Pol. J. Environ. Stud. Vol. 32, No. 2 (2023), 1125-1143
DOI: *10.15244/pjoes/156034* ONLINE PUBLICATION DATE: 2022-12-30

Original Research

Developing a Strategy for Sustainable Rural Development in the COVID-19 Pandemic

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Received: 10 August 2022
Accepted: 24 October 2022

Abstract

The present paper assesses the strategic significance of transition to the multifunctional vector of sustainable development for rural territorial entities. The study outlines perspective research areas to examine the phenomenon of sustainable rural development. The purpose of this study is to develop a methodological approach to the implementation of sustainable rural development strategy in the context of the COVID-19 pandemic. The goal of this study was achieved through the development and implementation of a comprehensive research project that combines the advantages of desk and field research. Designing a cluster scenario of sustainable rural development exploited a multidimensional statistical analysis, scenario forecasting and foresight methods. The study used a systematic approach focused on the main elements of rural areas, their exogenous and endogenous factors of functioning and interconnection, the current state, weaknesses and strengths in identifying strategic priorities for sustainable development. In turn, the system analysis relied on conducting explicit examination and evaluation, subsequent expertise, and working out a rural development strategy. Rural areas of the Non-Chernozem zone of the Republic of Bashkortostan were chosen to approve the developed methodological approach. The main findings of this study include: overview of the previous research on strategic planning of sustainable rural development; justification of the integrated application of present-day methods of economic research to take "mainstream" directions for functioning of rural territorial

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entities. The results of this paper can be used as general guidelines to make long-term strategic plans and forecasts for rural development.

Keywords: cluster technologies, foresight methodology, rural area, rural territorial entities, strategic planning

Introduction

Rural territories have been taking an increasing importance in the transition to a qualitatively new multifunctional vector of sustainable innovative development. The development of the rural economy today is challenged by social and environmental risks around the world, the COVID-19 pandemic.

The leading countries of the world seek for a harmonious and balanced progression of rural territories as an ultimate objective in the system of planning and forecasting their economic and social spheres. It implies the efficient involvement of rural local communities and population. It is quite clear that to achieve sustainable development rural territories need to develop and implement a strategy that ensures the emergence of "growth points" and drivers. At the same time, issues of strategic development of rural areas in the post-Soviet economic space historically have a rather weak methodological basis, while the use of foreign methods of strategic management is often complicated or in principle impossible due to the critical differences in economic conditions.

This indicates need for scientific research on ways and means to provide steady growth of rural territorial entities and better living standards of the rural population under digital transformation of the economy [1-3]. The ongoing coronavirus pandemic and new challenges arise impulses and opportunities for rural institutions to operate based on the digital innovations and economy. The current economic environment provides conditions for sustainable innovative development based on the large-scale introduction of digital technologies into many industries and fields of public life. There are many tools available for application by agricultural producers as big data analysis (Big Data), autonomous systems, artificial intelligence (AI), blockchain and smart contracts, Internet of Things (IoT), virtual reality, digital agro-clusters, "cloud" computing and precision farming technologies [4, 5].

The immense significance of the agrarian sector has arisen from the existing industrial communications, realized export potential, a certain contribution to achieving the population's food self-sufficiency. Agriculture has a decisive impact on the social and economic underpins of stable advancement of rural territorial entities [6, 7]. The efficient operation of the agricultural sector, its higher competitiveness makes it possible to develop and implement a scientifically based cluster policy aimed at the sustainable functioning of rural territorial entities. Accordingly, the new cluster policy should become strategic, stimulating, proactive, flexible in relation to emerging trends in the agrarian economy. The disclosure of cluster potential will allow identifying additional opportunities that increase the investment attractiveness of rural areas for the agribusiness development of [8].

The development of rural areas requires a systematic approach and new methods of scientific research, in particular, cluster and foresight technologies, taking into account both external and internal economic, political and social factors [9, 10], which is especially relevant for developing countries and countries of the post-Soviet economic space. Modern trends in the development of agrarian economy determine the priority of new methodological approaches and provisions aimed at improving the competitiveness and efficiency of rural economic entities, which leads to a sharp increase in social demand for science-based innovative methods of strategic management of rural development.

Literature Review

The awareness of the role of rural areas in achieving sustainable development of regions and national economies as a whole, replacing global urbanization, has led to increased research interest in sustainable rural development [11-13]. The authors of the present paper conducted a content analysis of research findings for 2019-2022 on the issue under investigation. The performed analysis of academic literature made it possible to distinguish the following promising areas to examine the phenomenon of sustainable development of rural territorial entities:

1. Stable growth of rural territories based on the applied natural resource potential and better environmental well-being of rural areas. In this field of studies, the development of an index system for sustainable rural development based on the methodological provisions of the concept of ecological well-being is of particular interest [14]. In this conceptual perspective, sustainable rural development (SRD) is considered in relation to the ecological living conditions of the population. The given concept of sustainable rural development is aimed at achieving two key conditions, namely: the effective functioning of the sphere of environmentally friendly production, the "green" economy, waste disposal and the provision of the entire range of accessible public services and social benefits to the rural population.

Previous research has established the role and importance of natural and anthropogenic complexes in achieving sustainable development of rural territories [15]. Thus, within the classical scientific rationality,

the natural and anthropogenic complex of rural territories is a complex system consisting of four subsystems: economic, technical and technological, environmental and social. The sustainable development of the natural and anthropogenic complex of rural territories is characterized by the effective functioning of these subsystems. Economic entities keep them at equilibrium using feedback mechanisms.

On the other hand, under the non-classical scientific rationality, the natural and anthropogenic complex of rural territories is an active self-developing system. It is created in intercommunication with management entities and actively influences the implementation of management decisions in rural areas. It is evident that effective management of natural and anthropogenic complexes in rural areas being prerequisite for achieving sustainable development should be based on the integrated use of classical and neoclassical approaches.

The conducted assessment of rural progression in Scotland and Finland has shown that rural development is more beneficial than further urban expansion [16]. The post-covid world is likely to call into question issues relating to urban development. The authors of this study claim that enlargement of cities as sources of economic growth is a "zombie idea". The present-day management ignores the role and importance of farming as a driving force of the rural economy.

Other authors have shown that rural issues like damage to the environment, the increased outflow of rural people, a drastic reduction in agricultural production manifest the imbalance between demand and supply for services provided in rural areas [17]. The findings of the study conducted on the data of the Jinzhuang and Dongheng Village territories have brought to the following conceptual conclusion: changing the type and intensity of land use functions in rural areas can have a resultant impact on the actual structure of agricultural production, the ecology and living conditions of the population, thereby contributing to sustainable rural development.

2. Sustainable development based on a neo-endogenous model of human capital in rural areas. Within this approach, a neo-endogenous pattern of rural development is of particular interest [18]. It can be argued that the sustainable development of rural areas and the expanded diversification of the rural economy should be based on internal (endogenous) resources and take into account their spatial distribution within the area under consideration. The given scientific research demonstrates the exceptional importance of evaluating key target indicators reflecting the level of social improvement of rural areas when compared with similar parameters of urban development.

The conducted studies based on surveys, observations and statistical data from the Portuguese Agricultural Census emphasize the significant contribution of human capital to achieving sustainable rural development [19]. The correlation and regression analysis determine the relationship of parameters reflecting human capital and indicators of innovation activity of micro and small enterprises operating in rural areas. These scientific developments provide evidence for the efficient use of endogenous factors (considered as assets) for introducing innovations in rural areas and developing their competitiveness within the Common Agricultural Policy pursued by the European Union. Institutionally, micro- and small enterprises, determining the level of sustainability of rural areas, can be considered as endogenous assets. The Chinese experience demonstrates that restrictions hindering formation and achievement of sustainable rural development are directly related to the problems of large-scale introduction of inclusive finance in rural areas [20, 21].

A multi-criteria approach to assessing the well-being of the rural population, based on the theory of capabilities of A. Sen and fuzzy analysis supplies a scientific interest [22]. The practical application of the given method to the compiled model designs makes it possible to reveal the main reasons of social isolation in rural communities and determine the direct relationship between the level of well-being and the number of rural population. The conducted study arrived at the conclusion that higher life quality of the population has a resultant value for accelerating the endogenous development of rural areas.

3. The extension of digital economy and activated introduction of digital technologies as drivers of sustainable development of rural areas. In our opinion, the digital economy and technologies are one of the promising ways to provide sustainable rural development. In this conceptual perspective, a detailed examination and analysis of the positive and negative impact of digital technologies within the 4IR framework (the Fourth Indus-trial Revolution) is equally relevant and important both for cities and rural areas [23]. There is a need for eliminating the key barriers preventing the transition to a "smart rural future".

Recent research has used the index method in evaluating statistical materials of ten rural districts in the Chinese province of Guizhou. The study has identified a positive relationship between functioning of rural e-commerce and the level of socioeconomic development of rural areas [24]. The research has adopted the conceptual position on e-commerce. It is claimed to be a certain catalyst for rural development. The extension of "smart" commerce technologies results in revitalization of rural areas.

There has been emphasized the decisive role of "transformative" social innovations for implementing "inclusive" planning of sustainable rural development [25]. Undoubtedly, social innovations implemented in the adaptive management system determine the efficiency of managerial decision-making in sustainable development of rural areas.

4. Development of behavioral economy as a factor of sustainable rural development. Investigators have

assessed the behavioral factors of rural employment based on the clustering of rural areas, the development of a combined model (Geographic Model of Planned Behavior, GeoTPB). This approach makes it possible to simulate the reaction and behavior of rural residents when implementing e-marketing [26]. The conducted study has distinguished six clusters in the rural area under consideration and found out that the majority of the rural population (76% of the total number of respondents) support the use of e-marketing technologies.

Romanian scientists claim that the rural population decline is a decisive factor in the rural development. It must be considered along with environmental protection and food security issues [27]. The main conclusions of the study are as follows. Firstly, there is need to investigate the relationship between the incentives and needs of farmers. Secondly, it must be taken into account that new technologies can significantly diversify the needs of rural residents. Thirdly, the present-day rural environment is gradually turning into cyber-reality, becoming a museum of "how it was once" when the principle "from scythe to smartphone" is applied.

5. Application of a systematic approach to the design of a strategy for sustainable rural development. Within this framework, Chinese researchers suggest using a spatial analysis and an integrated assessment model for multidimensional typology and classification of rural areas [28]. They suggest dividing rural territories into four functional types according to the actual development level of agriculture, economy, social security and environmental protection. Given this evidence, it can be seen that the multifunctional rural development is a spatially complex category and is directly determined by managerial and market factors.

There are indications of the strategic importance for a comprehensive and systematic study of the development processes in rural areas, the need for assessing their resource potential in the context of intraregional characteristics [29]. Ukrainian scientists underline the prior use of power delegation in developing competencies of rural government bodies and the program-target method in assessing and monitoring the budgetary process of rural development. Designing a strategy for sustainable rural development is claimed to be based on the integrated scientific research methods (suggesting general hypotheses and mass observations, groupings, building time series, an index method and other approaches).

As Chinese experts emphasize, the decline in the rural population and the environmental deprivation caused by natural disasters have negatively affected the sustainable rural development [30]. At the same time, the impact of these adverse factors mainly depends on the level of socio-economic functioning and the development of the transport infrastructure in rural areas. It is recognized that rural sustainability should be determined based on typologization, identification and classification of the studied set of rural territories. It seems reasonable to distinguish the category of sustainable consumption and production (SCP) in achieving sustainable development goals (SDGs). Sustainable consumption and production play a key role in the development of agriculture and rural economy. Whereas sustainable consumption (SC) is considered by the authors to be of higher economic value than sustainable production (SP).

The conducted study has revealed some "gaps" in existing theory and practice, namely: insufficient scientific justification of methodological and procedural framework for the integrated use of a systematic and scientific methods in designing a strategy for sustainable rural development. In this conceptual perspective, the research goal formulated in the first section of this paper seems possible to be achieved. In turn, the research hypothesis of the present work relies on the scientific standpoint of the authors that a strategy for sustainable rural development should be based on the integrated use of a systematic approach and methods of strategic planning, multidimensional statistical analysis, scenario forecasting and foresight.

Problem Statement

As the analysis of theoretical sources has shown, despite the increasing attention of modern researchers to the issues of sustainable development strategy in rural areas, the actual research works offering scientifically grounded methodological approaches for the implementation of sustainable development strategy in rural areas are clearly insufficient [31]. Thus, the main motivation for the study was the sharp increase in social need for modern methods of strategic management to achieve sustainable rural development in the context of the COVID-19 pandemic, and insufficient elaboration of this aspect by modern science.

The purpose of this study is to develop a methodological approach to the implementation of sustainable rural development strategy in the context of the COVID-19 pandemic. The aim of the research is achieved by setting and solving the following tasks, namely: (1) to generalize the results of previous research on strategic planning for sustainable development of rural territorial entities; (2) to substantiate the comprehensive application of advanced methods of economic research to achieve sustainable development of rural territorial entities; (3) to develop a methodological approach for clustering of rural areas as a sustainable development strategy implementation; (4) to test the developed methodology.

Accordingly, the main research question has become the issue of updating the methodological basis for the elaboration of sustainable rural development strategy in the context of COVID-19 pandemic and digital transformation of agriculture. The solution of this research question will make it possible to fill the lack of relevant methodological approaches to

the implementation of sustainable rural development strategy in the modern scientific literature, as well as to meet the increased demand of the real economy sector for practically implementable methodologies to ensure sustainable rural development.

Experiment

Methodological Study Design

The goal of this study was achieved through the development and implementation of a comprehensive research project that combines the advantages of desk and field research. The conceptual basis of the study was the systems approach, as the use of the systems approach in an unstable environment allows one to maximize the benefits and minimize the risks of economic entities in an unstable external environment.

The theoretical and methodological basis of this study consists of foreign and domestic fundamental works on the phenomenon of sustainable development, the use of cluster and foresight technologies, scenarios, and models to develop projects, forecasts and roadmaps for strategic development of rural territorial entities [32-34]. However, according to the authors, in the context of COVID-19 pandemic and extremely high risk of additional administrative constraints aimed at combating the pandemic, the greatest efficacy of developing a sustainable rural development strategy can be achieved by choosing a systematic approach, which is determined by the adequate and accurate choice of tools and procedures. The latter, in turn, also depends on the overall goals and objectives of the study, the feasibility of the research methods, and the stages and sequence of the algorithm to be implemented. The elaboration of the sustainable development strategy based on the system approach helps to analyze the main elements of rural areas, their exogenous and endogenous factors of functioning, as well as the main interrelations determining the current state of rural areas, their weaknesses and strengths to assess the strategic priorities of sustainable development.

The use of the system approach as a conceptual basis for the study allows one to achieve impressive efficiency in the course of detailed analysis and evaluation, subsequent examination and elaboration of the strategy of rural territorial entities' development. In doing so, the selection and interpretation of statistical data for decision-making on the choice of a sustainable rural development strategy generally form the basis of "wishful thinking" of the envisaged future.

Furthermore, the system approach identifies the main methodological principles that need to be implemented when designing a sustainable rural development strategy, such as the mandatory implementation of the plan. The central core of the strategic plan of agricultural enterprises should be considered the production program, which sets the volumes of production and sales of certain types of agricultural products. The production program should ensure the sustainable development of the objects of strategic planning to guarantee the expanded repeatability of the factors of production: labor, capital, and, above all, the quality of land resources used in an indefinitely long time. It points to the possibility and necessity of working out strategies of sustainable development of rural areas as a system with internal and external components, including production and social subsystems.

The traditional approach to rural development cannot solve the existing problems in the agro-industrial complex and rural areas. The development strategy, based on the system approach, considers the interaction of external and internal elements of rural environment in the strategic perspective, taking into account the successful realization of goals and objectives. In its turn, strategic foresight is required for those directions of rural areas' development where there is a high degree of uncertainty concerning their future functioning.

Fig. 1 presents a conceptual framework for developing a sustainable development strategy that allows one to reasonably identify "mainstream" areas for functioning in rural territories and take into account the projected targets and parameters that quantitatively reflect the degree to which specific strategic goals of sustainable development are achieved.

The application of the system approach also determines the importance of the algorithm of rural typification, i.e., the identification of similar productive, economic, and social characteristics of rural areas for the subsequent formation of a sustainable development strategy (Fig. 2).

Uniform clusters were generated based on the characteristics as follows: geographical concentration, consistency, uniqueness, territorial integrity, relative homogeneity of the farm specialization, social and economic potential of the studied rural territorial communities. The clustering allows one to differentiate the rural territories according to the level of development and unite the similar rural territories into one cluster with the common strategy of sustainable development that allows one to increase the use of limited resources in the unstable economic environment. In the framework of this research the authors propose to use multidimensional grouping that allows one to take into account similarities and differences of thirty main typological features (indicators) characterizing the functioning of the rural territories under consideration (Fig. 3).

The use of the system approach in the design and implementation of a sustainable rural development strategy in an unstable external environment not only provides additional opportunities for analyzing the socio-economic potential of rural areas, but also creates conditions for the manifestation of synergies that will increase the efficiency of the use of limited resources of rural areas and ensure their sustainable development.

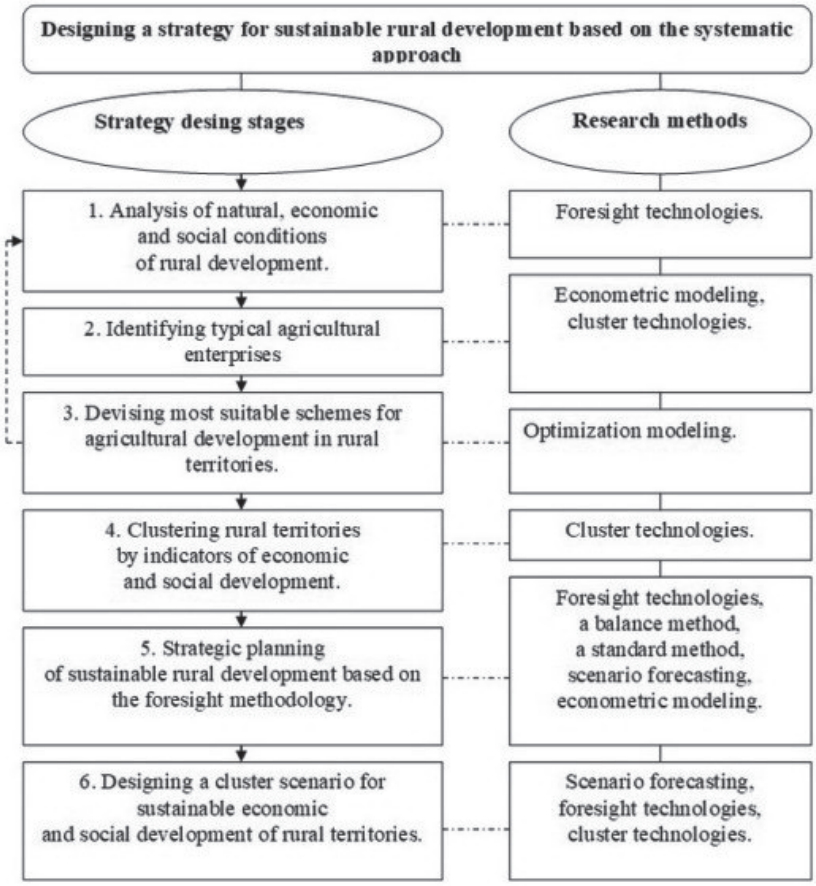

Fig. 1. Conceptual framework for a sustainable rural development strategy based on a systems approach.
Source: developed by the authors

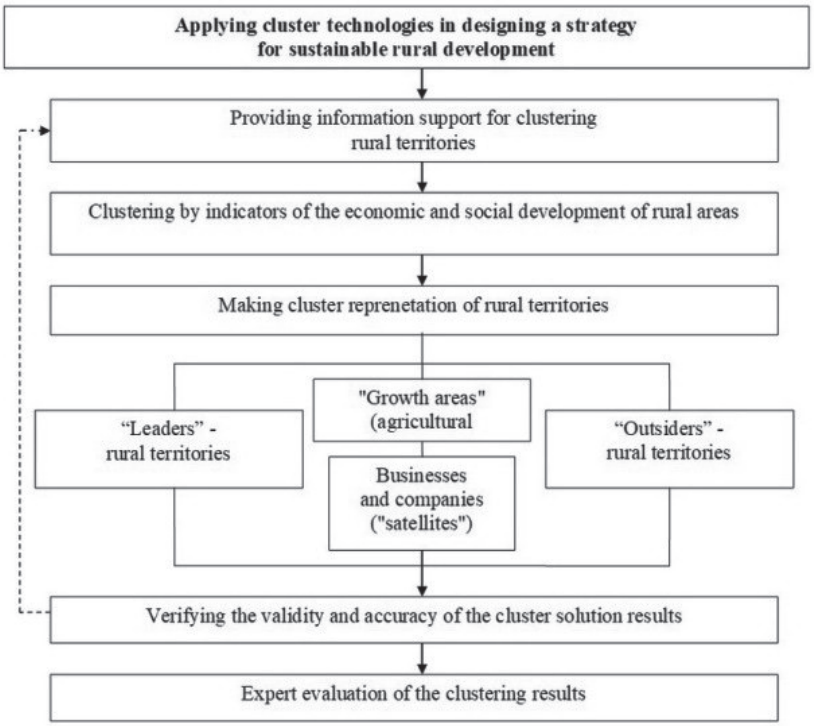

Fig. 2. Algorithm for clustering rural areas according to socio-economic development indicators.
Source: developed by the authors

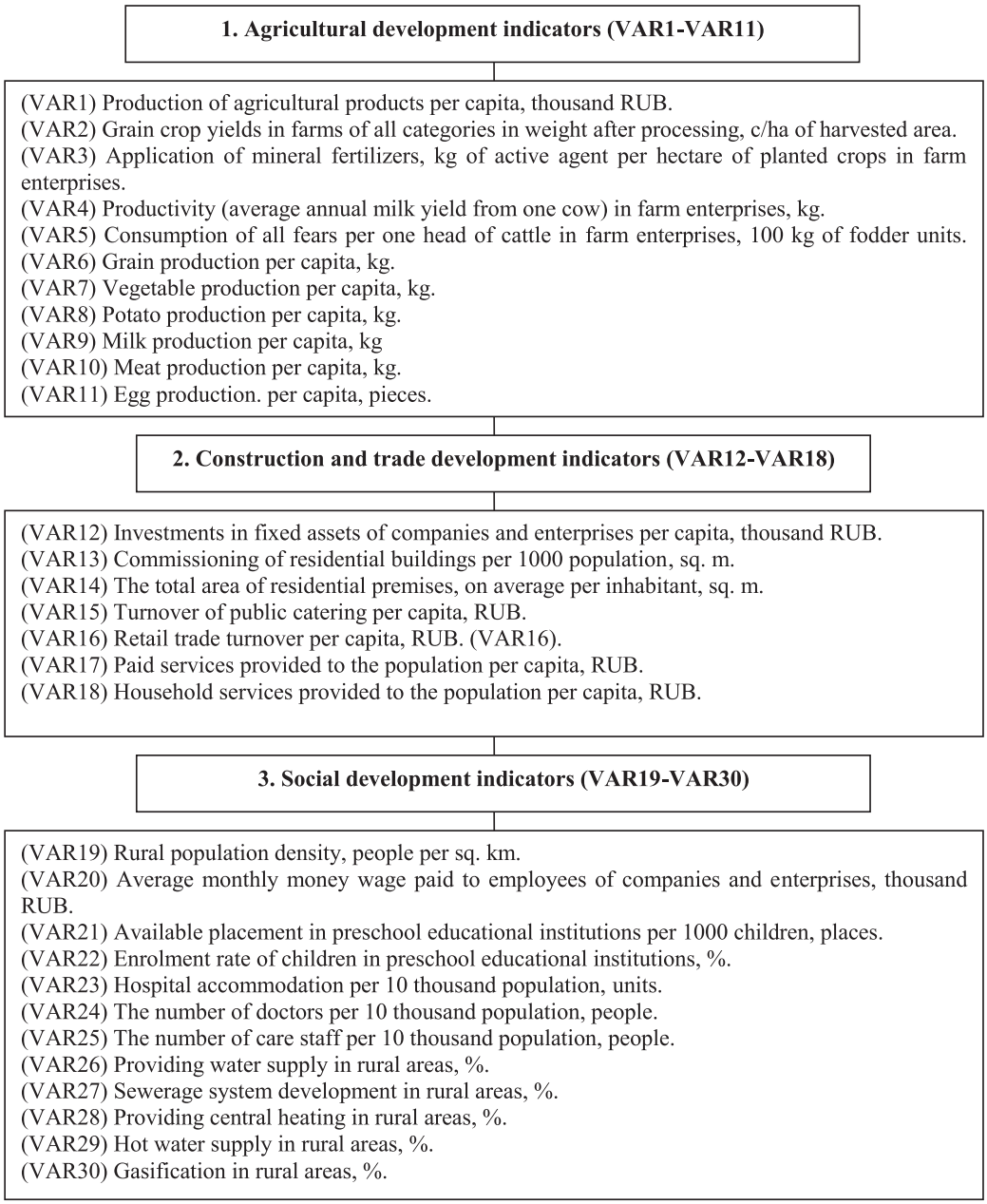

Fig. 3. Socio-economic development indicators in rural clustering.
Source: developed by the authors

The theoretical and methodological basis of this study consists of foreign and domestic fundamental works on the phenomenon of sustainable development, the use of cluster and foresight technologies, scenarios, and models to develop projects, forecasts, and roadmaps for strategic development of rural territorial entities [35-37].

Research Information Base

Rural areas of the Non-Chernozem zone of the Republic of Bashkortostan were chosen to approve the developed methodological approach, which is primarily due to the region's acute need for innovative, highly effective methods to design and implement a sustainable development strategy, as traditional methods of strategic management are not effective enough to ensure sustainable development in this region.

At the stage of desk research the information base consists of statistical data of Rosstat [38], materials of the Ministry of Agriculture of the Republic of Bashkortostan [39] and the Ministry of Economic Development and Investment Policy of the Republic of Bashkortostan [40]. At the same time, the study's desk research allowed identifying imperfections in existing information and statistical support, which became the main implementation limitation of this study. This limitation had a significant impact on the methodological design of this study, the choice of

methods and tools. Thus, the unavailability of secondary information to assess a significant proportion of the characteristics of rural areas determined the need for a field study phase to obtain primary information.

Procedure for Collecting Information

In this study, the method of expert partially structured interview was used to obtain primary information. The expert interview was conducted by means of a face-to-face interview with a reference sheet. Both verbal and non-verbal information from the interview was taken into account during the interview. A feature of the reference list was the scoring of certain characteristics of socio-economic development of rural areas, which made it possible to unify the experts' assessments for subsequent analysis. A 7-point system was used for the scoring; 7 points meant the maximum score for the indicator, while 1 point meant the minimum score.

The experts chosen were specialists from the Ministry of Economic Development and Investment Policy of the Republic of Bashkortostan, the Ministry of Agriculture of the Republic of Bashkortostan, heads of large agricultural enterprises, researchers, and teachers from Bashkir scientific institutions, including the Bashkir State University and the Bashkir Academy of Sciences. A total of 24 interviews were conducted, all of which were deemed valid. Since the interviews were conducted entirely anonymously and did not contain any personal data, written consent to conduct the interviews was not required. Verbal consent to conduct interviews and publish the results was obtained from all experts at the stage of agreeing the time and place of the interview.

Information Processing and Analysis

The unification of the obtained results of assessing rural areas of the Non-Chernozem zone of the Republic of Bashkortostan was carried out using the integral indicator x_{in}, calculated by the sum of the weighted arithmetic average group indicators (formula 1):

$$x_{in} = \Sigma w_i \times x_i \quad (1)$$

x_i – value of the i-th indicator by the total number N;
w_i – indicator of significance (weight) of the i-th indicator

In addition, during the study, a set of general scientific and economic-mathematical methods was widely used for data processing and analysis, including, among others, the ranking method and ABC-analysis. The use of a comprehensive integral indicator made it possible to increase the comprehensiveness of the assessment, combine the results of primary and secondary information analysis and significantly reduce the risk of distortion of the data obtained during clustering. A data visualization method was used to interpret and present the results obtained. The main part of the presented calculations and distributions was obtained by means of Microsoft Excel spreadsheet software.

Limitations of the Study

The main study limitations that influenced the methodological design were:

(1) an underdeveloped information subsystem that limited the availability of secondary information,

(2) the limited availability of experts,

(3) limited research budget, which influenced both the number of interviews conducted and the possibility of conducting periodic (monitoring) studies,

(4) limited time for conducting the study, which influenced the formation of repeated and periodic studies.

Results and Discussion

Since the main research question of this study was the issue of updating the methodological basis for the implementation of sustainable rural development strategy under the COVID-19 pandemic and the digital transformation of agriculture, the solution to this issue lies in the development of modern effective methods that ensure sustainable development of rural areas in modern conditions. Indeed, economic and technological modernization of the world economic structure shows positive trends of digital economy development in rural areas with large-scale implementation of innovative technologies. However, different geopolitical and socio-economic risks and challenges result in the transformation of scientific ideas and fundamental approaches, conceptual provisions into strategic goals, mechanisms, tools, technologies and trajectories of rural development design.

One of the most significant factors and indicators of stable and progressive functioning of the economy, the social sphere and the higher population welfare is the development level of rural areas. It should be noted that the strategic and program documents adopted legislatively in Russia and Bashkortostan designate the role and importance of a qualitatively new multifunctional vector of sustainable innovative development for rural territories.

Rural territories are unique multifunctional communities with considerable natural resource potential and historic cultural significance. Present-day rural territories are integrated into the rural-urban environment, performing diverse tasks in certain sectors of socio-economic activity and public life. It is the rural territories, in addition to solving the strategic task of providing the population with food, that carry the civilizational mission of reproducing national identity and clearly demonstrate the distribution of productive forces. The strategic goal in developing

rural municipalities based on the diverse agricultural production, the versatile and multifunctional rural economy is to improve the quality and standard of living of rural residents while improving all the basic elements of the social sphere and infrastructure. Taking into account the fact that rural territories represent an elaborate socio-economic system, the development of their strategies is determined not only by the agro-industrial production.

At present, the peculiarities of the geographical location, climatic and soil conditions, the historically established specifics of siting agricultural production and socio-cultural objects, the current demographic situation, the actually achieved level of the economy and social sphere, the mentality of residents have a resultant impact on the functioning of rural entities in different districts of the Russian Federation. The development of rural territories is of strategic importance in the economy and social sphere of the regions. It directly depends on the combined potential of rural local communities and people.

It should be noted that there is still much uncertainty on a reference toolkit and methodology for conducting research on the sustainable functioning of rural territorial entities at the regional level. There are no unified principles for strategic planning documents and methodological recommendations to work out development plans for rural municipalities based on the methodology of the systematic approach. The imperative for its implementation has not been approved. Bashkortostan, as one of the largest subjects of the Russian Federation, demonstrates an insufficiently effective use of the natural resource and labor potential of rural areas. It is characterized by insignificant investments in capital stocks, production and social infrastructure of villages and, as a result, a low standard of living of the rural population.

The ongoing reforming of the agro-industrial complex in the republic has directly affected the actual progress of the rural economy. This "modernization" has brought transformational changes in different spheres of the economy and social life, the imbalance of intra-sectoral proportions and the redistribution of resources. The key problem of sustainable innovative development of Bashkortostan is the "lack of strategic vision".

Recent years have shown negative trends in the rural life: the decline of the rural population, degradation and lack of the necessary social, engineering and institutional infrastructure, making the countryside an unattractive and unsafe living place for people. Official statistics show an increase outflow, migration and "departure" of rural residents to urban areas, currently there is an increase in the number of unemployed and villagers below the poverty line. All this directly leads to the extinction of the rural territories and settlements.

The ongoing "re-wildness" of rural territories and labor and life "decivilization" make the village less attractive for living. Other obstacles in the sustainable rural development are the spatial dispersion of agro-industrial production, associated with farming specifics and administrative barriers hindering the positive functioning of the agricultural sector of the economy.

It should be noted that management structures effect activities aimed at the development of agro-industrial production without applying the systematic approach. They do not take into account territorial features, resource base, infrastructure development and financial capabilities of rural territories. In our opinion, these interrelated problems should be addressed by a reliable assessment of promising trends in rural development and the objective need to increase the population's self-sufficiency with agro-food products.

In recent years there has been much uncertainty in the regional agri-food market due to unstable market conditions. The existing potential of food security in the Republic of Bashkortostan allows inertia to overcome crisis situations at the regional level. However, there are certain risks for the population in economic accessibility of food products. All this creates certain threats and obstacles for the further development of agricultural production on a regional scale.

It is important to emphasize that digital innovations in rural areas can be one of the key stages in designing a strategy for "smart villages". It is almost certain that the operation of "smart villages" based on digital innovations will contribute to the rational use of resources and improve the quality of municipal services.

Up to date, there is a clear differentiation of rural areas in the region in terms of the introduction and use of advanced digital and innovative technologies. The issues associated with the implementation of digital innovations in the agri-food sector include administrative barriers, the deterioration of the main production assets of agro-formations, the inefficient structure of demand for innovative products. Currently, it is necessary to search for drivers to develop economic entities operating in the agricultural food market, determining the opportunities for economic growth, both in individual sectors of agriculture and the regional economy as a whole.

The actual state of rural development largely determines the solution of key problems of sustainable functioning of the agricultural sector. The Republic of Bashkortostan has a considerable production potential. Being used efficiently, it can provide sustainable rural development. Structural imbalances in the development of the economy and social sphere cause the objective need to develop strategic plans and design strategic directions for the functioning of rural territorial entities. In turn, a sustainable development strategy implies working out and solving applied problems of the economy and social infrastructure in rural areas, as well as achieving interrelated priorities for their modernization.

Designing the future development of rural territorial entities in the digital economy should take into account the specific context of the foresight

process. The modern foresight is based on a system of formalized technologies for analysis and evaluation, subsequent expertise, and development strategy design.

The key advantage of implementing foresight research is the use of extensive tools, including such technologies as: bibliometric method, review, mapping of stakeholders, cluster analysis, Delphi survey, brainstorming, extrapolation of trends, modeling and construction of development scenarios. Conducting foresight research is aimed at higher efficiency of innovative territorial systems, network interaction and involvement of key actors in the forecasting process.

It should be noted that foresight technologies can identify "points of innovative growth" as positive territories in socio-economic terms. They can also reveal the negative aspects of individual rural entities that are pronounced "incubators of poverty" in the area under consideration. One of the main results of foresight can be a "map of the future". In doing so, the use of foresight technologies is usually based on the results of expert assessments, allowing the use of experts' research intuition as an additional synergistic component of strategy development. In the present study, some of the indicators were evaluated both according to statistical information (indicators of agricultural development, construction and trade development, and social development) and according to the results of expert interviews. The integral score was calculated according to the sum of the weighted arithmetic average of the group indicators. Unification of statistical indicators was carried out by ranking with the assignment of a score and subsequent calculation of the comprehensive integral indicator for the group of factors. Complex integral indices which characterize strategically important aspects of rural areas are given in Table 1.

The study results indicate a rather low level of digital innovations' implementation in rural areas

Table 1. Complex integral indices characterizing strategically important aspects of rural areas' activity.

Name of rural area	Indicator of agricultural development	Indicator of construction and trade development	Indicator of social development	Indicator of investment capacity	Indicator of strategic management development	Indicator of digital innovation
Arkhangelsky	5.7	5.7	5.2	5.9	3.7	5
Askinsky	6.3	6.3	6.1	6.9	6.2	3
Baltachevsky	5.7	5.9	5.1	5.8	6.1	6
Belokataysky	6.1	5.9	5.7	6.3	5.3	5
Beloretskiy	5.1	4.2	5.1	6.1	3.4	3
Birsky	6.4	6.1	6.2	6.1	5.4	5
Blagoveshchensky	6.3	6.2	6.1	6.4	5.2	5
Burayevsky	6.3	6.3	5.9	6.1	5.7	6.3
Burzyansky	5.4	5	5.1	5.9	3.4	3.2
Duvan	6	5.8	5.3	5.1	6.1	6
Zilairsky	5.5	5.1	5.2	6.1	3.4	3
Iglinsky	6.3	6.1	5.7	6.2	5.6	6.5
Kaltasinsky	6.1	6	6.1	6.3	5.7	5.1
Karaidelsky	6.1	5.3	4.7	6.4	2.9	3
Kiginsky	6.2	5.9	5.7	6.2	5.2	5
Krasnokamsk	6.2	6	5.9	6.1	5.9	5.1
Mechetlinsky	5.7	5.7	5.6	5.9	3.4	3
Mishkinskiy	5.7	5.1	5	6.5	3.2	3
Nurimanovsky	6.4	6.2	6.1	6.1	5.4	5.1
Salavatsky	6.2	5.8	5.4	6.2	3.4	3
Tatyshlinsky	6.5	6.2	5.9	5.6	6.2	6
Yanaulsky	6.5	6.1	6.2	6.3	5	5

Source: developed by the authors

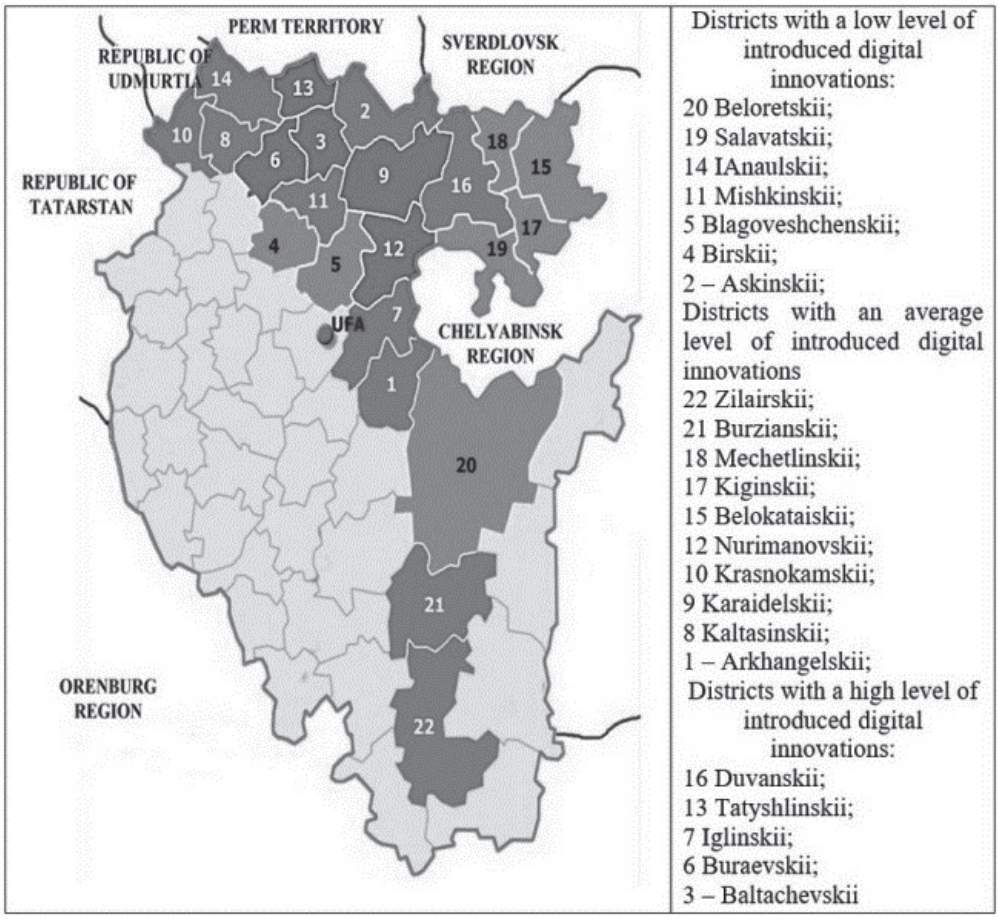

Fig. 4. Typification of rural areas by the level of digital innovation implementation.
Source: authors' development

in the Non-Chernozem zone of Bashkortostan. On the administrative map of the Republic of Bashkortostan, color highlighting allows visualizing rural areas with high (Baltachevsky, Burayevsky, Duvansky, Iglinsky, Tatyshlinsky), medium (Arkhangelsky, Belokataysky, Burzyansky, Zilairsky, Kaltasinsky, Karaidelsky, Kiginsky, Krasnokamsky, Mechetlinsky, Nurimanovsky), and low (Beloretsky, Salavatsky, Yanaulsky, Mishkinsky, Blagoveschensky, Birsky, Askinsky) levels of digital innovation implementation.

The present results of the foresight study demonstrate the promising directions for rural areas under consideration to introduce digital innovations. The study took into account that the quality of the predicted state of any research target (including rural territorial entity) is directly determined by the choice of an alternative course of events and characterized by the reliable results.

Today, there is a need for unconventional technologies, in particular, cluster and foresight technologies that can design promising areas of sustainable rural development. Thus, developing agro-clusters stimulates the introduction of innovative and information technologies in rural areas, helps to reduce transaction costs and increase the competitiveness of agricultural enterprises included in cluster structures.

It should be emphasized that digitalization and digital innovations set a new vector of sustainable development of rural territorial entities in the Republic of Bashkortostan. The conducted research has identified the following perspective areas for the development of digital agriculture in the Republic of Bashkortostan, presented in Fig. 5.

Given the significant differences in the level of adoption of digital innovations, it is advisable to implement digital agriculture by means of clustering. Clustering is one of the main goals of world politics implemented in management activities, and clusters are an effective tool for stimulating economic growth, innovation and structural transformation of regional socio-economic systems. Cluster models uniting agricultural enterprises and rural municipalities into effective structures position drivers and "growth points". By concentrating resource and innovative opportunities they can reveal new development impulses for each specific economic entity, ensuring the fullest disclosure of their potential. It is necessary to emphasize the multidimensionality, innovativeness and multidisciplinarity of the very concept "cluster".

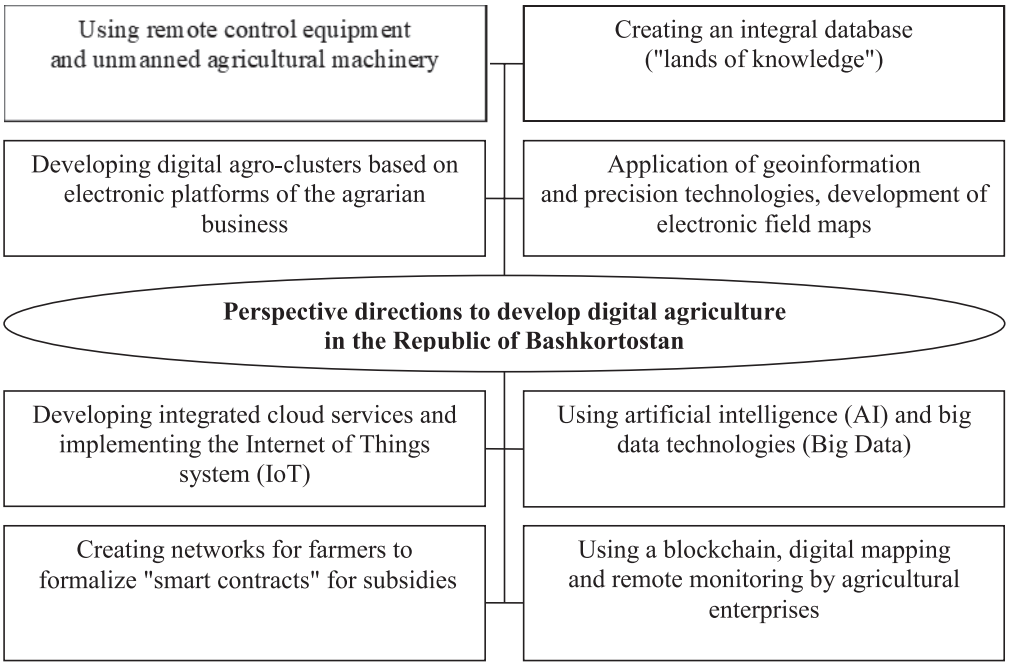

Fig. 5. Perspective areas to develop digital agriculture.
Source: created by the authors

It determines the potential application of clustering for the intensive development of any branch of the economy and the social sphere of life.

It seems obvious that cluster policy should be based on new methodological approaches to identify regional innovative “growth points”, develop measures to formalize them into clusters, as well as the methods used to analyze cluster activities and assess their efficiency. Thus, cluster screening can act as one of the improved methodological approaches to the analysis of rural territorial entities. The universal provisions of cluster structures are based on the methodology of M. Porter and their distinctive feature can be represented by the sectoral components of rural areas.

At the same time, the present-day concept of clusters can be built on traditional localization theories and combine the notions of regional innovation, agricultural production systems and “poles of growth”. The objective demand for innovative developments on a regional scale creates positive conditions for cluster and foresight technologies, scenario forecasting methods in strategic planning programs for rural development.

In the clustering process, an overall integral index was determined by the sum of the weighted arithmetic average of the group indicators. Further cluster assignment was carried out using ranking followed by the Pareto principle. The clustering results are presented in Table 2.

Thus, using the Pareto principle, 4 main clusters were identified: Arkhangelsky (C, cluster 3); Askinsky (C, cluster 3); Baltachevsky (C, cluster 3); Belokataysky (C, cluster 3); Beloretsky (D, cluster 4); Birsky (B, cluster 2); Blagoveschensky (B, cluster 2); Buraevsky (A, cluster 1); Burzyansky (D, cluster 4); Duvansky (C, cluster 3); Zilairsky (D, cluster 4); Mechetlinsky (C, cluster 3); Mishkinsky (C, cluster 3); Nurimanovsky (A, cluster 1); Iglinsky (A, cluster 1); Kaltasinsky (B, cluster 2); Karaidelsky (C, cluster 3); Kiginsky (C, cluster 3); Krasnokamsky (B, cluster 2); Salavatsky (C, cluster 3); Tatyshlinsky (A, cluster 1); Yanaulsky (B, cluster 2).

The functioning of clusters is based on the institutional support of the state, including the use of strategic planning and forecasting technologies, the development of support mechanisms for programs aimed at improving the competitiveness of rural areas included in multidimensional groupings. Providing assistance in creating cluster formations and implementing new cluster initiatives can be positioned as one of the strategic objectives of economic entities.

Clusters actively contribute to the development of innovative technologies. Their application has a positive effect on the very sustainability of rural areas of the regions and the levels of their social and economic development. Clustering of rural territorial formations is an additional factor in extracting the effects of collaboration. The synergetic effects of cluster formations on the studied territorial systems manifested in their optimization provide the multivariance and alternative development of different constituent elements of multidimensional groupings. The results of foresight of individual target economic indicators of sustainable rural development in a cluster display are presented in Figs 6 and 7.

It should be emphasized that the implementation of the strategy will result in the ‘smart specialization’

Table 2. Clustering of rural areas of Non-Chernozem region of Bashkortostan using Pareto principle.

	Indicator of agricultural development	Indicator of construction and trade development	Indicator of social development	Indicator of investment capacity	Indicator of strategic management development	Indicator of digital innovation	Integral indicator	Share (with accumulation), %	Cluster
Burayevsky	6.3	6.3	5.9	6.1	5.7	6.3	5.39	5.11	A
Iglinsky	6.3	6.1	5.7	6.2	5.6	6.5	5.36	10.2	A
Tatyshlinskiy	6.5	6.2	5.9	5.6	6.2	6	5.39	15.32	A
Nurimanovsky	6.4	6.2	6.1	6.1	5.4	5.1	5.17	20.22	A
Kaltasinsky	6.1	6	6.1	6.3	5.7	5.1	5.16	25.12	B
Krasnokamsk	6.2	6	5.9	6.1	5.9	5.1	5.16	30.02	B
Birsk	6.4	6.1	6.2	6.1	5.4	5	5.15	34.9	B
Blagoveshchensky	6.3	6.2	6.1	6.4	5.2	5	5.13	39.77	B
Yanaulsky	6.5	6.1	6.2	6.3	5	5	5.12	44.63	B
Baltachevsky	5.7	5.9	5.1	5.8	6.1	6	5.11	49.48	C
Duvan	6	5.8	5.3	5.1	6.1	6	5.1	54.32	C
Askinsky	6.3	6.3	6.1	6.9	6.2	3	5.03	59.09	C
Belokataysky	6.1	5.9	5.7	6.3	5.3	5	5.01	63.85	C
Kiginsky	6.2	5.9	5.7	6.2	5.2	5	5	68.59	C
Arkhangelsky	5.7	5.7	5.2	5.9	3.7	5	4.54	72.9	C
Salavatsky	6.2	5.8	5.4	6.2	3.4	3	4.31	76.99	C
Mechetlinsky	5.7	5.7	5.6	5.9	3.4	3	4.21	80.98	C
Mishkinskiy	5.7	5.1	5	6.5	3.2	3	4.07	84.85	C
Karaidelsky	6.1	5.3	4.7	6.4	2.9	3	4.06	88.7	C
Zilairsky	5.5	5.1	5.2	6.1	3.4	3	4.05	92.54	D
Burzyansky	5.4	5	5.1	5.9	3.4	3.2	4.02	96.36	D
Beloretskiy	5.1	4.2	5.1	6.1	3.4	3	3.84	100	D

Source: authors' development

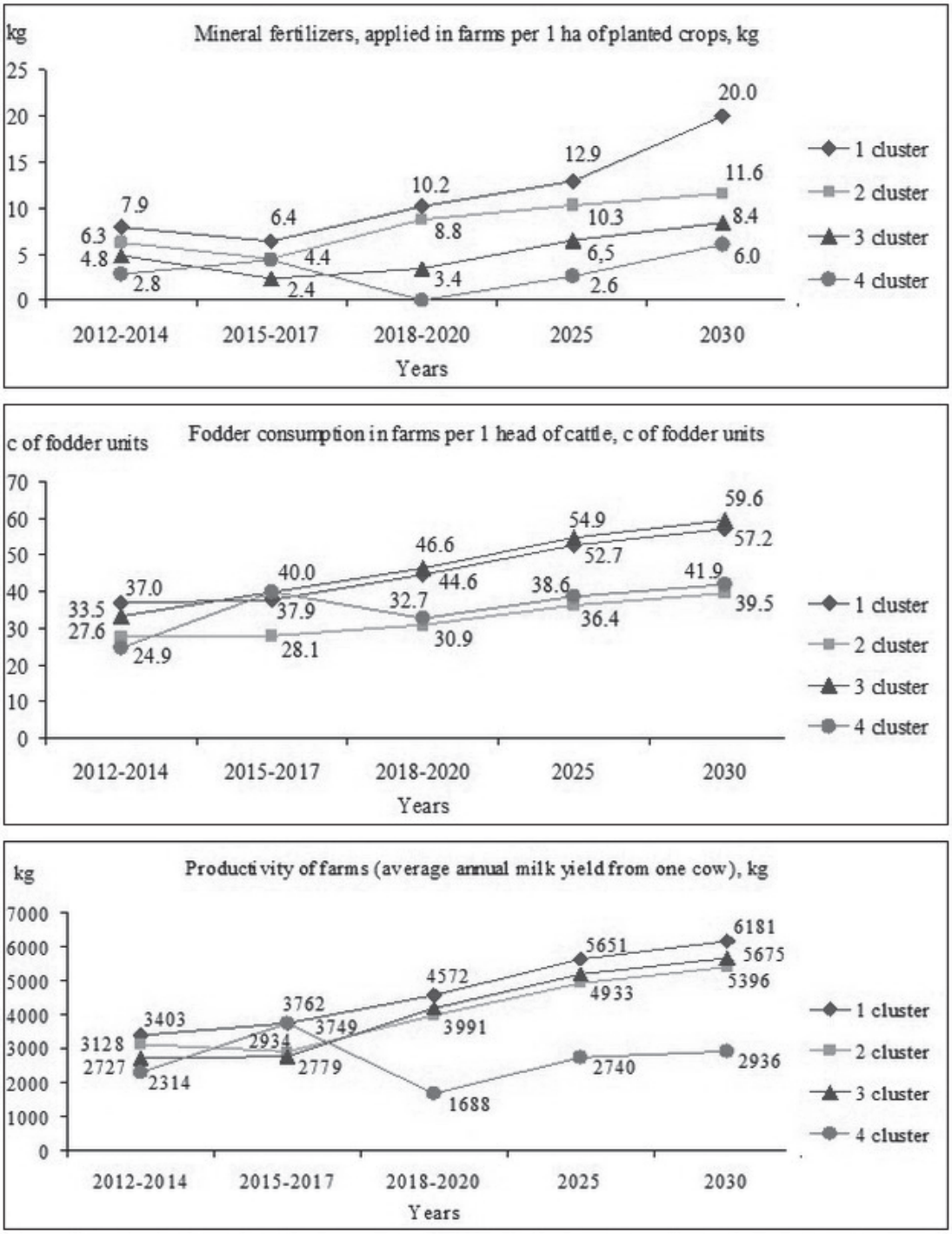

Fig. 6. Foresight of individual target economic indicators of sustainable rural development in cluster mapping.
Note: Calculated by the authors based on their own research

of agricultural producers based on digital agriculture. This allows economic entities (agro-formations) to concentrate their efforts on specific activities within rural areas.

As a result of the study, a methodology for implementing a sustainable rural development strategy based on the system approach has been proposed. The use of clustering as the main tool for implementing a sustainable development strategy allows for a more efficient allocation of limited resources in a poorly predictable external environment, as well as taking advantage of the synergies arising in clusters when implementing a sustainable development strategy. Thus, the result of this study was to address the main research question: updating the methodological framework for the implementation of a sustainable rural development strategy in the context of the COVID-19 pandemic and the digital transformation of agriculture. The testing

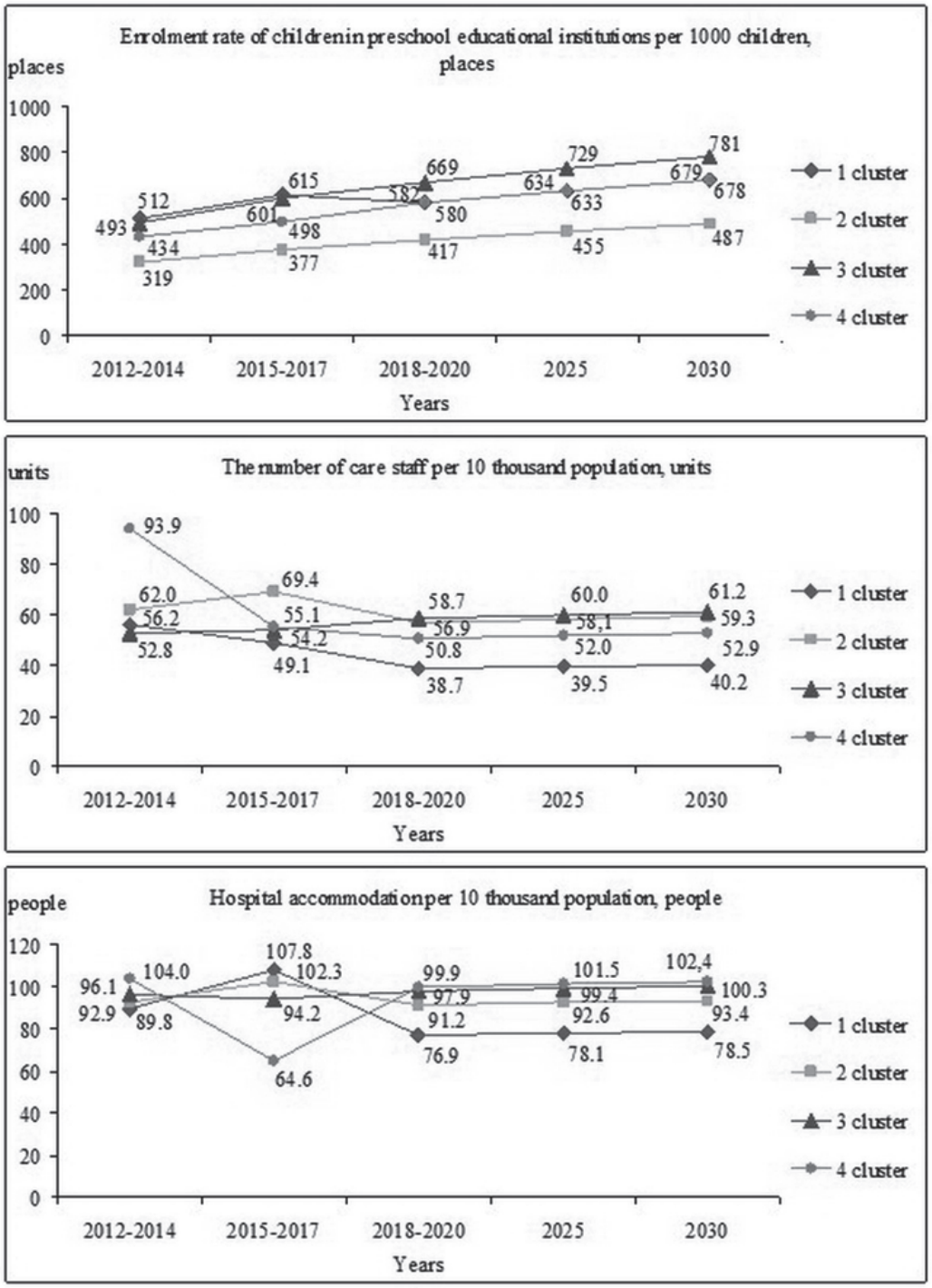

Fig. 7. Foresight of individual target social indicators of sustainable rural development in cluster mapping.
Note: Calculated by the authors based on their own research

of the methodology on the example of rural areas of the Republic of Bashkortostan has confirmed the feasibility and practical applicability of the proposed methodological approach in the real economy.

The motivation of this article was based on significant unsatisfied demand of real sector of economy for new methods of design and implementation of sustainable development strategy in unstable external environment, which determines rather small share of theoretical sources available for direct discussion in relation to the research question of this work. At the same time, the study results confirm, to a certain extent, the results of predecessors' studies, including from the perspective of (1) a comprehensive assessment and analysis of the current development of rural territorial units as an integral condition for the elaboration of the sustainable development strategy [20, 25]; (2) the effectiveness of the integrated use of different

methods of strategic planning [22]; (3) the availability of restrictions on the application of individual methods of strategic planning, including financial, territorial, and temporal frameworks [41, 42].

The current state and potential functioning of rural areas are limited by a whole range of heterogeneous problems of an economic and institutional nature. Thus, in recent decades, the most acute issue in Russia has been the irrational use of the resource base and the turbulence of the economic sphere in rural areas. There is a significant lag in key social parameters of rural territories in most subjects of the Russian Federation from similar development indicators of urban territorial entities.

As foreign researchers emphasize, in the observed time period, the stability of territorial formations with increasing uncertainty and variability of the external and internal environment is the optimal factor determining the positive development of the rural economy, ecology and society [14]. At the same time, present-day rural territorial entities, demonstrating a combination of contradictory trends, represent a necessary component in the functioning of the state and society [43]. There is an objective need for a content analysis of rural territorial entities, an appropriate assessment and fore-casting of prospects for achieving sustainable development, taking into account existing methodological requirements and provisions of the systematic approach [44, 45].

Today, food supply is a determining prerequisite for the effective social and economic development of rural territorial entities. Thus, in 2020 The UN World Food Pro-gram was recognized as the winner of the Nobel Peace Prize. The steady supply of food products to the population is in a certain dependence on the actual level of agricultural production and the stable functioning of rural territorial entities [46, 47].

The rural territorial development should be based on a strategy that takes into account not only the public and personal interests of the rural community, but also determines the local and national conditions for the functioning of the digital economy. Digital innovations are a key imperative of higher competitiveness of rural producers [48]. This conceptual position implies the transition of agricultural industries to a new technological order by the accelerated development of innovative technologies and the predominance of automation and digital platforms in rural areas.

The allocation of competitive advantages of rural territories in the conditions of digital economy transformation will allow representatives of municipal management structures and decision makers to implement strategic programs, which will positively affect the sustainable functioning of the territorial entities under consideration [49, 50]. Foreign scientists rightly suggest that a key role in ensuring and implementing a “circular” economy is given to investments in innovations and technologies. Taking into account the goals of sustainable development set in the EU countries for the period up to 2030, it will contribute to reducing agricultural waste and lead to savings for agricultural enterprises [51].

In the current conditions, the positive dynamics of social and economic development of rural territorial entities can be achieved by the joint efforts of all stakeholders (including key stakeholders), selecting and applying new forms, methods and technologies of strategic planning, modeling and management [52, 53]. In the future, predictive management activities to design sustainable functioning of rural territorial entities should be directly aimed in the targeted aspects of unlocking the potential of long-term forecasting technologies and the possible limits of their effective application.

Thus, this study not only confirms the results of the predecessors’ studies [20, 22, 25], but also proposes an updated methodological approach to develop and implement a sustainable development strategy for rural areas in an unstable environment. An important advantage of the proposed methodological approach is its accessibility, scalability, and high adaptability to regional specifics, which allows for the practical application of the developed methodological approach even in conditions of limited resources.

Conclusions

The modern stage of economic development has considerably updated the issues of methodological support of sustainable development of rural areas, which determined the purpose and objectives of this study. The study of theoretical sources resulted in the development of an integrated research project, combining the advantages of desk and field research types to address the main research question.

In the course of the research project, a number of complex solutions related to the acquisition and processing of both secondary (statistical information) and primary information were used. An expert partially structured interview method with a reference sheet was used to obtain primary information. General scientific and specialized methods of analysis, including calculation of the complex integral indicator, various ranking methods, and ABC-analysis (Pareto principle) were used comprehensively in processing the information, which ensured high adaptability of the methodology. Thus, the result of this study is the author’s methodological approach to the elaboration of a sustainable development strategy based on the clustering of rural areas. The results of this investigation show that the present-day concept of sustainable rural development should be considered from the standpoint of the systematic approach. The methodology of the systematic approach can reveal reserves of sustainable development and the potential of rural territorial entities. The proposed author’s algorithm is focused both on the sustainable development of specific areas of

rural territorial entities and addressing particular socio-economic issues, new risks and challenges.

In our opinion, the agro-industrial complex should become a driver stimulating the sustainable development of the rural economy and contributing to the social stability of the rural community and people in conditions of the pandemic. Designing a strategy to develop rural territorial entities from the standpoint of the systematic approach increases validity of management decisions implemented in the agricultural sector of the economy. Effective strategies and sustainable development programs will allow agricultural producers to expand the export opportunities of agrifood products, localize agribusiness, and invest earnings in the modernization of their production.

It should be emphasized that digitalization and digital innovations set a new vector of sustainable development of rural territorial entities. The introduction of digital and innovative technologies radically changes the traditional socio-economic paradigm of rural territorial entities and opens new opportunities and prospects in the economic activities of agricultural producers. Thus, developing agro-clusters on digital platforms stimulates the introduction of innovative and information technologies in rural areas, helps to reduce transaction costs and increase the competitiveness of agricultural enterprises included in cluster structures.

Presently, the concept of sustainable rural development is directly related to the introduction of digital innovations, determined by developed target competencies and new approaches in the field of planning and modeling a strategic vision of the future based on cluster and foresight technologies and scenario forecast management. In the future, the main contours of the paradigm providing an innovative type of rural development should be designed in the context of achieving sustainable development.

An important advantage of the proposed methodological approach is its high adaptability and scalability, which increases the practical value of the research results for the development and adjustment of strategic development programs in rural areas. In addition, this article may be of interest to academic researchers, primarily in terms of shaping new research perspectives.

Author Contributions

Conceptualization, A.S. and Z.Z.; methodology, N.A. and E.S.; software, N.F.; validation, R.G., A.S., E.S., N.A., Z.Z., and N.F.; formal analysis, Z.Z.; investigation, A.S.; resources, N.A. and N.F.; data curation, R.G.; writing-original draft preparation, R.G. and Z.Z.; writing-review and editing, E.S. and N.F.; visualization, R.G. and N.A.; supervision, R.G.; project administration, A.S.; funding acquisition, E.S. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Informed Consent Statement

Not applicable.

Data Availability Statement

Data will be available on request.

Conflicts of Interest

The authors declare no conflict of interest.

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