

Current Situation and Prospects of the National Environmental Economics

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Abstract

One of the major global problems of the world is commodity, since land resources are the main sources of viability and prosperity of any country. In connection with the beginning of the final stage of changing technological structures, the questions of the current condition analysis and prospects of the economy development and marketing of natural resources within the framework of the international bio-economic interactions have become a priority for the relevance in the overall spectrum of scientific problems of economic development now. The functioning of national economies and the entire global economy is based on economic resources - natural, labor, capital, entrepreneurship, and research. In the aggregate the economic resources form the potential of the national economy, region or the entire global economy. In this regard, great importance is the study of natural-resource potential of the whole world, separate continents and countries, the analysis of systems of economic use, has developed in different socio-economic structures of the modern world community, the development of ideas about the regional and the optimal exploitation of natural resources. The primary purpose of scientific research was the implementation of economic analysis, based on scientific methods, the current situation of the economy and market natural resources within the framework of the international cooperation for bio-economic development of the environmental economics in Russia. The economic aspects and marketing of natural resources of Russia were analyzed by the authors using abstract logical, deductive, inductive, monographic, economic and statistical methods within the framework of research, it was determined the most effective product on the market in these sectors. The authors of the research made conclusions of the current economic analysis and the prospects of environmental economics development based on a review of scientific literature and the authors' calculations.

Keywords: Bio-Economy, Biotechnology, Environmental Economics, Policy

1. Introduction

The issue of the bio-economic policy formulation at the federal, branch and regional levels is becoming increasingly important at the present stage of economic development¹. The researches on the interactions with the sector of scientific knowledge - environmental economics are kindle everybody interest in the framework of these problems^{2,3}. These published works arouse great interest particular as in the analysis of their introduction into the training complex of higher education, as well as in the real

economy (industry) and financial areas of the economy⁴⁻⁸.

The fundamental profile of the biotechnology industry is the application of the biological processes and systems in production. It can be formulated more detailed as biotechnological methods, which include microbiological synthesis, genetic engineering, cell and protein engineering, engineering enzymology, cell culture of plants, animals and bacteria, cell fusion techniques. Historically, biotechnology emerged based on traditional microbiology (mostly fermentation) production; because many such "technology" unknowingly used in ancient

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times in the preparation of wine, beer, bread and other foods. Further, the development of these traditional bio manufacturing were connected with the advances in biochemistry and other disciplines of biological cycle⁹.

2. Methods

Within the framework of research the authors were using abstract-logical, deductive, inductive, monographic, economic-statistical, economic methods; the also analyzed aspects of the economy and marketing of the Russia natural resources, determined the most effective product on the market in these sectors.

3. Results

Within the framework of the scientific and technical support to identify resources at the present stage of development between the Government of the Russian Federation which is represented by the Ministry of Education and Science and the European Union, which is represented by the Program “Horizont” 2020, despite of the current difficulties in economic cooperation, there are very close positive progressing relationship today¹⁰⁻¹².

The following sections of the study are devoted to the results on the existing scientific potential and current development trends and market potential of the biotechnology industry:

The prospects for the development of the researching priority determined by the following challenges:

- Loss of biodiversity.
- Climate change and the scarcity of suitable land for agriculture.
- Urbanization and an increasing burden on the environment.
- Spread of genetically modified products.

The Development of the priority trends of development is determined by the following vectors of economic development at the present stage:

- Economic and social: Prolongation of the active life.
- Increase the world population.
- Increase the number of personal mobile devices, analyzing the state of health.
- Greening the economy, “green growth” and development of the economy knowledge.
- Exhaustion of the cheap stocks of traditional hydrocarbons.

- Increase in demand for food.
- Science and technology: The development of high-performance methods for analyzing genome, transcriptome, proteomes and metabolomes.
- Computer modeling of the structure of biomolecules and processes in living systems.
- Development of technologies of synthetic biology, metabolic engineering and bioengineering.
- Technology to work with extra-large amounts of data.
- Development of supercomputing.
- Distribution of materials with new properties and technologies of “green” construction.
- Increase the use of renewable energy sources and demand for biofuels.
- Power systems for vehicles which is used alternative fuels.
- The development of environmentally sound waste management, including producing the valuable products.
- Development of alternative energy technologies.
- Introduction of the technology “smart” agriculture.

The development of Bio-Refining direction will allow to the national timber industry to make a fundamentally new step in the use of forest resources of Siberia and the Far East. In practice, it is a radical change in the use of existing forest resources in a cost-accessible area. This will create a sustainable resource base for the implementation of the priority investment projects.

With its unique properties – high sorption capacity, pulp larch can be used for paper and paperboard production, viscose fibers, cellulose ethers and hygiene products.

The value of the project for the world is:

- World trade Development of the products deep processing of timber.
- Development of waste production.
- In-depth processing of wood raw material directly in the region of growth.
- Reduce the impact on the environment.
- Reducing emissions of greenhouse Reduction of the greenhouse gases.
- Reduction “carbon footprint”
- Creation of conditions for preventing illegal logging.
- Development of new products for the global markets.
- Improving the quality of products.
- Increased production.

- Compliance with the principles of forest certification and quality management system.

Russian Agriculture is developing in a line with global trends. On the one hand, there is a gradual decline in employment in the sector, on the other is an increase of commodity production per employee. Of course, modern technology and intensive production is a key factor in the success of the industry in terms of rise in price of resources, growing competition from the side of the foreign suppliers, and the need to comply with WTO requirements.

The use of biotechnology by the agricultural enterprises allowing you to increase performance indicators, as well as to reduce environmental damage from production. The government program of agricultural development for 2013-2020 provides for financing biotechnology in 2015-2020 years in the amount of 2 billion 226 million rubles from the federal budget and 780 million rubles - from the regional budgets.

Agri's market consists of three segments:

- Biotechnology used in crop production (biological plant protection products, including plant growth stimulants and microbiological fertilizers).
- Creation of new types and varieties of plants by genetic engineering.
- Biotechnology used in animal husbandry (vaccines, therapeutic feeding and antibiotics and diagnostic tools, probiotics, feed additives biological components).

The most common method of protecting crop production is the use of special chemical plant protection products (pesticides). However, their intensive use leads to the contamination of crop production, soil, environment, development of resistance of plants.

For these reasons, it has been actively developing a new method of crop protection products based on the use of biological crop protection products, or biopesticides - microbiological preparations on the basis of microorganisms (bacteria, fungi, viruses and protozoa) and their metabolic products in the past few years.

The main drivers of market development of bio pesticides are the development of organic production, as well as the established governments of many developed countries, more stringent environmental requirements for food in the world. So, after the entry into force of EU rules governing the compulsory registration, production

and trafficking of chemicals (REACH) and the prohibition of the use in the EU the most dangerous pesticides from 1000 active substances on the market, there are about 250.

The advantages of using bio pesticides include the following: Possibility of rejection of the use of chemical means of protection, reduced total pesticide load and as a result, improvement of soil fertility; possibility of reorientation of a number of farms for the production of eco-friendly products; small waiting period - you can harvest a few days after treatment.

In Russia, the bio pesticides market is at an early stage of development. The agricultural enterprises mostly exist in a low profitability and prefer a more effective and universal protection chemicals. Moreover, it has been considered low level of farming in general and awareness of current trends in agricultural practices. Organic farming is widespread in Europe, and it is just beginning to develop in Russia.

The penetration of the bio pesticides in Russia is less than 1%, while the total market is estimated at \$4 million. For comparison, according to the marketing agency Kleffmann-AGROSTAT, agrochemicals market capacity in 2013 in Russia amounted to 1.3 bln \$.

It should be noted that the market of the bio pesticides is under rapid growth, despite the fact that, as mentioned above, is just in its infancy. Over the last 5 years of its capacity in real terms increased by twice. The main sale markets are the southern regions of Russia (Krasnodar region, Stavropol, Voronezh region, and others).

It was presented not more than 20 manufacturers in the national market of biological plant protection as of mid-2015. The main of them are OOO "PO Sibbiofarm" FGBI "Russian Agricultural Center" ("Rosselhoztsentr"), LLC NVP "BashInkom", JSC "Agrobiotechnology", LLC "Vedabio", ZAO TPK "Tekhnoexport". They account for about 70% of sales both in volume and in value terms. In the Krasnodar Territory is functioning Research Institute of Biological Plant Protection (VNIIBZR).

About "Sibbiofarm" is the large-capacity enterprise manufacturing products of microbial synthesis. The company exports its products to India, CIS, Latin America, Turkey and Thailand. The main obstacle for the development of bio pesticides market the experts note the absence government measures to support the industry in Europe. That is why in the short-term market growth is projected at 4-5% per year. If the government takes a proactive stance on limiting the use of chemical means of protection, the market could get a significant boost in

its development: According to various estimates, there are at least 10 times potential of the bio pesticides market growth. At the heart of the spread of GMO crops are economic and environmental reasons. The world has to produce increasing amounts of food into smaller areas. By 2020, the area of arable land per one person will decrease by 2.4 times compared to 1960. The use of biotech crops to reduce production costs and increase productivity.

In addition, the cultivation of GM crops resistant to herbicides and insects, is allowing several times to reduce the use of chemical means of protection, respectively, is being decreased the chemical load on the soil and products. As well as around the world, the subject of GMOs is the subject of acute social and political discussions in Russia. While the academic community called for the speedy development of the system of state regulation of the use of GM crops in Russia, the general public, by the way, treat them negatively. According to the research portal Superjob.ru, 81% of Russians believe that the country needs to prohibit the production of GMOs at the legislative level, while 72% refuse to buy a product if they know that it contains GMOs. According to the Russian Government Resolution No 839 of September 23, 2013, July 1, 2014 in Russia, it had to begin state registration of Genetically Modified Organisms (GMOs). However, under pressure from the public, it was decided to postpone its entry into force for three years, until July 1, 2017, referring to the need for more in-depth assessment of the problem.

According to experts, the key issue on the market of GMOs in Russia is actually his absence. The state finance new developments, but it does not create opportunities for their commercialization. The development of the Centre “Bioengineering” of RAS can serve as an example, which was created potato varieties resistant to Colorado beetle. The products have passed all required safety tests and been approved for use in food, but the Centre is not eligible for the cultivation of these crops in Russia. The development of the transgenic plants are also involved in the laboratory of the Institute of Bioorganic Chemistry, Russian Academy of Sciences and the Russian Institute of Agricultural Biotechnology. In particular, the institutions are working on the creation of transgenic wheat, tomatoes, apples, canola, barley, stone fruits. Modern livestock industry cannot develop without intensive use of biotechnology products. These include veterinary immune-biological drugs (vaccines) that enable timely prevention of infectious diseases of animals and birds, and

a variety of biological components of feed and premixes (vitamin and mineral mixture).

The Russian vaccine market is growing quite rapidly and outpacing the growth of the livestock industry. Consumers are both farmers and the public sector in the face of the veterinary service. The Russian market of immuno-biological preparations is estimated at 235.7 million dollars in the next few years will grow by 7-10% per year. In general, the market enters into a stage of saturation, and further growth is correlated with an increase in the number of livestock and poultry.

Up until 2005, about 90% of national demand for vaccines is met by national production. However, as a result of active liberalization of foreign economic relations and intensified integration processes in agriculture, there were large agricultural holdings, which are imported livestock from abroad and taking on a commitment to vaccination, using preferential imports. The totality of these factors opened the way for foreign manufacturers of vaccines – from 2001 to 2011, imports of veterinary vaccines in Russia increased more than 80 times. Only in 2013 the volume of imports increased by 40% and amounted to 140 million dollars. The market share of vaccine Russian production has decreased from 73% in 2006 to 46% in 2013.

Despite of the strong competition in the Russian market, national producers are increasing their exports annually. In 2013, exports of veterinary vaccines were increased by 23% and amounted to 35.4 million dollars. Export geography includes 27 countries, 50% of the capacity accounted for Belarus and Kazakhstan. The biggest national producer of vaccines in Russia is the Federal Center for Animal Welfare (FGBI “NIIVZZH”). Among other manufacturers holding “Rosagrobioprom” should be noted which consists of “Basil plant biologics” (production) and JSC “Institute of Biotechnology Veterinary Medicine” (research and development); All-Russian Research Institute for Veterinary Virology and Microbiology of the Russian Academy of Agricultural Sciences (VNIIVO), a network of state “biofactories” (Orel, Stavropol, Kursk, Armavirbiofactories, ShchelkovskyBiokombinat), ZAO NPP “Agrofarm”, NGO “Narvak”, SPE “Avivac”. The limiting factor of the industry development is a slowly agriculture development in comparison with developed countries, the culture, expressed in the late vaccination of animals. In addition, market participants point out the ineffectiveness of the government system of vaccine prevention. For example,

a large amount of public procurement of vaccine against foot and mouth disease. At the same time in Europe, compulsory vaccination against FMD was canceled for economic reasons, and in case of epidemic livestock farms destroyed, and the damage is covered by insurance companies. There is also the problem of counterfeits.

Another large segment of the veterinary drugs for cattle breeding is the production of therapeutic and feed antibiotics. According to experts of the WTO, the use of antibiotics is growing annually by 35-40% in Russia. The share of therapeutic antibiotics accounted for the largest volume of sales - 80% in monetary terms. Every year the consumption of feed antibiotics is growing, which is considered a serious problem. According to the experts of the World Health Organization (WHO), the use of pharmaceuticals in livestock has a negative impact on human health. That is why, back in 2006, EU countries have completely refused feed antibiotics in animal husbandry. In Russia there is a strict ban on the use of feed antibiotics. Farmers are increasing consumption of antibiotics, including and illegal ways.

An alternative way to stimulate growth, the enhancement of resistance and immunity of animals is achieved by the use of the diet of natural products - probiotics. Despite of the fact that probiotics are much more expensive and generally less effective than antibiotics, this area is actively evolving in Russia, mainly due to the national production. Russian companies have created resistant strains of bacteria to develop technology of storage, growing and established a large-scale production of these products.

The capacity of the Russian market of probiotics was estimated at 25-30 million dollars in 2013, and the annual growth rate is of 15-20%. Thus, in 2018 the market capacity could be doubled in size and reach 50 million dollars. In conditions of need to improve the profitability of the livestock industry is becoming extremely important issue to optimize feed costs. Russia still lags behind the developed countries in the efficiency of feed production, which is largely carried out without the use of biologics - premixes, protein-vitamin supplements. About 5-6 years ago the share of grain in compound feeds in Russia amounted to 75-75% (compared to 40-45% in the EU), which is considered outdated industry practice. The production of premixes and protein-vitamin supplements is highly dependent on imported raw materials in Russia. Only a few plants produce the necessary products in

Russia. For example, the amino acids are produced by the plant "VolzhskyOrgsynthese" in the Volgograd region. The volume of its production is 25 thousand. Tonnes of methionine, 70% of which is consumed in the national market, 30% is exported.

Another essential amino acid - lysine, Russia imported 100% mainly from China some time before. In 2013, the country was supplied by lysine for about 108.5 million dollars. However, in the near future Russia will be able to close completely their need for lysine at the expense of national production. A number of investment projects on grain processing and production of lysine are carrying out in Russia in 2013. The lysine production was launched in the Belgorod region with capacity of 57 tonnes per year in June 2014. The total requirement of lysine is about 100 thousand tonnes in Russia. In addition, plant is built in Volgodonsk for deep processing of grain. The "DonBioTekh" is being implemented in cooperation with the world's leading producer of specialty chemicals - Concern Evonik Industries AG and the company "Russian agroindustrial trust". The processing capacity of the plant will be 250 thousand. Tons of grain a year. Capacity will be 100 thousand. Tonnes of feed Biolys (trademark amino acid L-lysine). Russia has planned to implement 50% of production, while the rest will be exported to the countries of Eastern.

Another project of deep processing of grain carried out in the Ishim district of the Tyumen region. The capacity of the plant which is being built now "Siberian lysine" will allow processing 120 thousand tons of wheat a year. The plant will be 40 thousand tons of lysine sulphate in the year, and 10 thousand tons of gluten, 30 thousand tons of protein-vitamin mixture concentration of 40%. Approximately 65% of lysine produced will be exported. Expected starting date of production is 2016 year. That's why, in the next 2-3 years, Russia will be able not only to provide themselves with lysine, but also become a major exporter. Forestry Russia must "step over" through the stages that gradually took place in recent decades.

The development of information technology has led to structural changes in the range and output of paper products. In particular, a new class of paper appeared; that is office paper. Their share in the total output of paper and cardboard is growing rapidly in the world. At the same time the share of newsprint is reducing. The development of computer technology in construction has led to the concept of "smart home". Joint use of computer

technology and second-generation biofuels (pellets) in individual automated heating systems allow moving to the “Green Building” houses. Heating of such houses is programmed for the days of the week and time of day and is characterized by a high wood burning efficiency. The combination of wooden housing construction, computer technology and wood pellets provide a supra-additive effect; improve the environment and the economy of the forest sector.

In Russia, ecologists paid much less attention compared with the developed countries of Europe and the United States. Meanwhile, sustainable economic development cannot be achieved without a developed infrastructure, waste management and elimination of consequences of man-made pollution. In the recent years, in the world the direction of environmental technologies has been developing, with priority to get use of biotechnologies. This sector is represented by two main segments: Biotechnology recycling and bioremediation of soil, water and air.

The biotech recycling industry is at an early stage of its development in Russia. One of the largest producers of waste is the agro-industrial complex. According to Rosstat, in agriculture and forestry, recycling and disposal of waste is subject to 85%. However, according to other sources, the actual figure is about 30. However, there has been a positive trend in the increase in the use of biotechnology for waste agricultural industry in recent years. This is due to the advent of more affordable technologies and the gradual intensification of agriculture in the face of increasing competition. Thus, the waste of plant origin as a meal and cake obtained by spinning oilseeds (sunflower, soybeans, pumpkin, laziness) is almost completely utilized for feeding purposes and are used as dietary supplements. Animal waste are widely used to produce biogas in some regions.

The lack of modern environmental requirements is prevented from the widely used agents-destroyers to protect the environment in the Russia. The current system of registration and obtaining permits for the use of biologics in nature is complex and the high financial cost for the necessary inspections. In addition, the current system of penalties leads to the fact that oil companies conceal the spill and eliminate its consequences only in a part. In the USA and European countries, on the contrary, a system of insurance, which helps to eliminate the emergency situation, and the penalty is imposed only if the work has been done poorly or not specified in time.

The perspective direction of development of technologies for the production and use of biopolymers is currently giving biodegradability industrial polymers used in a wide range of industries.

Basic researches in this area are focused in imparting properties of biodegradability well established large-tonnage industrial polymers such as polyethylene, polypropylene, polyvinyl chloride, polystyrene, polyethylene terephthalate. The use of biodegradable polymers, the most important and promising in the production of disposable tableware, packaging materials, bags for collection and composting of food waste, agricultural films. In the recent years, biodegradable polymers are increasingly penetrate the product market. The development of the health of the oceans is one of the priorities of most countries^{13,14}. Currently, more than half the world's population lives within 100 km from the coast, and in the future with a steady population growth this percentage may significantly increase. Ocean currents carry marine organisms, nutrients and waste over long distances, including far beyond the country's borders.

The close relationship of ocean ecosystems leads to the conclusion that the weighted ocean governance at the international level. Currently, a number of international agreements and conventions aimed at preserving the biodiversity of the ocean. Often, however, the provisions of the documents beyond national jurisdictions, do not apply. This suggests the need for a definition at political level mechanisms for international regulation of access to the riches of the oceans and to prevent environmental hazards associated with poor environmental management. OECD countries carried out targeted activities in this area and we intend to continue to take consistent steps to strengthen international cooperation and the promotion of joint initiatives.

4. Summary

Among the most perspective areas in the regulation of development of ocean resources is the organization of international infrastructures and platforms for joint research and development in biotechnology. As marine biotechnology will be one of the main priorities for public investment in R&D and development of national innovation policies need to develop and introduce new measurements and indicators of effective public and private investment. To date, marine biotechnology has a sufficiently broad range of practical applications.

This production of bio fuel, food and feed as well as pharmaceutical and chemical industries which are already inconceivable apart from the achievements of marine biotechnology. In the future, the importance of this sector to the global economy is likely to be only grow.

Still one of the most promising segments of Marine Biotechnology is considered to be the cultivation of energy crops of algae. The OECD experts believe that the use of algae for biofuel production is promising for several reasons. Some types of algae can achieve greater energy efficiency of biomass per ton of feed. Besides, algae grow much faster than traditional agricultural crops, such as soybeans and cotton. According to some estimates, the transition to the cultivation of algae for energy crops can significantly reduce the area needed to produce similar volumes of biofuels on land. For example, the algae plantation area of 39 thousand. km² would be enough to fully replace petroleum fuel in the United States.

The prospects for future large international mega-projects in the field of marine biotechnology are represented to the majority of experts' justifiable investment. For example, discoveries and achievements of the world's largest US project to study the human genome, which required financing in the amount of \$6 billion, brought to the US economy income of about \$800 billion and made it possible to create more than 300 thousand new jobs. Relatively the recent project 1000 Genomes, whose mission was to identify components of genetic variation among 1,000 individual genomes, in three years will provide the researchers 60 times more information in the public domain on the DNA sequences than all projects for the previous quarter of a century.

The research community in the integration with the industry embarked on some promising development and demonstration projects. For example, the EU is implementing a project BIOFAT, has a budget of over 30 million euros, which is to demonstrate the potential of marine biotechnology and economic benefits from the production of biofuels based on algae. GREENSTARS similar project with a budget of about 160 million euros carried out in France. However, according to experts of the OECD, it is necessary to continue to stimulate interest in marine biotechnology in different countries as well as international efforts to develop this direction.

Among the issues of further development of marine biotechnology is highlighted the possibility of obtaining the most accurate and objective assessment of the economic impact of the development of the oceans, using

the achievements of modern genomics. Its impact on the welfare of national states and OECD countries. It is also important the availability of methods of measurement and evaluation of return on investment, including new statistical measurements and indicators. Development of Marine Biotechnology also encompasses non-market values, namely the preservation of ecology for future generations and improving the quality of life of people, so you need to enter in the methodology for assessing the performance of "health" of marine ecosystems. Only a healthy oceans and the health of marine biotechnology can be the key to economic prosperity of individual nations and humanity as a whole.

5. Conclusion

The instability of the environment, in the final phase of the change of technological structures for effective economic development and marketing of natural resources is necessary to make the sharing of risks between the different actors of the national economy in Russia, as well as the use of state guarantees for the growth of international cooperation as the most viable scheme to attract financial resources for the successful implementation of the transition to a new technological way.

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