

Problems of transformation of social and labour relations in conditions of agriculture robotization

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Abstract – The key factors of transformation of social and labour relations can include means of production development and scientific and technical progress. The robotization of agriculture is an objective process connected with the development of techniques and technology as well as with the increasing shortage of employees in this field and the necessity to increase the production efficiency. The research methods are SWOT-analysis and different methods of generalization and data processing. The analysis has shown the strengths of transformation of social and labour relations in conditions of the robotization which include the increase of production efficiency based on growth of labour productivity, reducing injuries at work, improving of the staff working life quality. The weaknesses include inequality and discrimination of the agricultural employees, increase in labour intensity with the growth of sensory loads, workers resistance to robotization processes. There are opportunities to create additional working places in hi-tech sector including programming, production of components for robots, appearance of new jobs connected with using of robotics in agriculture. It should be noted that modern generation of employees are focused on digital technologies, so robotization of agriculture will promote attractiveness of this branch for employees. The main threats can possibly be connected with the increase of unemployment because of robotization. It is possible to predict an increase in the polarization of labour in the agricultural sector of economics. The research results can be used by executive agencies while developing programmes of innovative agricultural development and technical modernization of the branch.

Keywords – robotization, social and labour relations, agriculture, working conditions, employment, polarization of labour, discrimination

I. INTRODUCTION

Nowadays we can see the development of the great amount of new digital technologies including Big Data,

IoT(The Internet objects), AI(artificial intellect), adaptive technologies and robotization of manufacturing process. These technologies and the effects of their usage deserve special attention because they are surely to change and transform the existing social and labour relations. The application of this level of technologies in production of goods and services has been named digital economy.

One of the main directions of digital economy is new manufacturing technologies with the use of robotics. Besides, one of the levels of its development where the interaction of subjects takes place is separate branches including agriculture. Many scientists and experts speak about the appearance of the fundamentally new approach to manufacturing, the fourth industrial revolution, the so called Industry 4.0 and robotization of production [1,2].

To promote development of the digital economy in Russian Federation the programme “The digital economy in Russian Federation” is adopted and approved by the governmental decree dated July, the 28th 2017 № 1632-r [3]. This programme is aimed to create conditions for the development of a knowledge society in the Russian Federation, welfare increase and quality of life of citizens of our country by means of increasing the availability and quality of goods and services manufactured in the conditions of digital economy. It should be mentioned that robotization is an objective process connected with the development of scientific and technical progress. Wherein the level of robotization in The Russian Federation (density of robotization 3,0) remains low in comparison with the world average indicators (density of robotization 76,3 in 2017) [4].

These technologies allow raising labour productivity, reducing human factor exposure and increasing the quality of performed operations and received products. At the same time,

in spite of some practical experience, robotization patterns of agricultural production have not been studied thoroughly yet.

The purpose of the present study is to identify the main laws of transformation of social and labour relations in the process of agricultural robotization.

II. LITERATURE REVIEW

According to the experts' forecasts in the short term the population of rural areas will be decreasing and the speed of this negative process will be increasing. Nowadays there are 39,5 million people living in the rural area (27% of the total population of Russia); only 21 million people of them are employable (53,2%). The main part (9,1 million people -23%) of the rural population is pensioners. In specialists' opinion the number of rural population in Russia taking into account migration will decrease by 4,6% by the year 2020 and by 10,2% by the year 2040 [5]. These demographic trends lead to increasing staff shortage in agriculture.

At the same time, governmental programme of agricultural development and regulation of markets of agricultural products, raw materials and food for 2013-2020 foresees an increase in agricultural production in farms of all categories in 2020 in comparison with 2010 by 39% [6].

Achievement of these indicators requires literate, technically trained and educated labour force in the required volume to fulfill work, develop ideas, manage difficult processes, social services, etc.

These circumstances cause the necessity to use labour-saving technologies which can include digital, intellectual and robotic technologies. Robotics can be used in animal breeding for milking animals [7], manure removal, shearing, etc.; in crop production for sowing crops [8], spraying plants with pesticides and fertilizers, weeding [9], harvesting, etc.; in auxiliary production for farmland monitoring [11], product sorting and packaging [12], etc.

The development of robotics and other labour-saving technologies displaces a man from production [13]. It will lead to the constriction of labour market what will affect the fertility decline, reduced funding for health programmes (and corresponding increase in mortality) and increase in migration flows, external as well as internal, especially in developing countries. Displacement of women out of production can increase fertility only provided that every citizen of the country has a fixed income [14].

Some research confirms that necessity and expediency of creating and using robots (including Western Europe) has been caused by two main factors: sharp increase in the wage rate of farmers and possibility to cope without additional work force [15].

Usage of robots can lead to the decrease of employment rate [16]. With the help of international comparison methodology the share of potentially robotized working places in Russia has been estimated. It made up about 44% than lower than in industrially developed countries.

Mass usage of robotics contributes to the formation of new forms of labour, cooperation and exchange because The Internet connects people with machines and objects [17].

Labour activity becomes more transparent and controlled from outside as the opportunities of education improve, the quality of labour resources; besides employee profile and requirements to him change. However, in Russia the process of mass labour transformation and employment goes much slower because of slow pace of robotization.

The main question is still the employment rate connected with further robotization. The analyses shows [18] that at the level of individual firms the connection between innovations and employment is practically always positive, at the level of sectors – ambiguous, at macro level technological progress acts either like a positive or a neutral factor. So, widely-spread concerns about comparatively sharp rise of unemployment because of technological factor do not have sufficient grounds. The analysis also testifies that new technologies influence the structure of unemployment more than its rate, and it does not only change the distribution of workers by professional groups but also the number of tasks solved in every job.

III. METHODOLOGY OF THE RESEARCH

For research of transformation of social and labour relations in conditions of the robotization of agriculture a number of methods are used. During the process of research the influence of adverse factors of external and internal environment in which agricultural organizations function is minimized. These factors include animal breed, availability and quality of food supply, difference in payment systems, etc. For this purpose we have selected all organizations using traditional technology and robotization of production at the same time.

Quantification of production burden was carried out due to "Guidance R 2.2.755-99 "Hygienic criteria of evaluation and classification of labour conditions in terms of working environment hazards, load and intensity of production process". For objective assessment of transformation of social and labour relations SWOT-analysis has been used. Universal and statistical techniques of this method have allowed to reveal strengths and weaknesses of transformation of social and labour relations, to chart opportunities and threats. As general economic methods, the following methods have been used: economic statistical analysis, systemic approach as well as other methods of scientific research, generalization and data processing according to the certain aims of the research.

IV. RESULTS OF EXPERIMENTAL STUDIES

The process of robotization of agriculture causes significant transformation of social and labour activity in this field.

Robotization of agriculture increases labour content. Labour activity in this field with the use of traditional technologies as a rule lacks creativity and is connected with physical effort. The qualitative composition of labour force changes, the level of education as well as social expectations of the new generation of people rises, the requirements to labour conditions and character changes. Nowadays young specialists are less interested in labour with a high proportion

of manual operations and a monotonous character devoid of creative approach. In these conditions robotization of agriculture promotes freedom from routine operations without intellectual content.

Reduction of labour conditions, heaviness, monotone, repetition of operations during the production process influence positively the attraction of agricultural professions, especially to young people living in rural areas who have been leaving them lately. Currently agricultural universities let out experts who do not want to get a job by profession because labour in agriculture is characterized by high load, low attraction, routine and does not provide personal and professional prospective and is not conducive to mastering new technologies.

No doubt usage of digital, intellectual technologies and robotics increases attraction and diversity of labour and it can have a positive impact on retention young specialists in the industry. The main factors that contribute to job satisfaction are interest to job, reducing the number of repetitive processes, increasing the comfort of production conditions, etc.

The following data shows that 393 robotics units have been introduced into agricultural organizations of Russian Federation from 2006 to 2016 [19].

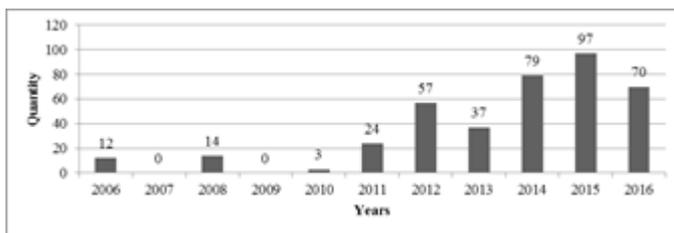


Fig.1 Presence of robotics in agricultural organizations of Russian Federation by region by January, 1st 2017, units

Overwhelming majority of robotics used in Russian agriculture is represented by milking robots mostly by European manufacturers. The most famous manufacturers of these techniques are DeLaval (Sweden), Lely (Holland), Fullwood (Great Britain), GEA Farm Technologies (Germany), SAC (Denmark). In some regions feed spreaders by Lely are used. There are also other kinds of robots in various fields of application but they are not widely-spread in Russia.

However, transformation of social and labour relations in conditions of the robotization of agriculture is not developed enough theoretically; the processes of transformation, essence and character of labour, working life quality, efficiency increase in agriculture as a result of labour productivity growth are practically unexplored.

The solution to this problem is to find new regularities of social and labour relations in conditions of the robotization of agriculture as well as practical recommendations for using digital, intellectual production technologies and robotics systems in agricultural sector of economics of rural enterprises.

For this purpose SWOT-analyses is used (Table 1). It will allow defining main strengths and weaknesses of transformation of social and labour relations in conditions of the robotization of agriculture as well as understanding possible opportunities and threats of these relations.

TABLE I. SWOT-ANALYSES OF TRANSFORMATION OF SOCIAL AND LABOUR RELATIONS IN CONDITIONS OF THE ROBOTIZATION OF AGRICULTURE

Strengths	Weaknesses
Labour productivity increase and as a result, decrease of production costs	Growing inequality and discrimination of employed in agricultural sector, first of all women and elderly people
Reduction of the adverse effects of human factor on production results and quality of production increase	Possible reduction of rural population income as a result of human crowding out of the economic process
Reduction of occupational injuries and illnesses due to elimination of a person from harmful and dangerous works	Probability of employee resistance to innovation including robotization of the industry
Improving the quality of life of agricultural workers, reduction of labour load, reduction of share of manual monotonous labour	Increasing in labour intensity including intellectual, sensor and emotional loads
Opportunities	Threats
Orientation of new generation of employees to digital technologies, increasing attractiveness of the industry for young generation of employees	Probability of increasing unemployment in rural areas
Creation of additional working places in the hi-tech sector including programming, production of components for robots, etc.	Personnel training in industry schools according to old-fashioned programmes with the lack of competence in using robotics in agriculture
Reduction of industry dependence on employee shortage in rural areas	Polarization of labour in the industry
Appearance of new professions connected with the use of robotics in agriculture	Low tempos of robotization in the agriculture of Russian Federation

No doubt that the strength of robotization in agriculture is labour productivity increase [20]. The previous research allows to make a conclusion that labour productivity increases by 95, 3% per 1 person in comparison with a traditional farm. It is necessary to mention that on the farms with robotics there are no cases of occupational injuries. At the same time on traditional cattle farms minor injuries are quite common. Decrease of injury level is connected with reduction in the share of manual labour when performing production operations.

To weaknesses we can refer increase in inequality and discrimination of the employees in agricultural sector, first of all women and elderly people. As a rule, women comprise a smaller part of the employees engaged in technique service. They rarely have education in engineering or mathematics and so they cannot cover the growing demand for workers qualified for these spheres. There is also increase in labour intensity. It can be connected with the growing signal and message density, a great number of production objects of simultaneous observation and the necessity to watch monitor screens.

Main opportunities of transformation of social and labour relations are connected with orientation of new employee generation to digital technologies that can also raise the attraction of the industry. We can also predict the appearance of new professions such as an operator of automated milking. It is a rather new category of personnel on Russian farms. These specialists perform functions of analysis of the reports made by robots, correct some actions, change consumables, directly enter data into the system, and prod animals to the milking box of the robot.

The main threats include low tempos of robotization in agriculture. We consider it necessary to mention a decreasing number of robotization objects entered after 2014. The problem is that all robotics for agriculture is of foreign produce, and it has become less available for peasants due to the rise in price because of currency appreciation. Another threat is absence of educational programmes with the use of modern robotics in industry schools. Polarization of working places in robotization conditions means reduction in the number of employees in the workplace which are easily amenable to algorithmization. So we can predict sharp decrease in the number of employees of mass professions (machine milking operators, cattlemen). Wherein there remains the same number of employees engaged in creative activities and low-paid employees, robotization of working places of which is economically impractical.

V. CONCLUSION

Robotization in agriculture is developing slowly. SWOT-analysis of transformation of social and labour relations testifies to the fact that there are significant reserves of increasing the efficiency and content of agricultural labour. New opportunities appear to create additional working places of highly technological character. In agriculture there appear new professions taking into consideration the potential of the industry robotization. The weaknesses can include the possibility of increasing inequality and discrimination first of all among women and elderly people who are less competent in this field. So because of this there is a probability of resistance to robotization. One of the drawbacks is the growth of labour intensity with the increase of intellectual, emotional and sensor load.

VI. DISCUSSION OF THE RESULTS

At the same time transformation of social and labour relations in conditions of the robotization of agriculture is still not thoroughly researched. Consequences of the following processes first of all connected with possible increase in agricultural unemployment are still to be defined. The research results can be used by executive agencies while developing innovative agricultural programmes and technical modernization of the industry.

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