UDC 330.131.7:338.43:63

Halytskyi O.
Doctor of Economics, Associate Professor,
Odessa State Agrarian University, Ukraine;
e-mail: oleksandrgalickij9@gmail.com; ORCID ID: 0000-0001-9549-7627
Koliadenko S.
Doctor of Economics, Professor,
Vinnytsia National Agrarian University, Ukraine;
e-mail: koladenko@vsau.vin.ua; ORCID ID: 0000-0001-7670-6905
Leshchuk H.
Doctor of Economics, Associate Professor,
Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine;
e-mail: galynaleshuk@gmail.com; ORCID ID: 0000-0003-1625-1536
Polenkova M.
Ph. D. in Economics, Associate Professor,
Chernihiv Polytechnic National University, Ukraine;
e-mail: m.v.polenkova@gmail.com; ORCID ID: 0000-0003-1571-6792
Herasymenko Yu.
Ph. D. in Economics, Associate Professor,
Kharkiv National Agrarian University Named after V. V. Dokuchaiev, Ukraine;
e-mail: interstudent@knau.kharkov.ua; ORCID ID: 0000-0001-8048-2537

RISK ASSESSMENT FOR BIOFUEL PROJECTS: PROBLEMS OF METHODOLOGY

Abstract. Excessive use of traditional fuels in various sectors of the economy has led to the problem of exacerbation of environmental problems, rising CO_2 emissions, climate change and so on. Therefore, the share of renewable energy sources, among which biofuels play an important role, has been growing in the last few decades. If the world pays considerable attention to the development of this area of alternative energy, in Ukraine, unfortunately, so far this segment has not found the right place. Agricultural, food and other enterprises are implementing various projects for the operation of production sites for the production of various types of biofuels. This, in turn, reduces the level of dependence on external price fluctuations, untimely supply of traditional fuels to enterprises, caused by seasonality in agricultural activities. However, we must not forget about the high level of risks associated with this area of business (economic) activity. Practical observations show, for the most part, that entrepreneurs (business owners) focus on subjectively-oriented methods of risk assessment, which are based on expert opinions, reducing the importance of objectively-oriented and analytical methods. Despite the obstacles to the development of biofuel production in the world and in Ukraine in particular, scientists are conducting fundamental and applied research in the use of the world's best achievements in the use of mathematical apparatus for the evaluation of investment projects. The use of mathematical methods and models to select an effective risk assessment for biofuel production was no exception. Currently, the risk assessment of these projects takes into account: natural and climatic risks, market prices for primary products or waste products, equipment costs, prices for biofuels compared to traditional types, and so on. The methodological basis of risk assessment is contained in DSTU IEC/ISO 31010: 2013 and IEC/ISO 31010: 2009, which is the basis for the construction and use of business project assessment in various economic activities. The most effective, in terms of risk assessment for biofuel projects, is the introduction of automated information systems in business process modeling. This, in turn, makes it possible to use effective methods, namely: Multiple Imputation, leading indicators, event tree analysis, Value at Risk and correlation-regression analysis methods.

***Keywords*:** biofuels, risks, agriculture, risk assessment, risk assessment methods.
Formulas: 0; fig.: 0; tabl.: 0; bibl.: 21.

ISSN 2306-4994 (print); ISSN 2310-8770 (online)

Галицький О. М.
доктор економічних наук, доцент,
Одеський державний аграрний університет, Україна;
e-mail: oleksandrgalickij9@gmail.com; ORCID ID: 0000-0001-9549-7627
Коляденко С. В.
доктор економічних наук, професор,
Вінницький національний аграрний університет, Україна;
e-mail: koladenko@vsau.vin.ua; ORCID ID: 0000-0001-7670-6905
Лещук Г. В.
доктор економічних наук, доцент,
Прикарпатський національний університет імені Василя Стефаника, Україна;
e-mail: galynaleshuk@gmail.com; ORCID ID: 0000-0003-1625-1536
Поленкова М. В.
кандидат економічних наук, доцент,
Національний університет «Чернігівська політехніка», Україна;
e-mail: m.v.polenkova@gmail.com; ORCID ID: 0000-0003-1571-6792
Герасименко Ю. С.
кандидат економічних наук, доцент,
Харківський національний аграрний університет імені В. В. Докучаєва, Україна;
e-mail: interstudent@knau.kharkov.ua; ORCID ID: 0000-0001-8048-2537

ОЦІНКА РИЗИКІВ ДЛЯ ПРОЄКТІВ ВИРОБНИЦТВА БІОПАЛИВА: ПРОБЛЕМИ МЕТОДОЛОГІЇ

Анотація. Надмірний рівень використання традиційних видів палива в різних галузях економіки призвів до проблеми загострення екологічної проблеми, зростання викидів CO_2, зміни клімату тощо. Тому декілька останніх десятиліть зростає частка відновлювальних джерел енергії, серед яких важлива роль належить біопаливу. Якщо у світі приділяють значну увагу розвиткові цього напряму альтернативної енергетики, то в Україні, нажаль, поки що цей сегмент не знайшов належного місця. Сільськогосподарські, харчові та інші підприємства запроваджують різноманітні проєкти з функціонування виробничих майданчиків з виробництва різноманітних видів біопалив. Це, у свою чергу, знижує рівень залежності від зовнішніх цінових коливань, несвоєчасності поставок традиційних палив на підприємства, що викликано сезонністю в сільськогосподарській діяльності. Однак потрібно не забувати про високий рівень ризиків, супутніх цьому напряму підприємницької (господарської) діяльності. Практичні спостереження свідчать, у своїй більшості, що підприємці (господарники) акцентують увагу на суб'єктивно-орієнтованих методах оцінювання ризиків, в основі яких лежать експертні висновки, знижуючи важливість об'єктивно-орієнтованих та аналітичних методів. Попри перепони розвитку виробництва біопалива у світі та в Україні, зокрема, науковці проводять фундаментальні та прикладні дослідження щодо використання найкращих світових досягнень в області використання математичного апарату для оцінки інвестиційних проєктів. Не стало винятком й використання математичних методів і моделей для вибору ефективної оцінки ризиків для виробництва біопалива. Наразі при оцінці ризиків зазначених проєктів враховуються: природно-кліматичні, ціни на ринку на первинну продукцію або відходи виробництва, вартість обладнання, ціни на біопалива в порівняння з традиційними його видами тощо. Методологічна основа оцінки ризиків міститься в ДСТУ IEC/ISO 31010:2013 та IEC/ISO 31010:2009, що й виступає базою для побудови і використання оцінки бізнес-проєктів у різних видах економічної діяльності. Найбільш ефективним щодо оцінки ризиків для проєктів біопалива є запровадження автоматизованих інформаційних систем при моделюванні бізнес-процесів. Це, у свою чергу, дає можливість використовувати ефективні методи, а саме: Multiple Imputation, випереджаючих індикаторів, дерева подій, Value-at-Risk і методів кореляційно-регресійного аналізу.

***Ключові слова*:** біопаливо, ризики, сільське господарство, оцінка ризиків, методи оцінки ризиків.

Формул: 0; рис.: 0; табл.: 0; бібл.: 21.

Introduction. Biofuels, like other renewable sources, are playing an increasing role in energy production today. The use of biofuels in the overall energy balance of the European Union has reached 7% [1]. However, a more characteristic example for Ukraine can be Latvia, where the share of biofuels in domestic energy consumption is already 28%. Latvia, according to this indicator, occupies a leading position in the EU. Even for the more developed economy of Sweden, this figure is lower than in Latvia — 22%, for Denmark, this figure is 21% [2]. According to statistics, the share of biofuels in domestic energy consumption for Ukraine is 2832 thousand toe, which is only 3.1% of the total [3].

About 90% of the gross production of biofuels in the EU are industrial facilities of three countries — Germany, France, Italy [1; 2]. Therefore, experience, in particular, biofuel production schemes in these countries, are used in other countries. The French scheme is a centralized production of diesel biofuel at large enterprises with a capacity of more than 10,000 tons per year. The German scheme that is more suitable for Ukraine is decentralized biofuel production [2]. Already nowadays, according to the Ministry of Agrarian Policy and Food, there are more than four dozen facilities and plants producing diesel biofuels in Ukraine. At the same time, the volume of biofuel production of small farms is significant and continues to grow. According to state statistics, Ukrainian agricultural owners at low-capacity plants already produce from 50 to 70 thousand tons of diesel biofuel per year [3].

But the implementation of biofuel projects is exposed to risks. Minimizing and, if possible, neutralizing these risks will accelerate the introduction of biofuels, make investing in such production more economically attractive.

Analysis of research and problem statement. Many fundamental works of well-known scientists, both Ukrainian and foreign: Havrysh et al. [4], Nitsenko et al. [5], Jiang et al. [6], Bazaluk et al. [7] etc deal with the problems and risks of biofuel production. The importance of this issue is emphasized even by the number of not only scientific articles, but also fundamental works and monographs on this topic [8—11].

An analysis of the literature and the conclusions of experts with extensive experience in working with business plans for innovative projects in agriculture, revealed that in practice, subjective-oriented methods of risk assessment are mostly used. At the same time, objectively-oriented, analytical methods are the least used in practice [12].

Despite the availability of modern theoretical research on mathematical approaches to risk analysis [12—14], many scientists who study the investment and innovative development of production in general do not analyze the risks that are crucial for this type of business [15].

Unsolved aspects of the problem. Despite the achievements and accomplishments of scientists, a mathematical approach to this issue needs further evaluation and enrichment.

The purpose of the article is modern approaches to the potentially reliable and effective use of mathematical methods for investment with the risks of innovation.

Research results. Provision of Ukrainian agriculture with fuel and lubricants has always been a risk factor. For farms, the impact of environmental changes has always been significant, which can cause a shortage of fuel resources at a time when their availability allows the enterprise to survive. The provision of agricultural labor with fuels and lubricants is influenced by seasonal fluctuations in prices for these materials, logistical problems with their delivery due to weather conditions, and so on.

Moreover, it is a risk not only for the individual farm but also for the village community or even the rural district center. Their lives are closely linked to agricultural production, which requires fuel, and complicated seasonal logistics, seasonal supply prices directly affect the life of the rural community. A certain guarantee against the consequences of this risk would be the production of biofuels directly on site by an agricultural enterprise or a rural community. But the

ISSN 2306-4994 (print); ISSN 2310-8770 (online)

purchase of equipment and the organization of work on the production of biofuels also has certain risks and requires loans. Obtaining loans requires analysis, risk assessment and development of measures to reduce their consequences.

The analysis shows that agricultural holdings, mostly small and medium-sized, diversify their production activities, thus eliminating risks. In our opinion, biofuel production is such a means of leveling risks. This provides an additional source of income, the ability to use their own secondary resources (eg, used sunflower oil), to make universal processing of raw materials (using rapeseed for biodiesel and rapeseed meal as animal feed), to provide a certain energy independence, reduce fuel costs, avoid seasonal growth of fuel prices, create additional jobs, etc.

All these circumstances contribute to the fact that the only way to produce biofuels in Ukraine is to build small plants close to producers of raw materials. Even the proposals of scientists to create a network of diesel biofuel plants with an annual capacity of 10,000 to 20,000 tons are not sufficiently substantiated [16]. The best solution would be to produce diesel biofuel at smaller facilities. This would simplify the use of waste, in particular, cakes for animal feed, the problem of crop rotation (which is easier to do for small sowing plots) and so on. An example of such production is a plant built in the Sarata district of Odessa region with a plan to produce 7,000 tons of biodiesel annually.

The state standard DSTU IEC / ISO 31010: 2013 (IEC/ISO 31010: 2009, IDT) «Risk management. Methods of general risk assessment» (2018) provides a complete list of all methods to be used for risk analysis. A detailed list of risks and methods of their assessment is also given in the international standard IEC / ISO 31010: 2009 «Risk management — Risk assessment techniques» (2018). We will consider the methods of risk analysis given in the specified standards, examples of practical implementation of the specified methods and we will estimate the possibility of their direct application for the solving of the tasks set by us.

In literature there is a description of the introduction of automated information systems (AIS) in business process modeling, in particular [17; 18]. However, analyzing the results of these automated information systems, it is clear that they do not perform the function of modeling business processes taking into account the impact of risks and their consequences, but rather the function of databases and ERP-systems. The use of databases, AIS and ERP-systems for small and medium-sized businesses in agriculture of Ukraine is not yet achievable given the financial and technological capabilities of agricultural producers.

Scientists also recommend the use of the Multiple Imputation method [19; 20]. This is a method based on the Bayesian approach and the Monte Carlo algorithm. The result of this work will be several values of the volume that is searched for. This leads to the formation of an appropriate number of different databases. The obtained results are passed on to experts, who, on their basis, offer their conclusions. Obviously, such a methodology also makes it extremely difficult to use this method in practice.

Scientists consider the method of leading indicators to be more suitable for risk analysis. This method makes it possible to predict the trends of a small set of parameters of economic activity of the organization and ensure a certain consideration of risks and strengthening the competitive position of the enterprise [4; 6; 20; 21]. But so far, no algorithmic variant of the leading indicators method has been proposed, which complicates its application in practice.

It is known about successful examples of risk analysis and their consideration in the models of production resources management of some companies [5; 7; 21] using the method of «event tree». However, this method is also not suitable for its application in order to analyze the feasibility of investing in innovative projects of small and medium-sized agricultural production.

The use of the Value at Risk (VaR) method is also considered to be a promising way to algorithmize risk assessment [4; 9]. The method is widely used in scientific sources so that various modifications have appeared: Conditional VaR (CVaR), Expected Shorfall (ES), Average value at risk (AVaR), Expected tail loss (ETL). This method with a given value of a certain risk for a certain time allows to find the average expected loss. But the specified amount of risk in monetary terms under the condition of this modification of the method should be greater than the corresponding value of VaR under the same conditions [7; 8; 10].

The use of the VaR method has proved its worth in the banking sector to assess the risks of the bank's loan portfolio. It was the VaR method that provided the matrix of attitudes to risk management. But the application of this method for assessing the risks of innovation and investment activities of small and medium-sized agricultural production is not very convenient. The fact is that losses from 100% to 300% of the predicted value of VaR are common [7; 8; 10]. And when a banking institution has certain reserves to withstand such losses, for small and medium-sized farmers it can end in bankruptcy.

The use of methods of correlation-regression analysis, which has become widely used in the formation of mathematical models, can be used, in our opinion, as one of the possible methods for effective implementation of these models, and specific examples of its application prove this [7; 18].

Conclusion. Despite the obstacles to the development of biofuel production in the world and in Ukraine in particular, scientists are conducting fundamental and applied research using the world's best achievements and mathematical apparatus for the evaluation of investment projects. The use of mathematical methods and models to select an effective risk assessment for biofuel production was no exception.

Currently, these projects are taken into account when assessing the risks: natural and climatic ones, market prices for primary products or production waste, equipment costs, prices for biofuels in comparison with those of traditional types, etc. The methodological basis of risk assessment is contained in DSTU IEC / ISO 31010: 2013 and IEC / ISO 31010: 2009, which is the basis for the construction and use of business project assessment in various economic activities.

The most effective, in terms of risk assessment for biofuel projects, is the introduction of automated information systems in business process modeling. This, in turn, makes it possible to use effective methods, namely: Multiple Imputation, leading indicators, event tree analysis, Value at Risk and correlation-regression analysis methods.

The next step will be the practical use for scientific research purposes and substantiation of the choice of technological option for biofuel production.

Література

1. International Energy Agency. Website. 2020. URL : http://www.iea.org/stats/index.asp.
2. EU energy statistical pocketbook and country datasheets. EU Energy in Figures / European Commission. URL : http://ec.europa.eu/energy/observatory/statistics/statistics_en.htm.
3. Енергоспоживання на основі відновлювальних джерел за 2007—2019 роки / Державна служба статистики України. 2020. URL : www.ukrstat.gov.ua.
4. Havrysh V., Nitsenko V., Bilan Yu., Streimikiene D. Assessment of optimal location for a centralized biogas upgrading facility. *Energy & Environment*. 2019. № 3 (30). P. 462—480.
5. Nitsenko V., Mardani A., Streimikis J., Shkrabak I., Klopov I., Novomlynets O., Podolska O. Criteria for Evaluation of Efficiency of Energy Transformation Based on Renewable Energy Sources. *Montenegrin Journal of Economics*. 2018. № 14 (4). P. 253—263.
6. Jiang Y., Havrysh V., Klymchuk O., Nitsenko V., Balezentis T., Streimikiene D. Utilization of Crop Residue for Power Generation: The Case of Ukraine. *Sustainability*. 2019. № 11 (24). P. 7004.
7. Bazaluk O., Havrysh V., Nitsenko V., Baležentis T., Streimikiene D., Tarkhanova E. A. Assessment of Green Methanol Production Potential and Related Economic and Environmental Benefits: The Case of China. *Energies*. 2020. № 13 (12). P. 3113.
8. Калетнік Г. М. Виробництво та використання біопалив. Вінниця : Консоль, 2015.
9. Блюм Я. Б., Гелетуха Г. Г., Григорюк І. П., Дмитрук К. В. Біологічні ресурси і технології виробництва біопалива. Київ : Аграр Медіа Груп. 2010.
10. Agarwal A. K., Agarwal R. A., Gupta T., Ram B. Biofuels: Technology, Challenges and Prospects. Singapore : Singapore Springer Nature Singapore Pte Ltd., 2017.
11. Souza G. M., Victoria R. L., Joly C. A., Verdade L. M. Bioenergy & Sustainability: bridging the gaps. Soa Paulo : SCOPE, 2015.
12. Овчинникова А. В. Оцінювання маркетингових ризиків в інвестиційних проектах на підприємствах альтернативної енергетики : автореф. дис. на здобуття наук. ступеня канд. екон. наук : спец. 08.00.04 «Економіка та управління підприємствами (за видами економічної діяльності)». Київ, 2014.
13. Priesa F., Talebia A., Sandra R., Margaret S., Lemayc A. Risks affecting the biofuels industry: A US and Canadian company perspective. *Energy Policy*. 2016. № 97. P. 93—101.
14. Шевченко Н. Ю. Математична модель прийняття інвестиційних рішень з урахуванням ризику. Структурні зміни у суспільстві та економіці під впливом комунікацій та інформації : матеріали Міжнародної науково-практичної конференції (м. Полтава, 12—13 травня 2016 року) / за ред. М. В. Макарової. Полтава : ПУЕТ, 2016. С. 316—319.
15. Зінькевич Т. С., Долгополова І. А. Стратегічний потенціал альтернативної енергетики в Україні. *Ринок цінних паперів України*. 2016. № 9—10. С. 69—74.

ISSN 2306-4994 (print); ISSN 2310-8770 (online)

16. Концепція цільової комплексної програми наукових досліджень НАН України «Біологічні ресурси і новітні технології біоенергоконверсії» на 2013—2017 рр. Додаток 1 до розпорядження від 20.03.2013 № 189 / Президія НАН України. URL : http://www1.nas.gov.ua/infrastructures/Legaltexts/nas/2013/directions/OpenDocs/130320_189.pdf.
17. Reva N. Logic, Reasoning, Decision-Making. *Future Human Image*. 2018. № 10. P. 76—84.
18. Nitsenko V., Mardani A., Kuksa I., Sudarkina L. Additional opportunities of systematization the marketing research for resource conservation practice. *Management Theory and Studies for Rural Business and Infrastructure Development.* 2018. № 40 (3). P. 361—368.
19. Movchan U. Features of Computer Methods in Political Forecasting. *Ukrainian Policymaker*. 2018. № 3. P. 29—35.
20. Thornley P., Gilbert P. Biofuels: balancing risks and rewards. *Interface Focus*. 2013. Vol. 3. Is. 1.
21. Ніценко В. С., Руденко С. В. Управління ризиками на підприємствах агропродовольчої сфери. *Актуальні проблеми інноваційної економіки*. 2017. № 3. С. 12—21.

Статтю рекомендовано до друку 02.12.2020

References

1. International Energy Agency. (2020). Website. Retrieved from http://www.iea.org/stats/index.asp.
2. European Commission. (n. d.). EU energy statistical pocketbook and country datasheets. EU Energy in Figures. Retrieved from http://ec.europa.eu/energy/observatory/statistics/statistics_en.htm.
3. Derzhavna sluzhba statystyky Ukrainy. (2020). *Enerhospozhyvannia na osnovi vidnovliuvalnykh dzherel za 2007—2019 roky [Energy consumption based on renewable sources for 2007—2019]*. Retrieved from www.ukrstat.gov.ua.
4. Havrysh, V., Nitsenko, V., Bilan, Y., & Streimikiene, D. (2019). Assessment of optimal location for a centralized biogas upgrading facility. *Energy & Environment*, *3* (30), 462—480. https://doi.org/10.1177/0958305X18793110.
5. Nitsenko, V., Mardani, A., Streimikis, J., Shkrabak, I., Klopov, I., Novomlynets, O., & Podolska, O. (2018). Criteria for Evaluation of Efficiency of Energy Transformation Based on Renewable Energy Sources. *Montenegrin Journal of Economics*, *14* (4), 253—263. https://doi.org/10.14254/1800-5845/2018.14-4.17.
6. Jiang, Y., Havrysh, V., Klymchuk, O., Nitsenko, V., Balezentis, T., & Streimikiene, D. (2019). Utilization of Crop Residue for Power Generation: The Case of Ukraine. *Sustainability*, *11* (24), 7004. https://doi.org/10.3390/su11247004.
7. Bazaluk, O., Havrysh, V., Nitsenko, V., Baležentis, T., Streimikiene, D., & Tarkhanova, E.A. (2020). Assessment of Green Methanol Production Potential and Related Economic and Environmental Benefits: The Case of China. *Energies, 13* (12), 3113. https://doi.org/10.3390/en13123113.
8. Kaletnik, H. M. (2015). *Vyrobnytstvo ta vykorystannia biopalyv [Production and use of biofuels]*. Vinnytsia: Konsol [in Ukrainian].
9. Blium, Ya. B., Heletukha, H. H., Hryhoriuk, I. P., & Dmytruk, K. V. (2010). *Biolohichni resursy i tekhnolohii vyrobnytstva biopalyva [Biological resources and technologies of biofuel production]*. Kyiv : Ahrar Media Hrup [in Ukrainian].
10. Agarwal, A. K., Agarwal, R. A., Gupta, T., & Ram, B. (2017). *Biofuels: Technology, Challenges and Prospects.* Singapore: Singapore Springer Nature Singapore Pte Ltd. https://doi.org/10.1007/978-981-10-3791-7.
11. Souza, G. M., Victoria, R. L., Joly, C. A., & Verdade, L. M. (2015). *Bioenergy & Sustainability: bridging the gaps*. Soa Paulo: SCOPE.
12. Ovchynnykova, A. V. (2014). Otsiniuvannia marketynhovykh ryzykiv v investytsiinykh proektakh na pidpryiemstvakh alternatyvnoi enerhetyky [Estimation of marketing risks in investment projects at alternative energy enterprises]. *Extended abstract of candidate's thesis*. Kyiv.
13. Priesa, F., Talebia, A., Sandra, R., Margaret, S., & Lemayc, A. (2016). Risks affecting the biofuels industry: A US and Canadian company perspective. *Energy Policy, 97*, 93—101. https://doi.org/10.1016/j.enpol.2016.07.006.
14. Shevchenko, N. Yu. (2016). Matematychna model pryiniattia investytsiinykh rishen z urakhuvanniam ryzyku [Mathematical model of investment decision making taking into account risk]. *Strukturni zminy u suspilstvi ta ekonomitsi pid vplyvom komunikatsii ta informatsii: materialy Mizhnarodnoi naukovo-praktychnoi konferentsii (m. Poltava, 12—13 travnia 2016 roku) — Structural changes in society and economy under the influence of communications and information: materials of the International scientific-practical conference (Poltava, May 12—13, 2016).* M. V. Makarova (Ed.). (pp. 316—319). Poltava: PUET [in Ukrainian].
15. Zinkevych, T. S., & Dolhopolova, I. A. (2016). Stratehichnyi potentsial alternatyvnoi enerhetyky v Ukraini [Strategic potential of alternative energy in Ukraine]. *Rynok tsinnykh paperiv Ukrainy — Ukrainian Securities Market, 9—10*, 69—74 [in Ukrainian].
16. Prezydiia NAN Ukrainy. (2013). *Kontseptsiia tsilovoi kompleksnoi prohramy naukovykh doslidzhen NAN Ukrainy «Biolohichni resursy i novitni tekhnolohii bioenerhokonversii» na 2013—2017 rr. Dodatok 1 do rozporiadzhennia vid 20.03.2013 №189 [The concept of the target comprehensive research program of the NAS of Ukraine «Biological resources and the latest technologies of bioenergy conversion» for 2013—2017. Annex 1 to the order of 20.03.2013 № 189]*. Retrieved from http://www1.nas.gov.ua/infrastructures/Legaltexts/nas/2013/directions/OpenDocs/130320_189.pdf [in Ukrainian].
17. Reva, N. (2018). Logic, Reasoning, Decision-Making. *Future Human Image, 10*, 76—84. https://doi.org/10.29202/fhi/10/8.
18. Nitsenko, V., Mardani, A., Kuksa, I., & Sudarkina, L. (2018). Additional opportunities of systematization the marketing research for resource conservation practice. *Management Theory and Studies for Rural Business and Infrastructure Development, 40* (3), 361—368. https://doi.org/10.15544/mts.2018.34.
19. Movchan, U. (2018). Features of Computer Methods in Political Forecasting. *Ukrainian Policymaker, 3*, 29—35. https://doi.org/10.29202/up/3/4.
20. Thornley, P., & Gilbert, P. (2013). Biofuels: balancing risks and rewards. *Interface Focus, 3,* 1. https://doi.org/10.1098/rsfs.2012.0040.
21. Nitsenko, V. S., & Rudenko, S. V. (2017). Upravlinnia ryzykamy na pidpryiemstvakh ahroprodovolchoi sfery [Risk management in agri-food enterprises]. *Aktualni problemy innovatsiinoi ekonomiky — Actual Problems of Innovative Economy, 3*, 12—21.

The article is recommended for printing 02.12.2020