Bulgarian Journal of Agricultural Science, 25 (No 5) 2019, 920–925

Plant proteins in the focus of bioeconomy[1]

Plamena Yovchevska

Institute of Agricultural Economics, Agricultural Academy, Sofia, Bulgaria
E-mail: yovchevska@abv.bg

Abstract

Yovchevska, P. (2019). Plant proteins in the focus of bioeconomy. *Bulgarian Journal of Agricultural Science*, 25(5), 920–925

The purpose of the study is to frame the boundary and substantive links between nature-economic activity-socium, located on the platform of the current concept of bioeconomy as an element of linear and circular economy. Using the scientific method the genesis, development and prospects of the bioeconomy are traced. The example of the production of plant proteins, in particular the production of fodder peas, illustrates the importance of the natural element, the transformation of substances in nature and the importance of socium in promoting the concept of the bioeconomy. The current challenges and the preservation of parameters of human living environment in the coordinate system are: the future is development protein is the future; socium is refining the legal framework of society in order to preserve the nature's parameters for generations to come.

Key words*:* bioeconomy; proteins; fodder peas; living environment; concept; future

Bioeconomy as a concept

Genesis

Bioeconomy is the paradigm of the 21st century. Before it emerges as one of the most pressing issues of the current, increasingly digitalizing humdrum of modern man, the idea of the concept of bioeconomy "sprouts" in the works of many, renaissance-minded, scientists. Scientific achievements, industrialization, increased urbanization mark/characterize the 19th century. At the beginning of the century, Alexander von Humboldt[2] introduced the term "plant geography". He is considered the founder of biogeography. In the middle of the century, based on rich empirical material collected, Charles Darwin[3] developed the theory of evolution along the path of natural selection.

Over the last few decades, a number of global science centers, research schools and eminent scientists have increasingly focused their work on the study of fundamental problems of sustainable development. In the specialized literature, disturbing results from interdisciplinary studies on the state of *human-activity-nature* and *nature-activity-human* relations are published. The systematic and two-way relationship expresses the existential rank of man's attitude to nature and the responsibility of socium to preserve the living environment of both modern man and future generations. The wise philosophy of the Indians that we have borrowed nature from our children and grandchildren is recognized by environmental NGO on all continents.

Mass media are circulating "footage" illustrating meeting of today's modern man with "hundred-year-old natural phenomena". The model of behavior of *homo economicus* has made its mark on nature. A man's desire to

[1]The study was done with the financial support of the Ministry of Education and Science, within the framework of the national scientific program "Healthy foods for a strong bioeconomy and quality of life", FP 1.3. WP. 1.3.

[2]In 1805, the German traveler, explorer and biologist Friedrich Heinrich Alexander von Humboldt (1769-1859) published "An Experiment in Plant Geography".The book describes his five-year journey across continents of Nord and South America and presents a systematic review of plant species.

[3]During the five-year voyage of the Beagle Ship in the Origin of Species published in 1859, Charles Robert Darwin 1809-1882.

multiply his or her consumption must be combined with the preservation of the potential of the surrounding environment. This is an imperative condition that must be respected not only in order to provide the necessary existential material goods for the development of the human race, but also for the maintenance of sustainable development. The algorithm for solving this task is the concept of bioeconomy.

Evolution

The current 21st century brings to the fore a number of challenges for society, the main one being the improvement of the human living environment and the containment of adverse processes in climate change. Working solutions are sought to overcome the irreversible depletion of natural resources and active climate changes. The state of human-environment-society relations is accessible to the general public. It becomes subject to special political activity. In 2018, as a result of global "climate" diplomacy, a Global Commission on Adaptation[4] is set up in Hague with Chairman Ban Ki-moon and tasked with development a report on the state of climate change (Figure 1).

The graphic image of the figure reflects a long evolutionary period of human development, communication with the natural environment and the intensification of the footprint of human activity in our time.

The evolution of the flora and fauna, the development of human social skills, the construction of the individual is the subject of research and analysis on the basis of systematic knowledge collected and developed by scholars-erudite who lived and worked during the epoch, framed in the 19th century. In the 20th century, the advancement of societies was marked by the dominant role of man over nature and the expansion of industrial production. The resources detracted from nature exceed the capacity to recover them. The linear economy is valued according to the material goods created and acquired. The consumer society fetishes consumption. Man dominates over nature. A number of balances are disturbed. Climate change and a number of other natural anomalies with a negative impact over the environment occur. Agriculture as a primary sector is particularly affected. The land, as an indispensable means of production, is subject to adverse influences leading to distortion of its basic quality characteristics, depletion of humus substance, desertification, etc.

Digital communications provide an ever-faster exchange of information. Each individual is given the opportunity to access data, analyzes and various materials regarding the man's relationship with the environment. Socium's development in our time requires an awareness of responsibilities, urgent action and high expertise. Compared to the times of two centuries ago, the development of technology today pro-

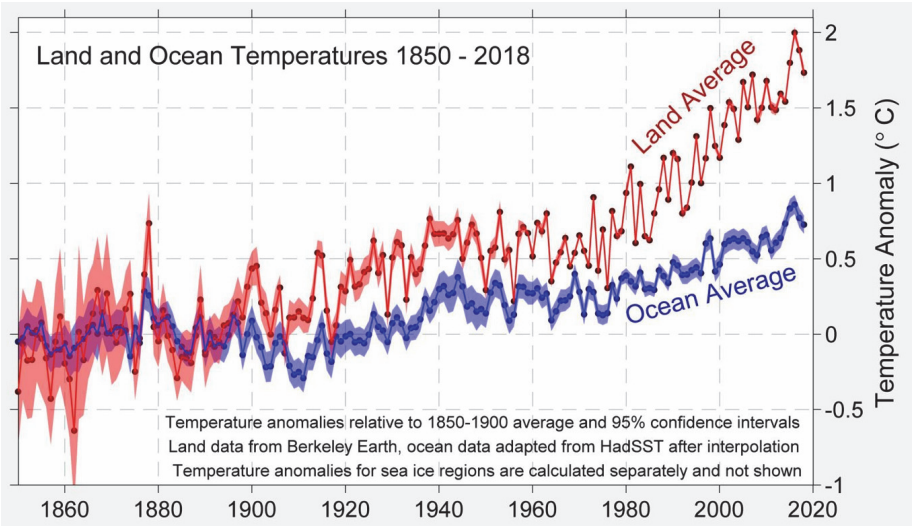

Fig. 1. Land and ocean temperature data for the period 1850-2018
Source: Based on a report from the Global Commission on Adaptation, 2019.

[4]https://gca.org/news/global-leaders-call-for-urgent-acceleration-of-climate-adaptation-solutions

vides us with opportunities to use empiricism from precision research, metadata, fieldwork, and more sources. Cabinet scientists and cabinet studies build methodologies and test methodological approaches both to study and to create objective strategies and policies for their implementation (Nelson et al., 2009). Agriculture as a primary sector is the subject of special attention (Murray et al., 2015).

Over the last two centuries, this paradigm has evolved continuously. Every change in modern environmental improvement processes is being developed in two ways – from society to the individual and from the individual to the society. Communication is sustainable and two-way. The activities society – individual – society is in a systematic connection of functioning and mutual influence. The essentiality of this process also includes opportunities for positive and perspective development of the concept of bioeconomy.

Prospects

In 2012, the European Commission adopted a strategy to steer the European economy towards a more intensive and sustainable use of renewable resources. This strategy is called 'Innovation for sustainable growth: a bioeconomy for Europe'[5]. In parallel, the Commission adopts an action plan aimed at building an innovative low carbon economy. In this context, the need to reconcile the pursuit of food security through the use of available biological resources, while guaranteeing the preservation of biodiversity, is underlined. The goal is sustainable agriculture, which is imperative in both the linear and the circular economies. In a follow-up document in 2013, the European Union notes that the bioeconomy is contributing to the goal of sustainable development linked to the achievement of neutrality on agricultural land degradation by 2030 and of ambition of restoring by 2020 the minimum 15% of degraded ecosystems[6]. The use of biological thought and expertise in science, the application of the scientific method is fully involved in the process of making money in agriculture as a primary sector of the economy. The bioeconomy of the European Union already has a turnover of EUR 2 trillion. It provides jobs to 22 million people. This represents 9% of total employment in the EU.

The bioeconomy strategy is based on 3 pillars: – investment in research; – developing markets and developing competitiveness with bio-products and consumption of bio-products; – enhanced policy coordination and involvement of all stakeholders. New business models, as recommended in 2016 Cork Declaration 2.0[7]. In view of the dynamics of the processes related to the development of the bioeconomy, in 2018 the European Commission updated the bioeconomy document of 2013[8]. Emphasis is put on the need for a strategic and systematic approach in order to fully realize the benefits that the bioeconomy brings to the economy and the environment. Such an approach should bring together all actors in the value creating chain in order to identify the specific actions that need to be taken. In order to ensure and accelerate the implementation of the circular economy models, particular attention need to be paid to systemic cross-sectoral challenges, including synergies and compromises.

Achieving this goal implies: developing new technologies and adapted production processes, using the potential of value creating chains, market signals and dynamic communication with the creators of new policies to regulate activities to limit human footprint on the natural environment.

The future CAP (2021-2027)[9] will continue to provide access to high quality food and strong support for the unique European model of farming with increased focus on the environment and climate, supporting the continued transition to a more sustainable agricultural sector and the development of viable rural areas. New commitments include maintaining humus-rich soils, limiting levels of ammonia and nitrogen oxides; crop rotation instead of crop diversification; animal nutrition, which protects animals and humans from antibiotic resistance and various feed additives.

Development of the last few decades is based on political platforms, which are specified in strategies and implemented by regulations, etc. interactive, informative and desirable documents. The political platform of the President-designate of the European Commission includes a number of new substantive panels, the content of which outlines/ tells directions for future European development. One of them is the "European Green Deal", which will include the first European legislative act to set the goal of neutral attitude to climate by 2050 (Ursula von der Leyen, 2019: 5).[10]

[5]Communication from the Commission to the European Parliament, to the Council, the European Economic and Social Committee and the Committee of the Regions COM / 2012/060 final. https://eur-lex.europa.eu/legal-content/

[6] Decision No 1386/2013 / EU on a Common European Union Program of Action for the Environment by 2020. "To live well within the limits of our planet", 20.11.2013

[7]Cork Declaration 2.0 – Better Rural Life, 2016 https://enrd.ec.europa.eu/sites/enrd/files/cork-declaration_bg.pdf

[8]https://eur-lex.europa.eu/legal-content/BG/TXT/PDF/?uri=CELEX:52018DC0673&from=EN

[9]https://ec.europa.eu/commission/publications/natural-resources-and-environment.

[10] Presented by Ursula von der Leyen on 17.09.2019. Policy guidelines for the next European Commission (2019-2014).https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en_1.pdf

Switching to a more sustainable consumption of animal-based products will in addition bring significant health benefits for consumers and will have a positive environmental impact[11].

Plant Proteins and Bioeconomy

It is increasingly important for local production of raw materials and agricultural products to be carried out in harmony with local natural and climatic conditions and economic conditions. Compliance with this condition is also a mandatory element in linear and circular economy. Both the sustainable development and the concept of bioeconomy are placed in the coordinate system of the linear and circular economy.

All information on the progress made in this regard is regularly published on the Internet through a specially designed monitoring center[12]. There anyone can see how far the European bioeconomy has progressed.

Bioeconomy is a philosophy. Bioeconomy, as a way of combining / utilizing the circulation of substances in economic activity, replicates the natural model of matter transformation. At the beginning of the twenty-first century, society reached/has its proper reading of the processes of material production and of processes in nature. Human living space is a set of conditions of the natural environment in which man develops as a biological species and of conditions of the economic environment that man builds to satisfy his needs.

The bioeconomy is also framed by the institutional environment in which material production takes place. Institutions are a dominant factor in the creation, implementation and improvement of policies to „copy" natural phenomena whose balance and harmony are human habitats.

The process of transition from a linear to a circular economy still needs clarification, research and development. If we want to move forward in this direction, academics should think how to shorten it[13]. Support for farm diversification should diversify and expand existing activities, enhance the sustainability of farms and fully exploit the resources (Kopeva, 2011).

The combination of linear and circular economy can be achieved by adhering to an agro ecological approach, a balanced approach in agricultural production combining technological, agronomic, zootechnical, environmental, individual and social scientific approaches and solutions (Bastianelli et al., 1995; Gliessman, 2007; Tomich et al., 2011). An element of applying a circular economy is also ensuring the production of economy's own protein for animal feed. This ensures a positive economic result and guarantees a bio economic effect in stock-breeding. The benefits of legumes are known to solve the protein problem (Morrison, 1969; Kalaidjieva, 1979). The legumes belong to the *Fabaceae* or *Leguminosae* family and rank third among species in the world (Schneider et al., 2015). There is extensive research in Bulgaria (Sachanski and Kirilov, 1988; Naneva, 1990) and sufficient experience in the study and cultivation of both forms of fodder peas (spring – *Pisum sativum* and wintering – *Pisum arvense).* The presence of exceptionally favorable natural and climatic conditions, the combination of suitable soils and the high plasticity of fodder peas as a cultivated plant species, as well as its ability to enrich the soil with nitrogen, are prerequisites for attributing fodder peas to the circular economy. Fodder peas provide a valuable vegetable protein that, if imported, consumes serious financial resources (Table 1).

The information in the table below illustrates the significant advantage of fodder peas for grain, the production of which makes it a preferred crop of significant economic importance in the circular economy model, in particular in the bioeconomy. The cultivation of fodder peas for grain is an example of a combination of linear and circular economics, illustrated by the forms of matter movement, the circulation of substances, and the economic importance of plant species not only with the metric measurement of yield, but also with the qualitative characteristics of the nutritional value produced. In animal nutrition, the type and quality of a protein are as important as its quantity. Protein substances are complex compounds, each molecule of which is composed of a considerable number of nitrogenous compounds, called amino acids. The lack or shortage of only one of them reduces the utilization of the ration. The confirmation of the biological value of fodder peas is the presence of fourteen essential amino acids in its grain. The high biological value of the protein makes fodder peas a suitable substitute for other protein sources for dairy cows, sheep, pigs and other animals. The advantage of grain peas is that after grinding it can be fed in the raw state without the need for heat treatment. Fodder peas do not contain any substances harmful to animals and are readily accepted by them.

[11]In-depth analysis in support of the Commission Communication COM (2018) 773 — A Clean Planet for all — A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy. Production of meat has one of the largest land requirement per calorie. The shift and reduction in meat consumption will free additional land.

[12] https://ec.europa.eu/research/bioeconomy/index.cfm#

[13]At the fourth Green Forum of Manager Magazine, held on July 4, 2013, Prof. Yana Topalova of the Faculty of Biology at St. Kliment Ohridski University of Sofia clarifies the importance of bio economics.

Table 1. Essential aminoacids in 100 g protein, g

Amino-acids	Lysine	Methio-nine	Cyste ine	Agri-nine	Histi-dine	Isoleu-cine	Leucine	Glicine	Serine	Phenyl alanine	Tyrosi ne	Treonin	Trypto-phane	Valine
Pea	7.2	1.0	1.1	9.0	2.6	4.4	13.9	4.2	4.5	4.8	3.8	3.4	1.1	5.2
Soy-bean	6.6	1.4	1.6	7.7	2.3	4.0	9.2	5.1		5.1		3.8	1.3	5.4

Source: Rates and normes of farm animals feeding and tables of fodder and feeds nutrients. „Zemisdat", Sofia, 1984, p. 213

The approach to growing fodder peas is a technological solution, an element increasingly recognized by the modern bio economic paradigm. In the rediscovery of these well-known business practices, significant horizontal and vertical relationships and interactions can be found that are an emanation of deep dialectical relationships. Knowledge of the nature-individual-socium-nature relations, and deriving their importance over purely scientific research and the economic interest of producers, is not only an element of cognition. Exactly after the accumulated knowledge, a motivated and sustained behavior is manifested, which guarantees unimpeded assurance of the circulation of substances in the economic activity. At the same time, ensuring the circulation of substances in the economic activity of individuals provides processes and methods of production that are an emanation of the circular economy.

Policies of the Socium and Bioeconomy

This process can be defined as an element of a social model whose core is at the heart of socium's success in applying the bioeconomy as a method of economic activity. A number of changes in the regulatory framework of national, regional and global bodies and organizations are proof of the realized significance of the attitude of humans to the environment and of socium to the policies for regulating nature-society relations.

In 2018, the "Legume Translated" thematic network began collecting existing knowledge and best practices for sustainable legume crop systems and value chains creation. EIP-AGRI organized a protein crop task force, which produced a report[14]. The document is in response to a commitment made by the Commission in the process of adopting Regulation (EU) 2017/2393 to review the demand for and supply of vegetable proteins in the EU and to explore the potential for further development of their cost-effective and environmentally friendly production. In April 2018, the European Parliament adopted a report making a founded proposal to adopt a European strategy to promote European protein crops.[15]

[14] Report of the Commission to the Council and the European Parliament on the development of plant proteins in the EU. Brussels, 22.11.2018.COM (2018) 757 final.
https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-focus-group-protein-crops-final-report

[15] 2017/2116(INI).

Community agricultural policy provides several instruments that directly or indirectly support / acknowledge the environmental benefits of leguminous crops and, accordingly, sustain and support the production of protein crops in the EU. Such tools in the implementation of the CAP 2014-2020 are:

• greening, through the possibility of growing certain nitrogen-enriching soil crops that benefit biodiversity in eco-friendly areas, and by requiring crop diversification and crop rotation;

• rural development programs through agroecology and climate measures, knowledge transfer, advisory services, co-operation and innovation and investment instruments;

• Voluntary coupled support that can be provided to sectors experiencing difficulties and to maintain the current level of production.

Under the new CAP 2021-2027 program and budgetary framework, the development of protein crop production could contribute to the achievement of most of the CAP's 9 objectives (economic, environmental, relevant to climate and socio-economic, including healthier nutrition). To support Member States in defining targeted measures according to an analysis of national priorities and needs, the Commission envisages providing advice on how to include plant proteins in national strategic plans.

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Received: March, 19, 2019; *Accepted:* April, 15, 2019; *Published:* October, 31, 2019