The Use of Cluster and Foresight Technologies in the Design of Strategies for Sustainable Development of Rural Areas of the Region

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Abstract. The article justifies the need of the use cluster and foresight technologies in the strategizing of sustainable development of rural areas. A brief analysis of foreign experience in applying the cluster approach and foresight technologies in the development of regional strategic planning programs has been carried out. The strategy design algorithm of sustainable development of rural areas in the region based on the use of cluster and foresight technologies has been presented. It is revealed, that in the modern conditions of rural areas development of the Republic of Bashkortostan, it is necessary to develop strategic programs and anti-crisis measures that should focus on the use of the cluster approach and foresight technologies. As a result of the clustering and foresight research, the “reference” (“leaders”) and “outsiders” (“outliers”) municipalities of the Nonchernozem zones of the Republic of Bashkortostan have been defined. It is summarized, that the use of cluster and foresight technologies helps to make the transition from the actually existing monofunctional model to a multifunctional model of sustainable development of rural areas of the region.

1. Introduction

Today, the global scientific community has a growing understanding of cluster philosophy, and the clusters themselves are becoming a key component of the national strategic plans for the sustainable development of various economy sectors. The use of the cluster approach gives a high importance to the innovative component in the concept of sustainable development and most fully reflects the triunity of "nature - population - economy". In the traditional reflection, clusters form unique competences of rural areas based on the development of a competitive environment and integration relations.

In economically developed countries the formed clusters determine the creation of a kind of framework reflecting the direction of sustainable development of all modern economy sectors [1, 2]. The Declaration on Strengthening Economic Cooperation in Europe, adopted in 1997, declared the development of cluster-based production systems as one of the priorities of sustainable development. In the USA, Canada, Japan, the EU countries, clusters became the basis for the development of regional innovation systems and depressed areas [3, 4, 5].
The use of the cluster approach is more effective if the grouped clusters fit into the wider context of the sustainable development strategies of the regional economy [6]. The regions with the formed clusters become the leaders of the economic development of the country. According to the conducted research, 7 out of 19 European regions, where clusters are effectively developing are innovatively active territories [7].

As world practice shows, the use of cluster and foresight technologies is not only an effective means of achieving the goals of the agricultural policy, but is also a strategic imperative for the sustainability of rural areas [8, 9, 10]. In the 50 OECD member countries, foresight research is considered to be a mandatory tool for the development of science, technology and innovation policy. The foresight methodology is used not only at the level of studying of global trends, but also for the formation of scenarios for a projected sustainable future at the regional level and at the level of urban and rural municipalities [14, 15]. The heuristic and organizational and management potential of foresight is actively used by foreign experts as an effective tool for strategic planning of rural development [11, 12, 13].

2. Results and discussion
The issue of rural areas sustainable growth is determined by the complexity and dynamism of different scientific approaches and methods to solve it [16, 17]. These circumstances determine a special role in the application of cluster and foresight technologies to determine the prospects for rural areas sustainability of the constituent entities of the Russian Federation [18].

For the strategic vision and the future of such a region as the Republic of Bashkortostan, the sustainable development of rural territories representing complex socio-economic systems is important [19]. The rural municipalities system of the republic can be considered as a certain model area from a scientific point of view of the purpose of foresight technologies using for its sustainable growth and development, a set of methodical and practical problems associated with this process and the results achieved.

We have formed an algorithm for a strategy designing for sustainable development of rural areas of the region based on the use of cluster and foresight technologies (Fig. 1). An integral part of the formed algorithm is the clustering of rural municipalities in terms of indicators reflecting basic food self-sufficiency of the population.
The use of cluster and foresight technologies for designing of the strategy for sustainable rural areas development

| Cluster Technologies | Foresight Technologies |
|----------------------|------------------------|
| Preparation of information support for clustering of rural municipalities | Foresight analysis and expert evaluation of the results of the clustering |
| Clustering of rural municipal formations by indicators reflecting basic food self-sufficiency of the population | Formation of strategic plans for sustainable rural areas development |
| Verification of reliability and adequacy of the cluster solution results | Identification of “reference” (“leaders”) and “target” (“outsiders”) rural municipalities on production of agricultural food products in the formed clusters |

**Figure 1.** Algorithm of a strategy design for sustainable development of rural areas of the region on the basis of cluster and foresight technologies.

Multidimensional classification of municipalities was carried out taking into account their contribution and the degree of participation in basic food production. Clustering was implemented for all 22 municipalities of the Nonchernozem zone of the Republic of Bashkortostan using statistical indicators for 2005-2018, reflecting the production of grain, potatoes, vegetables, meat, milk and eggs per capita. The use of cluster analysis methods made it possible to group municipalities similar in terms of the characteristics determined in the course of calculations into three homogeneous clusters (Table 1).

**Table 1.** Brief description of the formed clusters.

| Indicators                              | Cluster number |
|-----------------------------------------|----------------|
|                                        | I  | II | III |
| Number of municipalities                | 6  | 7  | 9   |
| Number of rural settlements             | 74 | 109| 126 |
| Number of rural communities             | 324| 596| 685 |
| Population, thousand people             | 139| 340| 206 |
| Total annual production of agricultural products, thousand tons |     |     |     |
We conducted a foresight survey of experts (scientists, community leaders and agribusiness representatives) regarding the development prospects of the Chernozem zone rural areas of the republic. On the basis of clustering and complex foresight analysis, “reference” (“leaders”) and “target” (“outsiders”) municipalities in the production of agro-food products were identified. “Reference” territories form the “golden section” or “diamond” of the agricultural and food industry of the area under consideration. They are a strategic benchmark for development and have the highest rates among the entirety of studied objects.

Pointing out the strengths and advantages of the “reference” municipalities allows to determine their competitive attractiveness and makes it possible to assess the promising volumes of food production within their municipal boundaries. At the same time, the subjects interacting in cluster (agricultural organizations and peasant (farmer) farms) can create positive external effects that enhance the competitiveness of other cluster members. The “core” (integrator) of the formed clusters are stable functioning, positioning and successfully developing agroformations. “Points of growth” form a kind of cluster-forming block of agricultural organizations and peasant (farmer) farms. At the same time, “satellites” are enterprises and organizations engaged in the processing of agro-food products and agricultural raw materials.

“Target” municipalities are themselves characterized by an extensive level of agricultural production and the non-effective development of crop farming sectors. If we follow the basic concepts of the P-convergence theory worked out by the scientists R. Barrot and H. Sa-la-Martin, the “poor” (“target”) territories have higher rates of economic growth compared with the “rich” (“reference”) territories, and, therefore, in the long term, this should lead to an equalization of their levels of economic development. That is, the strategic management of rural areas, based on cluster and foresight technologies, will allow to reorient unprofitable agricultural organizations through the spread of innovation to all agroformations located within the formed clusters. This thesis is confirmed by application of the concept of “mutual and cumulative conditionality” of G. Myrdal, according to which an interdependence of economic growth factors is observed and, accordingly, variations of one factor will cause changes in other factors [20]. In this case, the achievement of efficiency is expected in the production of agricultural products increase.

3. Conclusion
It is important to emphasize that the formation of a new sustainable development of rural areas architecture, based on cluster and foresight technologies, should be an integral part of the region long-term development strategy. The cluster approach is one of the fundamental directions in designing a strategy for sustainable growth of rural areas. Foresight monitoring of municipalities helps to provide a forecast assessment of the actual situation development of rural areas with low ratings in the sphere of food supply for rural residents.
Thus, the use of cluster analysis methods combined with foresight technology allows to form an applied base for statistical research of rural areas and contributes to the definition of indicators of for sustainable development strategy of rural areas. The realization of these promising research methods helps to make the transition from the actually existing monofunctional model to the multifunctional model of sustainable development of rural areas of the region.

4. References

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