibility;
- corporate practices for the implementation of labour safety systems in projects;
- availability of systems, processes, and procedures necessary to implement the occupational safety strategy;
- infrastructural factors for ensuring labour safety;
- inter- and intra-organizational cooperation for the implementation of safety culture in projects.

It is possible to name a number of objects of labour that pose significant risks to industrial safety at work. Among them is work with fertilizers, pesticides, insecticides and other chemicals used in the production process. A number of publications highlight the importance of quality education and training for farmers as an important factor in occupational safety, especially in middle and low-income countries. This is the opinion of the authors J. BarrónCuenca, N. Tirado, M. Vikström, M. Berglund, K. Dreij [3]. The results of the study showed a high level of negative impact of pesticides on the health of farmers due to improper use of protective equipment and insufficient knowledge in the field of occupational safety when working with chemicals in agricultural production. This study shows the relevance of issues of occupational safety culture in agricultural production processes and the need to reflect them in the competence profile of an agricultural specialist. The authors S. Santaweesuk, P. Boonyakawee, W. Siriwong obtained similar results of a study of the health effects of farmers who worked with pesticides in rice cultivation [4]. Among the conclusions and proposals based on the results of the study, scientists advocate conducting informational trainings and monitoring the safe behaviour of farmers in contact with pesticides. The social effectiveness of such measures lies in the reduction of residues of harmful chemicals, both in the body of farmers and in the environment and agricultural products [5].

In the technological processes of animal husbandry, there is a similar negative picture of the influence of the physical and chemical characteristics of the object of labour on workers. This is exposure to organic dust that contains germs, allergens, viruses, and etc. The authors of the article G. Campo, L. Cegolon, D. DeMerich, A. Guglielmi, G. Mastrangelo show research results confirming that exposure to dust and endotoxins on livestock farms leads to a high risk of developing respiratory diseases in workers and, in extreme cases, to occupational asthma and rhinitis [6]. Thus, it is emphasized the importance of ensuring safe working conditions and the development of a safety culture in the process of training such agricultural specialists as veterinarians, agricultural engineers, biotechnologists, and livestock specialists [7, 8, 9].

The complication of agro-technical and agrochemical processes of modern agricultural production is considered in their article by the authors A. Gomez, M. Narayan, L. Zhao, and

M.L. Lopez-Moreno, J.R. Peralta-Videa [10]. As a conclusion that is significant for the study of the processes of ensuring safe working conditions in agricultural production, we see insufficient knowledge of the impact of nano agrochemicals, both on workers and on food products obtained from such plants.

In the discussion track of modern publications on agricultural production, we see the presentation of the issues of ensuring safe working conditions in working with mechanisms and transport complexes in crop production and on livestock farms. Researchers B.G. Hansen, E.P. Stræte offers the results of the influence of technological innovations in the field of dairy farming on the satisfaction of farmers with labour [11]. An empirical study found that among the key factors of job satisfaction, one of the most important places is occupied by the working regime of the day, safety, and working conditions. Thus, technological innovations related to the operation of mechanical production systems emphasize the importance of a factor – labour safety. Working on dairy and livestock farms is associated with severe physical processes that negatively affect the health of workers and lead to occupational diseases of the musculoskeletal system. Modern technological innovations associated with the use of an exoskeleton in the work of farmers have a positive effect on such characteristics as comfort and safety at work, note the researchers A. Omoniyi, C. Trask, S. Milosavljevic, O. Thamsuwan [12]. Data obtained from semi-structured interviews with farm workers who used exoskeleton at work helped to reduce the ergonomic hazards of work processes. These findings will help develop effective strategies to improve the farming environment and the safety of other agricultural processes.

Natural factors, due to the seasonality of agricultural work and their implementation outside production premises, play an essential role in labour safety issues. Among them are low and high temperatures, seasonal labour intensity, precipitation, intense solar radiation, etc. The authors A. Orlov, J. Sillmann, K. Aunan, T. Kjellstrom, A. Aaheim in their study provide data on the economic costs of implementing health and safety recommendations in combating heat stress of workers, which reduce global GDP by 2.4% [13]. These results confirm the global scale and significance of the problems of ensuring safe working conditions in the agricultural sector [14, 15, 16].

The generalization of the results of the analysis of publications confirms the relevance of labour safety issues in modern agricultural production and the importance of safety culture in the requirements for agricultural specialists.

2 Materials and methods

The empirical part of the study was carried out by the method of a questionnaire survey of agricultural specialists in the south of Russia in the areas of agro-engineering, agronomy, plant protection, veterinary medicine and animal husbandry (267 people), as well as employees of enterprises of the Stavropol Territory in rural and urban areas (812 people), the data were processed from using SPSS Statistics (version 21).

3 Results

In modern production conditions, robotics, automation, and unmanned equipment are being actively introduced. This forces engineering specialists to constantly improve their level of knowledge, skills in production management, service. During the survey, experts from the regional professional community note that the most important duty of an agricultural engineer, as in any other specialty, is to comply with safety rules so as not to endanger themselves and colleagues. Experts emphasize that agricultural machinery works under different weather conditions and terrain: mountain ranges, swampy areas, lowlands,

depressions. And in different conditions, equipment must regularly perform its functions. Keeping track of this is the main responsibility of an agricultural engineer. To achieve all of this, an agricultural technician needs to engage in research and development activities. Constantly look for possible ways to improve the work of agricultural machinery in different weather conditions, correctly carry out calculations, and introduce innovations. An agricultural engineer, in addition to his own industry, must understand the related areas of biology and botany, chemistry, physics, also determine possible risks for employees. Confirmation of the relevance of these expert recommendations is the results of a survey of employees of enterprises in the Stavropol Territory, conducted by the Office of the Federal State Statistics Service for the North Caucasus Federal District.

In total, 812 people took part in the regional survey in 2019. Comparative data on the assessment of the level of labour safety of employees of enterprises in urban and rural areas are presented in Table 1.

Table 1. Comparative data for assessing the level of labour safety of employees of enterprises in urban and rural areas (%).

Labour safety level (answer options)	Total for the Stavropol Territory	Urban areas			Rural areas		
		Total	Men	Women	Total	Men	Women
Work is completely safe	32.9	33.9	17.9	49.9	31.1	14.1	55.3
Work is safe enough	35.4	39.6	36.2	43.1	28.1	29.0	26.9
Work is dangerous to some extent	27.3	21.7	36.9	6.6	36.7	49.9	17.8
Work is dangerous	4.5	4.7	9.0	0.4	4.1	6.9	0.0

Table 2. Comparative data of employees' personal experience of industrial accidents of enterprises in urban and rural areas (%).

Answer options	Total for the Stavropol Territory	Urban areas			Rural areas		
		Total	Men	Women	Total	Men	Women
There was at least one accident	3.0	2.6	4.7	0.6	3.7	5.7	0.8
There were no accidents	97.0	97.4	95.3	99.4	96.3	94.3	99.2

4 Discussion

Based on the results of the survey as a whole in the Stavropol Territory, about a third of the respondents note a certain level of danger of the work performed. Moreover, the assessments of the level of danger are higher among respondents working in rural areas (40.8%), while in urban (25.4%) and especially among men in rural areas (56.8%). Thus, agricultural labour is associated with high risks, and workers of enterprises clearly understand this. The following Table 2 presents data on accidents at work among respondents in segmentation by urban and rural areas.

Comparative data show that the most vulnerable category of workers in relation to accidents at work is also men who work in the agricultural sector. The level of accidents at work in this category of respondents is 5.7%, while on average in the Stavropol Territory 3.0% of the respondents note that there was at least one accident. In the course of training specialists in the agricultural sector, much attention is paid to labour safety issues. Educational programs in the areas of agro-engineering, agronomy, plant protection, veterinary medicine and animal husbandry are built on the requirements of the Federal State Educational Standard of Higher Education and are supplemented by expert opinions from employers that characterize relevant areas for improvement. In the competence profile of each educational program, there is an occupational safety position. Its relevance from the point of view of expert assessments of the professional community, obtained during the regional survey, varies from 85 to 90 % among other professional competencies in the areas of training agro-engineering, agronomy, plant protection, veterinary medicine and animal science.

5 Conclusions

The relevance of labour safety issues in the agricultural sector was confirmed in the review of publications of scientists dealing with this issue. In the professional development of young agricultural professionals, occupational safety should be among the most significant positions in the competence profile.

Labour safety issues in the agricultural sector are associated with the characteristics of the object and subject of workers' labour and require attention from the heads of production departments and the agricultural enterprise as a whole. Potentially hazardous objects of work include: work with equipment and mechanisms, living objects, chemicals and medicines, feed and additives, as well as natural and climatic conditions for outdoor work during different seasons with temperature drops and precipitation. All these circumstances lead to higher rates of injuries in agricultural production.

In the course of a comparative analysis of the results of a survey of enterprises' employees of the Stavropol Territory, it was found that the level of danger and injury in the agricultural sector is higher than at other production facilities.

The comments of the professional community of agricultural specialists emphasize the high level of responsibility of graduates of educational programs in the areas of training in agro-engineering, agronomy, plant protection, veterinary medicine and animal husbandry in the field of labour safety for employees of agricultural enterprises.

The culture of labour safety as the value orientation of agricultural specialists is formed in the process of developing professional competence in the system of agricultural education and is supported in the production activities of agricultural enterprises through institutional mechanisms, corporate culture, requirements of technological processes.

References

1. C. Madigan, K. Way, M. Capra, K. Johnstone, *Influencing organizational decision-makers – What influence tactics are OHS professionals using?,* SafetyScience **121** (2020)
2. P. Manu, A. Poghosyan, A.M. Mahamadu, M. Behm, O.O. Akinade, *Design for occupational safety and health: key attributes for organisational capability,* Engineering, Construction and Architectural Management **26**(11) (2019)

3. J. Barrón Cuenca, N. Tirado, M. Vikström, M. Berglund, K. Dreij, *Pesticide exposure among Bolivian farmers: associations between worker protection and exposure biomarkers,* J. of Exp. Sci. and Envir. Epidem. **30**(4) (2020)
4. S. Santaweesuk, P. Boonyakawee, W. Siriwong, *Knowledge, attitude and practice of pesticide use and serum cholinesterase levels among rice farmers in NakhonNayok Province, Thailand*, Journal of Health Research **34**(5) (2020)
5. R. Sapbamrer, A. Thammachai, *Factors affecting use of personal protective equipment and pesticide safety practices: A systematic review*, Environm. Res. **185** (2020)
6. G. Campo, L. Cegolon, D. De Merich, A. Guglielmi, G. Mastrangelo, *The Italian national surveillance system for occupational injuries: Conceptual framework and fatal outcomes, 2002–2016,* Inter. J. of Envir. Res. and Publ. Heal. **17**(20) (2020)
7. H. Gomes, J.M.C. Menezes, J.G.M. da Costa, R.N.P. Teixeira, R.F. do Nascimento, *A socio-environmental perspective on pesticide use and food production*, Ecotoxicology and Environmental Safety **197** (2020)
8. S. Santiteerakul, A. Sopadang, K.Y. Tippayawong, K. Tamvimol, *The role of smart technology in sustainable agriculture: A case study of wangree plant factory,* Sustainability (Switzerland) **12**(11) (2020)
9. P. Delval, *Actions by agricultural technical institutes (ITA) to ensure the safety of people exposed to pesticides*, Environnement, Risks and Health **19**(2) (2020)
10. A. Gomez, M. Narayan, L. Zhao, M.L. Lopez-Moreno, J.R. Peralta-Videa, *Effects of nano-enabled agricultural strategies on food quality: Current knowledge and future research needs*, Journal of Hazardous Materials **401** (2021)
11. B.G. Hansen, E.P. Stræte, *Dairy farmers' job satisfaction and the influence of automatic milking systems,* NJAS - Wageningen Journal of Life Sciences **92** (2020)
12. A. Omoniyi, C. Trask, S. Milosavljevic, O. Thamsuwan, *Farmers' perceptions of exoskeleton use on farms: Finding the right tool for the work(er),* International Journal of Industrial Ergonomics **80** (2020)
13. A. Orlov, J. Sillmann, K. Aunan, T. Kjellstrom, A. Aaheim, *Economic costs of heat-induced reductions in worker productivity due to global warming,* Global Environmental Change **63** (2020)
14. V.N. Goncharov, E.E. Nesmeyanov, O.U. Kolosova, V.V. Arutyunyan, V.A. Ivashova, *Analysis of the modern science and technology in the context of the concept of CDIO,* Journal of Physics: Conference Series **1353** (1) (2019)
15. V.A. Ivashova, G.V. Tokareva, E.G. Agalarova, Yu.B. Nadtochiy, I.V. Yushchenko, *Social practice of urban environment quality assessment*, IOPConference Series: Materials Science and Engineering **775** (1) (2020)
16. O. Mukhoryanova, K. Hercegová, S. Kalyugina, O. Tretyakova, Terra Economicus **16**(4) 130–143 (2018)