New approaches to the assessment of fisheries enterprises' economic sustainability

Nuevos enfoques para la evaluación de la sostenibilidad económica de las empresas pesqueras

Novas abordagens para a avaliação da sustentabilidade económica das empresas de pesca

Written by:
Olga V. Korneyko
Vladivostok State University of Economics and Service Candidate of Economic Sciences, Associate Professor, Associate Professor at the Department of Economics
Yustina S. Moroz
Public Joint Stock Company "Rostelecom", manager

Abstract

The importance and necessity of transition to the paradigm of sustainable development of Russian fishing enterprises is associated with the accumulation of many complex and unsolved problems. First of all, they concern the low susceptibility to innovation and the significant technological inferiority in comparison with the developed countries, as well as the lack of systematic implementation of a national industrial policy aimed at ensuring the sustainable development of the industry. The purpose of the study is to propose a methodology for assessing the economic sustainability of fishing enterprises on the basis of generalizing the achievements of economic theory and practice. To achieve the goal, methods of comparative multidimensional analysis, as well as dialectical and general scientific methods were used. The paper provides a critical assessment of common approaches to assessing the economic sustainability of the enterprise. The system of quantitative and qualitative indicators for assessing the economic sustainability of fishing organizations, which takes into account the strategic factors of enterprise development, has been proposed. The work provides an opportunity for an in-depth understanding of the problem of economic sustainability and its comprehensive solution. In particular, the proposed system of indicators can serve as a methodical tool to justify the effectiveness of government support measures because it allows ranking the fishing business structures according to their economic sustainability, and therefore,

Resumen

La importancia y la necesidad de la transición al paradigma del desarrollo sostenible de las empresas pesqueras rusas está asociada a la acumulación de muchos problemas complejos y no resueltos. En primer lugar, se refieren a la baja susceptibilidad a la innovación y la significativa inferioridad tecnológica en comparación con los países desarrollados, así como a la falta de implementación sistemática de una política industrial nacional dirigida a garantizar el desarrollo sostenible de la industria. El propósito del estudio es proponer una metodología para evaluar la sostenibilidad económica de las empresas pesqueras sobre la base de generalizar los logros de la teoría y la práctica económica. Para lograr el objetivo, se utilizaron métodos de análisis multidimensional comparativo, así como métodos dialécticos y científicos generales. El documento proporciona una evaluación crítica de los enfoques comunes para evaluar la sostenibilidad económica de la empresa. Se ha propuesto el sistema de indicadores cuantitativos y cualitativos para evaluar la sostenibilidad económica de las organizaciones pesqueras, que tiene en cuenta los factores estratégicos del desarrollo empresarial. El trabajo brinda la oportunidad de comprender en profundidad el problema de la sostenibilidad económica y su solución integral. En particular, el sistema de indicadores propuesto puede servir como una herramienta metódica para justificar la efectividad de las medidas de apoyo del gobierno porque permite clasificar las estructuras de las

select government recipients of budgetary funds, preferential credit resources and other government measures. In conclusion, the definition of economic sustainability is clarified.

Keywords: Russia, economic sustainability, fishery enterprises; fishing industry.

empresas pesqueras de acuerdo con su sostenibilidad económica y, por lo tanto, seleccionar a los receptores gubernamentales de fondos presupuestarios, recursos crediticios preferenciales y Otras medidas gubernamentales. En conclusión, se aclara la definición de sostenibilidad económica.

Palabras claves: Rusia, sostenibilidad económica, empresas pesqueras; industria pesquera.

Resumo

A importância e necessidade da transição para o paradigma do desenvolvimento sustentável das empresas de pesca russas está associada à acumulação de muitos problemas complexos e não resolvidos. Em primeiro lugar, dizem respeito à baixa suscetibilidade à inovação e à significativa inferioridade tecnológica em comparação com os países desenvolvidos, bem como à falta de implementação sistemática de uma política industrial nacional que vise garantir o desenvolvimento sustentável da indústria. O objetivo do estudo é propor uma metodologia para avaliar a sustentabilidade econômica das empresas pesqueiras com base na generalização das conquistas da teoria e prática econômica. Para atingir o objetivo, métodos de análise comparativa multidimensional, bem como métodos científicos dialéticos e gerais foram utilizados. O documento fornece uma avaliação crítica de abordagens comuns para avaliar a sustentabilidade econômica da empresa. O sistema de indicadores quantitativos e qualitativos para avaliar a sustentabilidade econômica das organizações pesqueiras, que leva em conta os fatores estratégicos de desenvolvimento empresarial, foi proposto. O trabalho oferece uma oportunidade para uma compreensão profunda do problema da sustentabilidade econômica e de sua solução abrangente. Em particular, o sistema proposto de indicadores pode servir como uma ferramenta metódica para justificar a eficácia das medidas de apoio do governo, pois permite classificar as estruturas do negócio pesqueiro de acordo com sua sustentabilidade econômica e, portanto, selecionar beneficiários governamentais de recursos orçamentários, recursos de crédito preferencial e outras medidas governamentais. Em conclusão, a definição de sustentabilidade econômica é esclarecida.

Palavras-chave: Rússia, sustentabilidade econômica, empresas pesqueiras; indústria pesqueira.

Introduction

Fishing depends on natural, socio-economic, demographic and biological factors. It has a higher risk ratio and is less attractive for investment than other sectors of the economy. The fishery complex, especially in developing countries, plays an important role in providing employment for the population, supplying raw materials for industry, meeting the nutritional needs of the population, preserving limited natural resources. Given the importance of fishing, its sustainability is vital, despite the challenges it faces. Sustainability in the industry is possible only if the fishery enterprises are sustainable, because the economic sustainability of industrial enterprises is an essential attribute of the effective development of the national economic system and society as a whole.

Until 1991, the USSR had a centrally planned system for the complex implementation of organizational, scientific, resource and other measures to ensure the economic sustainability of the fisheries complex enterprises. This system operated effectively, as evidenced by the high-quality, stable, uninterrupted and sufficient supply of fish products to the entire population of the country. The state bodies were responsible for ensuring the socio-ecological-economic sustainability of enterprises and organizations. The present-day realities don't allow the state to assume the same function. At the federal level, there is no systematic and consistent national industrial policy aimed at ensuring the sustainable development of entrepreneurship in fisheries, and business entities demonstrate low economic efficiency

and insensitivity to innovation, being, in fact, a raw materials appendage of developed countries.

The precarious situation of the fisheries enterprises is associated not only with their internal production, technological and financial problems, but also with the inevitable external variables accompanying the functioning of a market economy (Terentieva T.V. & Korneyko O.V., 2018). For example, fluctuations in the exchange rate, changes in consumer demand, increased activity of competitors, etc. Currently, it is the adverse external conditions caused by an unstable economy, sanctions against Russia, inefficient exchange rate policies that are the main factors not allowing a serious change in the material and technical potential in the industry, preserving the qualitative and quantitative characteristics of reproduction. Being in the field of economic dynamics, entrepreneurs inevitably face uncertainty, risk, and therefore, negative and emergency situations. The need to scientifically comprehend the essence of the fisheries enterprises sustainability is caused by the presence of a significant number of inefficient and unstable business entities.

Modern scientific ideas about the category of economic sustainability take into account its systemic nature, considering the enterprise as an element of the social, economic and natural environment, as an integral part of the sectoral, regional, national economic system. Moreover, the enterprise itself possesses all the properties of a system that can react with certain flexibility to changes in the external environment, change its program of actions and set new priorities.

MATERIALS AND METHODS

Sustainability (micro and macro) is widely discussed in the relevant literature (EuropeanCommission, 2001; Pezikoğlu, 2006; Rigby, Howlett, & Woodhouse, 2000).

The most common approach to assessing the economic sustainability of an enterprise is based on a study of its financial condition on the basis of an obvious fact: the causes of a violation of sustainability may be different; its final phase manifests itself as a loss of financial sustainability. This determines the level structural elements balance of the enterprise's assets and capital, as well as the level of efficiency of their use. Crisis financial condition creates the threat of bankruptcy, which is considered as a criterion of sustainability and an institution designed to ensure the functioning of sustainable enterprises. In the economic literature, there is a growing number of works on the search and development of methods for assessing the financial sustainability of the enterprise. Statistics also confirms that an assessment of the financial condition is necessary. According to the Center for Macroeconomic Analysis and Short-term Forecasting, in the first quarter of 2017, the number of bankrupt enterprises in Russia increased by 1.6% compared with the previous year. Despite the fact that this is less than in the crisis year of 2015, the reverse trend towards an increase in bankruptcies does not satisfy the specialists. Summarizing the results in figures, it can be specified that from 1000 to 1050 enterprises lose financial stability every month (Results of socio-economic development, 2018).

At the moment, to assess the financial condition and prevent bankruptcy, the researchers have proposed and have already tried various econometric models (mainly MDA models for Russian business and logit models in western practice), models based on artificial intelligence and decision trees, which are actively used by managers, neural network models that are becoming increasingly popular, and even hybrid models that combine two or three approaches (Mandel, 2004; Salkova, 2012; Nisak, 2016.). Undoubtedly, all these methods have their advantages and disadvantages, but most of them are applicable only in the case of a large set of data, a huge number of indicators in different periods of time to obtain accurate and unbiased estimates. In the context of fisheries enterprises, the use of common methods is limited primarily because of the quality of the data (no data, inaccurate data) (Korneiko O.V., 2017). Indeed, the Russian fisheries sector, a large proportion (about 80%) is made up of non-public companies, many of which are small or medium-sized enterprises. Moreover, in our opinion, consideration of financial sustainability alone is not enough for a comprehensive solution to the problem of increasing the sustainability of fisheries enterprises. This approach does not reduce the likelihood of failures in the enterprise due to the lack of a system for considering the strategic factors of its development, which relate to the innovation and investment policy of the enterprise.

In addition, due to the differences in nature of the industries making up the economy, it is not possible to develop a unified approach to the

concept of sustainability. (Bayramoglu, etal2018; Garbie, 2014; Choi&Lee, 2017).

Sustainability research for fishing enterprises covers social, economic, and a number of other variables (Korneyko&Poleschuk, 2017; Karaseva, 2010). In this study, we propose a system of indicators depicting economic sustainability of fishing enterprises, which form levels of operational sustainability and sustainability of development (table 1).

Table 1 – The system of sustainability indicators of fishing enterprises

Parameter	Unit
1. Operational sustainability	
1.1. Fish and seafood capture	thousand tons
1.2. Output of salable fish production	million rubles
1.3. Catch quotas	thousand tons
1.4. Production of fish products per 1 ton of raw materials	thousand rubles
1.5. Net profit margin	%
1.6. Return on sales	%
1.7. Funding ratio	fr. unit
1.8. Equity-assets ratio	-||-
1.9. Financial sustainability ratio	-||-
1.10. Current ratio	-||-
1.11. Absolute liquidity ratio	-||-
1. 12. Labor productivity	rubles/rubles.
Rating assessment of the operational stability	
2. Sustainability of development	
2.1. Validity coefficient	%.
2.2. Fixed assets turnover ratio	rubles/rubles.
2.3. The share of products certified in the "HACCP" and the Voluntary Certification System	%
2.4. Production automation level	%
2.5. Volume of investments in the development of material and technical base	million rubles
2.6. The share of personnel for the development and implementation of innovations (programmers, designers, etc)	%
2.7. The amount of property, liabilities and risks insured	million rubles
2.8. Innovative, marketing and financial potentials assessment	points

Assessment of innovative, marketing and financial potentials is carried out using qualitative indicators:

- the presence of various intellectual property objects (registered inventions, patents, technological documentation, know-how, computer programs);
- availability of business plans for the innovations development, innovative portfolio;
- the presence of registered brands, trademarks and positive reputation in the market;
- the opportunity of raising debt capital;
- availability of state financial support for investment and innovation;
- the possibility of obtaining grants, sponsorship and other types of extra-budgetary concessional financing;
- the opportunity of obtaining tax benefits.

With that said, it is logical to estimate the total value by assigning quantitative points to the qualitative data in the format of 1 point in case of presence of the indicator and 0 points in the absence of it.

This system is used in comparative multidimensional analysis, which allows to calculate three types of rating:
- rating assessment of the operational stability $R_j^{\,f}$;
- rating assessment of sustainability of development $R_j^{\,r}$;
- final rating assessment of economic sustainability $R_j^{\,f+r}$, obtained by summing up two rating scores.

The calculation of rating indicators is based on the comparison of enterprises for each indicator of operational sustainability and sustainability of development. For this, initial data matrix is formed, aij, where the rows stand for the numbers of indicators (i = 1, 2,…, n), and the columns represent the numbers of enterprises (j = 1, 2,…,m). Each column is determined by the maximum element, which is taken as one. Then all elements of this column aij divided by the maximum element, and a matrix of standardized coefficients xij is created. All elements of the matrix are squared. Due to the fact that the significance of indicators that make up table 1 is different, each of them is assigned a coefficient k from 0 to 1 by an expert method. Indicators that take into account the total catch (paragraph 1.1 of table 1), the volume of rights to carry out activities (paragraph 1.3), the depth of processing (paragraph 1.4), innovation, marketing and financial potentials (paragraph 2.8), status and renovation of physical facilities of the enterprise (paragraph 2.1 and paragraph 2.5) have the largest k. The rating for each type of sustainability is determined by the formula.

$$R_j = \sqrt{k_1 \cdot x_{1j}{}^2 + k_2 \cdot x_{2j}{}^2 + ...k_n \cdot x_{nj}{}^2}$$

Since all indicators that form the value of sustainability are unidirectional and are positive, an increase in the rating score can be considered as an improvement in the degree of sustainability of the object under study. The highest estimated indicator of sustainability of development and operation is an entrepreneurial structure with a maximum value $R_j^{\,f+r}$.

The most difficult is to evaluate the results of calculations and the obtained values of $R_j^{\,f}$ and $R_j^{\,r}$. At what values does the company remain in a state of relative stability or passes through a threshold increase in instability to its absolute value and loses its system-forming features? To resolve this issue, it is necessary to understand that the entrepreneurial structure is a developing system characterized by a fluid, dynamic equilibrium, which is clarified by the definition of entrepreneurship. The imbalance factor initiates evolutionary development. The recognition of the positive role of the economic crisis in the sustainable development of enterprises makes it possible to take timely measures to manage such crises and reduce their negative consequences. Therefore, the main task of an entrepreneur in

fisheries activities is not to deny the crisis in general, but to find such minimum values for the operational sustainability indicators that can be tolerated acting on an innovation-based risk basis, while ensuring a high potential for sustainable development. An entrepreneur, as a carrier of an innovative type of thinking, can sacrifice his financial and economic position, allowing for a decline in $R_j{}^f$, upon condition of a targeted increase in the indicator $R_j{}^r$, whereas the inverse ratio of rating values does not form the basis for the strategic sustainability of entrepreneurial fisheries structures. The display of insignificant interest in innovations and innovative development by enterprises of fisheries activities poses a threat to the economic security of both the business entity and the subject of the Russian Federation.

Results and discusión

The proposed system of indicators can serve as a methodical tool to justify the effectiveness of government support measures because it allows ranking the fishing business structures according to their economic sustainability, and therefore, select government recipients of budgetary funds, preferential credit resources and other government measures. For this purpose, public authorities should be guided by the following selection criteria (table 2).

Table 2.4 – Interpreting rating scores in multidimensional comparison

Values of $R_j{}^f$ and $R_j{}^r$ in multidimensional comparison	Decision on state support
$R_j{}^r$ is high, $R_j{}^f$ is low	The lack of a strategic development reserve indicates an incompetent management of the business structure. The issue of support is decided negatively.
$R_j{}^r$ is high, $R_j{}^f$ is high	Lack of operational problems and the availability of sustainable long-term development bases. The issue of support is not raised.
$R_j{}^r$ is low, $R_j{}^f$ is high	Formation of the foundations for future development. The issue of support is resolved positively.
$R_j{}^r$ is low, $R_j{}^f$ is low	The business structure needs to be reorganized or closed. The issue of support is resolved situationally.

The author's system of economic sustainability indicators has been practically tested at the fishing enterprises of the Primorsky krai on the basis of a scientific study of the data provided by rating participants using the comparative analysis method. The transparency of Primorsky krai fisheries entrepreneurship is still low. Each business structure is unique, and the indicators characterizing the innovative, marketing and financial potentials are not displayed, as they concern the strategic and tactical intentions of the economic entity. That is why the rating participants agreed to provide data on their activities on the conditions that this information will not be public. For this reason, instead of the companies' names the letter designations are used (table 3).

Table 3 – Initial data matrix

Parameter	Unit	A	B	C
1.1	thousand tons	4,776	10,15	1,2

1.2	million rubles	234,04	196,00	50,4
1.3	thousand tons	7,993	10,24	1,2
1.4	thousand rubles	49,0	70,00	42,0
1.5	%	88,7	11,50	1,6
1.6	%	43,5	18,37	1,2
1.7	fr. unit	0,7	1,45	0,7
1.8	fr. unit	0,3	0,59	0,4
1.9	fr. unit	0,3	0,59	0,4
1.10.	fr. unit	2,1	2,00	0,73
1.11.	fr. unit	0,2	0,30	0,09
1.12.	rubles/rubles.	4,9	0,72	0,04
2.1.	%.	30,0	42,00	15,0
2.2.	rubles/rubles.	2,6	0,98	2,02
2.3.	%	100,0	90,00	0
2.4.	%	10,0	54,00	10,0
2.5.	million rubles	22,5	70,00	15,0
2.6.	%	0	10,00	0
2.7.	million rubles	30,0	100,00	10,0
2.8.	points	3,0	7,00	1,0

Now we will transform the initial data matrix into a matrix of standardized coefficients. (table 4).

Table 4 –Standardized coefficients matrix

Parameter	Cover ratio	A	B	C
1.1	0,9	0,47	1,00	0,12
1.2	1,0	1,00	0,84	0,22
1.3	0,8	0,78	1,00	0,12
1.4	1,0	0,70	1,00	0,60
1.5	1,0	1,00	0,13	0,02
1.6	0,8	1,00	0,42	0,03
1.7	0,25	0,48	1,00	0,48

1.8	0,25	0,50	1,00	0,68
1.9	0,25	0,50	1,00	0,68
1.10	0,5	1,00	0,95	0,35
1.11	0,5	0,97	1,00	0,30
1.12	1,0	1,00	0,15	0,01
$R_j^{\,f}$		2,49	2,29	1,13
2.1	1,0	0,71	1,00	0,36
2.2	0,2	1,00	0,38	0,78
2.3	0,5	1,00	0,9	0,01
2.4	1,0	0,19	1,00	0,19
2.5	1,0	0,32	1,00	0,21
2.6	1,0	0	1,00	0
2.7	0,5	0,30	1,00	0,10
2.8	1,0	0,43	1,00	0,14
$R_j^{\,r}$		1,26	2,44	0,59
$R_j^{\,f+r}$		3,75	4,73	1,72

So, the "B" business structure has a lower value of operational sustainability, but at the same time it takes into account the strategic factors of development. It carries out a wider investment policy than other participants of the rating, despite the absence of such own funding sources as structure A possesses. Therefore, the economic sustainability value of the future-oriented business entity is the highest. The state is only required to maintain its current financial and economic condition.

Conclusion

Thus, a combination of quantitative and qualitative measures, as well as taking into account the strategic factors of enterprise development related to innovation and investment policy, provide an opportunity to deeply understand and find a comprehensive solution to the problem of economic sustainability of those business structures that operate in the fisheries sector.

Summarizing the above, we will give the following definition of the "economic sustainability" category: it is the ability of the system (enterprise) to maintain a certain level of achieving economic goals in the context of dynamic transformations which business environment undergoes and at the same time the ability to adapt and move to a qualitatively new level of development.

References

Bayramoglu, Z., Oguz, C., Karakayaci, Z., & Arısoy, H. (2018). Identification of the income level needed for agricultural enterprises to achieve economic sustainability. Economic Research-Ekonomska Istraživanja, 31(1), 510–520. doi:10.1080/1331677x.2018.1438908.
Choi, S.S. & Lee, J.Y. (2017). Development of a framework for the integration and management of sustainability for small- and medium-sized enterprises International Journal of Computer Integrated Manufacturing, Volume 30, Issue 11.

European Commission. (2001). A framework for indicators for the economic and social dimensions of sustainable agriculture and rural development. Agriculture Directorate-General, Brussels.

Garbie, I.H. (2014). An analytical technique to model and assess sustainable development index in manufacturing enterprises International Journal of Production Research, Volume 52, Issue 16.

Korneiko, O.V. (2017). Value orientations of modern entrepreneurship in Russia. Economic and Social Changes: Facts, Trends, Forecast, 10 (5),169-183.

Korneyko, O.V., Poleschuk, A.D. (2017). Estimation of economic stability of the fisheries sector's enterprises of the Primorsky krai. Russian Journal of Agricultural and Socio-Economic Sciences, 66, № 6, 298-306.

Karaseva, O. V. (2010). The method of assessing the economic sustainability of fisheries enterprises. News of TINRO, 160, 329 -334.

Mandel, A.S. (2004). The method of analogs in forecasting short time series: an expert-statistical approach. Automation and telemechanics, 4.

Nisak, S.C. (2016). Seemingly Unrelated Regression Approach for GSTARIMA Model to Forecast Rain Fall Data in Malang Southern Region Districts. CAUCHY journal of pure and applied mathematics, 4(2), 57–64.

Pezikoğlu, F. (2006). Determination of the policies related to application systems of the sustainable agriculture practices in Turkey (Unpublished Doctoral Dissertation). Uludağ University, Institute of Science, Department of Agricultural Economics, Bursa (in Turkish).

Results of socio-economic development. (2018). Retrieved from http://www.primorsky.ru/authorities/executive-agencies/departments/economics/development/results/

Rigby, D., Howlett, D. & Woodhouse, P. (2000). Sustainability indicators for natural resource management & policy (Working Paper 1; A Review of Indicators of Agricultural and Rural Livelihood Sustainability ISBN: 1 902518616). Manchester: Department for International Development Research Project No. R7076CA, University of Manchester.

Salkova, M.V. (2012). Methods of analysis and forecasting of the organization's activities in order to identify and prevent insolvency (bankruptcy) Retrieved from: http://www.scienceforum.ru/2014/576/1184

Terentieva T.V., Korneyko O.V. (2018). Investigation of the returns to scale of fishing enterprises of the primorsky territory // Amazonia Investiga. - Vol. 7, №. 14, 84-90.