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MODELLING MANAGEMENT OF RURAL AREAS UNDER CONDITIONS OF DECENTRALIZATION IN UKRAINE

ABSTRACT

The object of the study is the process of modeling the management of rural areas under conditions of decentralization. Developing and implementing an effective model of citizens' participation in economic decision-making is a matter of some difficulty. One of the possible solutions to this problem is the modelling of crisis situations and exploring of areas by socio-ecological and economic status.

The methods used in the research: analysis and synthesis, economic modeling, correlation, SWOT-analysis, cluster analysis method.

According to the results of research, five clusters for rural development in Ukraine were identified. The calculations made it possible to substantiate anti-crisis strategies in the designated territories within the defined clusters.

Key words: modeling, management, crisis, rural areas, decentralization.

JEL Classification: H12, R12, R15

1. INTRODUCTION

The socio-economic development of rural areas is one of the main priorities of the state policy of Ukraine aimed at raising living standards of the rural population, developing rural infrastructure, improving the quality of human capital. Today, it is very important to develop and implement an effective model of citizen participation in economic decision-making under conditions of crisis. At present, the focus is on the decentralization of power. Decentralization reform aims at removing the country from the crisis by activating the population and is a process of redistribution of functions, powers, people or things between governing bodies.

To improve the situation in the country, we propose to apply crisis management approaches in the context of decentralization reform. The main task is not only to create a crisis plan due to management, but also a strategy for successful rural areas development. In the context of decentralization reform, improving the management of

rural areas is possible through modeling and forecasting. Therefore, the study of the modeling process in the management of rural areas under decentralization is an urgent problem and needs to be explored.

2. STATE OF KNOWLEDGE

The research of theoretical and methodological aspects of rural area management was explored by researchers (Antoniuk, 2018; Karkovska, 2015). They proved their definition of crisis management, which foresee the dangers of the crisis, analyze its symptoms, measures to reduce the negative effects of the crisis and use its factors for future development. Fast identification of signs of crisis and creation of appropriate prerequisites for its timely overcoming are considered by the authors of research (Averianov, 2002; Ligonenko, 2004). The definitions and approaches more specifically considered the enterprise level, while the territorial dimension has been ignored.

The current peculiarities of crisis management in the context of crisis emergence and the associated difficulties make it necessary to study approaches to forecasting the processes of economic management in the context of decentralization in rural areas.

Examining the distribution of powers by level, it is proved that budgetary decentralization leads to efficient allocation of resources, in rural areas inclusively (Musgrave, 1959). The theory of decentralization was proved (Oates Wallace *et al*., 2005). Its essence is that in cases where decentralization does not affect the volume of expenditures, the decentralized decision to provide local public goods should be more efficient than centralized, but equal in terms of efficiency. These scholars consider that the central government should play a leading role in the macroeconomic policy of stabilization, income redistribution and provision of national public goods, while local governments should cater for the needs of rural territorial communities. However, this approach leads to budgetary federalization, which has mixed results in world practice. At the same time, the analysis of the experience of individual countries in the field of decentralization proves the presence of positive and negative sides of this process (Baldershame, 2000; Nakonechnyi, 2014). Different approaches to the reformation of individual countries were considered, and an analysis of reformation was carried out (Markvart, 2015; Otola, 2017). However, the trends in the world literature are not sufficiently considered in the Ukrainian situation.

Observations and studies of specific phenomena, experiments, as well as generalization, classification and description of the decentralization effects on the economic development dynamics are analyzed in (Blackburn *et al*., 2005; Bodman *et al*., 2009).

Thus, the results of the analysis suggest that the question remains of the choice of methods for effective management in the context of decentralization in rural areas using modeling.

3. MATERIAL AND METHOD

The following methods were used to study rural areas, prevent and overcome crises, and find approaches to management: methods of economic analysis, forecasting, development of anti-crisis programs and investment projects. Methods of studying phenomena (subject, object), division into components are applied; investigation of different parties; identification and analysis of relationships between factors and outcomes.

The object of the study is the process of modeling management of rural areas under decentralization conditions.

The management of territorial objects economy in the context of decentralization lies in its ability, in the process of growing crisis, to restore the effective activity of the economic entity as a microeconomic system based on the mechanism of self-organization, maintenance of a stable internal state and dynamic external environment.

The plural of poorly formalized tasks, which arise in the process of crisis management implementation, predetermines the usage of model support for decision-making processes at the development of programs, implementation of mechanisms and measures of the crisis strategy.

The territorial reform of the economy can lead to success in the current conditions of prolonged crisis. An important component of the reform is decentralization, namely the division into united territorial communities. Nowadays this process is in an early stage in Ukraine. One of the problems is that there is not such an experience in Ukraine. Thus, it is necessary to apply modeling to make forecasts based on the developed methods.

The aim of the study is to develop a methodological approach to modeling management of rural areas under decentralization conditions.

To achieve this goal, the following tasks were set: to develop an algorithm for grouping objects according to the level of improvement of rural area management in the context of decentralization; to justify the method of cluster ranking based on taxometric index.

4. RESULTS AND DISCUSSIONS

The essence of the management of rural areas reflected in the approaches to the restrictions that can be adjusted. For example, internal constraints can be alleviated by changing the management apparatus, rotating it, training, or by improving motivational approaches.

In the purpose of effective action planning, it is recommended to use a forecasting method that incorporates past experience and current assumptions about the object in the direction of identifying it. The result is a visualization of the future that can be used as a basis for further development and identification of

planning components. Management forecasting is the elaboration of managed object development models. Modeling methods are used for working out the implementation of forecasting, e.g. approbation of economic, political, social and environmental processes.

Particularly interesting is the forecasting under decentralization conditions. The main task of anti-crisis actions is to increase the socio-economic well-being of the rural population. This is the main aim of the decentralization reform, which addresses the following tasks:

- permanent monitoring of internal and external environment, accumulation and analysis of information for quick response in critical moments;
- quick diagnosis for the identification and elimination of problems in the economic mechanism;
- analysis and control of risks in the financial and economic activities of territorial entities, as well as the development of measures to neutralize and eliminate them;
- reliability of accounting and control systems functioning;
- assessment of completeness and accuracy of accounting data;
- designing a strategy of development for territorial formation, including benchmarking research and coordination of planning of financial and economic activities;
- analysis of deviations of actual indicators from planned;
- developing offers for coordinating plans and removing obstacles to their implementation;
- timely response to identify and develop strengths (manifestation of new opportunities);
- continuous control over the activities of employees in the implementation of budgets, compliance with the established document flow and the performance of functions and powers in accordance with their responsibilities;
- providing advice and information assistance in the planning and development of methodological support of some rural territorial entities;
- conducting internal (external) audit in the implementation of strategic and tactical economic objectives and allocation of grants on this basis.

The economic and social development forecast is a means of substantiating the choice of a certain strategy and taking concrete decisions by the bodies of legislative and executive power, bodies of local self-government on the regulation of socio-economic processes.

In order of effective modeling management of rural areas, it is necessary to take into account the specific features of all regions of Ukraine and analyze the results, taking into account the decentralization reform. Dividing the selected set of territorial objects into clusters using the selection of the most similar elements is suggested. Cluster analysis is a multidimensional statistical procedure, based on the

collection of information about a sample of object. This method allows arranging objects into relatively homogeneous groups, using several features at a time. This technique is fully suitable for modeling management of territories under conditions of decentralization, while simultaneously taking into account disparate indicators. For this purpose, appropriate indicators are used to characterize a certain degree of similarity across all classification parameters (Nakonechnyi, 2009).

The cluster analysis methods are divided into two groups: hierarchical and non-hierarchical (Katrenko, 2003). Multivariate classification methods are proposed to be used in the research: hierarchical agglomerative methods and *k*-means method. Hierarchical algorithms build a nested partition system. The output of the algorithm is a cluster tree with the root as the entire sample and the leaves as the smallest clusters. Non-hierarchical algorithms only build one object cluster. Hierarchical clustering methods include two categories of algorithms. The first is called agglomeration and starts with a single-element cluster that combines two clusters to build a hierarchy of clusters from the bottom up. The second group (divisive methods) is defined by the method of separation of a large macrocluster, which contains all elements and is divided into two groups, each of them also into two, etc. Thus, cluster hierarchy is generated from top to bottom (Yakymets, 2016).

K-means method is to identify a group of data. The input multitude is divided into *k*-group, while minimizing the function that determines the distance as the sum of squared errors. Then the quality of the separation is optimized iteratively. It allows minimizing costs and eliminating crisis by reducing the impact of serious risks in an early stage of crisis management.

Thus, *k*-sectioning can divide the data set of *n* objects into a set of *k*-clusters for which a sequence exists:

1. A centroid is selected based on the *k*-data array.
2. In a cycle, it performs the following actions until it reaches the convergence criterion (Yakymets, 2016):

– selection of k-clusters is formed by assigning each point to the nearest to it centroid;
– redefined centroids;
– the algorithm can use different measures of distance.

In the research, the average data of the State Statistics Service of Ukraine for 2018 were used to carry out and approve the proposed method of cluster analysis.

The results of the analysis were received using STATISTICA program. The studied aggregate of regions is divided into three groups of objects by macro indicators, similar by development characteristics. For the beginning of the classification procedure *k* randomly selected objects are assigned. They are used as benchmarks, in other words the centers of the clusters. Two modifications of the k-means method are possible. The first one involves the recalculation of the center of gravity of the cluster after each change of its composition and the second – only

after all data has been reviewed. In both other iterative algorithms, this method minimizes the variance within each cluster, but in reality such an optimization criterion is not used (Fedoseev, 2002). The computational procedures of most iterative classification methods are reduced to the following steps (Voinarenko, 2000):

– selection of the number of clusters to which the aggregate has to be divided, the task of initial distribution of objects and determination of the centers of weight of the clusters;
– in accordance with the chosen similarity methods, the new composition of each cluster is determined;
– after a complete review of all objects and their distribution by clusters, their centers of gravity are recalculated.

To find the optimal configuration, we compare the values of the potential cumulative results of all cluster participants in all possible variants, determine the reference configuration that is most beneficial for all participants, and select the optimal cluster composition, focusing on the standard. This problem can be solved by using the taxometric method. It is based on the choice of "reference configuration" and comparison of the optimal parameters (coordinates) of its vector with the corresponding parameters of the vectors of other possible configurations. In other words, finding Euclidean distances by which the ranking of possible cluster structures is carried out: the smallest distance corresponds to the highest position. The principle of this methodic is to represent all the data on the preferred benefits of participating in a cluster in the form of a matrix, where a single row is a vector of the benefits of the configuration option, the coordinates of which are the same values of the aggregate results. Since the parameters of the model of the three-component structure have different nature and different values, the normalization of the elements of the matrix is carried out. For this purpose, the original data were replaced with the matrix.

The results of the calculations made it possible to move on to determining the type of anti-crisis strategy that is appropriate for each of the selected clusters. This was done using a graphical zoning method. As a result of the calculations, a rating of possible configurations for the specified clusters was created (Figure 1).

The calculations of the existing potential of rural areas of the country and the identified priorities for future development and the possibility of crises in the conditions of decentralization testify to their further functioning. Probable imagination of the main trends of further changes over time is received, focusing on initial values. Developing an effective strategy for managing crisis processes in different clusters requires a comprehensive approach to solve the economic, social and ecological problems that directly affect and determine their status and future prospects.

The areas helping to make choice of the strategy are defined on the graphical matrix for each of the clusters (Figure 1):

– cluster I covers two zones H and L, which indicates the feasibility of developing and implementing basic crisis prevention strategies;
– cluster II – two zones G and H, which proves the necessity for implementation of action strategies;
– cluster III – zones D, F and K, which is related to the importance of focusing on development strategies;
– cluster IV – zones B, C, D, determines the implementation of basic crisis exit strategies;
– cluster V – two zones A and B, indicating the necessity to develop resource providing strategies.

The performed calculations allow justifying the necessary anti-crisis strategies in the fixed territories within the clusters defined. Developing their proof requires more detailed study, so let us focus on cluster V as one that needs more specific attention (Table 1).

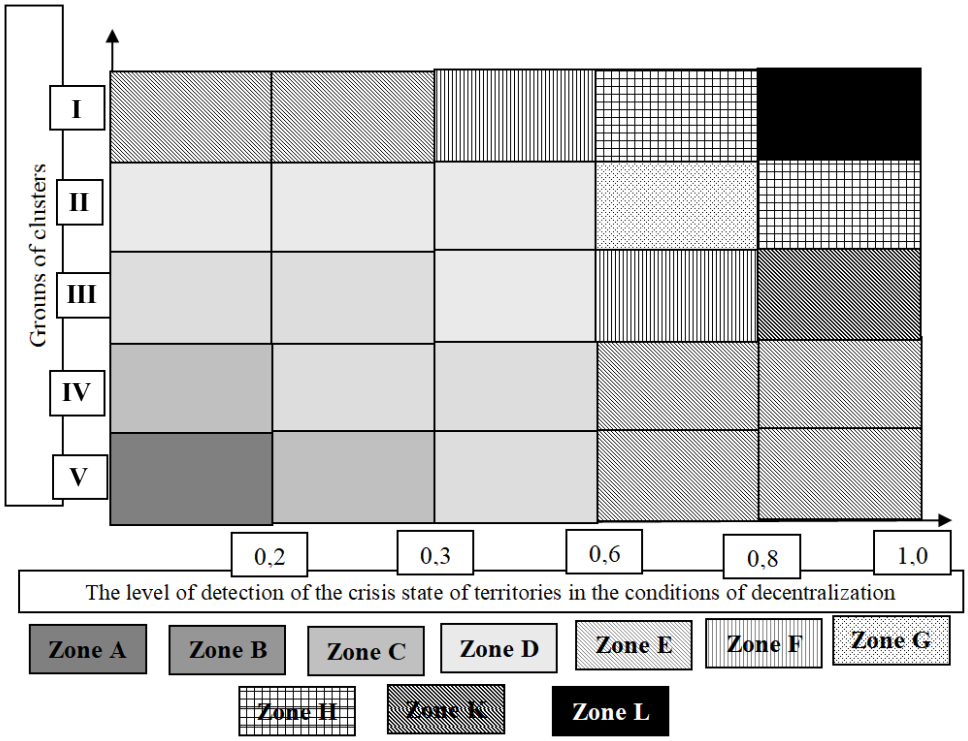

Figure 1. Graphical matrix for determining the type of anti-crisis strategy.

Table 1

SWOT matrix for V cluster

Object	**Strengths**	**Weaknesses**
The internal environment	– availability of resource potential; – availability of production potential; – availability of raw material base; – availability of skilled labor resources; – production of export products; – the presence of cultural heritage.	– unstable situation (border area); – significant external migration; – high death rate; – high level of unemployment; – production volumes do not meet the potential; – a high degree of fixed assets and infrastructure deterioration and obsolescence; – social and ecological risks; – significant territorial imbalance of socio-economic development of rural areas; – low level of real incomes of the population in rural areas; – low level of using alternative energy sources, which causes energy dependence; – rural budgets are subsidized; – high level of shadow economy; – poor quality of management in different spheres of economy; – lack of interregional partnership
Object	**Opportunities, prospects**	**Threats**
The external environment	– active implementation of anti-crisis public-private partnership; – implementation of anti-corruption legislation; – increasing the capacity of local authorities in the context of decentralization; – creating a favorable investment climate; – implementation of energy and resource efficiency policy; – reconstruction of infrastructure; – economic recovery from the point of view of sustainable development; – expansion of production; – support for the development of small and medium-sized businesses; – reduction of unemployment; – raising the population living standard; – life safety.	– lack of development stabilization policy; – unstable political, economic and social situations, also because of hostilities; – corruption in power and judicial structures, control bodies, difficulties of permitting and approval procedures; – instability of national currency, continuation of inflationary processes; – a large number of people unable to work; – lack of renewed production that can provide working places; – energy-intensive production; – increased labor migration, loss of intellectual and cultural elite; – significant natural reduction of the working-age population; – legislative non-regulation of legalization of the natural resources usage.

The following strategic approaches for rural areas are suggested:

1. Strategic priority of economic development: reforming territories, updating authority; development of public-private partnerships, creation of rural communities, etc.

2. Strategic priority of social development: stabilization of economic and social situations, demographic reforms, solving problems concerning unemployment in rural areas, equalizing levels of development of the countryside, promotion of development of small and medium-sized businesses, guarantee of security, etc.
3. Strategic priority of ecological development: improvement of legislative and regulatory framework for the use of environment and natural resources in rural areas, launching of environmentally safe and waste-free production, improvement of ecological education, etc.

Implementation of any of the priority areas of the anti-crisis strategy for rural areas requires the development and implementation of appropriate programs. It allows to put into practice the offered suggestions and to use the anti-crisis measures in accordance with the general problems and taking into account the peculiarities of managing the rural and territorial community.

5. CONCLUSIONS

1. The algorithm of grouping objects according to the level of improvement of management of rural areas in the conditions of decentralization has been developed, which, unlike the existing ones, takes into account the positive effect of the anti-crisis actions carried out. We can argue that taking into account social, environmental and economic parameters significantly influences the result of grouping of objects and determines the direction of anti-crisis actions.
2. The methodology of cluster ranking based on taxometric index is substantiated. It helps to find the most problematic territories. Unlike the existing ones, this method takes into account the indicator of the crisis situation of territories and allows analyzing the status of the integrated territorial object. A risk factor was introduced to identify the crisis situation of territories under decentralization conditions.
3. According to the research, a SWOT analysis was carried out and an anti-crisis strategy was proposed. An effective crisis management strategy in rural areas is provided with a comprehensive approach to solve the economic, social and ecological problems that directly affect and determine their status and future prospects.

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