

Assessment of the weather and climate conditions impact on the organization and planning of transport support for wheat harvesting

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Summary. The article presents the results of the research on the assessment of the weather conditions impact on organization and planning of the transport support in agriculture during the wheat harvesting. With the help of the theoretical studies of the sources and live surveys among the agricultural experts, who are involved in wheat harvesting, the assessment of the weather conditions impact on the organization and planning of transport support for wheat harvesting has been updated. The research on the impact of the weather and climatic conditions on the organization and planning of transport support for the wheat harvesting consists of two parts. The first part consists of a survey on the relevance of taking into account the weather conditions made among the subscribers of the specialized groups in the social networks, the second part – is a categorization of the experts, who are involved in wheat harvesting and the survey regarding the estimation of the weather and climate conditions impact on the organization and planning of the transport support. The relevance of taking into account the weather conditions is confirmed from the point of view of experience by such agrarian experts as: machine operators, combine harvester operators, tractor drivers, truck drivers caring the wheat out from the field to the threshing floor; managers of the agricultural enterprises, engineers, logistic specialists. The outcomes of the research in a shape of estimation of the impact of the weather conditions could be used by the agricultural enterprises when organizing and planning the transport support during the harvesting.

Key words: impact estimation, weather and climate conditions, transport support, harvest, agro meteorological provision.

INTRODUCTION

The contemporary trends of the national agricultural complex development in the conditions of a limited number of the harvesters and transportation machineries, its moral and physical deterioration demand higher standards of the organization and planning of transport support for agricultural enterprises. These demands are caused by considerable uncertainty in the choice of the optimal strategy for achieving the objectives of farms, in

conditions of a constantly changing environment, namely weather and climatic conditions.

Weather and climate increasingly play an important role in our lives, impacting on all the processes that surround us. Weather-climatic conditions have a procedural impact and are spatially-temporal. It is clear, time is money, and time is an important resource. Therefore, weather and climate take the right to be one of the key parts in the organization and planning of transport for wheat harvesting. Consideration of the weather and climatic conditions in the planning of transport processes, in particular, the process of transport provision in agriculture, is the key entry point to the sustainable development of agricultural enterprises.

An important component of improving the efficiency of agriculture in Ukraine in conditions of high changeability of the weather and climatic conditions is a scientifically grounded approach to the mechanism of transport provision. Calculation of the number of vehicles together with taking into account the weather-climatic factors, adaptation of the agricultural production to the above-mentioned changes will allow to plan and organize a harvest campaign the most effective way.

The harvesting campaign relates to the tense periods of agricultural work, its time is limited in short terms, which creates uneven production processes and leads to the need to attract a large number of vehicles.

THE ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

The outstanding agronomist Maltsev T.S. has such a saying: “The work of a peasant reminds me a chess game in which the weather always has the advantage of the first move. A modern appropriate step is possible to make only if the farmer is prepared for it.” [1].

The Ukrainian scientist Polovnyi A.M. emphasizes that agricultural experts need to be able to effectively use climate and weather resources to increase the agricultural productivity, beat up adverse meteorological conditions [1].

It is noted here [2] that the industrial and business operation of the agricultural commodity producers depends largely on the correct consideration of climatic,

weather, nature and biological factors, the rational use of natural resources, its conservation and recovery.

The output in agricultural business depends much on the weather conditions that determine the need to have more agricultural machineries and labour resources to conduct the operations in agrotechnical terms [3]. At the same time, the number of vehicles in each company is limited, so it is necessary to calculate these limits.

The composite work of [4] underlines, that the increasing weather dependency of the agricultural crops productive process justifies the necessity, in the regional context, to build scenarios showing the future state of the climate and how the agricultural production is expected to react on it as a condition for the temporary adaptation of agricultural production. The last is to ensure the food security.

Batih A.I. emphasizes that the multisectoral nature of production, dependence of agriculture on natural and economic conditions, complex interconnections of various factors, which affect the results of economic activity, need a scientifically grounded organization of production in the agricultural enterprises and their departments using science and best practices, taking into account the peculiarities of the laws of the development of nature and society in accordance with the market demands [5].

In [6] the authors believe that agricultural enterprises operate in the high-risk conditions, related to the unpredictability of the weather conditions, the duration and seasonality of production processes, the high limiting role of time factors.

The transport-technological processes productivity in the agroindustrial complex is influenced by the weather conditions, which largely determine the technology of growing and harvesting crops [7].

Kravtsov A.G. [8] notes that the complications that arise in the functioning of the transport and logistics system of the agro-industrial complex are dependent on factors that can not be taken into account and warned. These include the weather conditions of one or another climatic zone, which directly affect the level of yield, and, accordingly, the volume of material flow. We strongly disagree with the opinion of this author about the impossibility to adjust the weather conditions in creating the transport-logistic processes and systems. We believe

that in order to organize transport and technological processes to ensure the effective and safe execution of all actions in various weather and climatic conditions during harvesting, it is necessary to understand, evaluate the weather and climatic impact and its dependence. Taking into account the weather conditions will enable defining additional reserves to increase the productivity of the harvesting complex, which, as a result, will improve its productivity. [8].

Thus in the work of [9] it is noted that natural forces are the main factors of production and the future of agricultural enterprises will depend on their impact.

According to Popov L.A. it is necessary to be able to manoeuvre with the machineries and people depending on weather conditions, especially when harvesting and fodder conservation, to economically justify the use of each unit, to maintain normal technological processes with minimal cost [10].

As the composite work of [11] specifies that the impact of natural and climatic factors is carried out according to the scheme: natural factors – the object of the work (plants), soil – work equipment (gears, machineries) (Fig. 1). In this chain, the most developed is a link of natural factors – the object of the work and only a few studies are devoted to the issues of the dependence of machines on meteorological factors. Therefore, we conclude that there is insufficient knowledge of the impact of natural and climatic factors on the means of labour (tools, machines), which is a scientific interest both from a theoretical and practical point of view.

The composite work [12] considers impact of natural and climatic factors on the economy, which is presented in Fig.2.

The Fig.2. shows that the greatest impact of natural and climatic factors is felt by agriculture, and transport is on the fourth step.

It should be noted that our study emphasizes the importance of the comprehensive consideration of the impact of these factors on transport in agriculture, in particular during the wheat harvesting. As the agriculture significantly depends on the natural and climatic conditions, it is in greater need of improving the transport provision.

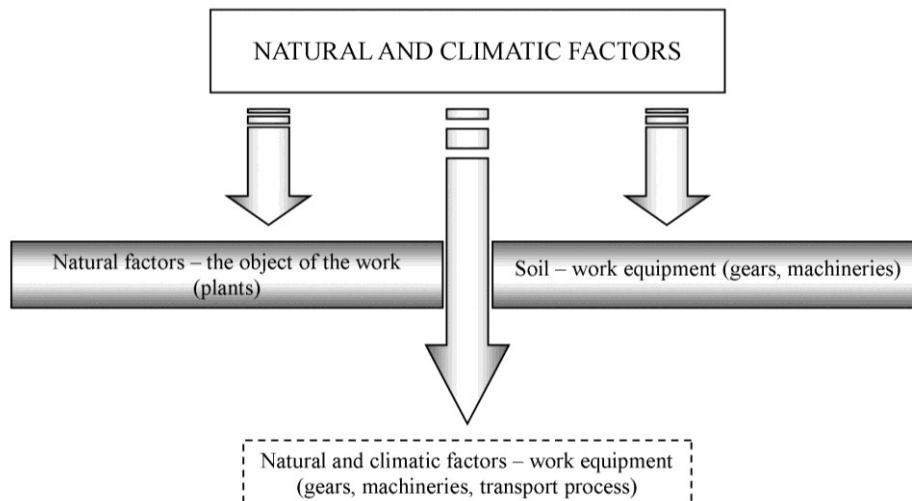


Fig.1. Scheme for natural and climatic factors impact


Agriculture	
Municipal Economy	
Power Engineering	
Transport, Building	
Industry, Protection And Restoration Of Natural Potential	
Tourism	
Fish and Marine Industry	
Extraction of Minerals	

Fig.2. Natural and climatic factors impact on the economy

In [13] the author emphasizes that the transport industry operation depends on weather and climate, affecting such properties as efficiency, regularity and security.

According to the Ukrainian Hydrometeorological Research Institute studies, the climate changes indirectly affect the functioning of the transport system of Ukraine due to increased frequency and intensity of dangerous natural disasters: strong winds, squalls, tornadoes, thunderstorms, fog, ice, heavy snowfalls and snow storms, floods, flood disaster, excessive moisture of the unpaved roads. The author believes, the temperature regimes, the depth of precipitation affect the turnover of cargoes. Besides, the increase of the depth of precipitation in the areas of excessive moisture leads to flooding of transport routes and buildings, energy and information communications.

The indirect effect of weather on the transport system of Ukraine is changing every season. An important climatic indicator is the date of a stable transition of air temperature over the critical values: a stable transition through 0°C in autumn causes ice, and a steady and early one in spring leads to the intensification of transport processes.

Massey Eric E. in his [14] notes that adaptation in the transport sector due to climate change is a relatively new topic for the countries, and only eight countries reported their activities in this sphere. Consideration of the effects of climate change in the long-term planning of the transport industry is one of the key priorities of the modern management.

According to Suleimenov T.B. and Arpabekov M.I. [15] when considering the management of the operation and development of the companies of motor carriers (MC) significant attention should be paid to one of the characteristics of the environment – this is uncertainty. The authors believe that uncertainty should be understood as the absence, incompleteness, lack of information about the object, process, phenomenon or uncertainty in the reliability of information.

The main sources of uncertainty for the MC include:

1) significant dependence of the transport process on weather conditions. For example, weather conditions can cause unforeseen consequences in the transportation of agricultural products;

2) presence in the transport operation of probability and randomness;

3) insufficiency, incompleteness of information about an object, a process, a phenomenon in relation to which the decision is made, limited in the collection and processing of information, its constant variability;

4) presence in the public life of the country of opposing tendencies, the clash of conflicting interests;

5) the impossibility of an unambiguous evaluation of the object under the level and methods of scientific knowledge that have developed in the given conditions;

6) the relative limitations of the conscious activity of the decision maker, the existing differences in the socio-psychological attitudes, ideals, intentions, assessments, behavioural stereotypes.

To mitigate the uncertainty of dependence on weather conditions when organizing and planning the transport operation in agriculture is the mission of the agrometeorological support. This is confirmed by Piskarev A.V. [16] who states that the uncertainty of the technological system significantly reduces if additional information is provided in the shape of in the form of a weather forecast for the future period, or, let us say, a forecast of yield before harvesting.

Agrometeorological support is the regular provision of the comprehensive information to the branches of agriculture on the issues of the most comprehensive and rational use of the weather, agrometeorological and agro-climatic conditions with a view to:

– obtain high and sustainable crops;

– minimize crop losses caused by the adverse conditions and also during the harvest, transportation and storage [1].

The implementation of the scientific methods how to apply the meteorological information makes it possible to reduce losses in the state economy by taking into account the weather conditions, get the best effect at minimal cost [1].

Scientifically grounded agrometeorological information helps to decide promptly which actions under the expected weather conditions or already known climatic parameters will be economically more profitable.

We emphasize the need to create an accessible database of meteorological information that will be useful for a prompt decision making and determination of actions under the expected weather conditions regarding the planning and organization of the transportation of the harvesting company.

Khandozhko L.A. in [17] believes that the development of modern technology is impossible without

taking into account the climate factor, which is included in the development of technical projects. This applies to transport systems, to stationary technical and technological facilities that are constantly subject to long-term effects of weather conditions, that is, climate. The main performance indicators of the machinery are productivity (the number of products produced per unit of time), reliability (preservation of specified parameters in terms of use, a set of quality indicators: reliability, durability, safety, etc.) and economy (the ability to optimally expend consumed raw materials, fuel and energy). These indicators are in the direct (reliability and efficiency) and indirect (productivity) dependency on weather and climatic conditions. It follows that technical climatology covers the entire modern technogenic sphere.

In [9] the author according to the results of the author's Pareto chart (on the sample of determining the impact of the main types of risk on the efficiency of the business activity of agricultural enterprises) the researcher has determined the factors, which have the greatest impact on the production process of agricultural enterprises. These include natural and climatic risks (23.3%); risks of a production nature (16.3%), financial (18.5%), economic (14%) and human-induced risks (11.6%).

Due to the fact that agricultural production depends to a large extent on weather and climatic conditions, firstly it is necessary to identify the risks associated with these conditions. [18].

In the article [19] the author believes that when applying the effectiveness indicators system of the machinery use it is possible to provide a full assessment of the mechanical appliances economic efficiency. However, when carrying out such an assessment in agrarian enterprises it is necessary to take into account the impact of natural factors on the results of agricultural production. In the author's opinion, in order to smooth out the effects of natural factors, the economic efficiency of using the machinery system should be assessed not only according to one year's data, but also according to average data over 3-5 years.

In the rate of investment attractiveness of the regions, compiled by the Institute for Economic Research and Policy Consulting in 2013 noted that unfavourable weather conditions have an impact on investments, and agriculture is not an exception, because it depends directly on them. At the national level, its significance was estimated at 5.94 points on a 10-point inverted scale, in which 0 means a strong impact on the investment activity of the enterprise, and 10 is a lack of impact [20]. It is known that insufficient investment for the renewal of fixed assets of agricultural production directly negatively affects transport provision.

The effect of climate changes and weather fluctuations is shown in the research [21] published in the International Weekly Journal Of Science. In this study, scientists came to the conclusion that the perfect average temperature for the national economic success is 13°C.

The scientists began by examining the economic performance of countries between 1960 and 2010. When a country's average temperature was above 13°C, they found that the country's economy suffered during the hot years. If the average annual temperature was below 13°C,

there was a deterioration of the economic situation in the cold years. The researchers pointed out that the link they have revealed between a country's economy and its temperature has led them to warn that the costs of unchecked climate change will be many times worse than previously thought.

Underlying the link is the impact that rising temperatures have on harm to crops and machinery. Today, the US, Japan and China have average annual temperatures close to the sweet spot of 13°C, meaning that further warming will begin to harm their economies.

At the same time Brazil, India, Indonesia and Nigeria are already much warmer, meaning the impact of climate change on their economic growth will be even greater. The UK and Germany are currently cooler, meaning their economies may improve a little as temperatures rise.

The Ukrainian Club of Agricultural Business' study shows as informative and indicative [22]. Regarding the current economic situation assessment at the enterprise, the study found out that positive sentiments prevail in the regions with the higher depth of precipitation, agrarian respondents believe that the current information at the enterprise to be "Good" and "Excellent" (Table 1).

Table 1. Estimation of the agrarian enterprise current economic situation

% of respondents who consider the current economic situation of the enterprise as "Good" and "Excellent"	Region
< 20%	Lviv, Transcarpathia, Cherkassy, Odesa, Mykolaiv, Kherson, Zaporizhia, Donetsk, Luhansk
20% – 40%	Volyn, Ternopil, Zhytomyr, Vinnytsia, Chernihiv, Kyiv, Kirovohrad, Kharkiv, Dnipropetrovsk, The Autonomous Republic of Crimea
40% – 60%	Khmelnyskiy, Sumy, Poltava
60% – 80%	Rivne
> 80%	Ivano-Frankivsk, Chernivtsi

In the paper [23] the researchers focus on agrometeorological group of factors, as it is uncontrollable, researchers focus their attention on the agrometeorological group of factors, since it is unmanaged, and disclosure of its impact on the intensity of work in grain harvesting projects is the basis for improving the management of harvesting.

The authors in [24, 25] emphasize the need to develop methods and models that allow to take into account the peculiarity of the agrometeorological conditions impact on the state of the subject of field crop farming and trends of change, as well as the formation of a naturally determined time fund for the execution of the relevant works is an important stage in the development of statistical simulation models for virtual projects and the assessment, on their basis, of the effectiveness of

managerial decisions on responses to technological risk.

Stochasticity of agrometeorological conditions and their impact on the state of the soil determine the variability of the naturally authorized timeframe and methods of soil and crop processing. The development of methods and models that consider the impact of agrometeorological conditions allows us to investigate the characteristics and trends of the parameters variability of the adaptive technological complexes of machines efficiency [26].

OBJECTIVES

By means of the theoretical sources argumentations and outcomes of the applied survey among the agrarian experts, involved in the harvest of wheat, to actualize the assessment of the weather conditions impact on the organization and planning of transport support for wheat harvesting.

THE MAIN RESULTS OF THE RESEARCH

The survey on the weather and climatic conditions impact on the organization and planning of transport support for the harvest of wheat consists of two parts. The first part is a survey on the relevance of taking into account the weather conditions conducted in the official specialized groups in the popular social networks, the second part – the categorization of the experts involved in

wheat harvesting process and the weather and climatic conditions impact assessment questionnaires regarding the organization and planning of transport provision.

The significance of taking into account the weather conditions is confirmed from the practical point of view by the agricultural experts, such as: machine operators, combine operators, tractor drivers, drivers carrying wheat from the field to the threshing floor, directors of agricultural enterprises, engineers, logistics, etc [27].

In order to determine the general opinion on the weather conditions impact on the organization and planning of transport provision during the harvesting campaign, in the first part of the research, a survey was conducted in two official specialized groups: AgroUA. Agronomist. AGRO. Agriculture and Agronomist. Agriculture. Business. The results of the survey are shown in Figures 3 and 4, respectively.

In total, the survey was attended by 503 practitioners in agriculture. Apparently, the experts, from their practical point of view confirm the strong impact (290 respondents or 57.7%) and temperate impact (140 respondents or 27.8%) on the process of organization and planning of transportation during the harvesting campaign. Weak impact option was chosen by 49 respondents or 9.7%, and 24 respondents or 4.8% did not consider impact at all.

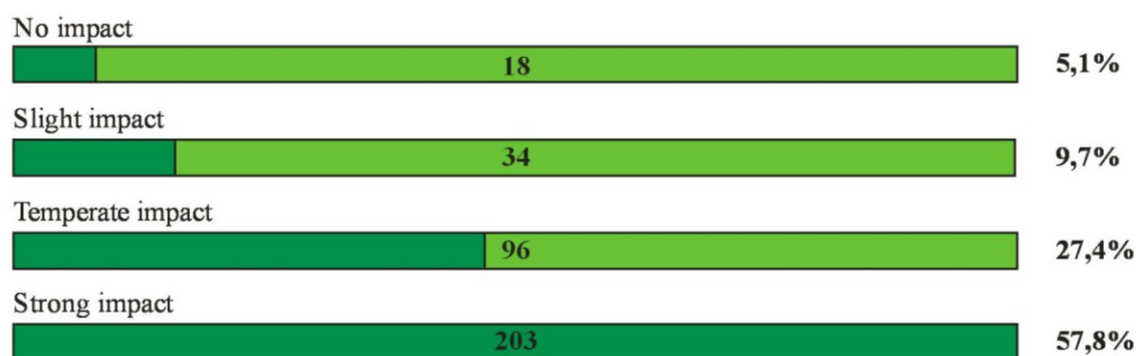
How do the weather and climatic conditions impact on the organization and planning of the harvesting campaign?



Total respondents - 152

Fig.3. Survey output in the specialized group “AgroUA. Agronomist. AGRO. Agriculture”

How do the weather and climatic conditions impact on the organization and planning of the harvesting campaign?



Total respondents - 351

Fig. 4. Survey output in the specialized group “Agronomist. Agriculture. Business”

At the second stage, the survey of the weather and climatic conditions impact on the organization and planning of transport support for the wheat harvesting was comprehensive and involved the experts of Ukraine, North America, Belarus, Lithuania, Poland, the Baltic states, Kazakhstan and the Russian Federation.

The experts were randomly selected, the survey was not specifically organized in the current manner at one enterprise, but it covered about 300 agricultural departments, agronomists-agrochemists, agronomists-consultants, agronomists-accountants, field specialists, statistic agronomists, agro-engineers, young agronomists specializing in wheat harvesting.

The group of experts “**Engineers**” included chief engineers, transport engineers, logistics, transport managers, engineers in operation of the machine-tractor park, service engineers, engineers-designers, engineers-mechanics, engineers of agricultural machinery operation, specializing in wheat harvesting.

The group of experts “**Researchers**” included researchers-agronomists, academicians, researchers, scientists (senior and junior), PhD in economics, agricultural sciences.

The group of experts “**Combine Harvester Operator**” included combine drivers, combine harvesters mechanics, tractor-combine harvesters, assistants to combine harvesters operators specializing in wheat harvesting.

The group of experts “**Drivers**” included drivers of vehicles involved in wheat harvesting, drivers of bunkers-reloaders, tractors drivers, tractors-engineers of the agricultural machinery specializing in harvesting wheat. The total number of experts in groups according to the categories that took part in the survey is shown on Fig. 5.

During the survey, the different attitude of representatives of each category to the issue of the necessity to take into account the weather and climatic conditions during the organization of transport support for harvesting was noted.

A representative of the category “**Agronomists**” emphasizes that the most critical point of the weather impact is harvest time – when long rainfall directly lead to loss of yield and, of course, the period of sowing (especially in the autumn period). The impact of these conditions is maximal and should be taken into consideration in quantity, quality of grain and time to transport it from the field.

The issue of taking into consideration the weather conditions is relevant when there is no a large number of vehicles, in terms of the organization with multi-dimensional structure. All logistics of the organization during the harvesting is in direct relation with the weather forecast, since the load on transport, besides the transportation of grain, is quite large.

Agronomists, in their turn, note that when organizing and planning transport services it is necessary to take into account the weather conditions by 100%, but for most farms it is a significant indicator of 60-70%.

Representatives of the category “**Researchers**” note that it is essential to take into account the probability of weather and climatic conditions in the organization and planning of transport, especially in the northern and western regions of Ukraine.

enterprises specializing in the cultivation and harvesting of wheat.

The group of experts “**Managers**” included directors, managers, heads of agricultural enterprises and farms specializing in growing wheat, deputy directors, commercial directors, heads of service departments and farmers who have their expertise in wheat harvesting.

The group of experts “**Agronomists**” included chief-agronomists, agronomists, agronomists of the

Representatives of the category “**Drivers**” note that the weather conditions play significant role in transportation as they affect both the consumption of fuel and the deterioration of the transport.

Representatives of the category “**Engineers**” indicate that, as a rule, weather conditions are taken into account, however, due to unreliability of information, the most favorable coincidence of circumstances and the maximum use of a machine-tractor park is always planned.

Representatives of the category “**Combine Harvesters Operators**” note that the weather conditions impact on the organization and planning of transport equipment differs in the regions of our country. Taking into account that Poltava and Vinnitsa regions are the traditional leaders in grain growing in Ukraine, Fig. 6, we consider it necessary, in connection with the large volumes of grain production, to approach the question of transport provision taking into account the weather and climatic conditions. These areas can face the problems of timely transport provision because of the large volume of harvesting operations.

Combine harvesters operators point out a direct proportional trend – good weather – lack of vehicles, and rain – no excess for the vehicles. The assessment of the weather and climate conditions impact depends on the technical support of the economy, as well as on the type and condition of road surface adjacent to the cultivated field.

The results of the research revealed that the weather conditions impact is not considered usually by small private farms that grow wheat. Companies that have their own fleet of vehicles usually do not pay close attention to the weather conditions when planning and organizing transport.

Interestingly, while interviewing, such experts as managers, noted that the issue of weathering relies on agronomists; combineers noticed that it’s on the managers. And ideally, we need a close interaction between all logistics chain participants in the harvesting campaign.

One of the respondents who participated in the survey is Sergey Aksyonov, M. Sc. MBA, Senior Specialist in Process Optimization at Tiemann Landtechnik GmbH & Co. KG International Distribution Sales Department, Germany notes the importance of describing the interaction of the machine – field – man – weather system, studying its features. This will give us the category of interaction. It makes sense to estimate the maximum number of events and scenarios in the simplest possible conditions. Minimally affect the weather – means not globally affect the climate. Where are the boundaries of this “minimum” – this is another question. But this would approximate the application of the technique to the optimum (necessary and sufficient). The wheat is

fertilized, treated with the protection products and conduct selection of the wheat according to the same principle in order to achieve the optimum. But they come

from climatic features and natural factors, not taking into account the weather, and it is the weather that makes its own adjustments to agricultural processes.

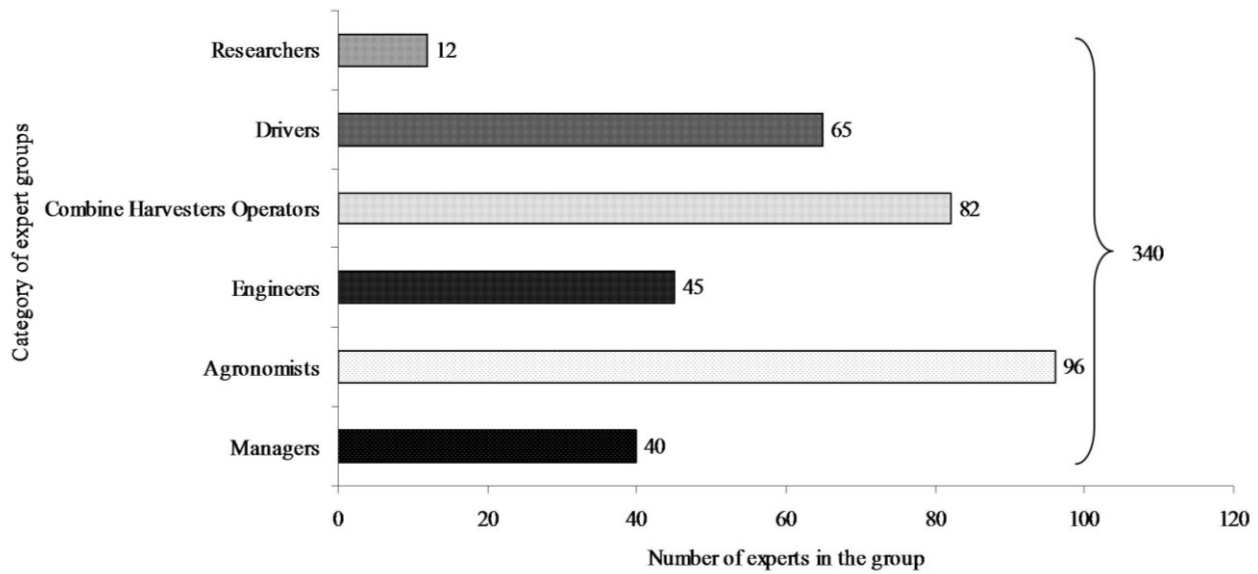


Fig.5. Total number of experts in groups by a category

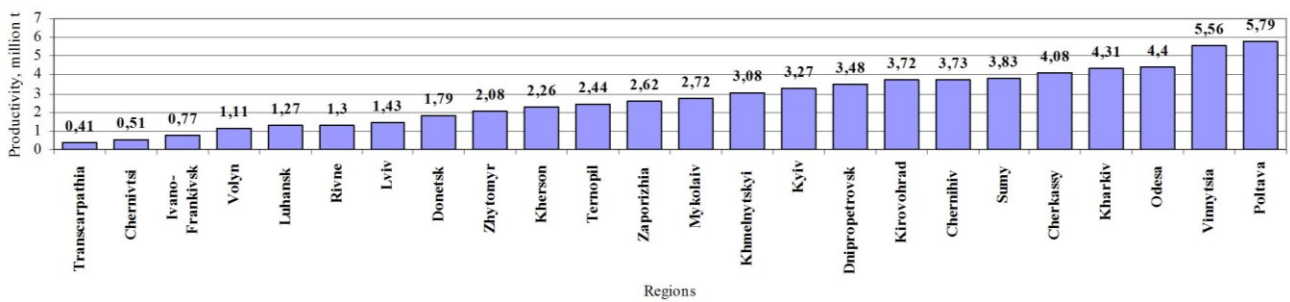


Fig.6. Grain yields by regions of Ukraine, million tons [28]

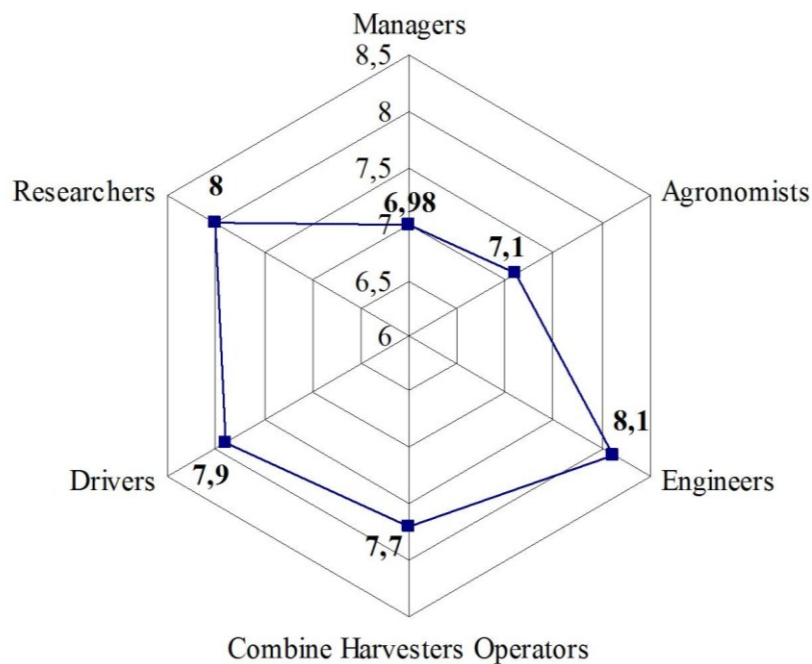


Fig.7. Assessment of weather conditions by experts categories

The diagram of the assessment of the weather conditions impact by the experts categories who participated in the research shown in Fig.7.

Analyzing this chart, it should be noted that representatives of the categories “Engineers”, “Researchers”, “Drivers” and “Combine Harvesters Operators” are the most optimistic about the weather conditions consideration when organizing and planning the transport equipment for the harvesting of wheat. This is due, first of all, to the applied nature of their work.

Representatives of the category “Agronomists” occupy the middle position regarding the account of the weather conditions. In our opinion, this is due to the inadequate use of modern information and computer technology in the organization and planning of agricultural production. For example, in our survey, only 3 of the 340 surveyed respondents reported the implementation and application of a local meteorological station and modern crop monitoring systems and harvesting equipment planning.

Representatives of the category “Managers” are most skeptical about taking into account the weather conditions during harvesting. This is evidenced by the result at 6.98 points out of 10 possible. Wheat harvest managers need to plan and make decisions in accordance with the changing situation that occurs due to the very short harvest time. Today agricultural directors work with large volumes of data, usually lacking data analysis skills, ability to handle them correctly, weather-climatic risks are virtually ignored, access to information is rather limited due to the lack of database maintenance at agricultural enterprises .

Thus, weather conditions in technological systems act as catalysts of the production process, they can both intensify and slow down its flow. For the harvesting complex, as one of the components of the production system of the enterprise, which has a central position and significant production potential, special attention is paid to transportation. A holistic assessment of the interconnections of transport, taking into account the dynamics of weather conditions, structural and functional organization, problems and prospects of development, determined the relevancy of the research.

The organization and planning of transport support during harvesting requires monitoring of external factors, in particular climatic, natural and weather, requiring research and development of optimization solutions in order to reduce their impact. Unfortunately, today, modern agricultural producers do not adequately take into account the above-mentioned factors in the organization of their activities, although they have important theoretical and practical significance. Based on the results of this research, the issues regarding transport support, the use of various transport means, it is relevant to take into account the weather conditions by the agricultural enterprises.

CONCLUSIONS

1. The weather-climatic conditions further more play significant role in our lives; they have an impact on all processes that surround us. In order to organize transport and technological processes to ensure the effective and safe execution of all actions in different climatic

conditions, it is necessary to understand and estimate this impact and dependencies.

2. Existing weather fluctuations during the wheat harvest campaign lead to differences in the efficiency of the use of transport resources, depending on climate change.

3. The results of the article in the form of an assessment of the impact of weather conditions can be used by agricultural enterprises in the organization and planning of transport provision during the grain crops harvesting, as well as in the educational process in the formation of professional competencies of specialty 275.03 Transport Technologies (in road transport).

4. Foreseeable assumptions about the development of the research object is improving the mechanisms of transport provision at agricultural enterprises during grain crops harvesting taking into account weather and climatic conditions.

REFERENCES

1. **Polovyi A.M. 2012.** Fundamentals of Agricultural Meteorology. OSENU. 'TES' Publishing House, Odessa, 252. (in Ukrainian).
2. **Pohribnyi O.O. 2007.** Agrarian Law of Ukraine. Istyna, Kyiv, Ukraine, 448. (in Ukrainian).
3. **Sandu I. S. 2013.** The efficiency of agricultural manufacturing (methodical recommendations). Moscow, FGBNU “Rosinformagrotech”, 228. (in Russian).
4. **Nechayev V.I. 2006.** The main directions of increasing the stability and efficiency of grain production. Krasnodar, Kybanskyy GAU, 402. (in Russian).
5. **Batih A.I. 2003.** Planning and organization of the agrarian enterprise. Kyiv, Agrarian Education, 425. (in Ukrainian).
6. **Mikhailovsky E.I., Vasilevsky P.N. 2014.** The concept of marketing logistics in agribusiness. Interagency Thematic Collection "Mechanization and electrification of agriculture". Vol. 2, 195-201. (in Russian).
7. **Mishchenko V. A., L. I. Hubska. 2012.** Features of formation of transport logistics in agroindustrial complex. Problems and prospects of entrepreneurship development. No. 1, 66-68. (in Ukrainian).
8. **Kravcov A.G. 2013.** The analysis of the prospects for the introduction of logistic approaches in the agricultural sector. Bulletin of the Kharkiv National Technical University of Agriculture named after Peter Vasylenko. Issue 136. 272-279. (in Ukrainian).
9. **Ostapenko O. 2013.** Classification of risk their influence on efficiency of commercial farm units. Socio-Economic Problems and the State. Vol. 8, No. 1. 190-198. (in Ukrainian).
10. **Popov L.A. 2004.** The exploitation of the machine and tractor park in the Agro-Industrial Complex. Syktyvkar. Syktyvkar Forest institute. 152. (in Russian).
11. **Vazhenin A.N. 2010.** Methods for increasing the efficiency of mechanized production processes according to the conditions of their functioning in crop production. Moscow. Publishing house "Academy of Natural History". 248. (in Russian).

12. **Khodakov V.E. 2015.** Natural-climatic factors and the development of socio-economic systems. Kherson. Grin, D.S., 2015. 344. (in Russian).
13. **Lutsko V.S. 2008.** Weather and economy. Environmental economics and environmental protection. RVPS of Ukraine of the National Academy of Sciences of Ukraine, 2008. 73-80. (in Ukrainian).
14. **Eric E. Massey. 2012.** Experience of the European Union in Adaptation to Climate Change and its Application to Ukraine. OSCE. 40. (in English).
15. **Suleimenov T.B. 2012.** Transport logistics (Part 1). Astana, Eurasian National University named after L.N. Gumilev. 211. (in Russian).
16. **Piskarev A.V. 2011.** Reliability of technological systems of machine use in plant growing: improvement of design and operation methods on the basis of the system approach. Novosibirsk. Novosibirsk State Agrarian University. 385. (in Russian).
17. **Khandozhko L. A. 2005.** Economic Meteorology. St. Petersburg. Gidrometeoizdat. 489. (in Russian).
18. **Nechaev V.I. 2007.** Organization of production and entrepreneurial activities in the agro-industrial complex. Krasnodar. KubGAU. 466. (in Russian).
19. **Vorobiev Yu.N. 1998.** Methods for assessing the effectiveness of the use of technology as an integral part of the fixed capital of agricultural enterprises. Culture of the peoples of the Black Sea region. No. 5. 90-94. (in Russian).
20. **Investing in the attractiveness of the regions. 2013.** Kyiv. Kiev International Institute of Sociology. Institute for Economic Research and Policy Consulting. 356. (in Ukrainian).
21. **Marshall Burke, Solomon M. Hsiang, Edward Miguel. 2015.** Global non-linear effect of temperature on economic production. Nature 527, 235-239.
22. **Agrobarometer 2.0.** Investment and economic sentiment of agrarians. Available online at: <http://ucab.ua>.
23. **Sidorchuk O.V., Dnes' V.I., Komarnic'kiy S.P. 2010.** Intensity of implementation of works is in projects of collection of grain-crops. Scientific Herald of the International Humanitarian University. No. 1. 30-33. (in Ukrainian).
24. **Sydorchuk O.V., Triguba A.M., Lub P.N., Sharibur A.O., Sidorchuk L.L. 2012.** Impact of agrometeorological component on the risk of agricultural crop projects. Eastern-European Journal of Enterprise Technologies. No. 1/10 (55). 49-51. (in Ukrainian).
25. **Sydorchuk O.V., Lub P.M. and Ivasiuk I.P. 2012.** Impact of the subject conditions on the terms of performing soil tillage and sowing operations of summer-autumn period. MOTROL. Commission of motorization and energetics in agriculture. Lublin. Vol. 14, No. 4. 16-20.
26. **Sydorchuk O., Lub P., Malanchuk O. 2014.** Impact of meteorological conditions on the need in adaptive performing of technological operations of soil tillage and crop sowing. Econtechmod. An International Quarterly Journal. Vol. 3. No. 4. 35-38. (in English).
27. **Medvediev Ie. P. 2017.** Expert estimation of influence of weather conditions on transport support. Abstracts of the Reports of the XVth International Scientific and Practical Conference "The Problems of the Transport Economics". Dnipropetrovsk National University of Railway Transport named after academician V. Lazaryan. 89. (in Ukrainian).
28. State Statistics Service of Ukraine. Available online at: <http://www.ukrstat.gov.ua>.

ОЦЕНКА ВЛИЯНИЯ ПОГОДНО-
КЛИМАТИЧЕСКИХ УСЛОВИЙ НА
ОРГАНИЗАЦИЮ И ПЛАНИРОВАНИЕ
ТРАНСПОРТНОГО ОБЕСПЕЧЕНИЯ УБОРКИ
УРОЖАЯ ПШЕНИЦЫ

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Аннотация. В статье представлены результаты исследования оценки влияния погодных условий на организацию и планирование транспортного обеспечения в сельском хозяйстве при уборке урожая пшеницы. Посредством проведения теоретических исследований из источников и практических опросов специалистов сельского хозяйства, которые задействованы в уборке урожая пшеницы, актуализировано оценку влияния погодных условий на организацию и планирование транспортного обеспечения уборки урожая пшеницы. Исследование оценки влияния погодно-климатических условий на организацию и планирование транспортного обеспечения уборки урожая пшеницы состоит из двух частей. Первая часть представляет собой опрос относительно актуальности учета погодных условий в специализированных группах, вторая часть – разделение специалистов, задействованных в уборке урожая пшеницы на категории и анкетирование относительно оценки влияния погодно-климатических условий на организацию и планирование транспортного обеспечения. Актуальность учета погодных условий подтверждается с практической точки зрения специалистами-аграриями, такими как: механизаторы, комбайнеры, трактористы, водители, которые перевозят пшеницу с поля на ток, директорами сельскохозяйственных предприятий, инженерами, логистами. Результаты исследования в виде оценки влияния погодных условий могут быть использованы предприятиями сельского хозяйства при организации и планировании транспортного обеспечения во время уборки урожая.

Ключевые слова: оценка влияния, погодно-климатические условия, транспортное обеспечение, урожай, агрометеорологическое обеспечение.

