Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 21, Issue 4, 2021
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ANALYSIS OF THE SOCIO-DEMOGRAPHIC STATE OF RURAL AREAS IN THE SYSTEM OF THEIR SUSTAINABLE DEVELOPMENT: A CASE STUDY OF UKRAINE

Mykola DZIAMULYCH[1*], Serhii PETRUKHA[2], Valentyna YAKUBIV[3], Oksana ZHUK[1], Oksana MAIBORODA[1**], Sofiia TESLIUK[4*], Andrii KOLOSOK[4**]**

[1]Lutsk National Technical University, *Department of Economics, **Department of Socio-Humanitarian Technologies, 75 Lvivska street, 43018, Lutsk, Volyn region, Ukraine. Emails: dziamulych.mykola@ukr.net, o.zhuk@lutsk-ntu.com.ua, o.mayboroda@lutsk-ntu.com.ua
[2]Kiev National University of Construction and Architecture, Department of Management in Construction, 31 Povitroflotskyi prosp., 03037, Kyiv, Ukraine. Email: psv03051984@gmail.com
[3]Vasyl Stefanyk Precarpathian National University, Department of Management and Business Administration, 57, Shevchenko Str, 76018, Ivano-Frankivsk, Ivano-Frankivsk region, Ukraine. Email: valentyna.yakubiv@pnu.edu.ua
[4]Lesya Ukrainka Volyn National University, *Department of Finance, **Department of Social Pedagogy and Pedagogy of Higher School, 28 Vynnychenko Street, Building 30, 43021, Lutsk, Volyn region, Ukraine. Emails: tesliuk.sofiia@vnu.edu.ua, kolosok.andrew@vnu.edu.ua

Corresponding author: dziamulych.mykola@ukr.net

Abstract

In the article we have substantiated and conducted statistically assess the impact of the final results of economic activity on the current socio-demographic situation of rural areas in Ukraine. Based on the results of determining the influence of conditioned factors on the level of labour migration of the rural population in Ukraine, we have developed a regression equation. Also, based on the results of the study, we built two cartograms, comparison of which provides an opportunity to assess the dynamics of the formation of the total fertility rate in rural areas (per 1 woman) for 2016 – 2020. We built a cartogram that visualizes the results of grouping regions of Ukraine by natural increase, decrease population in rural areas of Ukraine. The results of our study provide an opportunity to confirm that in the context of Ukraine's official accession to the European Union and the serious challenges of today, the Ukrainian state should perform the functions of regulating the most important spheres of society in general and rural areas in particular. The task of increasing the employment of the rural population should be raised to the level of state priorities, which would provide an opportunity to create new jobs for the rural population in industries that can provide the maximum competitive effect.

***Key words*:** *socio-demographic state, rural population, sustainable development, rural areas*

INTRODUCTION

The transformation of approaches to the formation of a new agricultural policy in Ukraine, which took place in the process of concluding an association agreement with the European Union, has significantly raised the issue of ensuring sustainable development of rural areas. In turn, the reform of the local self-government system, which has led to the creation of united territorial communities, as well as budgetary decentralization, allows rural areas to rely on additional resources that can be used to improve the socio-economic situation in general and achieve sustainable development goals in particular. The critical problem that needs to be urgently addressed in this area now is the formation of an effective organization of agriculture and the improvement of the new administrative system, as the former ways of organizing the socio-economic development of rural areas were not functional.

It should be noted that the main features of the current stage of development of rural areas in Ukraine are characterized by the presence of specific aspects of their functioning, formed in previous years under the influence of external and internal factors at the macro and micro levels. Such features include demographic problems, which are the reduction of the rural population,

strengthening of external migration processes, the transformation of the social base and infrastructure of the village. In the economic aspect, the characteristic changes that occur in rural areas are the growth of the share of personal households in agricultural production, intensive development of rural tourism, and so on. However, the main task that needs to be urgently addressed in the process of formulating a policy of sustainable development of rural areas is the general improvement of the socio-economic situation of the rural population in Ukraine. The solution of this problem is connected with the formation, modelling, and development of rural territorial communities in Ukraine, as well as with ensuring the proper stability, reliability, and efficiency of the functioning of administrative structures of local self-government in rural areas as systemic formations of increased complexity.

The study of socio-economic and demographic development of rural areas is one of the problems that are relatively widely covered in the scientific literature. However, a significant part of research on this issue is related to the development of the agricultural sector. Researchers such as O. Agres [1], I. Balaniuk [4], A. Boiar [7], O. Buhutskyi [8], Y. Chaliuk [9], T, Kulinich [17], V. Onykienko [19], A. Popescu [22-34], P. Sabluk [36], R. Sodoma [41-43], I. Yakoviyk [50], O. Yatsukh [52] and others. In addition, a significant contribution to the development of scientific-applied, structural-functional, and methodological aspects of solving problems of ensuring the efficiency of rural areas, made in the scientific works of such researchers as O. Apostolyuk [2], O. Binert [5], O. Bitter [6], M. Dziamulych [10-12], E. Libanova [18], J. Ostafiichuk [20]. T. Shmatkovska [38-40], O. Stashchuk [45-47], Ya. Yanyshyn [51], I. Zhurakovska [54] However, despite the relevance and theoretical and practical value of the research, some issues related to the effectiveness of socio-economic policy for rural development need to be improved.

MATERIALS AND METHODS

To study the socio-demographic condition of rural areas, it is necessary to use specific tools of demographic analysis, which will identify key aspects of natural and migratory population movements. The most effective methods in this aspect are indicators of socio-demographic statistics, suitable for cartographic reflection of demographic trends in rural areas.

Accordingly, in our study, the main indicators used in the analysis were the following:

1. Natural increase (decrease) per 1,000 persons of the existing population (total natural increase (decrease)), which is the ratio of natural increase (decrease) of the population to the average annual population or the difference between the total birth and death rates:

$$R_{ng(r)} = R_f - R_m \quad (1)$$

where: R_f – total fertility rate per 1,000 population;

R_m – overall mortality rate per 1,000 population.

2. The total fertility rate per woman in a given period. This indicator allows us to estimate the potential average number of births by one woman during her actual reproductive period, provided that the baseline birth rate remains unchanged for those years that fall into the analyzed period and for which there are age coefficients. This ratio can be determined by calculating the total amount of the corresponding age-specific fertility rates.

3. The share of the rural population in the total population of the region, %:

$$S_{rp} = \frac{P_r}{P_w} \quad (2)$$

where:

P_r – number of rural population;

P_w – total population.

4.Migratory increase (decrease) in population:

$$M_g = A - D \quad (3)$$

where:
A – the total population that arrived in the region;
D – the number of people who left the region.

5.Total migration growth rate (decrease) (migration increase (decrease) per 10,000 people of the current population):

$$M_{gt} = \frac{P_m}{P_a} \quad (4)$$

where:
P_m – migratory population growth over a period of time;
P_a – the average number of available population.

The processes of relationships and interdependencies can be studied using appropriate methods and models. To identify the relationship between factors and performance traits, we used the method of correlation-regression analysis. Correlation-regression analysis is one of the main statistical methods for studying the dependent random variable Y on random variables X. This method is used when the observation data can be considered random, unbiased, and typical. They are formed from the general population, which is distributed according to a multidimensional normal law. Indicators of correlation, which are calculated for a limited set, are only estimates of a statistical pattern. At the same time, it is necessary to consider that in any set the element which is not completely repaid by chance remains. Therefore, a statistical assessment of the degree of accuracy and reliability of the correlation and regression parameters is required [15].
The application of these methods involves the analysis of the studied indicators of demographic statistics and the construction of a mathematical model based on the results. In this case, a significant number of factor values necessitates the use of methods of multiple correlation-regression analysis, which allow to identification of the most statistically significant factors and assess their relationship with the resulting trait. The interaction of the resulting indicator (Y) with the factor features (X_1, X_2….X_n) is determined on the basis of the linear multifactor regression equation according to the following formula:

$$Y = a_0 + \sum a_i x_i \quad (5)$$

where:
a_0 a_i – estimates of unknown deterministic parameters, where i is the number of parameters;
x_i – factor (independent) features, regressors, where i – the number of features.
$i = \overline{1; n}$.

The analysis was performed by us according to the official statistical data on the regions of Ukraine for 2020, which were processed in the software product Statsoft STATISTICA (Multiple Regression program module).

RESULTS AND DISCUSSIONS

We believe that the study of the relationships between the main macroeconomic, social, and demographic indicators of rural development in terms of sustainable development requires modelling and further comprehensive research. Thus, the aim of the article is to statistically assess the impact of the final results of economic activity on the current socio-demographic situation of rural areas in Ukraine.
Socio-demographic processes in the country should be considered as complex, consisting of components of different areas of social activity of the geopolitical complex.
It is the systemic approach that provides an opportunity to present the socio-demographic situation of rural areas of the country as a system. In order to define and characterize it, it is necessary to build a system model that to some extent reflects the first and contains only the most characteristic indicators that evaluate it. The system model cannot be absolutely adequate to the system reality, because it is not able to reproduce all the details of the complex process of market functioning. Since

it is a static model that only captures (registers) the real process, a third system is needed: a modelling system, which is a process that provides the ability to accurately reflect the system reality in the system model. The more perfect the modelling system, the more fully it is possible to reflect the real market relations in the system-model of socio-demographic development of rural areas at the present stage [13; 35; 37; 44].

The set of methods that are most often used in the analysis, focus, as a rule, on solving two problems: proving the homogeneity of the modelled processes (variation statistics) and determining the extent of their relationship (correlation and methods of generalizing indicators). The main requirement of statistical research is the study of mass data. However, the practice of using statistical methods in modelling is often limited to the study of mostly isolated cases. Hence the contradictions: designed to study mass phenomena - statistical methods are artificially used to study individual cases. Therefore, sometimes in modelling, statistical methods are replaced by mechanical ones or statistical methods are used only as illustrative material [3]. The way out of this situation can only be in the use of mass statistical, focused on scientific methods, arrays of information.

To determine the relationships between economic, socio-demographic factors of rural development and their statistical evaluation, we have chosen a system of relevant indicators.

Economic factors of rural development are represented by the following indicators: gross value added per capita, thousand UAH; unemployment rate,%; level of environmental pollution in terms of emissions of harmful substances into the atmosphere by stationary sources of pollution by region, thousand Socio-demographic indicators of rural areas are represented by the following system of indicators: migration processes among rural workers; the general birth rate in rural areas; general increase in the rural population due to natural factors. The analytical basis for the calculations was the official static data of the State Statistics Office of Ukraine for 2020 [48].

Socio-demographic indicators of rural development include, first of all, indicators of natural and mechanical movement of the rural population. Labour migration of the rural population as a component of the mechanical movement largely reflects the features of the rural labour market in Ukraine, the level of rural employment, and unemployment, which are a consequence of historical, social, and economic conditions prevailing in Ukraine for many decades. The changes taking place in the economic system of the state also require appropriate changes in the system of social and labour relations and guarantees of workers' rights. In this aspect, it should be noted that in Ukraine there is a not very perfect labour market of the rural population, which is due to the specific causes of the process of changing property relations in rural areas. At present, there are significant problems associated with ensuring the regulatory impact and infrastructure development of this market. As a result, there are objective problems associated with ensuring the appropriate level of socio-economic development of rural areas.

The outflow of the most active part of the youth abroad is undesirable and is considered a rather dangerous risk for national development as a whole. This can be a significant problem for Ukraine, because, firstly, it will complicate the staffing needs of domestic agricultural producers, and secondly, in the context of demographic problems in rural areas will reduce the resilience of national social systems, including pensions and more [14].

In the process of studying the relationship between the level of labour migration of the rural population and a set of relevant economic factors, we used correlation-regression analysis. Based on the results of this study, we built a correlation-regression model and tested it for representativeness and adequacy.

$$Y = 5.9474 - 0.0572x_1 + 0.2843x_2 + \\ + 0.0068x_3 \quad (6)$$

Analyzing the obtained regression equation, we can say that the greatest influence on the performance indicator is exerted by factor X_2, namely, the level of rural unemployment. It

was found that if the level of rural unemployment increases by 1%, the level of labour migration of the rural population will increase by 0.28%. The third factor (X_3) has the least significant impact on the performance indicator. in particular, according to the results of the study, it was found that with an increase in the level of environmental pollution by 1 thousand tons, the level of labour migration of the rural population in Ukraine increases by only 0.007%.

Regression coefficients are numbers that are determined in actual units (in natural scale) and are therefore incomparable with each other. To transform them into relative indicators, we used the same transformation to obtain the pair wise correlation coefficient. The value obtained is a standardized regression coefficient or β-coefficient.

Table 1. Indicators of correlation-regression analysis on the impact of factors on the level of labour migration of the rural population of Ukraine in 2020

Factors	BETA coefficients	Standard error of BETA coefficients	Regression coefficient (B)	Standard error B	t- criterion	Actual materiality level (p-level)
X_1	-0.375623	0.354781	-0.0572	0.437921	-1.36011	0.045287
X_2	0.570515	0.354781	0.2854	0.437921	0.34254	0.031683
X_3	0.120642	0.354781	0.0069	0.437921	0.77716	0.703265

X_1 – GDP per capita, thousand UAH;
X_2 – level of rural unemployment, %;
X_3 – level of environmental pollution, thousand tons.
Source: own development.

According to the results of our study (Table 1), it was found that the β-coefficients for the three factors analyzed, respectively, are: -0.3755; 0.5704; 0.1206. The coefficient of determination = 0.311, ie only 31.1% variation in the level of labour migration of the rural population of Ukraine in the study period is explained by three factors.

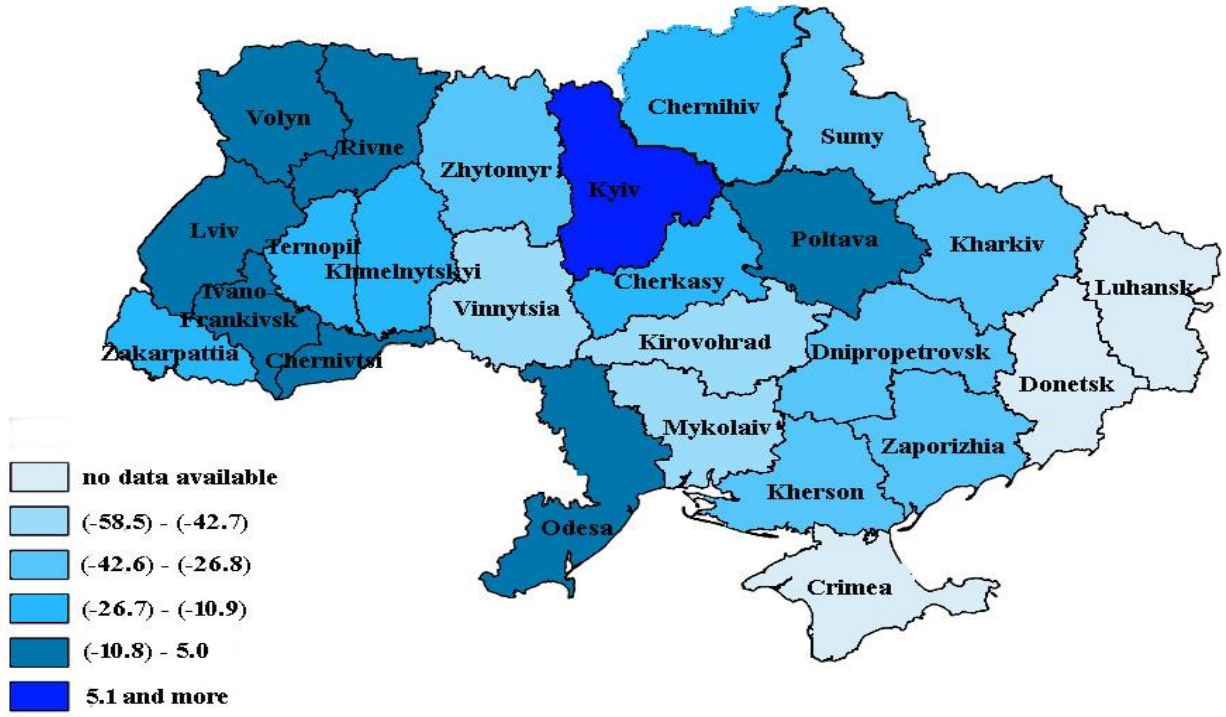

Fig. 1. Map of the results of grouping the regions of Ukraine by the total rate of migration growth, reduction (-) in rural areas in 2020, per 10,000 people of the existing rural population*

*Data on Luhansk, Donetsk regions, and the Autonomous Republic of Crimea are not available due to their temporary occupation by the Russian Federation and in accordance with the Law of Ukraine "On Temporarily Occupied Territories".

As can be observed from the cartogram developed by us (Fig. 1), the largest negative migration increase among the rural population in 2020 is observed in Mykolayiv, Kirovohrad and Vinnytsia regions. The largest positive migration growth is characteristic of the Kyiv region, where the capital of Ukraine is located, as well as Odessa (a resort region with access to the sea) and most regions of the Western region, which are characterized by their agricultural orientation.

It is well known that globalization and integration are an objective reality today. At the same time, the national state policy in the field of rural employment should be pursued for the sake of social justice in the context of globalization. The crisis has shown that the results of the process of globalization and integration are beneficial only for a few countries, but are not fair to most of them, because the declaration of equal rights does not guarantee their observance, especially in times of economic downturn. Thus, it should be understood that Ukraine's membership in the European Union will not automatically transform the Ukrainian labour force from migrants to local residents. Various occupational standards, the supply of low-skilled jobs for migrants, language barriers, etc. are also serious risks to European integration for the rural workforce.

In addition, the problems associated with hypertrophied disparities in the demographic trends of the rural population pose a number of threats and negative consequences for the economic development of the regions and directly for the proper provision of socio-economic aspects of the functioning of rural areas. In general, this trend is pronounced in terms of the reduction of the economically active population in rural areas, which is associated with the outflow of labour to other industries or to other, more attractive regions in terms of development. All this entails an increase in social tension, a decrease in local budget revenues, along the need to ensure an adequate level of social security for the rural population [4].

At the same time, it can be argued that the trend towards a general decrease in the rural population is not surprising for European countries in general. In particular, population decline is currently characteristic of more than 30% of the countries of the European continent. Among European countries, Ukraine is also distinguished by the scale and protracted nature of depopulation of both rural and urban populations [21].

Characterizing the specific features of depopulation within Ukraine itself, we should first emphasize the higher intensity of natural population decline and the duration of depopulation trends in rural areas, where the excess of deaths over births has been observed for more than thirty years (since 1979).

According to the average version of the multivariate demographic forecast, developed by specialists of the Institute of Demography and Social Research of the National Academy of Sciences of Ukraine, with the probable overall reduction of the population of Ukraine by 2050. more than 18%, the number of its able-bodied contingent will decrease by more than 1/3 [18].

Migrations of the rural population also have a negative effect on the processes of demographic reproduction. After all, migrants are dominated by the most productive and economically productive age groups. Today, according to various estimates, from 5 to 8 million people are looking for work and work outside Ukraine, which, of course, does not contribute to the growth of the birth rate in Ukraine [16; 49; 53].

The birth rate and mortality of the rural population determine its natural movement. The birth rate is calculated according to the fertility rate, which is determined in relative terms as the ratio of the number of births per year to the average annual population.

$$Y = -26.4516 + 0.0539x_1 - 0.0278x_2 - 0.00315x_3. \quad (7)$$

According to the results of the analysis of the correlation-regression model obtained by us, it is established that the first factor (X_1) has the most significant influence on the performance indicator. Namely, it was found that GDP growth by 1 thousand UAH per

person causes an increase in the birth rate of the rural population in Ukraine by 0.0538 ‰. The least significant impact on the performance indicator in this model has the level of environmental pollution (X_3).

Table 2. Assessment of the representativeness and adequacy of the results of the formation of the correlation-regression model to identify the relationship between the relevant factors and the birth rate of the rural population of Ukraine in 2020

Factors	BETA coefficients	Standard error of BETA coefficients	Regression coefficient (B)	Standard error B	t- criterion	Actual materiality level (p-level)
X_1	0.26575	0.25109	0.05394	0.78372	1.74648	0.48768
X_2	-0.40483	0.25109	-0.02793	0.78372	-0.53241	-0.75322
X_3	-0.50263	0.25109	-0.00324	0.78372	-1.03294	0.08307

X_1 – GDP per capita, thousand UAH;
X_2 – level of rural unemployment, %;
X_3 – level of environmental pollution, thousand tons.
Source: own development.

Summarizing the results shown in Table 2, it should be noted that there is insufficient confirmation of the variation in the birth rate of the rural population in Ukraine under the influence of our selected factors. Thus, it can be argued that the relationship studied in the analysis of the various features is not really marked by a high level of reliability. At the same time, on the basis of the obtained results, it became possible to form specialized analytical cartograms (Fig. 2). Therefore, based on a comparison of the data presented on these maps, it is possible to reliably estimate the overall dynamics of the total birth rate in Ukraine (in rural areas) for the period 2016-2020.

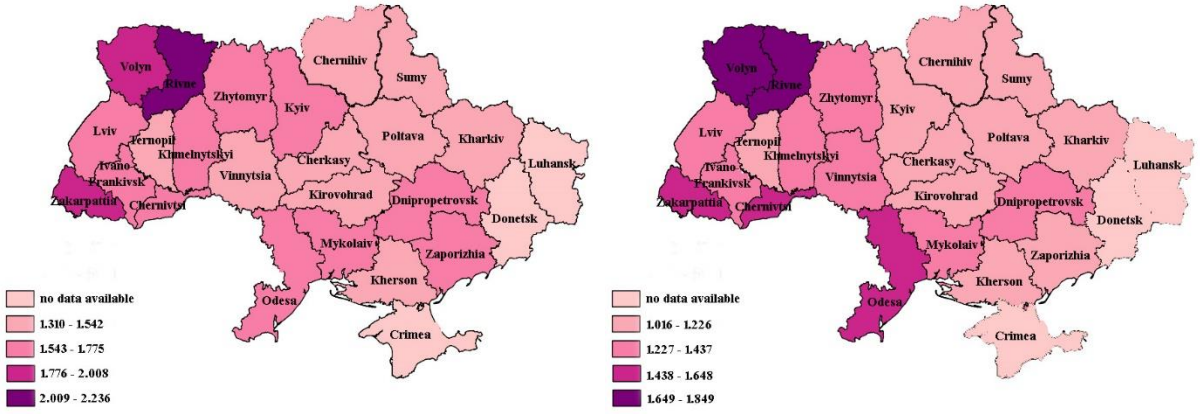

Fig. 2. Cartogram of the results of the grouping of regions of Ukraine by the total birth rate in rural areas in 2016 (left), and 2020 (right) per 1 woman*
*Data on Luhansk, Donetsk regions, and the Autonomous Republic of Crimea are not available due to their temporary occupation by the Russian Federation and in accordance with the Law of Ukraine "On Temporarily Occupied Territories".
Source: [48].

In particular, the dynamics of the formation of the total birth rate in rural areas for 2016 - 2020 revealed very positive dynamics of this indicator for the Volyn, Chernivtsi, and Odessa regions.

However, for the Zaporizhia region in the studied period, no positive dynamics were found. In addition, the Ternopil region of Ukraine is characterized by the almost unchanged indicator of the total fertility rate in rural areas in the study period, which indicates the questionable effectiveness of local government policy on the study.

The natural increase of rural population is one of the main in the system of socio-demographic indicators of economic

evaluation of rural areas of Ukraine in terms of sustainable development, so we conducted a study of its dependence on relevant macroeconomic and regional factors.

We have built a correlation-regression model to identify the relationship between the natural growth rate of the rural population of Ukraine and the three selected factors.

$$Y = 1.5537 + 0.00313x_1 - 0.00387x_2 - 0.00904x_3 \quad (8)$$

The results of the analysis of the influence of factor features on the natural movement of the rural population (formula 8), determined by the ratio of births and deaths per year to the average annual rural population, shows that the relationship between factor and performance is inverse (factors X_2; X_3) and cannot be considered significant. This suggests that the natural motion factors included in this model do not have a significant impact.

We found that among the selected factors the greatest inverse effect on the performance indicator is exerted by factor X_3, in particular, it was found that the increase in pollution by 1 thousand tons causes a decrease in the level of the natural movement of the rural population of Ukraine by 0.009‰.

Table 3. Assessment of the representativeness and adequacy of the results of the formation of the correlation-regression model to identify the relationship between the relevant factors and the natural growth rate of the rural population of Ukraine in 2020

Factors	BETA coefficients	Standard error of BETA coefficients	Regression coefficient (B)	Standard error B	t- criterion	Actual materiality level (p-level)
X_1	0.23731	0.23757	0.00322	0.00274	2.41362	0.04556
X_2	-0.04511	0.23757	-0.00366	0.00274	-0.63451	0.36215
X_3	-0.39588	0.23757	-0.00905	0.00274	-1.51513	0.04872

X_1 – GDP per capita, thousand UAH;
X_2 – level of rural unemployment, %;
X_3 – level of environmental pollution, thousand tons.
Source: own development.

Thus, the analytical study of the statistical population without cities of regional subordination of Ukraine (Table 3). allows us to conclude that we obtained a relatively homogeneous population, in which there is a small (23.73%), but confirmed impact on the performance of gross value added per capita (*p-level* = 0.04554) and 39.5 % impact of the level of environmental pollution (*p-level* = 0.04862).

Based on the results of the study, we built a cartogram that visualizes the results of grouping regions of Ukraine by natural increase, decrease (-) population in rural areas of Ukraine in 2020, per 1,000 people of the existing rural population (Fig. 3).

As can be seen from the cartogram (Fig. 3), the most negative value of natural growth (reduction) of the population in rural areas in 2020 is typical for Sumy, Chernivtsi, and Cherkasy regions, which, in our opinion, deserves special attention in the relevant public services. and local self-government organizations, whose activities are aimed at resolving the identified negative values and the formation of further positive trends in their development.

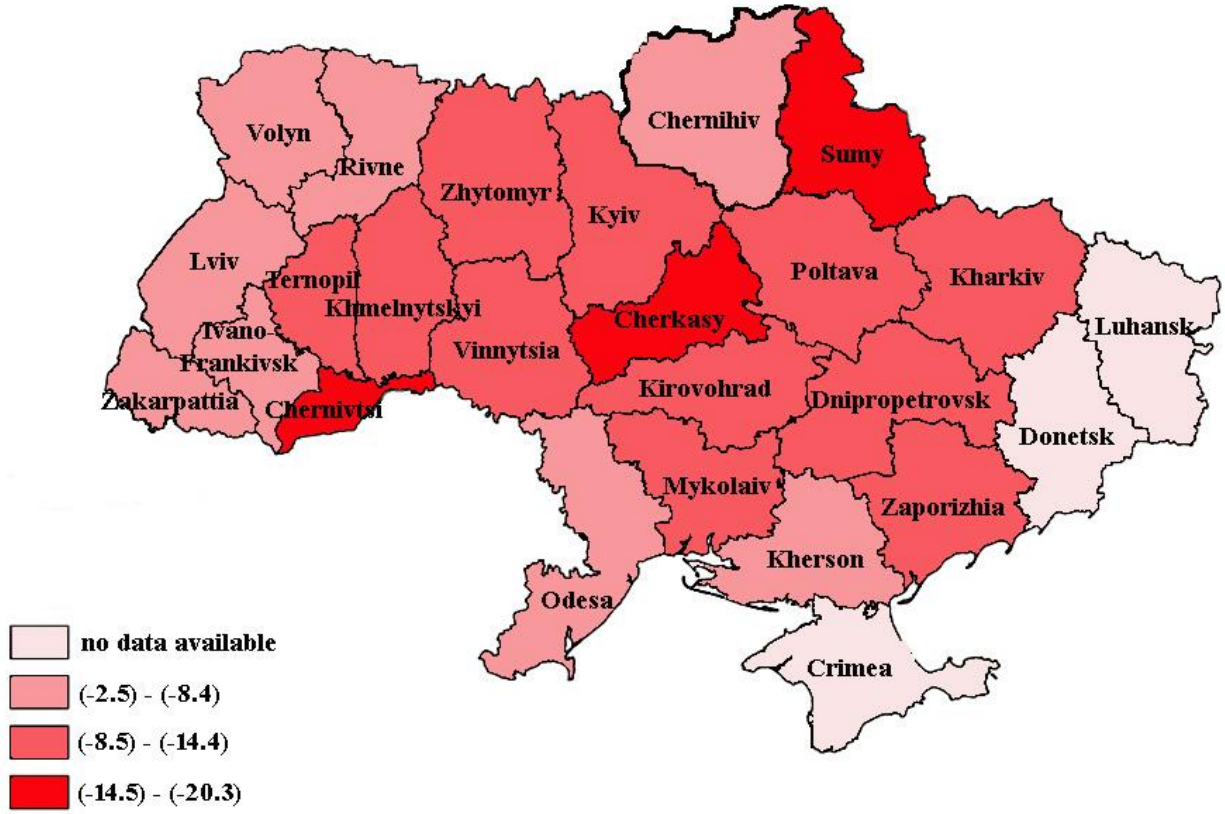

Fig. 3. Cartogram of the results of grouping the regions of Ukraine by natural increase, reduction (-) of the population in rural areas of Ukraine in 2020, per 1,000 people of the existing rural population*
*Data on Luhansk, Donetsk regions, and the Autonomous Republic of Crimea are not available due to their temporary occupation by the Russian Federation and in accordance with the Law of Ukraine "On Temporarily Occupied Territories".
Source: [48].

CONCLUSIONS

Thus, based on the study, it can be argued that there are objective problems associated with the socio-economic and demographic development of rural areas in Ukraine. The data obtained as a result of analytical calculations reflect the objective reality and indicate a negligible relationship between the selected for research economic, environmental, and socio-demographic indicators of socio-demographic development of rural areas. Given the fact that in real conditions the relationship between indicators is stochastic, finding the absolute truth in determining the relationship in practice is not always possible. But the approximate nature of any results of the correlation-regression analysis is not a reason to deny its usefulness and scientific purpose.

The results of our study provide an opportunity to confirm that in the context of Ukraine's official accession to the European Union and the serious challenges of today, the Ukrainian state should perform the functions of regulating the most important spheres of society in general. It can be argued that the priority for state institutions now should be economic incentives for rural development, attracting additional investment in agriculture and agritourism, and so on. The general trends of administrative reform and budget decentralization should also, above all, increase the level of investment in rural development, which will result in both an increase in the number of jobs and the provision of additional revenues to stimulate the socio-economic development of the village.

Thus, the achievement of high living standards of the rural population in Ukraine is possible only through the formation of appropriate mechanisms to stimulate economic and socio-demographic

development of rural areas by the state and public-private partnership.

REFERENCES

[1]Agres, O., Sadura, O., Shmatkovska, T., Zelenko, S., 2020, Development and evaluation of efficiency of leasing activities in agricultural sector of Ukraine. Scientific Papers Series «Management, Economic Engineering in Agriculture and rural development», Vol. 20(3): 53-60.
[2]Apostolyuk, O., Shmatkovska, T., Chykalo, I., Husak, A., 2020, Assessment of the rural population economic activity in the system of united territorial communities development: a case study of Volyn Region, Ukraine. Scientific Papers: Management, Economic Engineering in Agriculture and Rural Development, Vol. 20(3): 99-108.
[3]Arutiunian, I., Poltavets, M., Achacha, M., Bondar, O., Pavlov, F., Gerasymenko, O., Kulinich, T., 2021, Effective Concepts of Harmonious Management of Production Systems. International Journal of Computer Science and Network Security. Vol. 21(3): 141-144.
[4]Balaniuk, I., Kyrylenko, V., Chaliuk, Yu., Sheiko, Yu., Begun, S., Diachenko, S., 2021, Cluster analysis of socio-economic development of rural areas and peasant farms in the system of formation of rural territorial communities: a case study of Volyn region, Ukraine. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development", Vol. 21(3): 177-188.
[5]Binert, O., Sodoma, R., Sadovska, I., Begun, S., Shmatkovska, T., Balash, L., 2021, Mechanisms for improving economic relations in the milk subcomplex of the agricultural sector: a case study of Ukraine. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development". Vol. 21(2): 101-110.
[6]Bitter, O. A., Berezivsky, P. S., Melnyk, V. S., 1997, Efficiency of agricultural production and the standard of living of the rural population. Lviv, 188 p.
[7]Boiar, A., O., Shmatkovska, T. O., Stashchuk, O. V., 2018, Towards the theory of supranational finance. Cogent Business & Management. 5(1).
[8]Bugutskyi, O. A., 1999, Demographic situation and use of human resources in the countryside. Kyiv, 280 p.
[9]Chaliuk, Y., Dovhanyk, N., Kurbala, N., Komarova, K., Kovalchuk, N., 2021, The digital economy in a global environment. AD ALTA: Journal of Interdisciplinary Research. Vol.11, Special issue XVII: 143-148.
[10]Dziamulych M., Moskovchuk A., Vavdiiuk N., Kovalchuk N., Kulynych M., Naumenko, N., 2021, Analysis and economic and mathematical modeling in the process of forecasting the financial capacity of milk processing enterprises of the agro-industrial sector: a case study of Volyn region, Ukraine. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development". Vol. 21(1): 259-272.
[11]Dziamulych M., Shmatkovska T., Petrukha, S., Zatsepina, N. Rogach, S., Petrukha, N., 2021, Rural agritourism in the system of rural development: a case study of Ukraine. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development", Vol. 21(3): 333-343.
[12]Dziamulych, M., Stashchuk, O., Korobchuk, T., Mostovenko, N., Martyniuk, R., Strelkova, I., Grebeniuk, N., 2021, Banking innovations and their influence on the formation of digital banking. AD ALTA: Journal of Interdisciplinary Research. Vol.11, Special issue XVII: 108-112.
[13]Erina, A. M., 2001, Statistics of modeling and forecasting. Kyiv, 170 p.
[14]Ermakov, O. U., Velichko, O. V., Bohach, L., Nahornyi, V. V., 2018, To question of estimation of production potential of agricultural enterprises. Financial and credit activity-problems of theory and practice, 3(26): 162-168.
[15]Granberg, A. G., 1990, Statistical modeling and forecasting. Moscow, 383 p.
[16]Hrebennikova, A., Artemchuk, L., Nahornyi, V., Daliak, N., Ruban, O., 2021, Assessment of the network interaction synergistic effect according to the organization life cycle. Journal of eastern European and Central Asian research, 8(3): 311-323.
[17]Kulinich, T., Berezina, L., Bahan, N., Vashchenko, I., Huriievska, V., 2021, Application of Project Management: Lean Technologies and Saving Manufacturing (Aspects of Management and Public Administration). International Journal of Computer Science and Network Security. Vol. 21(5): 57-68.
[18]Libanova, E. M., Khvesyk, M. A., 2017, Socio-economic potential of sustainable development of Ukraine and its regions: vectors of real progress: national report. Kyiv, 864.
[19]Onykienko, V. V., 2006, Priorities of socialization of the labor market in the conditions of market stabilization and globalization of the national economy of Ukraine. Demography and the Social Economy. Vol. 2: 101-114.
[20]Ostafiichuk, Ya., 2014, Socio-ecological problems of rural development: modern dimension and prospects of solution. Socio-economic problems of the modern period of Ukraine. Vol. 3: 379–387.
[21]Pavelko, O., Lazaryshyna, I., Dukhnovska, L., Sharova, S., Oliinyk, T., Donenko, I., 2021, Construction Development and Its Impact on the Construction Enterprises Financial Results. Estudios de Economia Aplicada. Vol. 39(3).
[22]Popescu A., 2013, Considerations on the Rural Population as a Resource of Labor Force in Romania. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 13(3): 229-236.
[23]Popescu A., 2013, Considerations on the main features of the agricultural population in the European Union, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 13(4): 213-220.

[24]Popescu A., 2015, Research on labour productivity in Romania's agriculture. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 15(2): 271-280.
[25]Popescu, A., 2016, Research on the concentration of tourist arrivals in Romania. Scientific Papers: Series Management, Economic Engineering in Agriculture and rural development, Vol. 16(1): 425-429.
[26]Popescu, A., 2016, Research on the dynamics and territorial dispersion of the occupied population in Romania's tourism in the period 2007-2015. Scientific Papers: Series Management, Economic Engineering in Agriculture and rural development, Vol. 16(4): 279-288.
[27]Popescu A., 2016, The position of tourist and agrotourist guesthouses in Romania's accommodation structures. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 16(1): 417-424.
[28]Popescu A., Condei R., 2015, Research on Romania's employment in agriculture and its position in the European Union, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 15(2): 281-289.
[29]Popescu, A., Dinu, T. A., Stoian, E., 2019, Changes, trends and relationships between average income and consumption expenditures per household in Romania in the period 2007-2017. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development", Vol. 19(2): 363-374.
[30]Popescu A., Dinu T. A., Stoian E., 2018, Demographic and economic changes characterizing the rural population in Romania. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 18(2): 333-346.
[31]Popescu, A., Dinu, T. A., Stoian, E., 2019, Efficiency of the agricultural land use in the European Union. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development". Vol. 19(3): 475-486.
[32]Popescu, A., Dinu, T. A., Stoian, E., Serban, V. 2021, Efficiency of labor force use in the European Union's agriculture in the period 2011-2020. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development", Vol. 21(3): 659-672.
[33]Popescu, A., Grigoras, M. A., 2011, Research concerning Rural versus Urban Population–Present and Prospect. Scientific Papers: Series Management, Economic Engineering in Agriculture and rural development, Vol. 11(2): 151-156.
[34]Popescu, A., Tindeche, C., Marcuta, A., Marcuta, L., Hontus, A., Angelescu, C., 2021, Labor force in the European Union agriculture - traits and tendencies. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development", Vol. 21(2): 475-486.
[35]Ruzavin, G. I., 1999, Methodology of scientific research. Moscow, 317 p.
[36]Sabluk, P. T., Kurylo, L. I., 2014, Scientific (economic) centers of rural development in the management of agricultural economy. Economics of agro-industrial complex. Vol. 5: 51-56.
[37]Semenyshena, N., Khorunzhak, N., Lazaryshyna, I., Yurchenko, O., Ostapenko, Yu., 2021, Accounting Institute: on the Genesis and Impact of Management Revolutions. Independent Journal of Management & Production. Vol. 12(3): 243-261.
[38]Shmatkovska, T., Dziamulych, M., Gordiichuk, A., Mostovenko, N., Chyzh, N., Korobchuk, T. 2020, Trends in human capital formation and evaluation of the interconnection of socio-demographic processes in rural area: a case study of Volyn region, Ukraine. Scientific Papers: Series «Management, Economic Engineering in Agriculture and rural development», Vol. 20(2): 437–444.
[39]Shmatkovska, T., Dziamulych, M., Yakubiv, V., Myshko, O., Stryzheus, L., Yakubiv, R., 2020, Economic efficiency of land use by agricultural producers in the system of their non–current assets analysis: a case study of the agricultural sector of Ukraine. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development". Vol. 20(3): 543-554.
[40]Shmatkovska, T., Nikolaeva, A., Zabedyuk, M., Sheiko, Yu., Grudzevych, Yu., 2020, Increasing the efficiency of the labour resources usage of agrosector enterprises in the system of sustainable development of the rural territories: a case study of Ukraine. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development". Vol. 20(4): 467-476.
[41]Sodoma, R., Brukh, O., Shmatkovska, T., Vavdiiuk, N., Bilochenko, A., Kupyra, M., Berezhnytska, G., 2021, Financing of the agro-industrial complex in the context of the implementation of international experience. Financial and credit activity: problems of theory and practice, 38(3): 341-350.
[42]Sodoma, R., Cherevko, H., Krupiak, I., Andrusiak, H., Brodska, I., Shmatkovska, T., 2021, Regulation of the lending market and prospects of financial sector stabilization in Ukraine. Financial and credit activity-problems of theory and practice. Vol. 36(1): 4-13.
[43]Sodoma R., Shmatkovska T., Dziamulych M., Vavdiiuk, N., Kutsai, N., Polishchuk, V., 2021, Economic efficiency of the land resource management by agricultural producers in the system of their non–current assets analysis: a case study of the agricultural sector. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development". Vol. 21(2): 577-588.
[44]Soshnikova, L. A., Tamashevich, V. N. Webe, G., Schaefer, M., 1999, Multidimensional statistical analysis in economics. Moscow, 598 p.
[45]Stashchuk, O., Boiar, A., Shmatkovska, T., Dziamulych, M., Skoruk, O., Tesliuk, S., Zintso, Yu., 2021, Analysis of fiscal efficiency of taxation in the system of filling budget funds in Ukraine. AD ALTA:

Journal of interdisciplinary research. Vol. 11(1) Special Issue XVII: 47-51.
[46]Stashchuk, O., Shmatkovska, T., Dziamulych, M., Kovalska, L., Talakh, T., Havryliuk, O., 2021, Integrated assessment, analysis and management of financial security and stability of joint-stock companies operating in the agricultural sector: a case study of Ukraine. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development". Vol. 21(2): 589-602.
[47]Stashchuk, O., Shmatkovska, T., Dziamulych, M., Kupyra, M., Vahnovska, N., Kosinskyi, P., 2021, Model for efficiency evaluation of financial security management of joint stock companies operating in the agricultural sector: a case study of Ukraine. Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development". Vol. 21(1): 715-728.
[48]State Statistics Service of Ukraine, http://www.ukrstat.gov.ua, Accessed on November 1, 2021
[49]Voloshyna, S., Provolotska, O. Lazaryshyna, I., Nieizviestna, O., Skliar, N., 2019, Analytical assessment of the jewellery market in Ukraine. Economic Annals-XXI. Vol. 176(3-4).
[50]Yakoviyk, I., Chyzhov, D., Karpachova, N., Hlushchenko, S., Chaliuk, Yu., 2020,. National security policy in Ukraine: a change in the system of power relations of the modern world. Revista San Gregorio. Vol. 42: 224-235.
[51]Yanyshyn, Ya., Sodoma, R., Markiv, G., Lipych, L., Shmatkovska, T., Shidnytzka, G., 2020, Economic efficiency of the nuts complex business in the agriculture of Ukraine. Scientific Papers Series «Management, Economic Engineering in Agriculture and Rural Development» Vol. 20(2): 531-536.
[52]Yatsukh, O., Demchenko, I., Ilnytskyy, D., Tsap, V., Shmatkovska, T., 2021, Management of banking innovations in the conditions of digitalization. AD ALTA: Journal of Interdisciplinary Research. Vol.11, Special issue XVII: 123-127.
[53]Yermakov. O. U., Hrebennikova, A. A., Nahornyi, V. V., Chetveryk, O. V., 2019, Investment Support and Development of Social Responsibility of Agrarian Business Entities. 34th International-Business-Information-Management-Association (IBIMA) Conference. Madrid, Spain, 13-14, November 2019: 13260-13266.
[54]Zhurakovska, I. V., Sydorenko, R. V., Shmatkovska, T. O., Brodska, I. I., 2020, Factors of influence on employment in small and medium-sized business in Ukraine. Financial and credit activity: problems of theory and practice. Vol. 32(1): 109-119.