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Economic and statistical evaluation of the level of sustainable development of rural areas.

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ABSTRACT

Sustainable development of rural areas is the most important scientific and practical task of further improving the economic activity of the agro-industrial complex. The effectiveness of the solution to this problem is largely determined by the optimal and rational use of the production, financial and employment potential of rural areas. Meanwhile, in the scientific and applied aspects not fully considered methodological issues for evaluating sustainable socio-economic development of rural areas. For research and assess the factors and indicators of the level of sustainable development of rural areas in the scientific article substantiates and used RGC-method of economic and statistical research.

Keywords: stability and development, sustainable development, rural areas, economic evaluation, method.

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INTRODUCTION

Rural areas are the most important spatial and complex socio-ecological-economic unit. They combine the most important sphere of production and financial work [1, 4, 7, 12]. At the same time, rural areas in the Stavropol region are characterized by a high unemployment rate (on average 1.3-1.4 times) as compared to urban areas. It is here that have lower levels of employment and labor income of the working population, not fully resolved the individual socio-economic and demographic problems of rural development, not yet formed of control mechanism a stable agricultural and non-productive sphere [5, 8, 9, 11].

For this reason, markedly increased scientific interest in the research of theoretical, methodological and applied aspects of sustainable development of rural territorial entities at the level of individual regions of the country [2, 3, 10, 15]. Especially important is the methodology of comparative evaluation of sustainable economic, social and environmental development of rural areas of municipal districts.

MATERIALS AND METHODS

The purpose of research - to propose and test a methodological approach to assess the level of sustainable development of rural areas 26 of the Stavropol Territory. This will allow them to justify a comprehensive quantitative characterization and identification of reserves for improvement.

Quantitative evaluation of the sustainable development of a single rural area among the municipal districts of the region can be determined by calculating the integral index of sustainable development $INT_{res.}$

This index is defined as the geometric mean value of the partial indicators of economic (U_i^{econ}), social (U_j^{soc}) and ecological (U_k^{ecol}) sustainable development of the territory (1).

$$INT_{res} = \sqrt[3]{U_i^{econ} \cdot U_j^{soc} \cdot U_k^{ecol}} , \quad (1)$$

Here: *i, j, k* – characterize the main indicators that determine the main components of the development of rural areas.

In turn, each of the individual partial indicators of sustainable development component U is calculated as a geometric mean value of the group of indicators characterizing a particular factor in the sustainable development of the territory.

For example, the private component of sustainable economic development of rural areas U_i^{econ} can be calculated from formulas (2), (3).

$$U_i^{econ} = \sqrt[n]{U_1 \cdot U_2 \cdot ... \cdot U_n} \quad (2)$$

$$U_n = \sqrt[3]{K_R^{res} \cdot K_G^{gro} \cdot |K_C^{cor}|} \quad (3)$$

U_n– overall sustainable development factor (for the studied parameters) as an integral value of a particular indicator levels for a specific period;

K_R^{res}– stability coefficient (the difference between the 1 and the coefficient of variation in the aggregate level of performance with a dynamic series);

K_G^{gro}- development rate (average annual levels change in the dynamic range of indicators);

$K_C{}^{cor}$– tier relationship (correlation between the levels of the indicator and the serial number of the year - in the formula (3) is taken modulo for comparability with other factors, as it can take a value from -1 to +1);

n – serial index number.

The above listed components and the components of *RGC (Resistance, Growth, Correlation)* - authoring methodology for calculating the coefficients of the complex characterizing stability, the dynamics of change and their relationship; order aggregation of these factors in the private and integral indicators. The technique is an extension of the scientific approach, outlined in some scientific studies [6, 8, 9, 13].

In the present interpretation of the scientific approach all calculated ratios and indicators have a certain economic sense and characterize certain aspects of economic, social and environmental sustainable development of the territory.

For the purpose of comparability of complex heterogeneous indices, rationing their recommended calculated by the formula (4).

$$Y_i = \frac{X_i}{X_{max} - X_{min}} \cdot \left[1 - X_{med}^{sqr} / X_{med}\right] , \qquad (4)$$

Xi and *Yi* - original and normalized index values in the column i;

X_{med}^{sqr} - standard deviation;

Xmin, *Xmax* and *Xmed* - minimum, maximum and average value.

Normalized data matrix provides a presence in every line of the integral values of the index for a single territory as a geometric mean value of the formula (5).

$$Pj = \left(\prod_{j}^{m} Y_j\right)^{1/m} , \qquad (5)$$

Pj – the value of the integral index in the string j; m – the number of columns in the matrix.

In this case, the author's approach to the normalization of the calculated values is the calculated data that, firstly, the coefficient are adjusted for the dynamic stability number of levels and, secondly, at the same time involving minimum, maximum and average values. This increases the validity of the calculations.

RESULTS AND DISCUSSION

The proposed method of assessing the level of development of rural areas has allowed to calculate the integral and partial indicators of sustainable development in all 26 municipal districts of Stavropol region (Table 1). At the same time to determine the partial indicators 23, the most significant factors were selected, characterized by independent: economic (11 indicators), social (7 indicators) and environmental (5 indicators) development of rural areas over a five year period. The significance and the statistical weight of each factor were grounded integral combination of correlation analysis and expert method.

Table 1: Differentiation of indicators for sustainable development of rural areas in the Stavropol region (fragment), 2011-2015

Rural areas of municipal areas of the region	Integral indicator of sustainable development (INT_{res})	including private indicators of sustainable development		
		U_i^{econ}	U_j^{soc}	$U_k^{ecol\,*)}$
1. Aleksandrovskiy	0,727	0,726	0,759	0,697
2. Andropovskiy	0,699	0,526	0,734	0,885
3. Apanasenkovskiy	0,641	0,755	0,708	0,493
…	…	…	…	…
24. Trunovskiy	0,654	0,623	0,675	0,665
25. Turkmenskiy	0,736	0,718	0,691	0,805
26. Shpakovskiy	0,793	0,793	0,732	0,858
Coefficient of variation , %	26,2	19,7	27,6	32,4
Oscillation ratio, %	89,7	76,2	108,1	123,6
Polarization factor	2,36	1,21	3,17	2,43

*) indicator is calculated on the basis of the inverse values – for comparison with the economic and social factor components

Established the following laws: first, an integral component of sustainable development of rural areas is a direct and substantial relationship with respect to the private indicator of economic development of the territory (correlation coefficient R = 0,736). Во-вторых, уровень социального и экологического развития не оказывает существенного влияния на устойчивость сельской местности (R_{soc}= 0,217 and R_{ecol}= -0,198 accordingly).

Third, the level of economic development of rural areas (the most significant component), most affect following factors: the amount of investment in fixed assets of the municipal territory (per capita), the level of employment in rural areas and the proportion of profitable organizations (multiple correlation coefficient R_{mult}=0,883). Consequently, the problems of socio-economic development of each rural area should be addressed together, based on the characteristics, conditions and a certain type of development of the territory.

This conclusion is confirmed more specifically the corresponding cluster analysis of rural areas in the region for a number of characteristics (Table 2).

Table 2: Grouping of rural territories of Stavropol region according to their level of economic development (2011 - 2015)

Types of sustainable development of rural areas	Municipal districts	Integral indicator of the economic development of the territory	Private indicator		
			Investments in fixed capital per capita, thousand rubles	The level of employment in the village, %	The share of profitable organizations, %
relatively stable	Budenovskiy, Georgievskiy, Izobilnenskiy, Kirovskiy, Kochubeyvskiy, Levokumskiy, Mineralovodskiy, Neftekumskiy, Novoaleksandrovskiy, Predgorniy, Shpakovskiy	0,754	43,7	72,1	89,6

an average degree of stability	Aleksandrovskiy, Apanasenkovskiy, Blagodarnenskiy, Grachevskiy, Krasnogvardeyskiy, Novoselytskiy, Petrovskiy, Turkmenskiy	0,743	31,2	70,4	78,1
unstable	Andropovskiy, Arzgirskiy, Ipatovskiy, Kurskiy, Sovietskiy, Stepnovskiy, Trunovskiy	0,642	28,5	68,8	74,2

Economic and statistical analysis allows us to generalize the results of the study:

1. In relation to the rural areas for the sustainable development of the type recommended: priority development sectors of agriculture, construction and trade; the formation of a stable system of small and private business; expansion of the scope of self-employment in non-agricultural sectors of the rural economy.

2. For the territories of moderate stability requires the development and implementation of targeted municipal programs for the sustainable development of rural areas; increased ability to create new jobs in the field of agro-tourism, environmental and recreational activities.

3. Unsustainable type of rural areas determines: the establishment of municipal centers for rural sustainable development and employment; implementation of socio-economic development of rural areas of cards; quarterly monitoring of socio-economic development.

CONCLUSION

Sustainable development of rural areas - is the strategic direction of a stable, efficient and optimal functioning of the economic, social and environmental spheres of rural economy. This - the permanent ability to resist agribusiness constant internal and external influences. It involves systematic study and evaluation of the processes in the agricultural sector in order to improve the standard of living in the village.

Integral component of sustainable development in rural areas of the Stavropol Territory in 2011-2015, varies according to the municipal areas from 0.517 to 0.864, and the most correlated with the level of employment in rural areas (due to variation of 28.4%), the volume of investment in fixed assets (19.2 %) and profitability of rural territorial entities (17.5%).

In order to increase the validity of administrative decisions on the sustainable development of rural areas it is recommended: 1) to form the ecological and socio-economic policies of municipal districts with regard to the type of development; 2) diagnose the potential reserves and the sustainable development of rural areas through the use of the proposed method.

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