

Justification for perspective directions of fat-and-oil industry development of agricultural regions in the South of Russia

Justificación de las perspectivas del desarrollo de la industria de la grasa y el aceite en las regiones agrícolas del sur de Rusia

Inna Borisovna MANZHOSOVA [1](#); Ekaterina Leonidovna PUTRENOK [2](#); Oksana Anatol'evna ALEKSEEVA [3](#); Dmitriy Borisovich LITVIN [4](#); Maria Nikolaevna TATARINOVA [5](#)

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ABSTRACT:

Agricultural sector in the South of Russia is the backbone for the economy of the Russian Federation on several elements: production of products with high export potential, ensuring the country's food security, the maintenance of the functional condition of the entire socio-economic agro-industry. To justify the perspective directions of different sectors development of the agro-industrial complex in this regard it is necessary start from the forecast parameters of the trajectories of their functioning. The use of economic-mathematical modelling tools with elements of simulation forecasting is associated with study of fat-and-oil industry of the South of Russia, not only within the local scale, but as a subject of foreign economic activity. The methodical instrument of identification of scenario functioning forecasts of fat-and-oil industry in the South of Russia, developed by the authors, allows to use adapted approach for the development of mechanisms of state

RESUMEN:

La industria agrícola en el sur de Rusia es la espina dorsal de la economía de la Federación Rusa sobre varios elementos: la producción de productos con alto potencial de exportación, garantizando la seguridad alimentaria del país, el mantenimiento de la condición funcional de toda la agroindustria socioeconómica. Para justificar las direcciones perspectiva de desarrollo de los diferentes sectores agroindustriales compleja A este respecto, es comienzo necesario a partir de los parámetros de previsión de las trayectorias de su funcionamiento. El uso de herramientas de modelado económico-matemáticos con elementos de simulación de la previsión está asociado con un estudio de la industria de grasa de petróleo y del sur de Rusia, no sólo localmente, dentro de la escala, sino como sujeto de la actividad económica extranjera. El instrumento metódico de identificación del escenario de funcionamiento Las previsiones de la industria de grasa

stimulation, application of flexible fiscal policy measures and it can be used while working out strategic documents of agrarian sector of the economy development, both at regional and municipal levels as empiric and calculating base.

Keywords: Agrarian Economics, fat-and-oil industry, forecasting, simulation modelling, food security.

de petróleo y en el sur de Rusia, desarrollado por los autores, permite el uso de un enfoque adaptado para el desarrollo de mecanismos de estimulación del estado, la aplicación de medidas de política fiscal flexible Y puede ser utilizado mientras trabajan fuera documentos estratégicos de los sectores agrarios del desarrollo de la economía, a nivel regional y local, tanto niveles como base empírica y calculadora.

Palabras clave: Economía agraria, industria oleosa y de petróleo, de previsión, modelado de simulación, la seguridad alimentaria.

1. Introduction

Problems of the of fat-and-oil industry development in the structure of agriculture require analytical and predictive maintenance. The article aims to develop methodological tools for performing the forecast scenarios for fat-and-oil production, taking into account the identified and selected complex of forecasting limits (restrictors). Application of developed tools in implementing plan has allowed to justify three options of the fat-and-oil industry development with different horizons of the forecast.

In a higher level of empirical reinforcements, the results of the forecasting scenarios allow to form an effective agrarian policy and instruments for its implementation at various levels of industry management.

The authors note that current oilseed consumption is in the stage of growth, which necessitates to rationale perspective directions of fat-and-oil industry development of agricultural regions of Southern Russia with a view to the detail and specificity of risks and identification of industrial and technological specificity in the light of transformation of market factors and environment.

2. Methodology

2.1 General methodological approach of the authors

General provisions of the authors' research is based on theoretical concepts presented in the works of Russian and foreign researchers in the field of agricultural development (Gerasimov, 2015a; Gerasimov, 2015b; Erokhin, 2014; Bobryshev, 2014; Elchaninova, 2014; Evans, 2002; Taranova, 2015; Eswaran, 1986; Bobryshev, 2014; Acharya, 1997; Trukhachev, 2015; [Braverman, 1982; Lapina, 2015; Sharma, 2012; Litvin, 2015).

Methodological framework of the study is presented by synthesis of fundamental methods of scientific knowledge: analysis, synthesis, dialectical unity of qualitative and quantitative evaluation system and hierarchical approaches. Information and empirical base is provided with the data of Federal State Statistics Service of the Russian Federation, the territorial body of Federal State Statistics Service in Stavropol Region, academic sources, information from printed periodicals, expert assessments and the results of the authors' calculations.

The review of papers on agricultural development problems in territorial agrarian and social environment has shown that most of the problems are attributable and similar to systemic negative developments of agrarian sector of economy. In this context, it is worth distinguishing:

- Works related to the development of rural tourism and the study of diversification directions of rural economy (Sharpley, 2002);
- Study on the impact of globalization on the development of agrarian business [Bernstein, 2004], as well as the impact of economic crises on different aspects of the functioning of the agricultural organizations (Lobao, 2001; Bobryshev, 2015a; Bobryshev, 2015b);
- Study of the issues of agrarian political economy (Buttel, 2001; Bernstein, 2001), which creates conceptual framework for the interaction of economic entities in the agricultural sector of economy (Byres, 1995);

- Study of the balance in the development of rural territories (Marsden, 1995; Bernstein, 1996) in this context researches on study of agrarian structure and balance between large and small farms in agricultural sector are of considerable scientific interest (Deininger, 2012);
- Study of experience of strategic directions for the development of agriculture in different countries (Omamo, 2006).

It is also worth mentioning the work (Lerman, 2001), in which there is the analysis of institutional and organizational problems in the countries implementing the transition from Soviet agricultural model to the market one.

Researches on a number of connected topics show the sophistication of the condition for functioning of fat-and-oil industry of agriculture that requires the reserves identification of economic efficiency increase of production and business processes, taking into account the complex influence of complex factors of market and natural agrarian and social environment (Fröhlich, 2005) (Sharma, 2012). This conclusion allowed to form the scientific algorithm of heuristic tasks:

Phase 1:

- rank of forecasting goals according to the levels, trends and stakeholders;
- identification of groups of forecast information consumers;
- identification of indicators included in the models, selection of methods and tools for forecasting.

Phase 2:

- justification of alternative development scenarios base of oil subcomplex of Stavropol Region. Forming of simulation models with the designation of prognosis limitation (LP) of investigated system of indicators;
- identification of trends in production and consumption of oilseeds;
- selection of agricultural and technical restrictions;
- risk management level of oil production.

Phase 3:

- calculation and adjustment of forecasting value for the three scenarios;
- "reformation" of the production structure, depending on trends;
- economic, programmatic and targeted scenarios' interpretation of oilseed production in Stavropol region.

2.2. Specific provisions of the author's methodological approach

In accordance with the developed algorithm, we have distinguished the following methodical blocks:

- multilevel structure of effective block of forecasting procedure includes ranking of potential users of this information on the scale of interests: regional level acts as the macro environment, covering not only socio-economic challenges of development of fat-and-oil industry, but also performs an important function in foreign trade; industry-specific level contains the features of the regional categories, whose main objective is food market saturation and ensuring commercial growth of fat-and-oil industry; the level of interest of the territory's population reflects the "non market model" of agriculture, when the main challenge of the agro-industrial complex is to meet the actual needs of the population of a particular territorial unit, given the imbalance of regional conditions of production of oilseed crops;
- system of objectives is aimed at explication of targets of forecasting indicators, depending on considered levels;
- structuring of forecasting information possible consumers allows to overcome centralization and duplication of measures and directions of stimulation of oil-bearing subcomplex, based on industry-wide indicators of its activity depending on funding levels and targets of federal, regional and local authorities of industry-specific governance;
- indicators, included in simulation models constitute the platform for forecasting;
- a variety of techniques and tools for forecasting, applied in our research, allows to get the most

reliable indicators of forecasting values, taking into account the adjustment indicators.

2.3 Formation of system of prognosis limitation.

Formation of prognosis limitation (LP-prognosis limitation) for the purpose of scenario forecasting is necessary for control points allocation and identification of possible boundaries and "corridors" of simulation models. Reconciliation of criterial indicators includes the following main units:

- Forecast corridor taking into account the level of variables included in simulations.

Structural components are grouped depending on targets and forecasting problems; identification of maximum and minimum values is a restrictive measure enabling the most reliable forecasting the quantitative impact of oil-bearing subcomplex in different socio-economic conditions. Baseline scenario (1) indicators include the triad of social indicators; their impact on regional economic system is fundamental. Increase or decrease of the considered indicators generates the "pulsating" diffusion of entrepreneurial activity of agricultural producers in agrarian and social environment.

The model of second simulation scenario involves the incorporation of off-load indicator of oil subcomplex of Stavropol Region in the Russian Federation within terms, volumes and at prices which are the most profitable for producers. These indicators are represented by sample of statistics data for the period of 2008-2015.

While modelling of the third scenario indicator of foreign economic trade is added, it is presented in maximum and minimum volume.

Table 1 Limitations of basic criteria for assessing and forecasting the production of oilseeds

	Scenario 1	Scenario 2 (scenario 1 +)	Scenario 3 (scenario 2 +)
1. Forecast corridor taking into account the level of variables included in the simulation models.	<p>Maximum volume of oilseeds consumption is 19.4 kg/capita</p> <p>Minimal volume consumption is 14.1 kg/capita</p> <p>The maximum population is 833412</p> <p>Minimum population is 732543</p> <p>The maximum size of incomes is 21908 rubles</p> <p>The minimum size of incomes is 9765 roubles.</p>	<p>Maximum sale of oilseeds done by producers of Stavropol region in the Russian Federation is 545.06 thous. tons</p> <p>Minimum sale of oilseeds done by producers of Stavropol region in the Russian Federation is 221.7 thous. tons</p>	<p>The maximum amount of exported oilseeds is 104.2 thous. tons</p> <p>The minimum amount of exported oilseeds is 41, 8 thous. tons</p>
2. Risk management of efficiency of oilseed production *	<p>Strategy P1 - sunflower cultivation should be performed with a probability of 0.520; strategy P2 - soybean cultivation should be performed with a probability of 0.505; strategy P3 - winter rape cultivation should be performed with a probability</p>	Not used	

	of -0.243 and strategy P4 - flax cultivation should be performed with a probability of 0.270.
3. Trends of production and consumption of oilseeds	The global trend *: Sunflower - 11%, rape -14%, soybean - 30% flax - 0.4%
	Russian trends *: sunflower - 83%, rape -7%, soybean - 9%, flax - 1%. Stavropol region ***: Sunflower-62.8%, rape -26.5%, flax -5%, soybean-5%.
4. Agricultural criteria (is calculated on the basis of the risk assessment methodology, developed by the authors in previous researches; according to http://www.eurasiancommission.org/ according to oilworld.ru according to Stavstat)	The maximum possible proportion of oilseed crops in the structure of sown areas is 25-30%. Minimum required share of oilseeds in the structure of sown areas is under 15% The maximum size of sown areas is 479 thous. ha The minimum size of sown areas is 352 thous. ha Maximum yields of oilseeds: sunflower -16.7; rape -17.4; flax -15.1; soybean -15.4. Minimum oilseeds yield: sunflower - 11.6; rape -10.1; flax - 6.6; soybean - 9.6.

Studies have shown that for the period 2008-2015 there are the following changes in calculated rate toward global trends and consumer preferences inside the region and the Russian Federation: decrease of probability level of sunflower cultivation is at 0.001 units and rape cultivation at 0.012 units, increase of the level of probability of soybean is at 0.022 units and flax is at 0.008 units.

Estimates prospects depend on a number of factors:

- use in food industry of oil-bearing subcomplex products;
- the structure of foreign trade turnover;
- features of the internal market and price formation;
- natural and climatic conditions of cultivation;
- availability of processing base;
- technological characteristics of production.

Trends in production and consumption of oilseeds.

The assortment of oilseeds production on any given territory depends on many factors, such as food and flavouring preferences of people, natural and climatic conditions, profitability and cost price of the final product. We have identified three trends: at the metalevel - global preferences; at the macrolevel - all-Russian production structure and consumption of oilseeds; at the mesolevel - preference of Stavropol region residents. The result of this research is the identification of significant differences in the volumes and types of fat-and-oil products consumption. The scale of research and modelling dependencies and forecast calculations involves studying the peculiarities of the production trends and consumption of oilseeds in the section: global trends; Russian trends and trends in Stavropol region.

Agrotechnical criteria.

"Mechanics" of results forecasting of oil-bearing subcomplex activity is impossible without

inclusion of agricultural criteria and characteristics of oilseeds cultivation in the model. Criteria combination included in the production of oilseeds model takes into account not only economic aspects and realities of regional business systems; substantial and integral parts of any agriculture are crop rotation requirements and sustainable use of agricultural land. For that purpose, we, as restrictive criteria in forecast models, included indicators of possible maximum proportion of oilseed crops in the structure of seeding in Stavropol region and the minimum area, cultivated over the study period. Also for forecasting the volume of gross harvest we have taken into account fluctuations in yields of oilseeds in Stavropol region.

In accordance with the rules of rational agricultural land usage (Decree of the Government of Stavropol region from September 7, 2010 № 299-п last revised or amended on 10.03.2015 № 81-п) it is allowed to grow sunflowers on an area not exceeding 17 percent of the total sown area (maximum 25) in Stavropol region. For the purposes of land management and the conservation of soil, total aggregate of oilseed crops in the overall structure of sown areas and features of the crop rotation should not exceed 25-30% in Stavropol region. During the study period, the maximum size of cultivated areas under oilseeds totalled 479 thousand hectares, or 26%, minimum area was 352 thousand hectares, or 20%.

Perspectives of oilseed crops productivity increase are in development and implementation of technologies of cultivation and breeding; in this regard within the framework of the implementation of the Strategy of food and processing industry development in the Russian Federation for the period until the year 2020, approved by the Decree of the Government of the Russian Federation from April 17, 2012 № 559-п is implemented by the industry-specific program "Development of fat-and-oil industry in the Russian Federation for 2014-2016". Key areas of this document are the increase of oilseed production, competitiveness and improvement of consumer properties, and an assortment of fat-and-oil products.

3. Results

3.1 Generated scenario vision of the development processes of fat-and-oil industry in Stavropol region

Integrating in the research process mechanisms and instruments of oilseeds subcomplex development level modelling in Stavropol region, we have formed the group of criterial parameters, which constraint assessment and forecasting of oilseed production systems (Table 1). For each version of a forecast there is a system of parameters, which are carefully generated categories that take into account the specific features of the subcomplex.

Forecast variability is presented by three scenarios with different functionality and combination of conjugate analytic procedures.

The first scenario reflects the needs of the population of Stavropol region in the production of fat-and-oil industry and is the basis for assessing its condition. The parameter array contains special group of criteria that evaluate the risk nature of efficiency of oilseed production in the territory of the region under study. This scenario is socially oriented and implies social level of production and consumption, stability of market coverage by proprietary products of fat-and-oil industry in sufficient quantities for population of the region. In this context, indicators included in the model are of informational and accounting nature and make minimum amount of oilseed production in Stavropol Territory:

- the volume of actual consumption of oilseeds in Stavropol region, kg/capita;
- the population of Stavropol region, person;
- the population income in Stavropol region, roubles.

Maximum and minimum values restrict the model within the framework of prevailing trends and levels considered indicators allow you to adequately show prognostic value, proceeding from the actual behaviour of the economic system.

$$\begin{cases} P1 = ((I_{\max \min} + N_{\max \min}) + (J * \beta_{\max \min})) q_{x1x2x3x4}, P1 > 0 \\ I_{\max \min} [19,4; 14,1] \beta_{\max \min} [25; 15] \end{cases}$$

$$N_{\max \min} \{833412; 732543\} D_{\max \min} \{9765; 21908\}$$

$$q_{x1x2x3x4} \{0,503; 0,520; 0,243; 0,270\}$$

where $I_{\max \min}$ is the volume of consumption of oilseeds in Stavropol region, kg/capita;

$\beta_{\max \min}$ is the proportion of required and maximum acreage in the structure of all cultivated areas, %;

$N_{\max \min}$ is the population, person;

$D_{\max \min}$ is the population income, roubles;

$q_{x1x2x3x4}$ – probability of oilseeds cultivation according to crop type.

The second scenario involves the operation of the fat-and-oil industry in the form of over intensive localized system. In this regard, the number of indicators increases in the simulation model, while the "platform isolation" of the first scenario weakens. Assimilation of analytics criteria occurs, while increasing the number of actors that caused by the introduction of commercial component into the calculation model. The natural aspiration of agribusiness to increase production volumes in order to achieve stable commercial effect, profit growth and to build an infrastructure component is being made actual.

A characteristic feature of the second scenario is incorporation of additional indicator into the basic model - the volume of oilseeds sales, which surpasses by far the capacity of domestic oil consumption market of the region under study.

The system of equations of the 2 scenario

$$\begin{cases} P2 = P1 + C_{\max \min}, P2 > 0 \\ C_{\max \min} [545,06; 221,7] \end{cases}$$

where $C_{\max \min}$ is the sales volume of oilseeds sold by producers on the territory of the RF, thous. tons.

The third scenario involves generation of all possibilities of regional agricultural and social environment: features of fixed and natural assets, the specificity of the institutional platform and social resources. The main objective is to demonstrate the maximum production level of local agricultural production, the ability to operate in an unstable socio-economic system.

The general indicator, which identifies adaptation of fat-and-oil industry to modern competitive production conditions, is the indicator of export products. External-economic market imposes fairly tough requirements to the quality of food, which are achieved by improving the technological process of production, ensuring observance of the qualimetry principles at all stages and implementation of scientific-research works results.

The system of equations of the 3 scenario

$$\begin{cases} P3 = P1 + P2 + W_{\max \min}, P2 > 0 \\ W_{\max \min} \{104,2; 41,8\} \end{cases}$$

where $W_{\max \min}$ is the volume of oilseeds export by producers of Stavropol region, thous. tons.

3.2 Forecast results

The data was obtained as a result of the study (Table 2).

Table 2. Scenario forecasting of oilseed production from a perspective of various trends of production and consumption, thous. tons.

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Crops	1 scenario			2 scenario			3 scenario		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
Oil-bearing, total	464.2	487.1	516.9	617.32	631.85	646.57	730.78	755.74	780.78
Global trends									
Sunflower	51.1	53.4	56.9	67.9	69.5	71.1	80.4	83.1	85.9
Rape	65.0	68.2	72.4	72.4	88.5	90.5	102.3	105.8	109.3
Flax	1.9	1.9	2.1	2.5	2.5	2.6	2.9	3.0	3.1
Soybean	139.3	146.2	155.1	185.2	189.6	194.0	219.2	226.7	234.2
Other	206.9	217.5	230.4	289.3	350.1	288.5	325.9	337.1	348.24
Russian trends									
Sunflower	385.3	404.3	429.0	512.4	524.4	535.7	606.5	627.3	648.0
Rape	32.5	34.1	36.2	43.2	44.2	45.3	51.2	52.9	54.7
Flax	4.6	4.9	5.2	6.2	6.3	6.5	7.3	7.6	7.8
Soybean	41.8	43.8	46.5	55.6	56.9	58.2	65.8	68.0	70.3
Stavropol region									
Sunflower	291.5	305.9	324.6	387.7	396.8	406.0	458.9	464.6	490.3
Rape	123.0	129.1	137.0	163.6	167.4	171.3	193.7	200.3	206.9
Flax	23.2	24.4	25.8	30.9	31.6	32.3	36.5	37.8	39.0
Soybean	23.2	24.4	25.8	30.9	31.6	32.3	36.5	37.8	39.1

The next step of the forecast of oilseed production in the region is allocation of the calculated values in the context of production impact and consumption trends in three aspects: global trends; Russian trends; trends of Stavropol region. Analytical allocation is the ability to track trends and development strategies of oil-and-fat industry, develop the direction of territorial marketing in accordance with promising markets.

Soybean and palm oil prevail in the structure of oilseeds world consumption, they form the basis of the population diet and equals to 75%, minor amount of flax production is due to low demand for seeds and oil. High demand for soybean oil dictates a relevant proposal, but according to the analytical agency Oil World, the decline of soybean production is expected in the next few years in the United States, Argentina and Brazil at the expense of reduced yields. Market balance will be maintained at the expense of the existing transit reserves.

Russian consumption of oilseeds explains the structure of production, in which the leading position holds a sunflower. Statistics show annual growth of vegetable oils consumption, among which the sunflower amounts 83%. In recent years there has been an increase in cultivated areas of soybeans and growth in the usage of soybean oil in the food industry. Reduction of world soybean production due to deterioration of the agrochemical characteristics of land leads to an increase in the market value of soybean products, reducing the profitability of sales. In Russia the growth of cultivated areas under soybeans is because of sunflower and rapeseed decrease.

4. Discussion

General discussion of fat-and-oil industry functioning problems in scientific and expert community and their correlation with the results of studies (Fujita, 1999; Searle, 2005; Truhachev, 2015a; Trukhachev, 2015b) approve the author's hypothesis about the need to use an adaptive approach to justifying the development prospects of the oil industry. When this adaptation can be expressed in a variety of ways to support and encourage the development of the industry, focused on key characteristics of one of the three reasonable scenarios.

5. Conclusion

As a result, the authors have identified possible directions of development of oil-and-fat industry of the region under study, which allowed to formulate the following conclusions and suggestions for its further development:

- considered approach allows to increase the effectiveness of targeted measures to stimulate and support the subcomplex taking into account clear goals;
- accounting in forecasting of basic indicators of agricultural market conjuncture allows to increase the informative value of statistics and estimated data;
- the introduction of additional information on trends in consumption of oil products will adjust logistics and business implementation scheme;
- poly-variation of simulation scenarios allows to identify the strengths and weaknesses of fat-and-oil industry with regard to required minimum and maximum demanded production volume.

Statistical specification of forecasting results identified a growing trend of oilseed production in the region in the medium term. So, according to the third (realistic) scenario, growth of gross yield during the next three years will be about 17 per cent of the year 2015.

Institutional activities are conducive to this indicator (implementation of targeted programs) and the use of modern agricultural technologies; trends in consumption compose the basis of forecasting growth, the level of commercialization of the industry, import-export cooperation.

The second scenario adjusts the amount of production volumes, taking into account only domestic trades, minimum level of production will be 617 thousand tons total, the conditions of the Russian market will provoke the growth of oilseed production at 4%. According to the first scenario, (consumer) oilseeds production for needs of Stavropol region population was sufficient at the level of 464.2 thous. tons with consequent increase of 11%.

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1. Stavropol State Agrarian University 12, Zootechnical Pass, Stavropol, 355000, Russian Federation. Email: inna.manzhosova.asu@mail.ru

2. Stavropol University 355035, prospekt Kulakova, d.8, Stavropol, Russian Federation

3. FGAOU VPO «North Caucasian Federal University» Russian Federation, 355009, Stavropol, Pushkin Street, 1

4. Stavropol state agrarian University Russian Federation, 355000, Stavropol, trans. Zootechnical 12

5. FGBOU VPO Stavropol state agrarian University Russian Federation, 355000, Stavropol, trans. Zootechnical 12

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