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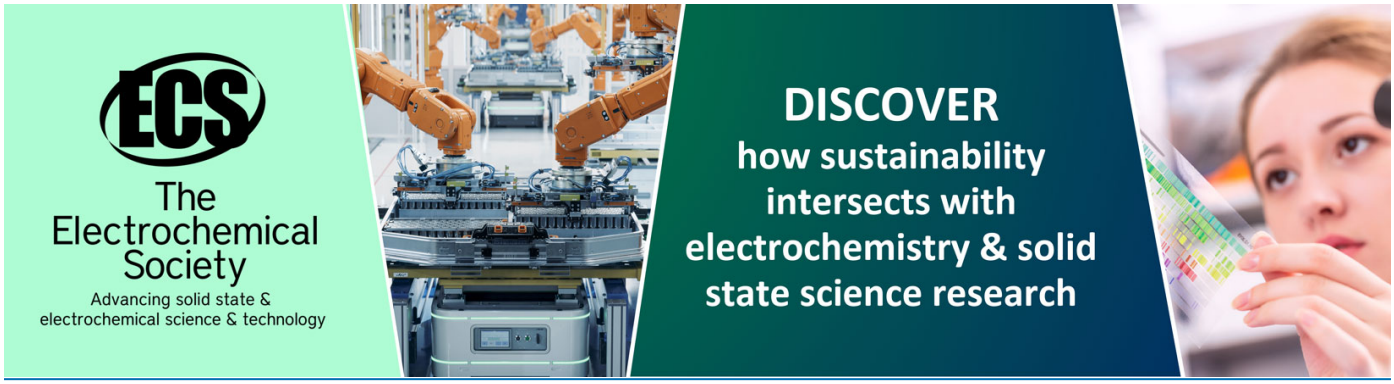

Analysis of Agricultural Production for Alcohol Production in the Light of World Trends

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Abstract. According to researches of analysts decrease in production of ethyl alcohol is marked, annual decrease makes more than four percent a year, and this tendency worsens. In the current conditions of increased demand, it is necessary to develop mechanisms to stimulate alcohol producers, but as the basis is an organic product, and the raw material for production is agricultural products, so it is necessary to increase the production of grain, potatoes and other types of products suitable as raw materials. Against the background of increase of world prices for grain, ethanol and other goods, the problem of own production passes into the category of main factors directed to economic and in general to national security because of increase of need in disinfectants in connection with situation on coronovirus. Leaders in production are the USA and China, where production capacities are growing rapidly, in these countries biotechnological complexes with full cycle of non-waste production are created. Growth in demand for methanol, particularly in China, has taken place against the backdrop of further declines in production capacity in the USA, where production costs were on average 40% higher than in other countries. Methanol production capacity in the USA has been decreasing annually, resulting in increased imports.

1. Introduction

With the recent increase in demand due to the lack of alcohol-based disinfectants, attention to the problem has increased. Besides, the use of alcohol in many branches of economy (food, chemical-pharmaceutical, perfumery, microbiological) also puts the solution of this problem on one of the first places.

For the current period the world production of ethyl alcohol is about 7 billion dal per year, and about 80% of it is obtained from plant raw materials. As noted by researchers, almost in all countries of the world, the development of technology and production of ethyl alcohol helps to saturate the market with processed products used for food, feed and energy purposes, which leads to increased efficiency of land use (which is especially important for Russia), and the creation of additional jobs in agricultural production (so ethyl alcohol is called "fuel for the agricultural economy"). Leaders in production are the USA and China, where production capacity is growing rapidly, these countries have created biotechnological complexes with a full cycle of waste-free production. Growth in demand for methanol, particularly in China, occurred against the backdrop of further declines in production capacity in the USA, where production costs were on average 40% higher than in other countries. Methanol production capacity in the USA has been decreasing annually, resulting in increased imports.

This trend is a long-term one. However, today the USA remains both the largest consumer (30% of world consumption, about 12 million tons per year) and producer of methanol (25% of world production, about 10 million tons per year). China is the second key player in the world market, consuming more than 5 million tonnes of methanol per year. This figure is expected to increase by 8% per year. Imports of methanol into China decreased from 1.8 million tons in 2002 to 1.4 million tons in 2003 and 1.36 million tons in 2004. The downward trend in imports will continue as Chinese methanol producers continuously expand the capacity of their plants. However, since Chinese methanol producers traditionally use coal gas as a feedstock, their production can only be profitable if the methanol price does not drop below $140-150 per ton [1].

2. Methods

The Russian Federation has lost many of its capabilities, owing to stricter requirements for distilleries, and their number has been reduced to forty units, with an annual volume not exceeding 50 million dal. According to BusinesStat analysts, the supply in the Russian ethyl alcohol market will grow at a slow pace, but the forecast was based on the total database on ethyl alcohol production and import. It is assumed that by 2022 the supply will be 1035.4 million liters [2].

The methodological basis of the study was a systematic approach, cause-effect analysis and comparative analysis of the experience of foreign countries. Theoretical basis was formed by the works of leading Russian and foreign researchers and specialists in the field of alcohol production.

3. Main part

With the spread of the virus, which partially paralysed the production process in many countries, production of antiseptics capable of producing has started to revive, and according to the World Health Organization, alcohol-based antiseptics are the only and main drug that effectively destroys harmful microorganisms. There are two types of alcohol: from food raw materials and technical synthetic alcohol. Against the background of rapid development of the pandemic, isopropyl alcohol (technical alcohol) is of high interest, as it is one of the main components of antiseptics. But at present on the territory of the Russian Federation isopropyl alcohol is produced only by two plants (PJSC "Khimprom", Novocheboksarsk, LLC "Impexneftekhim" at the production site "Synthetic Alcohol Plant", Orsk, Orenburg Region). But their capacities do not meet the needs [3].

Rapid increase in alcohol production on a food basis is also impossible due to several reasons: reduced production capacity in the alcohol industry, lack of raw material base, longer technological process in comparison with the production of technical alcohol.

The basis for alcohol production is still agricultural products (food raw materials) - grain, potatoes, sugar beet.

The most economical raw material is potato, but at the same time its disadvantage is the period of storage, as in the process of storage there are changes in the tissues of the tuber (dry substances, including starch, water and mineral compounds). The use of grain is undoubtedly the most optimal in the production of alcohol, as there is any grain, including unfit for food and fodder direction, the grain has a long shelf life if the requirements are met.

The main raw materials for alcohol production in Russia are wheat, triticale, rye. We also use technologies for preparing alcohol from potatoes, or combined technologies, where grain and potatoes are used (Table 1).

Table 1. Grain and potatoes production in Russia, mln. tons.

types of raw materials	1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2016	2016	2017	2018
cereals and legumes	116,6	439,7	325,4	394,1	425,9	467,5	120,6	135,5	113,2
including the main types used in the alcohol industry	66,0	234,6	198,4	249,1	278,6	281,5	75,8	88,5	74,1
wheat	49,5	240,4	171,5	224,7	261,2	267,7	73,3	86,0	72,1
rye	16,4	60,2	26,8	24,3	17,3	13,8	2,5	2,5	1,9
potatoes	30,8	184,0	159,1	141,7	128,7	126,2	22,4	21,7	22,3

During the first decade of transition and market economy formation, the Russian Federation lost large areas under cereals, which it was not able to restore, but programs aimed at import substitution, food security and development of agro-industrial complex, due to high-tech methods of cultivation of crops (high-yielding varieties) led to the position of the early nineties (Figure 1).

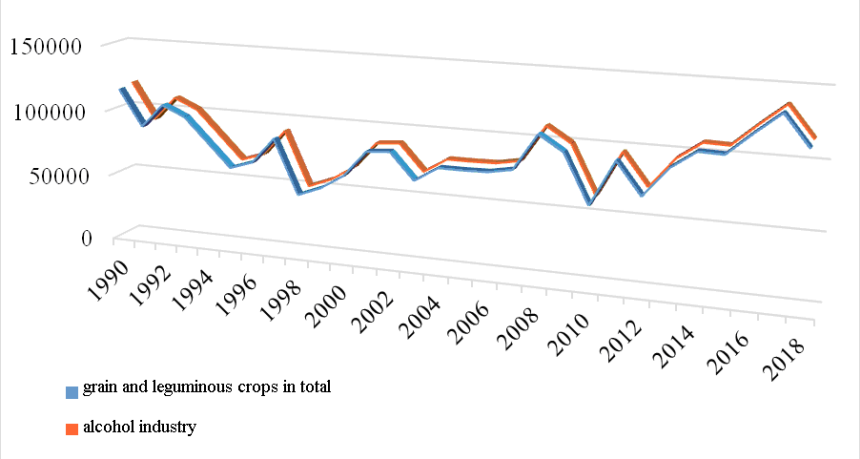

Figure 1. Cereal production, mln tons.

Another situation is with potato production, where the main reason for the decrease in production is the destruction of large agricultural enterprises, and the transition of production to peasant and private farms, which partially meet food needs, and do not increase areas under crops due to underdeveloped marketing policy (reluctance of large processing enterprises to work with small producers), the lack of logistics chains to bring the product to the consumer (Fig. 2).

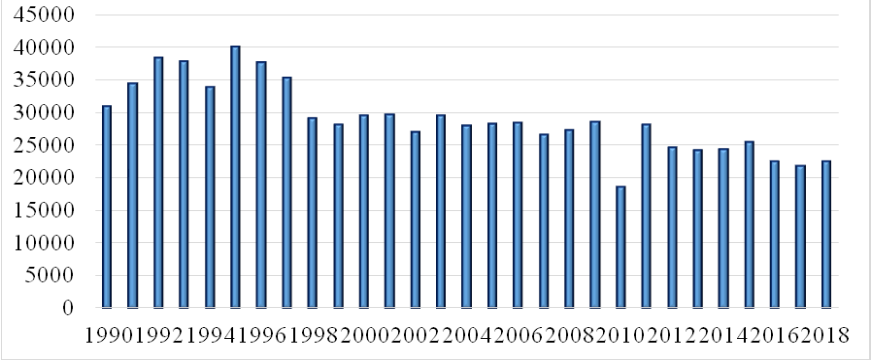

Figure 2. Production of potatoes used in alcohol production, thousand tonnes.

Despite the growing demand, Russia is increasing grain exports. As the researchers note, the main demand factor on the world market is the low cost of the rouble, as well as the growth of the population, and the lower cost of production of a unit of grain compared to other countries, Russia also has opportunities to expand areas under crops [4].

The current technical potential of the country's agriculture does not meet the requirements of modern agrarian production. In the current situation agricultural producers can not provide qualitatively the implementation of the production process, in connection with which the implementation of agricultural work is delayed, production losses are growing.

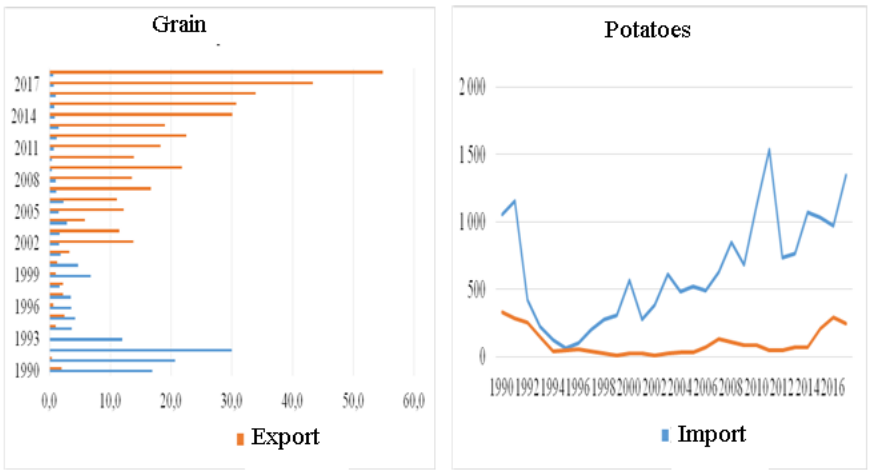

Figure 3. Grain and potato export and import.

The Russian economy, having a raw material orientation, has a unique opportunity to increase alcohol production with a trend of demand growth both in the domestic and international markets (Fig. 4).

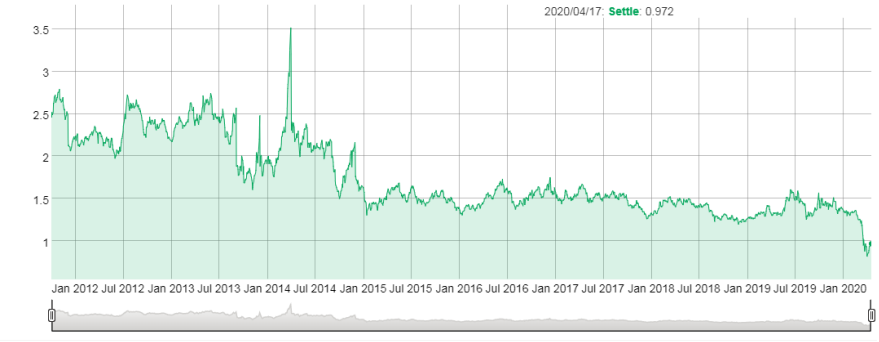

Figure 4. Futures market price changes. Source: [5]

Russian news agencies note the fact that the alcohol is increasing in price, for example, medical alcohol in March rose from 85 to 300 rubles, which led to the need for the government to "discuss a law on biosafety of Russia," and senators also pay attention to the situation with raw materials in the regions. At the same time, there is also an increase in the price of ethanol in a number of countries 5.

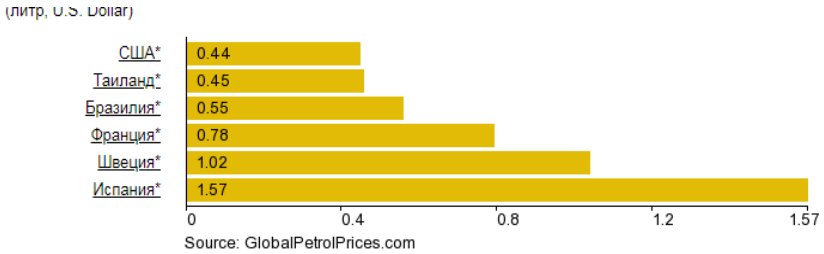

Figure 5. Prices for ethanol. Source: [6]

With this situation in the country and the world, it is necessary to increase the production of alcohol, using the technology of accelerated cycle, especially for food raw materials, in addition, technology for waste-free production.

Destruction of communications in branches of agrarian and industrial complex by 1995 has led to decrease in level of use of capacities on the enterprises making ethyl alcohol on level of 45 %, and first of all it was connected with absence of raw material base.

According to the official statistics, in 1990 the sown areas of grain amounted to 56.3 million hectares, of which 26 million hectares were sown under the grains suitable for alcohol production, in 2018 46.3 million hectares were sown. (28.2 million ha suitable for alcohol production), as we see Russia has both intensive (yield increase from 21 c/ha in 1990 to 27 c/ha in 2018 is not a sign of intensification) and extensive factors of grain industry development.

Worse situation in potato production, reduction of sown area from 3.3 mln ha to 1.3 mln ha, transition to small-scale sector, increase of yields from 107 c/ha to 170 c/ha, also assumes transition to intensive cultivation technologies, but so far this has not happened due to subjective factors.

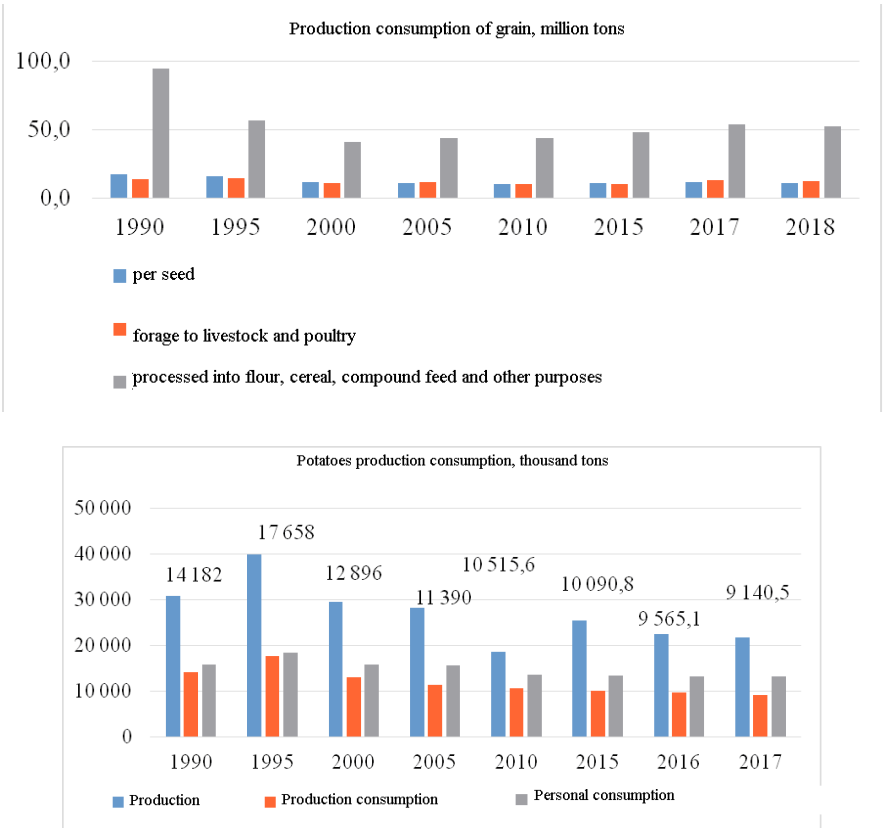

Figure 6. Production use of grain and potatoes.

Grain processing accounts for 30.4% of total reserves at the beginning of the year and production this year, and potatoes - 42%. A small share of the production use of these crops is used for alcohol production (Table 2).

Table 2. Manufacture of main alcoholic beverages.

alcoholic beverages	2016	2017	2018
Vodka, million dkl	73,2	79,8	78,6
Vodka spirits with content up to and including 25% of alcohol finished product, million dkl	2,7	2,7	2,7
Vodka spirits with content over 25% of finished alcohol production, million dkl	5,3	5,4	5,9
Cognac, million dkl	7,6	8,5	8,4
Low alcoholic drinks (containing alcohol less than 9%), million dkl	6,7	6,4	6,8

4. Discussion

Modernization of production capacities in order to preserve both export and domestic market with simultaneous deepening of methanol processing at own industrial sites will reduce dependence on external market supplies. Complex processing under the schemes "methanol-acetic acid-vinylacetate" and "methanol-KFC" is promising. Melamine is another tempting product. Its production stimulates production of melamine resins, which, in their turn, are widely used to produce paint and construction products that meet the requirements of European standards [6,7].

In the near future development of the alcohol industry can be considered from the point of view of reduction of harmful influence on ecology (increase of legislative requirements to products of

processing) transition to innovative ways of manufacture of by-products; also for the purpose of acceleration of technological process it is possible to assume use of more progressive yeast cultures, innovative schemes of digestion. In order to ensure the food security of the country, it is possible to apply a multi-sectoral economy, to introduce a continuous production process; and as a mechanism to reduce production costs, it is possible to expand the energy sector.

5. References

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