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Human Factor in the Creation and Development of Energy Independent and Energy Efficient Rural Settlements

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Abstract:

The author's approach as to the impact of human factor on the possibility to create and develop energy efficiency of villages, providing their energy independence of difficult situation with conventional energy sources in Ukraine has been suggested in the article. The calculation of human development index in the agrarian sector of the Ukrainian economy during 2010-2017 has been conducted which enabled to reveal the negative tendency as to decreasing the level of employees' education. It has been determined that the human development index and the human development index of the Ukrainian economy's agrarian sector are within the average level with the slight positive dynamics of growth. It has been emphasized that under these conditions receiving higher education is a priority task both for each employee and for agricultural enterprises, which must contribute to the improvement of their employees' qualification level and training new professions. The model of the impact of educational level of employees in the agrarian sector of the economy on energy efficiency has been presented, taking into account the promising directions of energy independence and energy efficiency development of rural settlements.

Keywords: human development; rural settlements; agrarian sector; agricultural production; energy efficiency; energy independence.

JEL Classification: J24; O15; Q01; Q56; Q57.

Introduction

At present Ukraine is one of the most energy inefficient countries in the world because of high energy expenditure, since almost all energy consumption is ensured by fossil fuel, most of which is imported. Due to the global tendencies of increasing the cost of power sources together with large energy wastes and excessive dependence on imported fossil fuel, the country's economy is very vulnerable, which reduces the level of its competitiveness. In this connection, Western countries implement the policy of power resources' saving and search for new sources of energy.

Thus, Ukraine must also implement a systemic approach to energy saving and energy efficiency. Therefore, reducing the consumption of conventional fuels (especially natural gas), stimulating energy saving, diversifying the supply of energy sources, introducing energy efficient techniques and technologies, developing the using of local alternative energy sources and also solving important environmental problems are important objectives at the national level (Yasnolob 2018).

Under such conditions, in our opinion, the Ukrainian way to success will start from the social awareness that energy efficiency is not just a condition of the country's economic development. This is the indicator of the state's self-sufficiency and marker of its readiness to be at the forefront of innovation development, attract the technologies of the future and benefit from them. First of all, it concerns the most vulnerable objects - rural territories, on the basis of which energy independent and energy efficient villages have to be created on the principles of sustainable development of the economy's agrarian sector. However, under the conditions of political and economic instability, the processes of growing some branches and declining others take place, which somehow affect the process. So, in order to plan measures concerning the creation and development of energy independence and energy efficiency of settlements it is necessary to have the instruments for assessing various components of their potential. In our opinion, it is expedient to conduct such evaluation taking into account Human Development Index in the agrarian sector of the economy.

1. Research Background

The papers of such scholars as: Libanova Ye.M., Vlasenko N.S., Vlasiuk O.S. (Libanova 2002), Mudra O.V. (2011), Nazarko S. O. (2009), Radchenko L.P. (2011), and others are devoted to the research of the impact of human development at the macro- and micro-levels. At the same time, the questions as to using human development index in agrarian sector of the economy aimed at creating and developing energy independent and energy efficient settlements in Ukraine at present have not been sufficiently developed, which determines the urgency of our research.

2. Methodology

The methodological basis of the research are the following scientific methods: theoretical search and abstract-logical (to characterize the content of the Human Development Index components), analysis and synthesis (to identify the relationship and peculiarities between the structural elements of indicators), comparison (to compare the human development index in the agrarian sector of the economy during the period of research), modeling (to build the directions of energy independence and energy efficiency development in rural settlements).

The purpose of the research is to substantiate the role of the human factor in the creation and development of energy independent and energy efficient settlements by calculating the human development index in the agrarian sector of Ukraine, define problem questions and solutions.

3. Results and Discussion

It should be mentioned that the territorial location of villages, is, first of all based on the compliance of natural-climatic conditions and the development of the corresponding sectors of agro-industrial complex, which envisages scientifically-substantiated agro-ecological zoning. However, the relevant concept is currently at the stage of formation and implementation, only its separate components have been developed.

We agree with the viewpoint of O.O. Zhuchenko that, being one of the main components of the adaptive strategy of intensification of agriculture, agro-ecological zoning approach is based on the synthesis of the results of basic and applied research. As according to the adaptive concept agricultural production is considered as a component of rational nature management, and agro-ecosystems and agricultural landscapes as part of the biosphere, there is logical necessity and the need to use already cognized fundamental laws of nature in the process of the territory agro-ecological zoning (Zhuchenko 2004).

At the same time, in our opinion, in order to create and develop energy independent and energy efficient settlements it is expedient to determine its intellectual component, which is determined by the Human

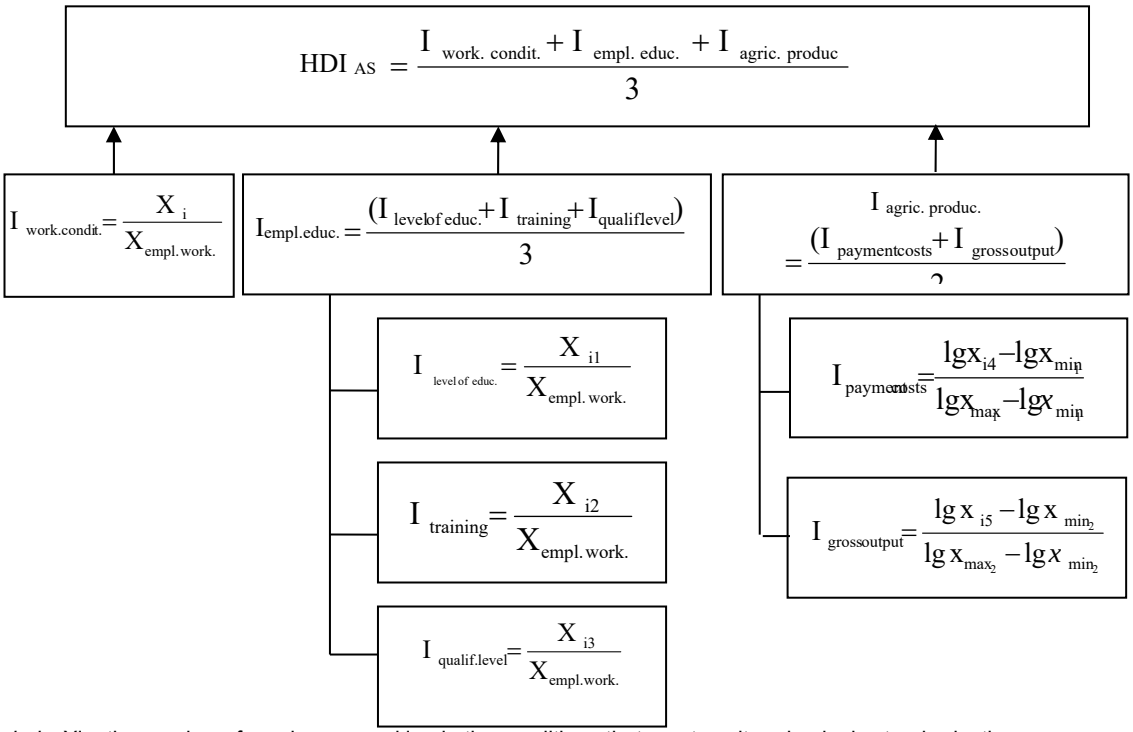
Development Index at the macro level. This index (hereinafter HDI) enables to make comparative analysis concerning 189 countries of the world by calculating three indices: to live a long and healthy life (the measurement – longevity); acquire, expand and update knowledge (the measurement – education); have access to the means of life, which ensure a decent standard of living (the measurement – material living standards) (International 2018).

At the regional level the regional human development index is used in Ukraine, based on the calculation of 33 indices grouped into 6 blocks according to the main aspects of human development, such as reproduction of the population; social status; comfortable life; well-being; decent work; education (The Methods 2018).

We have developed the human development index in the agrarian sector of the economy (hereinafter HDI AS), which consists of three partial indices (Figure 1) and shows how much it is necessary to do in order to achieve certain goals (Chayka 2004):

1) proper and safe working conditions;
2) a high level of employees' education;
3) a sufficient level of material living standards and labor productivity.

Figure 1. The calculation methods of HDI AS



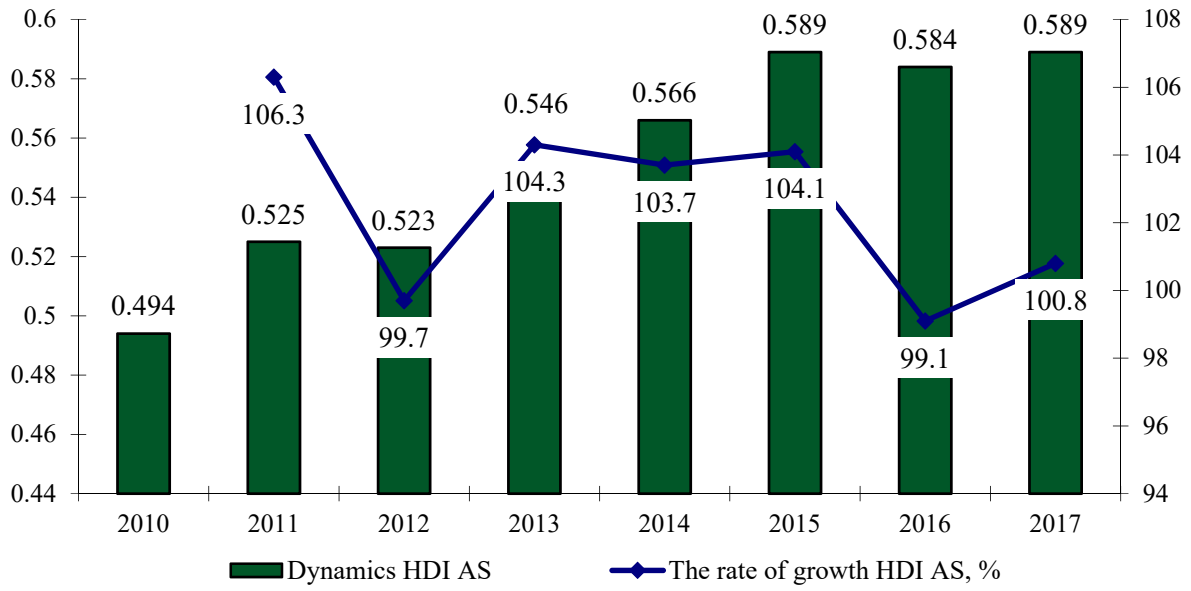
Symbols: Xi – the number of employees working in the conditions that meet sanitary-hygienic standards, thou. persons;
X empl. work. – the number of employees who work in the agrarian sector of the economy;
Xi1, Xi2, Xi3 - the part of employees having complete, incomplete, and basic higher education (mastered new professions or underwent advanced training, respectively) thou. persons;
X regular work. – the number of regular employees, thou. persons;
Xi4, Xi5 – labor payment costs (gross output) in the agrarian sector of the economy per 1 employee;
x_{max_1}, x_{max_2} – the upper bound of labor payment costs (gross output) in other sectors of the economy per 1 employee;
x_{min_1}, x_{min_2}, X min – the lower bound of labor payment costs (gross output) in other sectors of the economy per 1 worker.
Source: data (Chayka 2004)

As a rule, the indices of human development in the agrarian sector also include other indicators, however, in our opinion, using the suggested methods, the calculation of HDI AS will enable to: assess objectively the conditions of development of the people working in it; develop social-economic and innovation development strategies in agrarian sector in order to establish a direct link between innovation development indices and the level of employees' material well-being. The working out of social-economic and innovative strategies that will be based on HDI AS calculations will enable not only to develop the social-economic and innovation strategy for the

agrarian sector, but also to control the degree of their implementation, to conduct the correction of current plans and innovative development of the agrarian sector on the whole.

According to the data of the State Statistics Service of Ukraine, we calculated the HDI AS for Ukraine (Figure 2).

Figure. 2. Dynamics of Human Development Index in the agrarian sector of Ukraine's economy, 2010-2017.



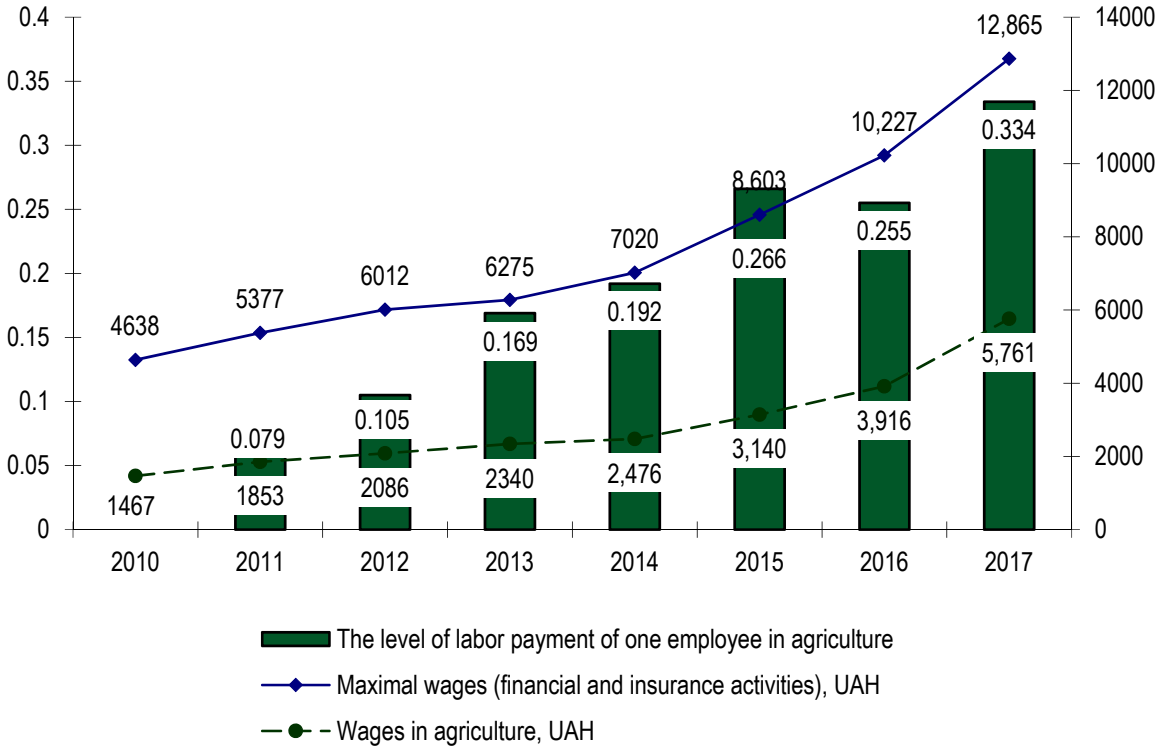
Notes:

1) to calculate HDI $_{AS}$ of Ukraine in 2010-2017 the upper bound of labor payment in financial activities was used, while the lower bound – in the postal and express delivery activities;
2) the upper bound of gross output in the processing industry was used for calculations, and the lower bound - in art, sports, entertainment, and recreation.
Source: calculated and made according to the State Statistics Service of Ukraine [10]

Taking into account the classification levels as to HDIAS of Ukraine it can be mentioned that it ensures the average level of development because it is in the range of from 0.500 to 0.799, but it has a slight tendency to increasing. However, in 2012 and 2016 the insignificant decrease of this index can be noticed, which is due to decreasing the level of agricultural products per 1 employee, because gross added value increased in processing industry and in the sectors of "Art, sports, entertainment, and recreation" (in 2012 by 12.4% and 35.8%, and in 2016 by 23.2% and 19.8% correspondingly), while in agriculture it grew only by 3.0% and 16.4% respectively during the same years.

The index of labor payment level per 1 employee in Ukraine is characterized by positive dynamics, which indicates the increase of employees' labor payment costs in agriculture by 3.9 times (in financial and insurance activities – by 2.8 times). At the same time, the average wages for this type of economic activity is only 44.8% of the highest level in financial activity, which is confirmed by the low value of labor payment level index of one employee – 0.334 (see Figure 3).

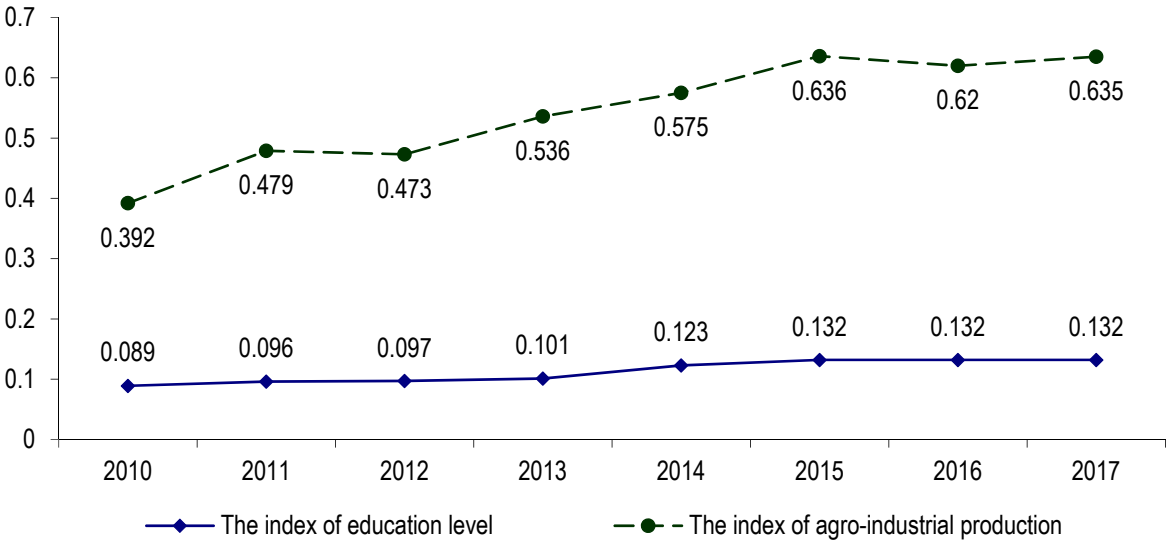
Figure. 3. The dynamics of labor payment level and wages in agriculture of Ukraine, 2010-2017



Source: calculated and made according to the State Statistics Service of Ukraine (The Publication, 2018)

At the same time, the level of employees' education in agriculture tends to growing; in 2017 it increased by 51.9% as compared with 2010, but the total number of regular employees during this period decreased by 39.8%. Moreover, the number of regular employees, who mastered new professions and upgraded skills, decreased by 42%, which indicates the lack of interest in improving the qualification level by employees. The level of basic and full higher education of employees in agriculture decreased by 8.5%, which, provided a significant reduction of regular employees, did not result in decreasing the education level (see Figure 4).

Figure 4. The dynamics of labor conditions and the level of employees' education indices in agriculture of Ukraine during 2010-2017



Source: calculated and made according to the State Statistics Service of Ukraine (The Publication, 2018)

Thus, according to each calculated partial index and the corresponding indicator, the directions of improving social-economic strategy in the agrarian sector of the economy can be determined. So, each of the indices of the education level of regular employees shows their low level of development:

1) the level of education increased from 0.248 in 2010 to 0.377 in 2017;

2) the proportion of regular employees who mastered new professions in 2017 decreased by 9.4 times as compared with 2010, and it made only 0.0013;

3) the proportion of regular employees who upgraded their qualification in 2017 increased by 1.16 times as compared with the level in 2010, and it made 0.16.

The index of labor conditions – 1.0 is rather high, which is a positive factor. However, in our opinion, it is somewhat relative, as it is calculated only according to the index of labor conditions' conformity with sanitary-hygienic standards. To ensure its greater reliability it is expedient also to take into account: the number of accidents connected with the production; capital investments and operating costs on environmental protection; the costs of improving health of employees in agriculture.

Our calculations show that HDIAS of Ukraine during 2010-2017 has the average level of development. The indices of education and agricultural production have the greatest impact on this final indicator, which enables to make the conclusion about unimplemented potential and existing prospects.

Ensuring a high level of employees' qualification in the agrarian sector of the economy must be accompanied by the corresponding level of labor payment because according to our calculations, it is insufficient and leads to the migration of labor force, especially the youth, to other sectors of the economy. The systems of labor payment, existing in the agrarian sector at present, are motivationally weak; the relationship between employees' salary and economic results is weakened. The level of labor payment almost does not depend on work efforts of employees, but it is formed under the influence of external factors (economic situation in the country, inflation, government regulation, etc.) (Yasnolob 2017).

It is worth mentioning that the total human development index (HDI) of Ukraine reached the level of 0.751 in 2017, which transferred it to the high human development category – the 88th position among 189 countries and territories recognized by the United Nations (Table 1).

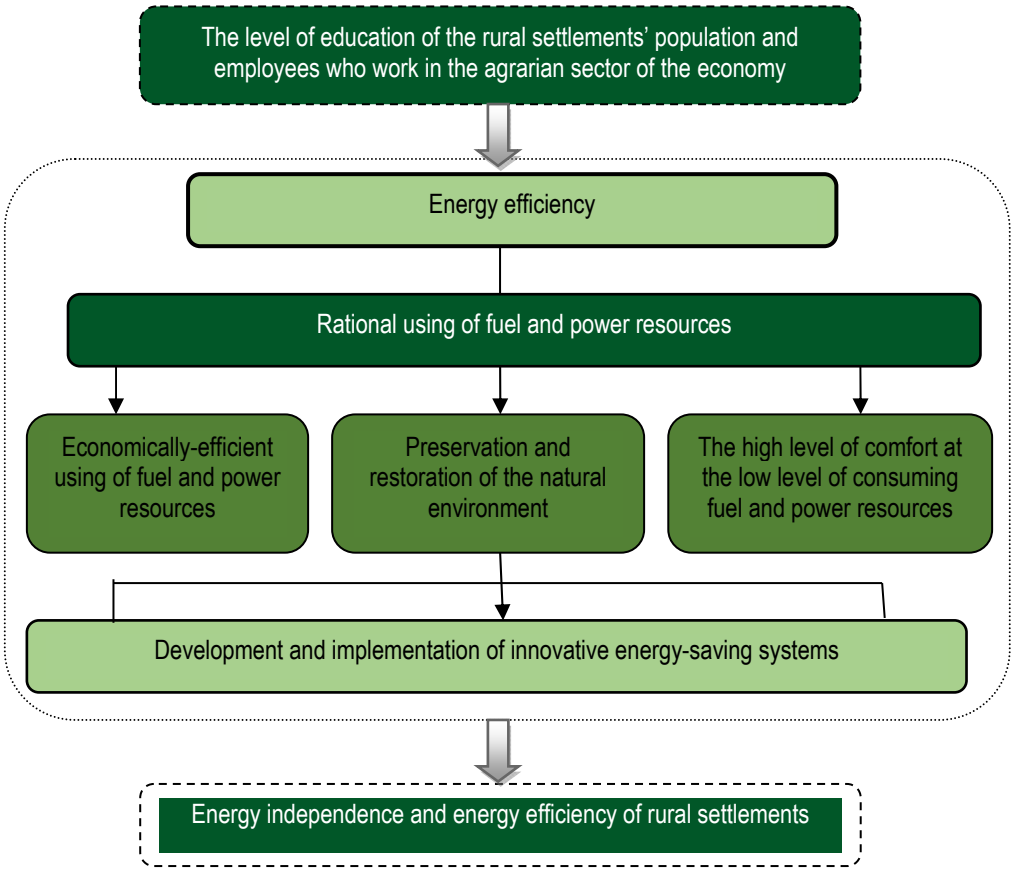
Table 1. The tendencies of HDI and HDI_{AS} of Ukraine, 2010-2017

Years	HDI		HDI_{AS}	
	Value	the rate of growth / decrease,%	value	the rate of growth / decrease,%
2010	0.733	-	0.494	-
2011	0,738	100,7	0,525	106,3
2012	0,743	100,7	0,523	99,6
2013	0,745	100,3	0,546	104,4
2014	0,748	100,4	0,566	103,7
2015	0,743	99,3	0,589	104,1
2016	0,746	100,4	0,584	99,2
2017	0.751	100.7	0.589	100.9

Source: made according to (International, 2018) and own calculations

Thus, according to the data in Table 1, it is clear that the human development index during 2010-2017 increased by 2.5% and the human development index of the economy's agrarian sector – by 19.2% and they are within the average level. Our calculations of HDIAS showed that the level of regular employees' education is very low, while education is one of the main resources of modern society. The level and quality of the obtained education, educational achievements of the population considerably determine the structural-innovative opportunities of economic and many other areas' development, which are important for the people's well-being (Yasnolob 2017). Under these conditions, receiving higher education is a priority task both for each employee and for agricultural enterprises, which must support improving their employees' qualification level and training of new professions. It will enable not only to increase the level of agricultural products, but also its competitiveness on the world market, which will positively affect the profitability and competitive position of agricultural enterprises and it is a necessary condition for ensuring the model the agrarian sector innovation development, introducing energy efficient techniques and technologies.

Figure 5. The impact of educational level of employees in the agrarian sector of the economy on energy efficiency, taking into account the promising directions of developing energy independence and energy efficiency of rural settlements



Source: the author's development

Solving the problem of villages' energy efficiency is possible under the introduction of innovative techniques and technologies based on resource conservation, education and science reformation using innovative approaches to both agricultural production and housing-public services, which will help improve their quality and efficiency, the effectiveness of using the personnel and scientific potential of the industry, ensure the competitiveness of agro-industrial sector of the national economy and increase the well-being of the population on rural territories. In our opinion, energy efficiency is characterized by constant changes causing the increase of its level due to economic, ecological, and social components, ensuring the harmonious development of any system at the micro-, meso- and macro-levels.

Conclusion

The calculation of HDIAS revealed the problems and identified the directions of improving the existing ecological, social, and economic relations in the agrarian sector of the economy aimed at ensuring its innovation development on the basis of resource conservation and their rational management. In our opinion, Ukraine has prerequisites for the formation, creation, and development of energy independent and energy efficient rural settlements which will facilitate: reducing the dependence on external energy sources; increasing energy efficiency and development of rural territories; reducing dangerous emissions and improving the environmental situation; improving the quality of life of the inhabitants and their material well-being; reducing the risk of electric power cut-offs and decreasing the costs for households, municipalities, business; increasing energy independence of Ukraine.

References

[1] Chayka, T.O. 2014. Evaluation of Human Development Index in the Agrarian Sector of the Economy: Work copyright №54702 of 12.05.2014

[2] Libanova, E.M., Vlasenko, N.S., Vlasiuk, O.S. 2002. Human Development of Regions in Ukraine: Evaluation.

[3] Mudra, O.V. 2011. The Development of Enterprise's Human Capital in the Context of Social Partnership. *Bulletin of Donetsk University of Economics and Law*, 2: 70-72.

[4] Nazarko, S.O. 2009. The Impact of Education on the Regional Human Development and Employment of the Population. *Topical Issues of Economics*, 4 (94): 166-171.

[5] Radchenko, L.P. 2011. Human Development: the Evolution of the Concept and Priority Directions of Implementation in the National Economy of Ukraine. *Bulletin of Ya. Mudrogo National Academy of Law of Ukraine, 2* (5): 67-76.

[6] Yasnolob I. *et al*. 2018. The Innovative Model of Energy Efficient Village under the Conditions of Sustainable Development of Ecological Territories. *Journal of Environmental Management and Tourism*, 3 (27): 648-658. DOI:http://dx.doi.org/10.14505/jemt.9.3(27).25

[7] Yasnolob, I. *et al.* 2018. The Formation of the Efficient System of Ecological Enterprise. *Journal of Environmental Management and Tourism*, 9(5): 1052-1061. DOI: https://doi.org/10.14505//jemt.9.5(29).17

[8] Yasnolob, I.O. *et al.* 2017. Intellectual Rent in the Context of the Ecological, Social, and Economic Development of the Agrarian Sector of Economics, *Journal of Environmental Management and Tourism*, (Volume VIII, Winter), 7(23): 1442-1450. DOI:https://doi.org/10.14505//jemt.v8.7(23).13

[9] Yasnolob, I. *et al.* 2019. Energy Independence and Energy Efficiency of Populated Areas in the System of Management. *Journal of Environmental Management and Tourism*, 10(3): 538-549. DOI:https://doi.org/10.14505//jemt.v10.3(35).09

[10] Zhuchenko, A.A. 2004. *The Resource Potential of Grain Production in Russia (Theory and Practice): monograph*. M.: Publishing House Agrorus, 1110 p.

[11] *** International Human Development Indicators. Available at: http://hdr.undp.org/en/composite/HDI.

[12] *** The Methods of Measuring Regional Human Development. Available at: http://www.idss.org.ua/index.html.

[13] *** The Publication of Documents of the State Statistics Service of Ukraine. Available at: http://ukrstat.org.