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Issues Of Biotechnology Gray Economy In The Service Of Agriculture.

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ABSTRACT

In this study, the authors examine the issues of development of biotechnology gray economy in its application in the agricultural sector, in particular in the waste of the brewing industry. The authors make an analysis according to the current state of the volume of production of brewers' grains as the main waste production enterprises in the industry, as well as making recommendations on how to make the production of this product in our country more competitive.

Keywords: agribusiness, brewer's grain, citric acid, gray biotechnology, bioeconomics

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INTRODUCTION

"After a period of irrational belief in progress and human capabilities of the society entered a phase of greater awareness. There gain careful attention to the environment and to preserving the environment, maturing genuine and painful concern for what is happening to our planet ... There are forms of pollution, daily beating on people. Vulnerability to air pollutants has a multifaceted effect on health - especially the poorest, and leads to millions of premature deaths. For example, people get sick because of the inhalation of elevated concentrations of fuel combusted smoke, used for cooking and heating. Added to this is affecting all the pollution caused by transport, industrial fumes, release agents, acidifying the soil and water, fertilizers, insecticides, fungicides, herbicides and pesticides, which are generally toxic "[1].

THE MAIN PART

Today, the protection of the surrounding environment issues are concerned a lot of people, and initially did not always seem specialists in this matter. In particular, the quote about the problems of toxicity of emissions, acidifying the soil and water, fertilizers, insecticides, fungicides, herbicides and pesticides has been taken by the author of this article of the Russian translation Encyclical Laudato Pope Francis, the first ecologically-centered encyclical for the entire two thousand years of history of the Papacy Institute on the ground. For reference, the Encyclical is the main document of the Roman Catholic Church on important socio-political, religious and moral matters addressed on behalf of its leader - ministers, parishioners and the faithful of the Church, which in this case is the second in importance after the apostolic constitution.

Proposals to address environmental issues from all sorts of institutions and social active groups and journalists can be divided into the following segments:

- The rich should consume less;
- The poor need to consume less;
- All need to consume less;
- You need to earn more and consume, then invest more in the development of environmental technologies.

Not stopping at each position separately, without looking for the pros and cons of each of them, the author considers the question of the application, which can be used for each of these worldviews. This area is referred to as the "gray biotechnology". Considered an area of knowledge in the industrial format, including and agribusiness sector (food and agriculture) has been developing technologies and products for environmental protection; among them - soil remediation, wastewater treatment and gas emissions, recycling of industrial waste and degradation of toxic substances with the use of biological agents, and biological processes.

At the present stage of economic development of industrial and agricultural enterprises of Russia waste issues in connection with the introduction in 2017 of the Environmental taxes are extra actual. For the European economy issues of building green, bioeconomics, were important in the past 50 years, but became extra actual in the middle of last decade, in the period when oil prices were so high that the margin for cleaner production projects (including the introduction of alternative sources of energy and waste management) have become acceptable for investment by businesses [2]. At the present time, due to a decrease in hydrocarbon prices the situation is changing, but the running gear cannot be stopped [3].

One of the projects in the framework of the application of gray biotechnology in agribusiness sectors considered recycling brewing industry. For agribusiness sector, this industry is not giving the most significant equity participation in the amount of waste, in particular if the brewer's grain, as the main waste product gives 1500-1550 tons, pressed and dried pulp from sugar beet, a total of 6 000 tons , about the same volume of waste comes from alcohol stillage, and 4000 tons of meal with meal, as well as whey raw meat by-production of [4], however, this is not considered problematic to become less relevant. "Currently, the majority of the brewing industry waste is used as animal feed or disposed of in landfills. However, the cost of disposal at landfills brewing waste increases and the use of cattle on feed is gradually reduced, which stimulates the

search for alternative ways to reduce the amount of their education and improvement of commercial use, as well as the development of alternative, environmentally acceptable and affordable methods of disposal. [5]

Although it is believed that the brewing industry is not the environment more dangerous compared to other industries, due to the fact that most of its waste as a whole can be relatively easily recycled and easy to use, but it should take into account the fact that " landfills Russian breweries now accumulated hundreds of thousands of tons of spent grains. This mixture of plant and microbial proteins, complex carbohydrates, organic acids and other substances stockpiled in open areas and pits ranges, on the third day highlights the biosphere toxic products of hydrolysis and decay (including gases with bad smells - skatole, indole and ammonia). In this state, the waste can be in the "cemeteries" of up to 50 years, actively polluting the biosphere own secretions. Chemical degradation products, gradually penetrating into the soil, poisoning the ground water, the land becomes unsuitable for economic use for decades (and unpredictable ecological consequences) "[6], and also" The extent of the harmful effects of spent grains on the environment is listed as very low in which the ecological system is practically not broken ". [7]

In general, the spent grains as a product of a secondary resource material consisting of particles of grain nuclei and membranes, rich sources of protein and carbohydrates. The main share of all solid waste generated in the breweries, to 85%, it is brewers' grains. The formation of this waste occurs during filtration sugared mash filtration tanks in the remainder after separation of the liquid phase-wart. Fodder products by using the spent grains are extremely varied, especially at the present time on the basis of spent grains developed feed and feed additives for various species and ages of animals, birds and fish, in particular- cows, pigs, sheep, dogs, rabbits, fur-bearing animals, hamsters, chickens and ducks, turkeys. However, due to production specificity (seasonality and rapid process of decay), while the most the best possible option to send cattle feed can send no more than 40%. In some cases, spent grains are used as an additive in foods, as well as for the production of chemicals. There are application development with the introduction of the elements in the UK and the US (Alaska) "for obtaining energy from the spent grains, in particular: by its gasification, pyrolysis (with the formation of coke, methanol, tar and gases, such as hydrogen, methane and ethylene), processing in the alcohol fermentation or direct combustion with the formation of biogas (mixture comprising 60-70% methane, carbon dioxide and a small amount of hydrogen, nitrogen and carbon OLEDs). Most often receive biogas and produce immediate burning concentrated spent grains "[5]. Less conventional methods of using spent grains is recognized use as an additive to the substrate, organic fertilizers, building materials, waste water treatment pulp and paper industry and oil pollution of soil and water. Brewer's grain is part of the reagents for the treatment of mineralized drilling fluids used in drilling oil and gas wells. It is a subject to the production of cosmetic preparations, and as a sorbent for the biological purification of gases and aqueous solutions of various pollutants. For more details about the technologies used in the industry at the present stage is described in a number of scientific articles [8-18].

One of the new features for modern applications to implement - is the processing of spent grains in the citric acid [19]. As presented above to the consideration of projects called investment-attractive in its pure form it cannot be the economy. Without the support of the state and business in the market of this product is not competitive, because the price of its output of production will be 3-4 times higher than the market. However, due to the fact that the food industry is now introduced in the amount of companies that have the most negative impact on the environment, and therefore parallel to the introduced with 2017. environmental tax, from 2019 to introduce new stricter environmental requirements from the Ministry of Natural Resources for the 300 pilot enterprises, and in 2021 for all others, the development of this technology may be considered forward-looking, as breweries will now have to either invest in new and effective technologies for processing waste, or not to pay smaller amounts for environmental violations. [20]

Currently, citric acid is produced in the bulk of its production waste the sugar industry - molasses. In the Russian Federation there is today only one factory producing the product is located in the city of Belgorod, titled "Tsitrobel" LLC. The market share of products sold in the range of 25-35% in the past few years, the rest of the market for Chinese manufacturers, and in a very small extent from small and non-core manufacturing companies. Chinese manufacturer for the most part, both in Russia and abroad and is taking in this sector - a cheaper price for the commodity. A number of countries, despite the requirements of the World Trade Organization are trying to fight for opportunities for domestic producers at the expense of the customs and tariff regulation and protectionist policies in general, are not formulated in online format. The discoverer of

the citric acid is considered to be a Swedish pharmacist Carl Scheele, who in 1784 first isolated from the juice of unripe lemons this product. In the following two centuries citric acid was prepared from the juice of a lemon, biomass shagged sheet and were testing technology from leaves of cotton, the primary processing of raw cotton waste, but due to the high cost of production of these raw materials - these technologies have gone in to naught.

The development of domestic production of citric acid from sugar production waste product of the sugar industry (molasses), from the fermentation technology of its receipt, took place in two ways - by surface cultivation of micro mycetomas on sucrose mineral media and by submerged cultivation of citric acid producers.

If in 1961 100% of the volume produced citric acid took place on the basis of cultivated surface, by the year 2000 the situation has changed in the opposite direction, and the equator at 50% of production of citric acid by the method of deep cultivation took place during the second half of the 80s. of XX century. The complete victory of this technique occurred in connection with the closing of the Leningrad citric acid plant in the late 1990s. (Table 1).

Table 1 - Technical and economic indicators of the enterprises on the production of citric acid deep way in Russia

Years	The volume of citric acid production process depth, t.	The share of the citric acid produced by the deep technology, in %	The share of the citric acid produced by the surface technology, in %
1961	100,0	-	100,0
1965	520,0	7,2	92,8
1970	1348,0	17,0	83,0
1975	1189,7	17,1	82,9
1980	2562,0	36,5	63,5
1985	3003,0	33,0	67,0
1990	6127,2	62,2	37,8
1995	6700,0	68,4	31,6
2000	5100,0	100,0	0
2002	5800,0	100,0	0

* - formed by the authors on the basis of [21]

In the Soviet period, in addition to the Belgorod plant (built in 1979), also operated such plants by the method of deep cultivation of citric acid as a Smelyanskiy (1964, Ukraine), Skidelsky (1978, USA), Digorsky (1989, Russia), Kharkov (1990, Ukraine). As a method of surface from 1946 to 1974 were discovered such plants were Diryuginsky, Riga Experimental, Vyborg, Spitak (Armenia), Kharkov, Belgorod (1959), Skidelsky, Digorsky (1974). A first plant for the production of citric acid in Russia recognized at historical chronology of Leningrad, which was put into operation in December 1935.

According to research company Abercade «The global market for organic acids: citric and lactic acid", in 2010 the world market for citric acid reached 1.6 million tons, and continued growth in the coming years, despite the crisis.

Market development in the period of 2006-2010 occurred primarily due to an increase volume of output of the product manufacturers in People's Republic of China. The average annual growth rate of domestic production in the country amounted to 10%, while the figure is 3.3% for the US and EU production volumes during the period and at all reduced in the amount of 22 thousand tons, or an average of 1, 5% per year. The global structure of production and consumption of citric acid can be divided into three main regions: Western Europe, USA and China the country. Total consumption in these regions is about 73%. If we talk about the concentration of production, the largest number of enterprises for the production of citric acid is concentrated in China, the United States and Western Europe (primarily in Austria). Chinese manufacturers provide nearly half of the world market of citric acid, while the consumption of the region does not exceed 13%. In 2010, about 90% produced in the country of production is exported. During from 2006 to 2010, as in previous years, China holds a leading position on the global market for citric acid. It should be noted, however, that due to a series of anti-dumping investigations conducted against Chinese manufacturers in the EU and the United States, export of citric acid in these regions declined significantly. In 2010, you will notice a

reorientation of exports. The sharp decline in exports to the US and EU countries offset by increased deliveries in India, Indonesia, Thailand, Mexico, Israel and Russia. The situation in the Chinese market in the past few years has begun to change. From previously worked for the export of 30 manufacturers today left about 5 largest companies, which include two producers in Shandong province, RZBC Group, TTCA Biochemistry and BBCA Group. In order to export their products to European and American markets, manufacturers are required to comply with certain requirements and standards. Accordingly, the largest Chinese manufacturers are currently investing considerable sums to upgrade equipment for fermentation, purification and treatment of water, which is supplied largely by western companies. The quality of Chinese citric acid production in recent years has improved significantly, as it is produced in modern factories, has the potential to compete in the European market. In Asia, the highest consumption of citric acid is observed in India, Indonesia, Thailand and Korea. Approximately 85-90% of the demand in the region is satisfied by the beverage industry. In these countries, the industry is developing dynamically, and the alleged citric acid market growth is around 6-7% in the next few years in the year. On the world citric acid market is significantly affected by the price which at a certain point in time has decreased due to strong competition from Chinese products and excess global production capacity. With the increase in Chinese imports to Europe and the subsequent introduction of anti-dumping duties, the price of citric acid in 2008 rose on average by 35% compared to the previous year. In late 2009, the price starts to decline due to the release of several Chinese producers from the payment of anti-dumping duties, subject to a minimum market price, determined by the EU on a quarterly basis. Approximately 15-17% of citric acid produced in the world is used in the production of detergents, cosmetics and pharmaceutical industries use 7-9% and 6-8% still goes to other industries. In the US, due to the strong growth of production and detergent, this sector consumes more than 20% of citric acid, for pharmaceutical products and dietary supplements Americans use more than 10%. In addition, the demand for citric acid in America is increasing due to increased production of soft drinks, citric acid is used which is very active [22].

DISCUSSION

In Russia in the last 3 years it has begun a process of reducing the amount of the citric acid market in Russia back in 2013 it was 33, 9 tons. Tons, which is 0.04% less than in 2012, and significantly lags behind 2011, saturation peak year, when it stood at -. 38, 3 tons, which was above the level of 2010 by 44.7%. At the same time, market analysts in 2012 expected in the next year by 15-20% annual growth, but this was prevented by a new wave of economic crisis in the whole country, which is appropriately reflected in the citric acid market in Russia. It is worth noting that throughout the twenties, not including the failure of 2008, the amount of citric acid consumption grew extremely high market rates of food additives, sometimes reaching more than 50% growth for the year. Production of citric acid in the country at the moment does not change for the better, if by 2013 it amounted to about 40% of the total market, then 2014. citric acid demand is about three times higher than the domestic bid. By far the greatest share falls on imports of citric acid, and is dominated by Chinese manufacturers in the import structure. How to assure analysts on the background of faster growth of the dollar, investments in organization of citric acid production in the Russian Federation are the most attractive. Despite the slowdown in demand in times of crisis, the market of citric acid as the cheapest acidulate remains the most large-capacity and stable segment of the industry of nutritional supplements. And as we are assured the authors of marketing research on the market until 2014, the year it is increasing price competition from China slowed down the introduction of new capacities in the sector. [23] Buyers of citric acid are today in Russia by priority the food industry (Fluctuations between food and nonfood industries in the consumption of citric acid was varied in the last years in a stretch ratio of 0.75 / 0.25 to 0.84 / 0.16), volume of solvent market is 30-33 thous. m., with the potential for growth of up to 40 thous. m., in terms of money up to $ 60 million [24, 25]. Citric acid as mentioned earlier available in Russia as sugar, and from waste products of the sugar industry - molasses. Segment eco-citric acid, which can be done to improve biosafety soils from recycled waste brewing industry as a whole in Russia and in the world today is absent.

CONCLUSION

The analysis showed that the implementation of this kind of business project, it is possible reconquest of up to 3% of the market of citric acid from Chinese competitors, and does not affect the interests of the sugar industry in matters of waste production enterprises of the industry. In addition, through the use of this technology as a raw material is expensive safe product "silver nanoparticles", the introduction of these

technologies in the real economy will strengthen the implementation of federal target programs in Russia aimed at the development of nano and biotechnology [26-30].

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