

Kushchenko D.I.

Ukrainian Academy of Customs

**MODEL OF INFLUENCE OF CUSTOMS INNOVATIONS
ON ECONOMIC SECURITY OF THE NATIONAL ECONOMY****Summary**

Article is devoted to the impact of innovation on the activities of customs institutions abroad. The basic innovative developments in the leading countries of the world are analyzed. The international experience in the implementation of economic security is analyzed through the prism of public bodies. The model the impact of customs innovation on the economic security of the state is constructed. The factors of interaction of innovation processes with customs processes of the state are identified.

Keywords: innovation, innovation activity, customs administration, foreign economic processes.

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BIO-ECONOMY IN EUROPE: MODERN TENDENCIES AND CHALLENGES**Lymar V.V.**

Detached department of the National University
of Life and Environmental Sciences of Ukraine
“Nizhyn Agro-Technical Institute”

This article is devoted to the analysis of features of development of bio-economy in the European Union countries. The importance and necessity of bio-economy sectors developing for stable and inclusive growth for all sectors of European countries economies are defined. The Bio-economy Strategy and its Action plan for bio-economy developing are analyzed. Global challenges which promote the development of bio-economy sectors are defined. Main directions of bio-economy development in the EU countries are highlighted.

Keywords: bio-economy, bio-fuel, biotechnologies, economic challenges, social development.

The problem of the investigation. Over the past two decades, biotechnology has provided a motor for environmentally sustainable production and for the development of a diverse range of innovative products. The continued commercial application of biotechnology could lead to the development of a bio-economy, where a substantial share of economic output is partly dependent on the development and use of biological materials. The potential economic and environmental benefits of biotechnology have created a growing strategic interest in the bio-economy in both OECD and non-OECD countries. But for the bio-economy to succeed, considerable uncertainties and global challenges will need to be addressed.

Innovative policy frameworks, strategic thinking by both governments and firms, and citizen support will be required to meet these challenges.

The analysis of last investigations and publications. The problem of bio-economy development is interesting both for the foreign scientists and Ukrainian ones. Carlson R. [1] investigates theoretical aspects of bio-economy development, Morris C., Peht M. [2] analyze energy transition in a context of bio-economy developing. Ukrainian researches such as Gheletukha G., Zhelezna T., Kucheruk P., Oliynyk E. [3] study prospects of bio-energy developing in Ukraine. Segheda S., Voronetska I., Pronko L. [4] highlight the importance of bio-economy for energy safety of Ukraine.

Emphasizing the unsettled problem. The investigation considers the role biotechnology could play in addressing what are considered the most serious challenges to world economies and societies over the next

decades. These challenges include providing food, water, energy, healthcare and other resources and services to a world that will see its population increase by a third in the face of mounting environmental stresses over the next 20 years. The bio-economy can have a major impact in many of these areas to ensure long term economic and environmental sustainability.

The aim of the investigation is to define modern tendencies and challenges of the development of bio-economy sectors in the EU countries.

The results of the investigation. In order to cope with an increasing global population, rapid depletion of many resources, increasing environmental pressures and climate change, Europe needs to radically change its approach to production, consumption, processing, storage, recycling and disposal of biological resources. The Europe 2020 Strategy calls for a bio-economy as a key element for smart and green growth in Europe. Advancements in bio-economy research and innovation uptake will allow Europe to improve the management of its renewable biological resources and to open new and diversified markets in food and bio-based products. Establishing a bio-economy in Europe holds a great potential: it can maintain and create economic growth and jobs in rural, coastal and industrial areas, reduce fossil fuel dependence and improve the economic and environmental sustainability of primary production and processing industries. The bio-economy thus contributes significantly to the objectives of the Europe 2020 flagship initiatives «Innovation Union» and «A Resource Efficient Europe».

The Bio-economy Strategy and its Action Plan aim to pave the way to a more innovative, resource

efficient and competitive society that reconciles food security with the sustainable use of renewable resources for industrial purposes, while ensuring environmental protection. They will inform research and innovation agendas in bio-economy sectors and contribute to a more coherent policy environment, better interrelations between national, EU and global bio-economy policies and a more engaged public dialogue. They will seek synergies and respect complementarities with other policy areas, instruments and funding sources, which share and address the same objectives, such as the Common Agricultural and Fisheries Policies (CAP and CFP), the Integrated Maritime Policy (IMP), environmental, industrial, employment, energy and health policies.

The Strategy builds on the Seventh Framework Program for Research and Technological Development (FP7) and the EU Framework Program for Research and Innovation (Horizon 2020). More detailed information on the Bio-economy Strategy is included in the accompanying Staff Working Document (SWD) [5, p. 8].

OECD and non-OECD countries face a range of environmental, social, and economic challenges over the next two decades. By 2030, the global population is expected to increase by 28%, from 6.5 billion in 2005 to 8.3 billion, and average global per capita income by 57%, from USD 5 900 in 2005 to USD 8 600. A larger and a more affluent population will increase world demand for health services that improve the quality and length of life and demand for essential natural resources: food, animal feed, fiber for clothing and housing, clean water, and energy.

At the same time, many of the world's ecosystems that support human societies are already overexploited and unsustainable. Climate change could exacerbate these environmental problems by adversely affecting water supplies and agricultural productivity.

Biotechnology offers technological solutions for many of the health and resource-based challenges facing the world. It can increase the supply and environmental sustainability of food, feed and fiber production, improve water quality, provide renewable energy, improve the health of animals and people, and help maintain biodiversity by detecting invasive species. Yet biotechnology is unlikely to fulfil its potential without appropriate regional, national and, in some cases, global policies to support its development and application.

A bio-economy can be thought of as a world where biotechnology contributes to a significant share of economic output. The emerging bio-economy is likely to

involve three elements: the use of advanced knowledge of genes and complex cell processes to develop new processes and products, the use of renewable biomass and efficient bioprocesses to support sustainable production, and the integration of biotechnology knowledge and applications across sectors.

There are three main sectors where biotechnology can be applied: agriculture, health and industry. While primary production includes all living natural resources, such as forests, plant crops, livestock animals, insects, fish and other marine resources, the main current uses of biotechnology are for plant and animal breeding and diagnostics. Human health applications include therapeutics, diagnostics, pharmacokinetics to improve prescribing practices, functional foods and nutraceuticals and some medical devices. Industrial applications include the use of biotechnological processes to produce chemicals, plastics, and enzymes, environmental applications such as bioremediation to clean up polluted soils, biosensors, methods to reduce the environmental effects or costs of resource extraction, and the production of biofuels. Several applications, such as biopharmaceuticals, in vitro diagnostics, some types of genetically modified crops, and enzymes are comparatively "mature" technologies. Many other applications have limited commercial viability without supportive policies (e.g. biofuels and bio plastics) or are still in the experimental stage, such as regenerative medicine and health therapies based on RNA interference [6, p. 8].

There are six Grand Challenges currently identified that the world faces at present. These must be tackled and overcome to ensure a peaceful and healthy future for all.

Challenge 1. Management of natural resources. On a global level, natural resources both on land and in water are subject to steadily increasing demands from a growing population. Not just more and higher quality food is needed, but renewable feedstocks for energy and other industrial uses are increasingly in demand. At the same time, productive land is being lost to erosion, salinization, desertification and urban development. To meet the demand, forests and other virgin land are being cleared in developing countries, while overproduction and economic pressures lead to good quality land in other countries lying fallow. Water management is equally important as is the proper stewardship of natural resources, including biodiversity. Addressing this challenge properly first requires an understanding both of biomass needs at global, regional and local level and of the drivers and dynamics of land and water use change. Increasing and maintaining the productivity of existing farmland – what the Royal Society has called 'sustainable intensification' – is important in restricting both the amount of new land taken into production and further exploitation of water resources, and so preserve natural habitats. The development of mixed production systems and optimizing the use of genetic diversity to breed improved crops, trees, animals and fish will make a major contribution to this, alongside better management systems.

Challenge 2. Sustainable production. Managing natural resources sustainably is a vital start, but the whole supply chain must also be sustainable, to ensure food security, supply sufficient quantities of renewable raw materials and energy, reduce environmental footprints and promote a healthy and viable rural economy. Beyond this, it is also important to avoid unnecessary waste and to recycle unavoidable waste in useful and efficient ways. The ideal is to have closed loop systems of production and by-prod-

Table 1
Sectors of the EU bio-economy

Sector	Annual turnover, bln. €	Employment, (thousands)
Food	965	4400
Agriculture	381	12000
Paper/ pulp	375	1800
Forestry/ Wood Industry	269	3000
Fisheries and Acquaculture	32	500
Bio-chemicals and plastics	50	150
Enzymes	0,8	5
Biofuels	6	150
Total	2078	22005

Resource: [5, p. 17]

uct reuse. The bio-economy already does this adequately, but the ambition is always to use by-products from one sector in another part of the web if they cannot be used directly.

Specific opportunities include:

Biotechnology and other modern technologies, including long-term selection programs, give new ways to improve productivity, efficiency and robustness in the arable, livestock and aquaculture sectors, while at the same time reducing their environmental footprints.

The forestry sector provides great potential for the cascading use of renewable raw materials to produce a wide range of innovative value-added products.

The development of more diverse sectors, such as algal biofuels, gives opportunities for evaluating by-products as alternative sources of animal and fish feeds, so making less demand on food crops. The bio-economy web gives many such opportunities to balance and improve resource use efficiency.

Integrated multi-trophic aquaculture, cultivating a number of species in a managed environment.

Unavoidable waste streams whether from agriculture, forestry or the domestic sector can be used to produce biogas or as a source of other value-added biomaterials.

Challenge 3. Developing public health. The safety and quality of human food and animal feed in Europe today is very high, but there is no room for complacency, particularly when striving to make healthy daily diets affordable for all. The improvement of plants and the development of other functional food ingredients can help to produce high quality food, thus helping to achieve a healthy diet for the whole population in a sustainable way, while more efficient food processing and distribution can help to make high quality products available at an affordable price. In addition to the long-term effects of diet on health, threats to human health may also arise from zoonosis (animal-borne diseases) and the bio-economy provides the tools to minimize this hazard.

Areas where the bio-economy will have an impact include:

Developing new foods that contribute to improved nutrition and health. In particular, foods that promote healthy aging or 'adding life to years' will be of major importance. In addition, consumer trust in such health promoting products will be developed by encouraging better communication between scientists and consumers and constructive engagement with the public throughout the process of developing new foods and processes.

Improving animal resistance to disease via breeding, optimized farm management and feeding systems and using epidemiology as a basis for the development of prophylactic vaccination programs and to allow the better prediction and handling of disease outbreaks.

Reliable and extensive data gathering and traceability in the livestock sector can help to anticipate the need for early intervention and thus reduce the overall burden of diseases and infections.

Tailoring plants to produce specific pharmaceuticals can be an efficient way of making high quality and valuable materials and products such as vaccines for both human and animal healthcare.

Challenge 4. Mitigating climate change. The agriculture sector manages a significant amount of available land in Europe. It also makes a large contribution to emissions of greenhouse gases (GHGs) in the form of methane from ruminant production, nitrous oxide from breakdown of nitrogen fertilizers and carbon dioxide from fossil fuel use. On the other hand, it pro-

vides the essentials of human life and makes a large contribution to GHG capture via crop cultivation. The forest-based sector plays a significant role in capturing carbon in sustainable managed forest ecosystems and its products. There is also considerable energy use in the food chain beyond the farm gate, in preparation, processing, distribution and storage.

Challenge 5. Integrating and balancing social development. In contrast to the Industrial Revolution, which depopulated the countryside, the evolving bio-economy will be a major driver of rural and coastal development. Agricultural, aquaculture and forestry development will be boosted and high-skilled jobs will be created in economically disadvantaged rural and coastal areas. Patterns of employment in the bio-economy will alter as some areas become more efficient and employ fewer people. At the same time, new jobs will be created in other sectors, so overall employment is expected to stay steady. The bio-economy will be a growing part of the global economy, feeding and providing bio-products and energy to an increasing population.

The changing demands of European consumers can be met by increasing research in plant and animal varieties with improved nutritional balance, together with milder processing techniques and identification or incorporation of additional functional ingredients.

Clear communication of the benefits and risks of new developments will help build societal trust in the bio-economy.

Challenge 6. Global sustainable development challenges. More than a billion people remain chronically malnourished, are prone to disease and have reduced life expectancy. This is partly due to lack of calories but also because some staple foods in developing countries, including rice and cassava, are poor sources of some vitamins and minerals. European scientists working on new technologies and better production systems must also be helped to work in cooperation with developing countries to adapt these advances for local crops, animals and growing conditions.

Europe also traditionally played a key role in training agronomists and breeders from developing countries and it is essential that the decline in recent years is urgently reversed.

Conclusions. Prepare the foundation for the long-term development of the bio economy getting the most out of the bio-economy will require identifying and preparing for a range of possible futures to prevent locking-in inferior technological solutions. To achieve this, broad approaches, such as creating and maintaining markets for environmentally sustainable products, funding basic and applied research, and investing in multi-purpose infrastructure and education, will need to be combined with shorter term policies, over the next five years, to establish a foundation for future applications. These foundational policies include: In agriculture, encourage the application of biotechnology to improve plant and animal varieties through improving access to technologies for use in a wider range of plants, expanding the number of firms and research institutes that can use biotechnology (particularly in developing countries), and fostering public dialogue. In health, develop regulatory, research, and health record systems which can link prescribing histories, genetic and other information, to support long-term follow-up research into health outcomes. In industry, increase support for the adoption and use of internationally accepted standards for life cycle analysis, along with other incentives to reward environmentally sustainable technologies (e.g. boosting research into high energy density biofuels).

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Лимар В.В.

Відокремлений підрозділ

Національного університету біоресурсів та природокористування України

«Ніжинський агротехнічний інститут»

БІОЕКОНОМІКА В ЄВРОПІ: СУЧАСНІ ТЕНДЕНЦІЇ ТА ВИКЛИКИ**Анотація**

В даній науковій статті досліджено особливості та характерні риси розвитку біоekonomіки в країнах Європейського Союзу. Визначено важливість та необхідність розвитку секторів біоekonomіки для стабільного та інклюзивного зростання всіх секторів економіки європейських країн. Проаналізовано Біоekonomічну Стратегію та План дій Європейського Союзу для розвитку біоekonomіки. Визначено глобальні виклики, які постають перед країнами світу, які стимулюють розвиток біоekonomічних галузей. Виділено основні напрямки подальшого розвитку біоekonomіки в країнах ЄС.

Ключові слова: біоekonomіка, біопаливо, біотехнології, економічні виклики, соціальний розвиток.

Лимарь В.В.

Обособленное подразделение

Национального университета Украины биоресурсов и природопользования

«Нежинский агротехнический институт»

БИОЭКОНОМИКА В ЕВРОПЕ: СОВРЕМЕННЫЕ ТЕНДЕНЦИИ И ВЫЗОВЫ**Аннотация**

В данной научной статье проанализированы особенности и характерные черты развития биоэкономики в странах Европейского Союза. Определена важность и необходимость развития секторов биоэкономики для стабильного и инклюзивного роста всех секторов экономики европейских стран. Проанализирована Биоэкономическая Стратегия и План действий Европейского Союза для развития биоэкономики. Определены глобальные вызовы, которые встают перед странами мира, которые стимулируют развитие биоэкономических отраслей. Выделены основные направления развития биоэкономики в странах ЕС.

Ключевые слова: биоэкономика, биотопливо, биотехнологии, экономические вызовы, социальное развитие.