AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

JEL: Q410, Q420

Nataliia Stativka[1], Nataliia Lialina[2]

[1]Kharkiv Regional Institute of Public Administration
of National Academy of Public Administration under the President of Ukraine
[2]Kharkiv National Agrarian University named after V. V. Dokuchaev
Ukraine

FORMATION OF THE ORGANIZATIONAL-ECONOMIC MECHANISM OF AGRICULTURAL ENTERPRISES ENERGY EFFICIENCY

The purpose of the article – the deepening of the theoretical positions of the energy efficiency by studying of the organizational-economic mechanism of its provision in the agricultural enterprises, the definition of its main components. Improving the efficiency of the domestic economy is a crucial macroeconomic challenge that requires a systematic approach to strategic management processes, energy efficiency, energy saving. The article deals with the organizational-economic mechanism of energy efficiency assurance of agricultural enterprises, that will contribute to raising its level of competitiveness, sustainability and protection of the natural environment, the increase in the social component of the enterprise, region, state. The main components of the proposed mechanism are specified: the factors and components that should be considered when establishing a mechanism of energy efficiency assurance; energy saving assurance; state regulation of the national economy in the field of building energy efficiency, particularly in agriculture.

Key words: *organizational-economic mechanism, energy efficiency, energy saving, fuel energy resources, renewable energy sources, systemic approach.*

Introduction and review of literature. At this stage of development of market relations, the issue of energy efficiency in Ukrainian agriculture is extremely important. On its solution depends not only the economic security of agricultural enterprises, but also industrial enterprises and complexes, as well as effectiveness of the implementation of strategies of socio-economic development of the state.

An important direction of improving the energy efficiency is to increase energy saving. Its importance is confirmed by the orientation of the state policy in all advanced countries of the world. The level of energy dependence of Ukraine is close to the average European level and has a tendency to decrease (from 61.7 % in 2005 to 51.9 % in 2009 and up to 41.8 % in 2014), but it is characterized by the lack of diversification of sources of energy supply, especially oil, natural gas. At the same time, efficient use of fuel and energy resources in our country is very low, and the energy intensity of gross domestic product about 1.35 times higher than the average level in CIS countries (0.359 kg s.f./USD), 2.5 times higher than the global average (0.192 kg s.f./USD), and 3.39 times higher than the level in European countries (0.139 kg s. f./USD) as of 2015 [1].

Especially sharply this problem arises in the agro-industrial complex (AIC), in particular in agriculture. Ukrainian commodity producers on a unit of production in crop and livestock spend in 2–3 times more energy than abroad. And that's assuming

that agricultural enterprises do not only consume energy, but also can participate in its production.

The functioning of the agro-industrial complex in such conditions, using outdated technology, equipment and economic management principles, becomes problematic. Inefficient use of energy resources leads to a decrease in competitiveness, a decrease in the volume of current assets of agricultural enterprises, making investments in the renewal of the machine and tractor fleet more difficult, as well as the introduction of new technologies of cultivation and processing of agricultural products [2].

That is why the energy efficiency of agricultural enterprises requires the formation and implementation of effective organizational and economic mechanism of its providing.

Problems of increasing energy efficiency and ensuring energy saving of industrial enterprises, reduction of energy consumption and energy intensity of the economy, energy security, public policy of energy saving of the country was studied in the works by M. V. Afanasyev [3], V. V. Dzhedzhula [4], I. Ya Ippolitova [5], V. I. Krylenko, V. P. Kupchak [6], T. I. Salashenko [7], etc., including in agriculture, they were considered by J. Vítor [8], N. Kh. Hrabak [9], O. M. Korol [10], F. Rilong, L. Boqiang [11] V. V. Sereda, L. A. Fedorus [12], I. V. Stoyanenko [13], R. M. Sheludko [14], T. Svetlanská, N. Turčeková, I. Adamičková [15], V. Tkachuk, N. Kravchuk, O. Kilnitska, K. Shevchuk [16], etc. However, still the question of formation of organizational-economic mechanism of energy efficiency, determination of its key components in the agricultural enterprises is not sufficiently solved.

The purpose of the article – the deepening of the theoretical positions of the energy efficiency by studying of the organizational-economic mechanism of its provision in the agricultural enterprises, the definition of its main components.

Results and discussion. For the agricultural sector there is its own model of energy provision. The system of energy consumption in agriculture is brought about by several unique features: the use of the ground and of living organisms, the dependence on climatic conditions, seasonality of production, organizational and economic features. In addition, these characteristics are of different origin, intensity, type of action and, accordingly, cause the demand of agricultural enterprises for energy resources.

A characteristic feature of agricultural production (especially crop production) is its mobile nature, that is the need for constant movement of working machines and mechanisms in the work process, due to the significant spatial distance of the objects of labor that affects the nature of energy transfer. That is why almost 80% of generating capacity is represented by mobile power tools: tractors, vehicles and self-propelled harvesters. The smallest share among them is referred to the engines of combine harvesters and self-propelled machines.

Unfortunately, in the agricultural enterprises, there is no such kind of capacity as equipment for the production of renewable energy, which indicates the short-sightedness of management and lack of managerial decisions aimed at laying a strong

base for ensuring the future development of the industry and the realization of the potential of hidden reserves in agriculture [14].

In modern conditions of managing agriculture should be considered as one of the priorities of the country development as a complex system, that in the process of its operation can provide multi-faceted effect on the development of Ukraine. The main aspects are highlighted in Fig. 1.

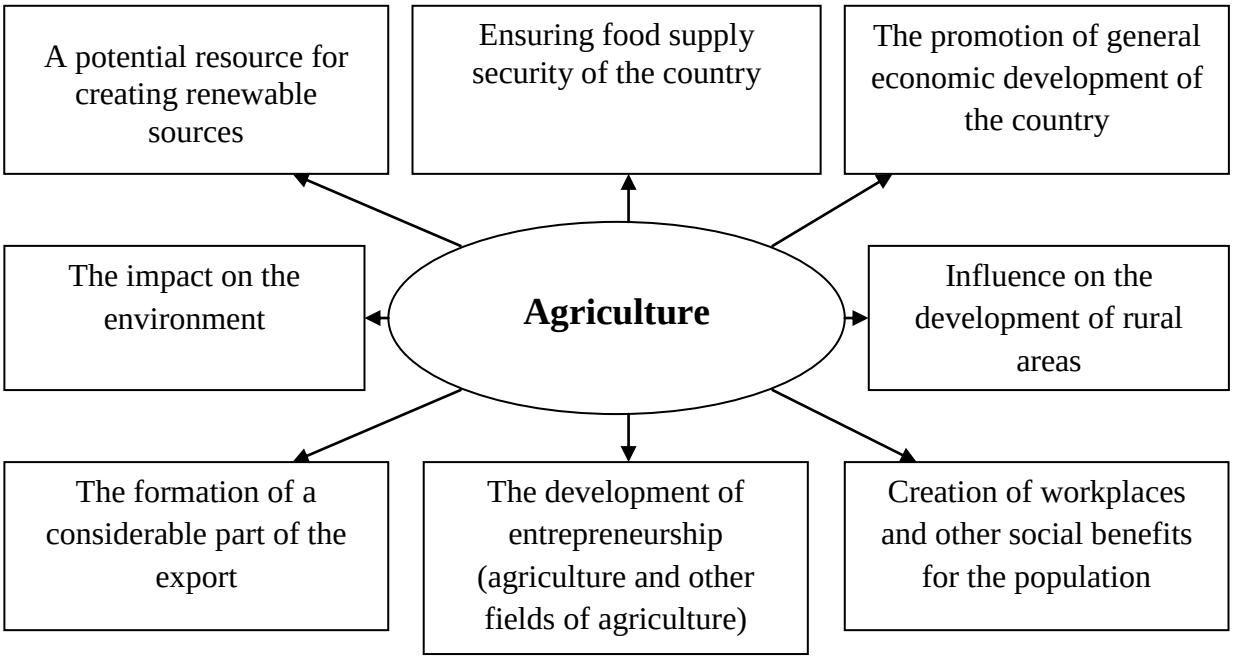

Fig. 1. The role of agriculture in the development of the state

Source: [17].

Today we need to take a new look at the strategic directions of development of agriculture, namely not only from the point of view of creating the necessary food, but also from the point of view of social, environmental and energy security of the country (potential resource to generate renewable sources).

No less important for understanding the specificity of agriculture is the distribution of tractors by type of suspension mechanism. The bulk of the tractors is wheel, and their share from year to year decreases, consequently the specific weight of the crawler tractors that regarding the transition to resource-saving technologies, is a rather negative phenomenon, because the creation of a favorable environment for the growth of plants in terms of minimum and zero cultivation requires careful attention to the soil in the context of its seal. The set of power capacity, formed in agricultural enterprises largely determines the volume and structure of consumption of fuel and energy resources (FER) [14].

Realizing the importance of the problem of reducing the share of costs of fuel and energy resources in the cost structure of goods and services, the state is making some positive steps towards ensuring energy efficiency. However, the proportion of renewable energy sources (RES) in the structure of fuel and energy balance (FEB) of Ukraine is less than 1 %.

The high energy intensity of the economy primarily has an impact on the

increase in costs of non-renewable natural fuel resources, especially hydrocarbons FER. In terms of increased development costs of new fields of FER in the long term this may adversely affect the development of the economy. In addition to the economic damage arising from low competitiveness of domestic producers on the domestic and international markets, it contributes to the formation of significant additional volume of greenhouse gas emissions and harmful substances in the environment [18].

At the same time, the potential use of renewable energy sources in Ukraine, according to experts, is 81 mln tons per year, which will provide replacement of 70.44 bln cubic meters of natural gas (Table 1).

Table 1

The potential for the development of renewable energy sources in Ukraine

The type of energy	Annual technically achievable potential		Annual replacement of natural gas
	bln kWh-year	mln tons s. f.	bln cubic metres
Wind energy	41.7	15.0	13.04
Solar energy	28.8	6.0	5.22
Geothermal energy	105.1	12.0	10.43
Bioenergy	27.7	10.0	8.70
Hydropower	162.8	20.0	17.40
Environment energy	154.7	18.0	15.65
Total	520.8	81.0	70.44

Source: [19].

One of the main reasons for underutilization of available reserve potential of energy saving is the lack of effective organizational and economic mechanism of ensuring the energy efficiency of enterprises.

Improving the efficiency of the domestic economy is a crucial macroeconomic challenge that requires a systematic approach to strategic management processes, energy efficiency, energy saving. Studies have shown that in most regions this approach is not used. The introduction and use of resource-saving and energy-saving technologies should be linked to strategies for socio-economic development of regions of Ukraine and must be regarded in the creation of strategic development plans of individual enterprises and industries. In practice, however, most of worked out strategic programs of development of regions do not even contain sections on energy saving. This is due to the lack of a systematic approach to the solution of problems of organization of investment activity in the field of energy efficiency and, consequently, the competitiveness of the economy of the regions [6].

The proposed model of the organizational-economic mechanism of efficiency of agricultural enterprises (Fig. 2) involves the use of a systematic approach to the development of energy conservation policy and management strategy energy efficiency and contains the following components:

- factors affecting the mechanism of energy efficiency;
- components that should be considered when establishing a mechanism to ensure energy efficiency;

- energy efficiency assurance;
- state regulation in the sphere of energy saving of the national economy, particularly in agriculture.

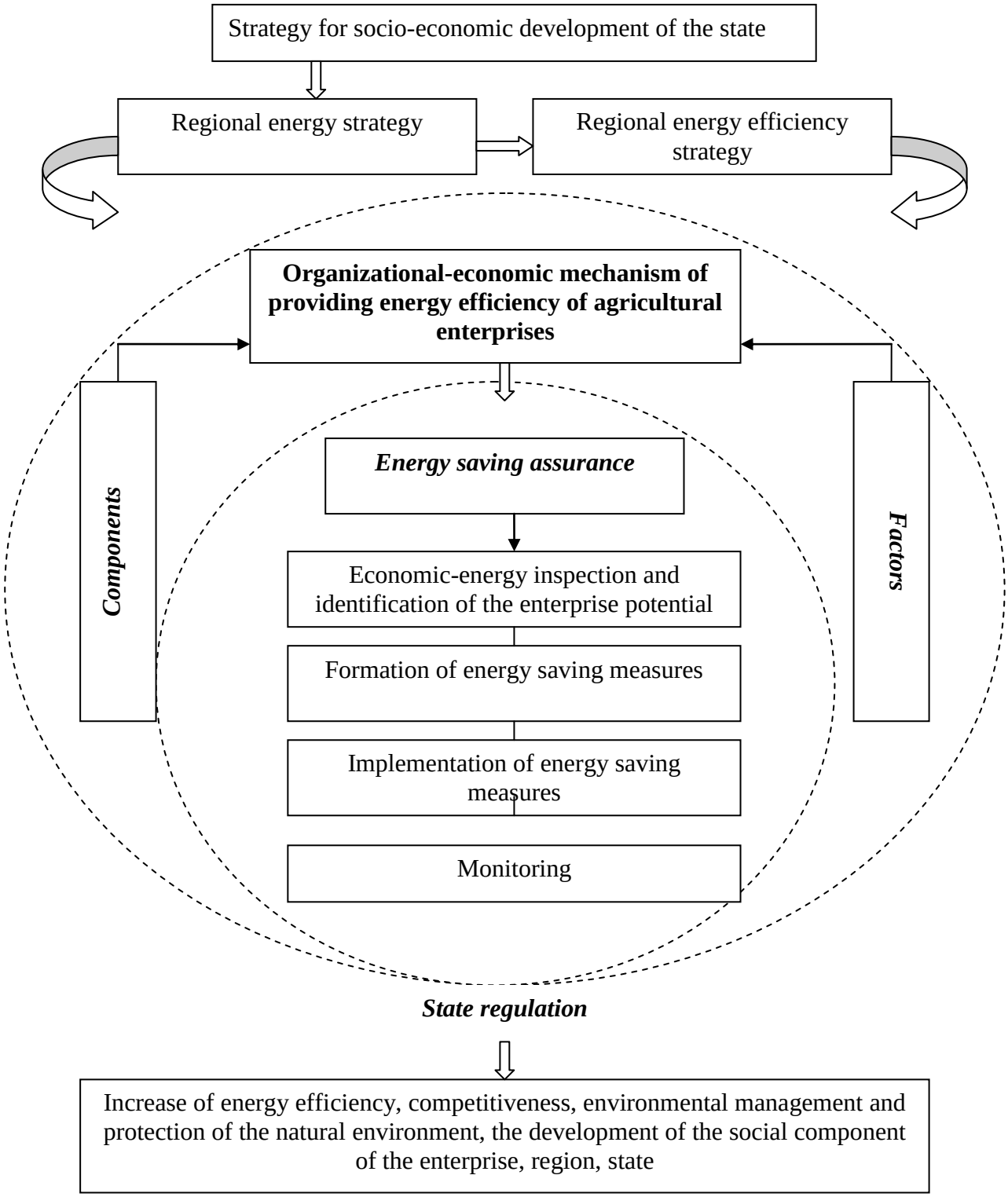

Fig. 2. The mechanism of energy efficiency of agricultural enterprises

Source: compiled by the author based on [4; 5; 6; 20].

The factors for the formation of the mechanism of efficiency of agricultural enterprises include: organizational, structural, technological, economic,

administrative.

Components that should be considered when establishing a mechanism to ensure the efficiency of activity of agricultural enterprises: principles, objectives, methods, tools, organizational structure, personnel, information.

Energy efficiency assurance involves the use of a system of interrelated and mutually reinforcing measures, which include:

- economic-energy research of the enterprise and determination of its energy saving potential;
- formation of energy saving measures;
- implementation of energy saving measures;
- monitoring of the enterprise condition.

Economic-energy research of the enterprise and determination of its energy saving potential involves: the analysis of the organizational and economic parameters of the enterprise; capacity and characteristics of the human, material and financial resources of the enterprise; enterprise management systems; study of the actual level of energy consumption; study of the basic and auxiliary production processes; calculation of energy intensity of products; identifying areas of energy loss; the study of potential energy; identification of the ways of redistributing recycled energy; drawing up energy balances.

The formation of the energy saving measures include: economic measures (the analysis of the dynamics of energy consumption; identification of energy intensity of production, identification of untapped reserves of energy efficiency); organizational measures (replacement of single-function machines with combined multi-functional ones; development and application in the construction of tractors, combines the internal combustion engines with low specific fuel consumption per unit of power; maintenance of internal combustion engines in good technical condition; creating objects for the production and distribution of agricultural use of biological fuels to replace traditional types of energy sources; replacement of incandescent light bulbs with energy efficient bulbs in lighting systems, domestic and industrial premises); technical measures (rational acquisition of the tractors; completing of machine-tractor fleet of the agricultural units according to technology and volume of mechanized work that will ensure the intensive use of machines and tools during the field period; the on-farm use of agricultural machinery); agro-technological measures (the increase of potential yield of agricultural crops; minimizing the depth of tillage to a level that does not reduce yield).

Implementation of energy efficiency measures requires: the elimination of direct costs; liability for irrational use of resources; transfer of production to alternative and responsible sources of energy; achievement of optimal modes of operation and loading of equipment; modernization of particular parts of production by replacing obsolete and inefficient equipment; improvement of control and accounting over energy resources.

Monitoring of the state of the enterprise involves: formation of service of power management and control over the observance of energy saving measures.

State regulation of the national economy in the field of building energy efficiency, particularly in agriculture, should be implemented in the following areas: full or partial covering of costs of the implementation of resource- and energy-saving developments; preferential crediting and the taxation of resource- and energy-saving production, and projects; financing of scientific research and development in resource- and energy-saving.

Conclusions. In the result of the conducted research it was grounded the organizational-economic mechanism of energy efficiency assurance of agricultural enterprises and its main components were identified: the factors and components that should be considered when establishing a mechanism of energy efficiency assurance; energy saving assurance; state regulation of the national economy in the field of building energy efficiency, particularly in agriculture. Energy efficiency assurance involves the use of a system of interrelated and mutually reinforcing measures, which include: economic-energy research of the enterprise and determination of its energy saving potential; formation of energy saving measures; implementation of energy saving measures; monitoring of the enterprise condition.

The proposed mechanism will improve the energy efficiency, competitiveness, environmental management and protection of the natural environment, the improvement of social component of the enterprise, region, state.

Prospects of further researches will be focused on the methodology of estimation of energy efficiency in agriculture taking into account the specifics of the industry.

References

1. The international Energy Agency (2014), Energy efficiency indicators: fundamentals of statistics, available at: http://www.iea.org/publications/freepublications/ publication/ energy-efficiency-indicators-essentials-for-policy-making-russian-version.html.

2. Stavnichuk, K. (2012), Energy efficiency of agro-industrial complex. *Energosberezhenie*, vol. 4 (150), pp. 4–5.

3. Afanasyev, M. V. (2014), *Stratehia pidvyshchennia enerhoefektyvnosti promyslovosti rehionu: teoretyko-metodychni aspekty formuvannia* [The strategy of increasing the efficiency of industry of the region: theoretical and methodical aspects of forming], KhNEU, Kharkiv, Ukraine.

4. Dzhedzhula, V. V. (2013), Formation of the organizational-economic mechanism of increase of efficiency of industrial enterprises. *Ekonomichnyi analiz*, vol. 12, no. 3. pp. 116–118.

5. Ippolitova, I. Ya. and Storozhenko, K. S. (2015), Formation of the organizational-economic mechanism of energy saving at the enterprise. *Global and National Problems of Economy*, vol. 8, pp. 406–411.

6. Krylenko, V. I. and Kupchak, V. R. (2016), Methodological basis of strategic management of energy efficiency in regional economic complexes. *Visnyk KhNAU, Ekonomichni nauky*, no. 1, pp. 309–322.

7. Salashenko, T. I. (2012), Strategic map as a tool for operationalization of the

strategy of energy efficiency of industry in the region. *Economics of development*, no. 1 (61), pp. 19–23.

8. Vítor, J. (2016), Energy consumption across European Union farms: Efficiency in terms of farming output and utilized agricultural area. *Energy*, vol. 103, pp. 543–556. https://doi.org/10.1016/j.energy.2016.03.017.

9. Hrabak, N. Kh. (2010), The problem of energy saving in agricultural sector of Ukraine and ways of its solution. *Ekolohiya. Naukovi pratsi*, vol. 150, no. 138, pp. 83–89.

10. Korol, O. M. (2012), The energy efficiency of the agrarian sector of the world economy. *Zovnishnia torhivlia: ekonomika, finansy, pravo*, no. 6, pp. 59–64.

11. Rilong, F. and Boqiang, L. (2016), Energy efficiency and production technology heterogeneity in China's agricultural sector: A meta-frontier approach. *Technological Forecasting and Social Change*, vol. 109, pp. 25–34. https://doi.org/10.1016/j.techfore.2016.05.012.

12. Sereda, O. V. and Fedorus, L. A. (2016), Renewable energy as a promising direction for sustainable development of rural territories. *Ekonomichnyi forum*, pp. 145–151.

13. Stoyanenko, I. V. (2016), Management of resource and energy saving in agriculture complex. *Molodyi vchenyi*, no. 7(34), pp. 135–141.

14. Sheludko, R. M. and Synytsi, O. S. (2015), Characteristics of energy supply of agricultural enterprises of Zaporizhzhya region. *Biznes inform*, no. 1, pp. 183–189.

15. Tkachuk, V., Kravchuk, N., Kilnitska, O. and Shevchuk, K. (2016), Energy efficiency and conservation as a strategic vision of the agricultural entities' competitiveness increasing. *Economic Annals-XXI*, no. 160 (7–8), pp. 71–76 https://doi.org/10.21003/ea.V160-14.

16. Svetlanská, T., Turčeková, N. and Adamičková, I. (2015), Efficiency of Biomass Production – Methodological approaches. *Visegrad Journal on Bioeconomy and Sustainable Development*, vol. 4, no. 1, pp. 2–6. https://doi.org/10.1515/vjbsd-2015-0001.

17. Yakubiv, V. M. (2013), Energy saving potential in the system of development of agriculture of Ukraine. *Problemy ekonomiky*, no. 1, pp. 57–61.

18. Lapko, O. O. (2000), State regulation of innovative activity: economic mechanism and its improvement, Abstract of Ph. D. dissertation, The organization of management, planning and regulation of economy, Institute of Economic Forecasting of NAS of Ukraine, Kyiv, Ukraine.

19. Havkalova, N. L. and Shumska, H. M. (2011), Energy supply and energy saving: problems and ways of their solution. *Problemy ekonomiky*, no. 1, pp. 47–49.

20. Abazina, O. A. (2016), The formation mechanism of energy efficiency activities in the industrial aviation enterprises. *Global and National Problems of Economy*, no. 12, pp. 193–196.

How to cite this article? Як цитувати цю статтю?

Стиль – ДСТУ:

Stativka N. Formation of the organizational-economic mechanism of agricultural enterprises energy efficiency [Electronic resource] / N. Stativka, N. Lialina // Agricultural and Resource Economics : International Scientific E-Journal. – 2017. – Vol. 3. – No. 2. – P. 56–64. – Mode of access : www.are-journal.com.

Style – Harvard:

Stativka, N. and Lialina. N. (2017), Formation of the organizational-economic mechanism of agricultural enterprises energy efficiency. *Agricultural and Resource Economics: International Scientific E-Journal*, [Online], vol. 3, no. 2, pp. 56–64, available at: www.are-journal.com.