Oil cluster: production, transportation and processing (regional experience)

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Abstract. The article examines the role of the oil cluster in the economy of the Samara region. Due to him in 2018-2019. formed about 19% of the gross added value of the region. It unites production, transportation, and oil refining, forming the regional budget, providing employment for the population. The work purpose is to study the oil industry state in the Samara region and determine the features of its development. Within the framework of this study, it is planned to solve the following tasks: - study of statistical data on the Samara region oil cluster state; - identification of patterns and dependencies of its development; - identification of the strengths and weaknesses of the Samara region as an oil-producing territory. The volume of oil production reached 16 million tons of oil per year, and there is a tendency towards its increase. At the same time, the cost of production and electricity consumption are increasing, which indicates the improvement of production technology, the formation of a modern infrastructure of the industry. The problem of inappropriate use of agricultural land under the facilities of the oil sector is emerging. Most of this land is located in the eastern part of the region. In the future damage should reach almost 2.0 billion rubles in year.

1. Introduction

Mining is the most important sector of the economy. The presence (or absence) of developed oil production remains especially critical (even in the context of globalization) [1-4]. Despite significant fluctuations in market prices characteristic of recent decades, oil production is both a significant source of gross domestic income and stimulates the development of related industries (mechanical engineering, construction, chemical industry, etc.), as well as energy-intensive industries [5-6]. In the latter case, incentives are provided due to the low level of refining costs (transport, transactional, etc.). An additional development opportunity for business entities is the state policy, which contributes to the stabilization of prices for petroleum products [7-8].

2. Materials and methods

The work purpose is to study the oil industry state in the Samara region and determine the features of its development. Within the framework of this study, it is planned to solve the following tasks: - study of statistical data on the Samara region oil cluster state; - identification of patterns and dependencies of its development; - identification of the strengths and weaknesses of the Samara region as an oil-producing territory.

In the course of the research, we used abstract-logical, monographic, econometric methods, methods of expert assessments. The research is based on the data of the Territorial Body of the Federal State Statistics Service of the Russian Federation.

3. Results

The location of the Samara region is limited to the southeastern part of the East European Plain. In the middle reaches of the Volga River, the so-called. Samarskaya Luka, which looks like a sharp bend. The region is divided into three parts (Right Bank, North and South Left Bank), the boundaries of which are formed by large rivers: the Volga and Samara. The area of the Samara region is 53.6 thousand km^2 (data as of 01.01.2020). Agricultural lands prevail in the structure of land - 76% (figure 1) [9].

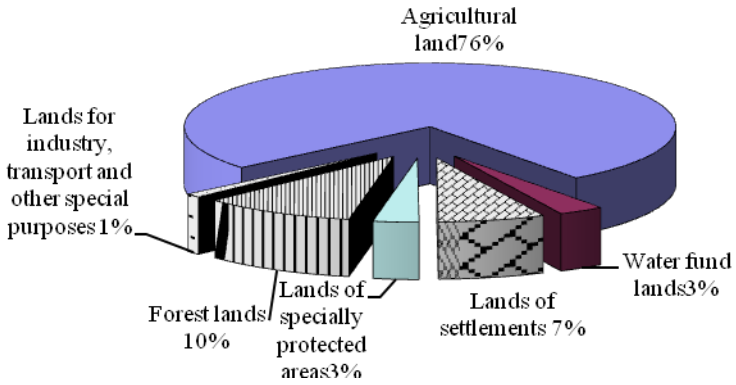

Figure 1. Lands of the Samara region (by category).

In addition to agricultural production in the Samara region, agricultural land is claimed by: oil and gas production enterprises, oil and gas transportation companies.

The Samara region is the old mining region. The its share in Russia oil production is 2.7%. At present and for the foreseeable future, the main mineral of the Samara region is oil, which contains about 300 million tons of recoverable oil reserves and 600 million tons of oil resources in the depths. More than 380 oil fields have been discovered. Among them, thirty-four can be attributed to the main operating ones: Avralinsky, Aglossky, Alakaevsky, Alekseevsky, Alimovsky, Altukhovsky, Bulatovsky, Verkhne-Gaysky, Vozdvizhensky, Gorodetsky, Dmitrievsky, Zhigulevsky, Zhukovsky, Zarechensky, Zolnyovrazhny, Kazakovsky, Kalmajursky, Karlovo-Sytovsky, Kokhanovsky, Kryukovsky, Malochernigovsky, Mamurinsky, Mikhailovsky, Mukhanovsky, Pokrovsky, Radaevsky, Sbornovsky, Sernovodsky, Syzransko-Zaborovsky, Tuvinsky, Yablonovoovrazhny, Yakushkinsky, Yaurkinsky (figure 2) [10-12].

Figure 2. Placement of oil fields in the Samara region.

For the years 2016-2019, the average annual volume of oil production in the region amounted to more than 16 million tons. In 2020, 16.6 million tons of oil were produced, which is 3.4% more compared to 2019 [13]. Oil production indices in the region in the period under study ranged from 95.4 to 102.6% (table 1).

Table 1. Oil production in the Samara region.

	2016	2017	2018	2019
Crude oil, including gas condensate, thousand tons	16683.5	16412.9	15641.9	16044.7
Production indices	101.5	98.4	95.4	102.6

In recent years there has been a sharp increase in the commissioning of new production facilities, both for exploratory drilling and for production. 2005 to 2019 the increase in the number of production wells was 25.5 times (figure 3), which requires an increased withdrawal of land from agricultural use.

In the Samara region, oil production is the main extractive industry. Its share among other similar industries ranges from 89.3 to 90.9% (table 2).

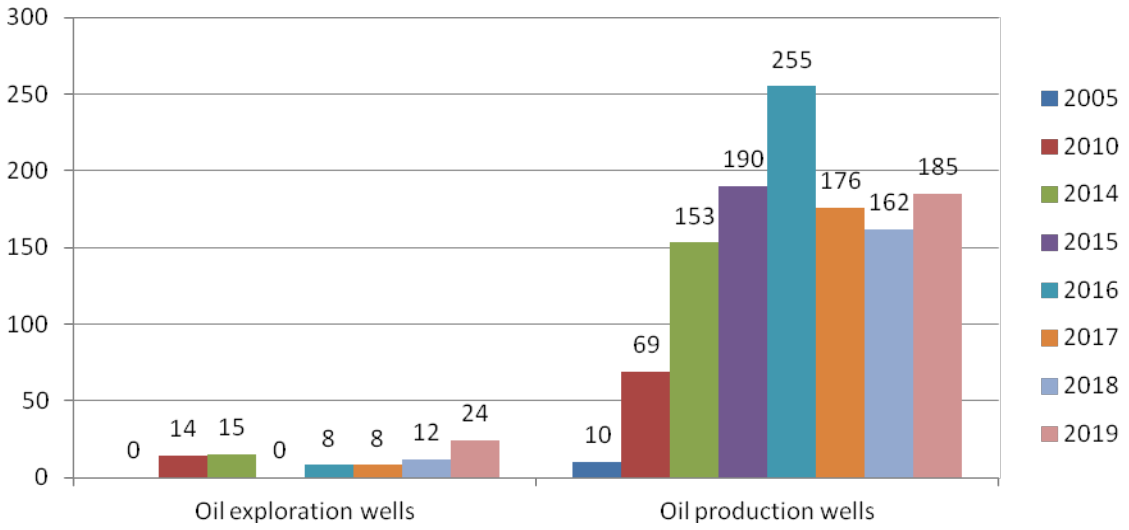

Figure 3. Commissioning of production facilities.

Table 2. The share of oil in the extraction of minerals in the Samara region, %.

	2016	2017	2018	2019
Mining	100	100	100	100
mining of crude oil and natural gas	90.5	90.3	90.9	89.3
mining of other minerals	0.9	0.9	0.7	0.8
provision of services in the field of mining	8.6	8.8	8.4	9.9

The main form of ownership in the oil production of the Samara region is private (100%). The main owners are Russian legal entities and individuals (about 96%). State property is completely absent. The rest of the property (about 4%) belongs to foreign shareholders or joint ventures (with foreign participation).

The cost of oil production in comparison with other types of minerals in the Samara region is quite low. If the costs of oil extraction are from 68.0 to 73.7 kopecks per ruble of manufactured products, then for other minerals the costs are from 77.1 to 91.6 kopecks. The structure of costs is shown in table 3. In contrast to other types of minerals, the main share is occupied by other costs (about 70% in the structure). This is followed by material costs (on average 14.4%) and depreciation (13.1%) [14-17].

Table 3. Structure of oil production costs in the Samara region, %.

Year	All costs	including:				
		material	wages	payments to extrabudgetary funds	depreciation	other expenses
2017	100	17.7	3.4	1.0	14.3	63.6
2018	100	13.5	2.8	0.8	11.8	71.2
2019	100	11.9	2.6	0.8	13.1	71.6

Oil production and processing technologies are quite energy-intensive. Since 2013, the cost of electricity for the production of 1 ton of oil has been constantly growing (from 99 kWh to 120 kWh or more than 20%). In 2019, electricity consumption in the oil production of the region reached 1958.8 million kWh, which is 95.6% of the total demand of the extractive industry. This is due to the increasing complexity of production conditions, higher labor standards and an increase in the number of wells located in small oil fields. The same factors are evident in oil refining. There is also an

increase in energy consumption, both in terms of electricity and other types of fossil fuels (figure 4). At the same time, the electrical labor ratio in oil production is significantly higher than in other extractive industries and is constantly increasing. If in 2017 its value was 253.4 thousand kWh per employee, then in 2019 it was 278.1 thousand kWh. In other industries, on the contrary, there was a decrease in this indicator (from 25.0 to 21.7 kWh per employee) [18-22].

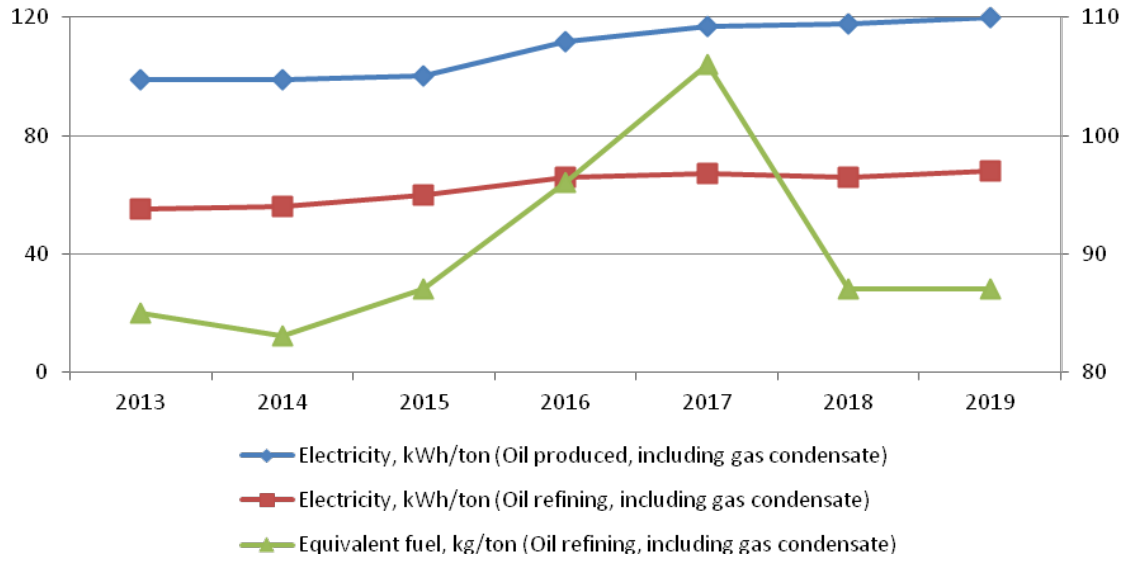

Figure 4. Specific consumption of electricity and equivalent fuel.

A significant proportion of the occupied land falls on pipelines for various purposes. Among them, the following groups can be distinguished: main oil pipelines, gas pipelines, product pipelines, water pipelines, grouped oil pipelines and flow lines (figure 5) [23, 24].

The share of pipeline transport accounts for 55.2% of the total freight traffic in the Samara region. The total length of pipelines across the region is about 2 thousand km.

The infrastructure is based on large-diameter trunk pipelines (1420 and 1220 mm), which transport oil and gas from Siberia and Central Asia to the central regions of Russia and abroad. Among others, the Druzhba oil pipeline runs through the region.

The developed oil and gas production in the region has led to the emergence of an extensive network of pipelines of local importance. Transport pipeline corridors usually run parallel to the main highways and railways [25-27].

A 300-kilometer section of the Togliatti - Odessa ammonia trunk line runs through the region.

Three largest Russian gas pipelines run through the region: Chelyabinsk - Petrovsk, Urengoy - Petrovsk, Urengoy - Novopskov.

If we analyze the distribution of damage by districts of the region, then the placement of new wells (and therefore damage from the inappropriate occupation of agricultural land) occurs unevenly across the territory [28-30]. The layout of new production wells in relation to the districts of the region was considered (figure 6). In total, 655 objects were laid in the analyzed period. More than half of this amount (59.8%) is located on the territory of 6 districts: Kinel-Cherkassky, Klyavlinsky, Koshkinsky, Neftegorsky, Sergievsky and Shentalinsky. The remaining 40.2% of objects are located in 14 districts of the region. On the territory of the remaining districts (7 pcs), no new facilities were noted during the construction period under consideration.

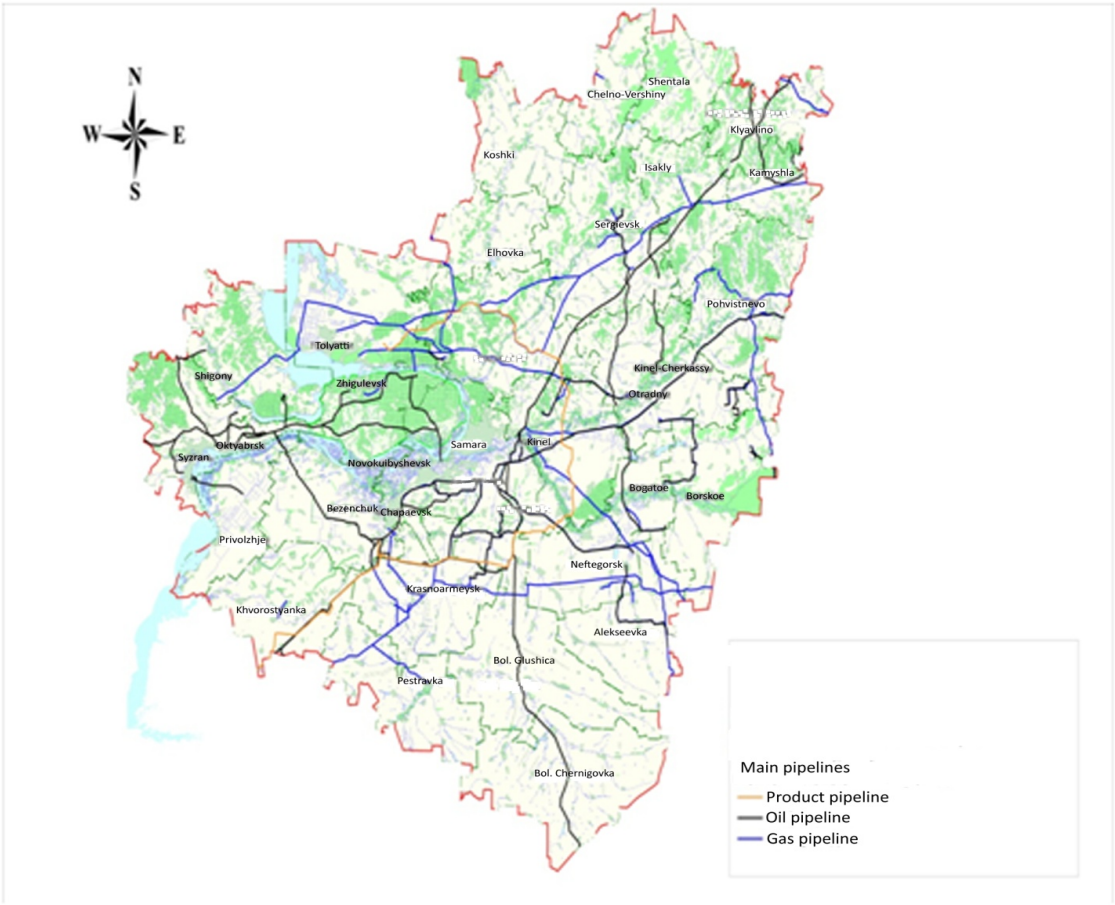

Figure 5. Placement of pipelines on the territory of the Samara region.

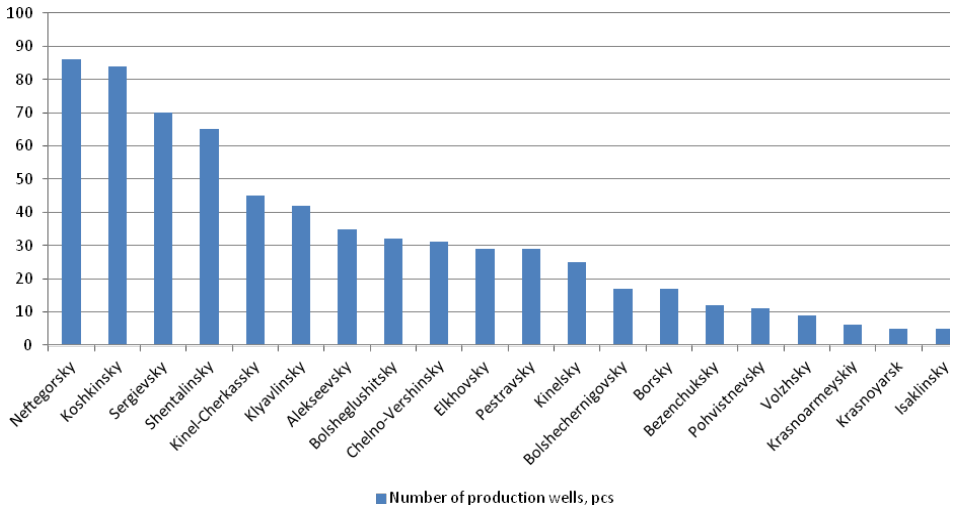

Figure 6. Distribution of production oil wells by districts of the Samara region.

When distributing lands according to the level of profitability of agricultural activities and compared with the data on the construction of new wells, it was revealed that on the lands with the highest level of income (group 4), drilling is practically not carried out. The largest number of constructed objects falls on the 3rd group of lands (Kinel-Cherkassky, Koshkinsky and Sergievsky districts) and the least valuable lands of the 1st group: Alekseevsky, Bolsheglushitsky, Bolshechernigovsky, Isaklinsky, Pestravsky.

Oil refining in the Samara region is represented by large refineries: Syzransky refinery, Novokuibyshevsky refinery, Nikolaevsky refinery and several small ones. This structure of oil refining allows not only to meet the demand for fuel within the region, but also to export fuel outside the region (table 4).

Table 4. Petroleum products, making in Samara region, thousand tons.

	2016	2017	2018	2019
Oil received for refining (primary oil refining)	19744.2	19576.5	20066.0	19583.3
Automobile gasoline	3252.5	3267.0	3315.6	3251.3
Diesel fuel	5671.3	5777.4	6114.2	5885.1
Fuel oil	5562.3	4874.5	4889.9	4891.6

In the analyzed period, the amount of damage from the inappropriate occupation of agricultural land by the objects of the oil cluster constantly increased. The main reason for this is the increase in the volume of activities for the extraction and transportation of oil, and the creation of infrastructure. The increase is manifold (if in 2015 - 50 new objects were built, then in 4 years already 236). Based on the methodology for assessing damage from improper use of agricultural land, its future value may grow significantly and annually amount to more than 2 billion rubles.

4. Conclusion

The oil cluster is the most important element of the economy of the Samara region. It unites production, transportation, and oil refining, forming the regional budget, providing employment for the population. The volume of oil production reached 16 million tons of oil per year, and there is a tendency towards its increase. At the same time, the cost of production and electricity consumption are increasing, which indicates the improvement of production technology, the formation of a modern infrastructure of the industry. At the same time, the problem of inappropriate use of agricultural land under the facilities of the oil sector is emerging. Most of this land is located in the eastern part of the region.

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