



SHERPA  
Rural Science-Society-Policy  
Interfaces

MAP Position Paper

# TOWARDS SUSTAINABLE & RESILIENT VALUE CHAINS



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## Authors

ERDN | Bozhura Fidanska, Daniel Petrov, Bozhidar Ivanov

## Contributors

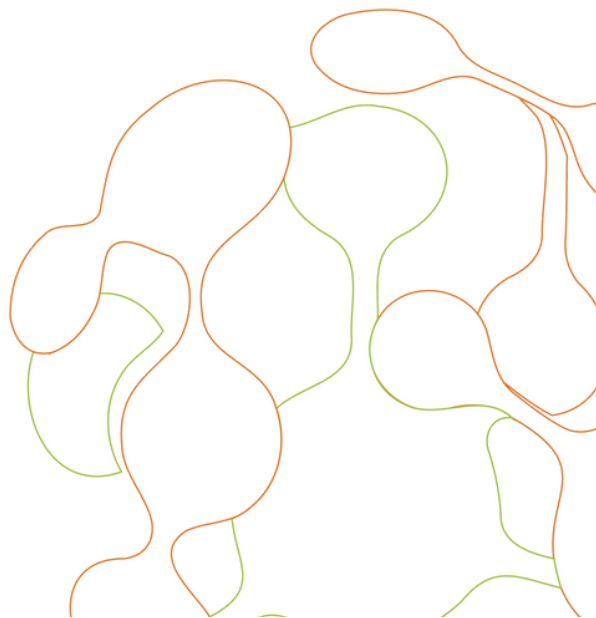
Tanya Dabnishka, Elena Ivanova, Snezhana Blagoeva, Simeon Petkov, Rositsa Djambazova, Svetlana Alexandrova and Neli Kadieva chairperson and representatives from the Association of Local Action Groups in Bulgaria.

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## Summary and key messages

Bioeconomics is the science of the dynamics of living resources using economic models. It is an attempt to apply the methods of environmental economics and ecological economics to empirical biology and thus to optimise the used resources that a biological system offers without destroying the conditions for its regeneration and therefore its ability to withstand impacts of man (environmental sustainability) and minimise the harmful consequences of human intervention.

It covers all sectors and systems that rely on biological resources (biomass of animals, plants, microorganisms, including organic waste), their functions and principles. It includes and interconnects: terrestrial and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services. For the Bulgarian bioeconomy to be successful, it must be based on sustainability.

In general, the economy based on biological resources, on the maximum utilisation of waste raw materials and on the increased use and extraction of the useful qualities of biological materials is perceived by the majority of experts and members of the regional MAP as new and without particularly significant results to date. The main part of the discussion and the positions that have been reached in the process of work of the regional MAR are in what can be done and what steps can be taken to achieve the desired and sought effect of the development of the bioeconomy.

The South-Western region of Bulgaria is among the most significant and with the largest share in the country's GDP, which is mainly due to the capital in it, which, however, can also be considered as an advantage in terms of investments, innovation models, provision of labour resources and markets. The South-West region and its relatively good economic development, which is close to the average regional level for the EU, has one of the best transport and other infrastructures, which is a significant advantage in view of the potential for the development of the bioeconomy.

The main recommendations that emerge from the regional MAP are that rural areas have great advantages for the development of some of the bioeconomy sectors related to agriculture and forestry, which are among the most important economic sectors. Agriculture and forestry are a source of raw materials and resources. This can be seen as one of the directions for future development. Other possible driver is for rural areas to become a place to build some of the capacities of the bioeconomy cycle, because of their advantages of having available space and have attractive real estate prices with comparably higher unemployment rate and lower wages. This will stimulate the renewal of the rural economy, the modernisation of primary production systems, environmental protection and improve biodiversity.

Scientific research is of great importance in order to achieve this potential. The members of the regional MAP agree that in order to have a successful and accelerated development of bioeconomy and the circular economy, it is very important to strengthen research on this issue. This will, on the one hand, shows where and what is most realistic to do, as well as to propose and implement viable technological solutions. It is of utmost importance that this agenda moves from the national to the regional and local level, by way of including it in the strategic and regional plans of the local authorities. These first steps will no doubt hold many ambiguities and undefined details, but will foster promising and opening opportunities that will bring economic strength in the coming decades.

## 1. Introduction

The Bulgarian economy, which has been defined as highly dependent on the availability of fossil raw materials, is gradually changing into an economy based mainly on renewable raw materials. This process can be described as a transition. This term is generally defined as the process of changing from one stage to another. In a narrower sense, transition is a process of change leading to an entirely new way of meeting societal needs.

In this process, the two principles governing the human-nature relationship are:

- The principle of ecological dependence, which holds that humans are dependent on nature for survival, and that the properties and nature of the nature they encounter has a significant causal effect on the course of their lives.
- The principle of ecological impact - human actions have a significant impact (planned and unplanned) on nature

Society is increasingly aware of the persistent nature of the problems associated with climate change, poverty, environmental pollution and the depletion of oil and other fossil resources. Technological renewal and innovation (including eco-innovation) proved insufficient to solve such problems. The need for the ubiquitous technological renewal is more and more clearly expressed:

- The economic system should be reformed;
- Socio-cultural patterns (egg. behaviour/consumption patterns) need to be restructured;
- The political and administrative system must begin to function in a manner that reflects global issues.

The change sought may be of an incremental type, involving small improvements along well-known trajectories, or it may be fundamental, leading to structural changes. The growing need for a sustainable supply of food, raw materials and fuels, together with recent scientific advances, are the main economic drivers for the growth of the knowledge-based Bioeconomy. The knowledge-based bioeconomy plays a key role in the aforementioned transformation process. Experts in the field emphasise the confrontation with the profound changes that economic systems face over longer periods, which practically calls into question all established production approaches. No single technology is solely responsible for realising the bioeconomy as an established process; rather complementary developments are available, such as interdependent technologies, multiple infrastructural developments as well as institutional changes.

The guiding idea behind the knowledge-based economy is based on the understanding that economic decline and restrictions are neither the first nor the only solution. The main idea is to offer new technological solutions within the overall process of economic transformation, i.e. different goods and services are produced and demanded in different ways and they are characterised by their sustainability. The realisation of the technological possibilities of bioeconomy consists not only in new investment opportunities, but also in the real prerequisite for socio-economic and cultural change.

Consumer acceptance and demand for bio-based products is a condition for this successful change. Therefore, innovation, functioning markets and changed consumer attitudes complement the conditions for creating a sustainable production system

## 2. Current situation based on background research and evidence

Bioeconomy offers serious opportunities for economic growth and addressing a number of challenges facing society. This is a new and untested policy for Bulgaria. The national regulatory framework, which regulates the preparation and formulation of policies, use of resources and scientific research potential in the country, does not consider the integrated approach of bioeconomy as a field covering the production of renewable biological resources, the transformation of these resources and the by-products and waste products into food, feed, industrial products and bioenergy.

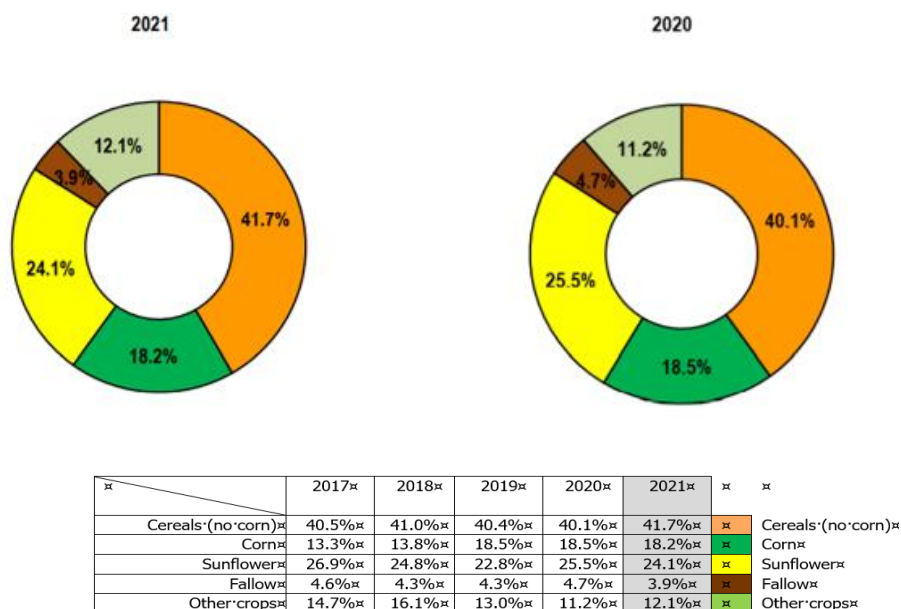
In scientific and research organisations and centres, have not considered this topic either. In the public information and media environment the meaning and importance of bioeconomy is not considered.

Based on renewable sources of raw materials, bioeconomy drives a process of transition to an economy with efficient use of resources, which takes into account the needs of environmental protection and the limitation of natural resources.

Bulgaria is a country with developed agriculture. The area devoted to agriculture by 2020 is 5,227,902 ha, which represents about 47% of the country's territory. The data on the employment of the used agricultural area shows that the main share (31% to 42% of the total) is devoted to cereal crops, followed by perennial grassland and meadows (27-36%) and oil crops (14-22%). The share of permanent plantations (3-4%), annual fodder crops (2-3%) and technical crops (1-2%) is significantly smaller. From 2013 there is a positive trend towards an increase in the share of areas occupied by vegetables and flowers– from 1.8 to 2.7%.

The relative share of crops to cultivated land is presented in fig. 1.

Figure 1. Relative share of crops to arable land for 2021 and 2020.



Source: Annual report of Ministry of Agriculture/Agrostatistics

From a scientific point of view, the answer to the question about the potential opportunities for the development of the biogas sector in the country is important. In Bulgaria, the production of biogas with the use of biomass and waste from agriculture is regulated by the national legislation and rules that are fully in sync with the European ones: Environmental Protection Act (EPA), Waste Management Act (WAA), the

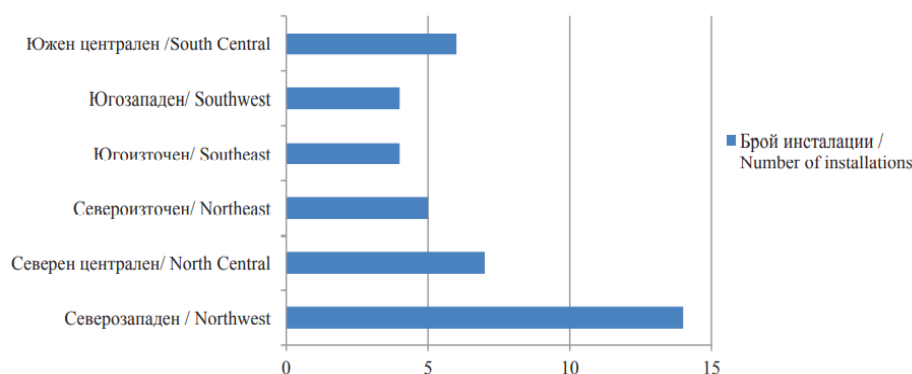
Programme of measures to limit and prevention of nitrate pollution from agricultural sources in vulnerable areas, or the so-called Nitrate Directive, (in force in in Bulgaria from 01.01.2011 to 31.12.2014).

Taking into account the area devoted to cultivated crops and yields as of 2020, it can be calculated that more than 3 million t/year of waste can be produced annually:.. about 1.7 million tons/year. from corn stalks; 760 thousand tons/year. from sunflower stalks; 40 thousand tons/year. from tobacco stalks; over 600 thousand tons of other plant waste.

Animal husbandry is the other branch of agriculture generating raw material for biogas plants. Since there is no official data, we calculated the amounts of waste from the most mass-raised farm animals based on daily waste from the respective animal: from cattle - 55 kg of manure; from pig - 4.5 kg; from goat or sheep - 1 kg; from 1 hen - 0.17 kg. Annual volumes of solid waste from one animal: - Cow – 55 kg x 365 days = 20075 kg./year.  $\approx$  20 t/year. - Sheep or goat - 1 kg x 365 days = 365 kg/year = 0.365 t/year. - Pig 4.5 kg x 365 days = 1642.5 kg./year.  $\approx$  1.6 t/year. - Chicken/hen – 0.17 kg x 365 days = 62.05 kg/year.  $\approx$  0.06 t/year.

Bearing in mind the approximate annual values of waste per animal and the number of animals raised by species, we calculate the total volume of waste generated by animal husbandry in the country for 2020. The results show that in animal husbandry , with more than 13 million tons of solid waste generated, cattle breeding is the largest contributor or 82% of the total waste generated. Summarising the results of the calculations, we can say that agriculture generates a total of over 16.5 million tons of biomass and waste from plant and animal substances. The built bio-installations in the country are shown in fig. 2, classified by Bulgaria's territorial planning areas.

Figure 2. Number of Facilities/Instalations



Source: RIEW

### 3. Position of the Multi-Actor Platform

#### 3.1. Identified needs

The main need for the development of the agriculture, forestry and fisheries sectors from the perspective of the bioeconomy is to pave the way to a more innovative, efficient use of resources and a competitive society that combines food security with sustainable use of renewable resources for industrial purposes, such as at the same time it is guaranteed environmental Protection. Another important need is to mobilise research and innovation in the agricultural sector, stimulating private investment, developing new value chains and engaging stakeholders. The need to have a strategy for the development and strengthening of the agrarian sector towards the bioeconomy is to lay the foundation for future political, inter-institutional, scientific and public dialogues and conversations about more innovative economic incentives and to increasing the

contribution of the bioeconomy to the national and European political agendas. The key needs to strengthen the position of bioeconomy within agriculture are as follows:

### **Closer linking of bioeconomy policies**

Bioeconomy has an impact on a wide range of existing or emerging policies at European and national level. This risks a fragmented political environment with incompatible framework conditions and possible contradictions between objectives.

- Solutions must be found to address the contradiction between the globally increasing demand for biomass and the targets set in other policy areas, which have a restrictive effect on supply.
- Efforts to promote the production of bioenergy and other non-food products should always take into account the competitive situation of these products with respect to food production.
- Promotion of research and policies supporting knowledge transfer should go hand in hand with the implementation of research results in processes and applications in industry.

Active communication between policymakers, business, science and civil society, as well as for the preparation of policy decisions that are based on interdisciplinary assessments of policy implications, will contribute from an early stage to ensuring coherence between policies in different areas, as well as to minimising or eliminating contradictions between various objectives.

### **Expanding information about bioeconomy and strengthening dialogue between society and bioeconomy stakeholders**

Production processes in bioeconomy affect citizens in different ways and mainly as consumers who use the products of this sector. When exploiting the innovation potential, it is important that the interests of citizens are taken into account, since bioeconomy cannot become a reality without them and their needs. To overcome the challenges of bioeconomy, it is necessary to maintain a broad consensus in society. Knowledge-based dialogue on contentious issues or conflicts between potentially conflicting objectives is particularly important for businesses, as it concerns different policy areas and interests. Public participation dialogue initiated by bioeconomy stakeholders from the fields of science and business, as well as targeted information and communication, contribute to formulating the demands that society places on the development of bioeconomy, as well as to strengthening openness regarding organic products and innovation. In this way, the benefits of bioeconomy for individual citizens and for society can be outlined more clearly, enhancing the support for the implementation of new scientific discoveries into practical applications.

### **Professional training and acquisition of practical skills**

The knowledge-based bioeconomy is a field that is both broadly branched and highly specialised in distinct narrow areas. It is a field that uses modern technology to create a whole range of innovations and jobs by developing and bringing together many different natural and technical sciences. That is why finding qualified personnel is a challenge. In the countryside, there is a need to create and expand the expertise that is necessary for the bioeconomy sector. Expectations need to be managed in view of negative demographic trends in rural areas and a shortage of well-prepared specialists. Creating new training programs and financial support measures, and in particular interdisciplinary research programmes to motivate young people and graduates to have the confidence, desire and courage to move with confidence, both in the academic world and in the private business sector.

### **Sustainable development in agriculture, forestry and fisheries**

Natural resources are the basis for bioeconomy. The sustainable management of agricultural and forest territories, as well as seas and other bodies of water, is a basic prerequisite for securing the majority of raw materials needed for bioeconomy. Only by saving resources and thus using resources efficiently, the necessary increase in agricultural production can be permanently married to the need to protect the

environment, climate and nature. This requires to consider all factors that concern production systems, including site-specific requirements and sustainability aspects.

The policy and regulatory framework is constantly evolving, with the aim of achieving sustainable agriculture adapted to the characteristics of the local environment. After 2013, as part of the further development of the Common Agricultural Policy (CAP), ecological adaptation requirements were introduced as a component in relation to direct ("green") payments for agricultural enterprises. After that change, enterprises applying for direct payments must comply with the "greening" clauses, both for land shares and crops, and for the protection of permanent pastures: each holding must use a minimum share of cultivated areas for ecological purposes ("areas of high natural value").

This way too, areas used for agricultural production can also be recognised as ecological areas having a direct environmental benefit. The agricultural sector must be embedded into the climate protection policy both regarding the provision of natural resources and through the protection of biological diversity. To support this process, the further development of environmental measures for agriculture, jointly supported by the EU, the national government and the regions, is of great importance.

Forests are of great importance as an economic factor, as a supplier of raw materials, a habitat for flora and fauna, a carbon storage and a place where people find recreation. Forestry policies currently pursue the goals of preserving the wealth of forest territories and their importance for the economy, the environment and society, and for future generations. In the context of the Strategy for Forests to 2020, decision-making procedures to ensure internal coordination between a wide range of requirements were defined to resolve any conflicts between the dual objectives of protection and use of forests.

To do this, it is necessary to mobilise the existing and sustainably usable potential in terms of timber raw material. Short-rotation afforestation's that are not part of forests can also contribute to wood supply. At national and EU level, additional restrictions imposed on forestry for reasons related to the protection of nature or the environment should be assessed by taking into account ecological benefits as well as economic, social and climate aspects.

In the fisheries sector, the link between resource efficiency and sustainability is clear. The management of fish stocks, based on the principle of maximum long-term profitability and the principle of precautionary measures, not only ensures stable fish stocks and the best supply for consumers: at the same time, it is the basis for sustainable and economically viable development of fisheries industry. Therefore, the measures of the Common Fisheries Policy (CFP) serve in particular the objective of rebuilding fish stocks, insofar as they are still excessive, and of managing them sustainably.

The objective of fisheries policy is the sustainable management of fish stocks, in accordance with the principle of maximum long-term yields. Through stocking plans and management plans that cover many years, as well as limits on catch quantities as well as on the resources dedicated to fishing operations, activities are directed towards achieving maximum long-term yields from all stocks. Bycatch reduces productive fish stocks, makes it difficult to assess stock status, damages marine ecosystems and threatens seabirds, marine mammals and other marine organisms. Therefore, it needs to be reduced. Industrial biotechnological processes that use aquatic microorganisms and algae for their diverse constituents (as a source of raw materials) are of increasing interest as a resource-efficient feedstock for biomass production.

### **Provision of agricultural raw materials with sustainable and highly productive use of agricultural areas**

In order to meet the growing demand for biomass of plant origin, while the amount of agricultural land used decreases, it is essential to sustainably increase the yields of cultivated crops. For this purpose, in addition to the use of modern methods of cultivation, efficiency improvements are necessary, especially in terms of the use of energy, fertilizers and plant protection products, while in parallel reducing the needs of natural raw materials and ensuring - the preservation of the biodiversity of land and water and ecosystems. Emissions



per product unit should be minimised. Along with plant breeding and other technical advances, carbon beneficiation and long-term storage can be a suitable means of increasing the area's productivity while also contributing to climate protection. Due to the expected increase in dry spells and other extreme weather conditions in the context of climate change, accompanied by the simultaneous shift and extension of growing seasons, irrigation and highly efficient water use are becoming increasingly important. Maintaining the humus content, which is adapted to their location, or increasing it in the long term, where it is reduced, also contributes to the maintenance and improvement of the soil's capacity to store water. Increasingly, rainwater scarcity and rising water prices will force the introduction or wider spread of water-saving technologies that can simultaneously reduce energy consumption.

### **Sustainable use of available wood potential and adaptation of forests to climate change**

The area occupied forests in Bulgaria has increased by almost 10% over the last four decades. As timber growth has also outstripped use, timber stocks have continued to increase. Moreover, in recent years, especially due to the increased level of use, the accumulation of stocks has slowed down, also due to the fact that the forests are relatively old. In the period 2002 - 2008, about 90% of the additional growth was used. The Forest Strategy 2020 recommends that the availability of existing and sustainable raw material potential be mobilised to a greater extent due to the positive effects of wood use on climate protection. As part of this, the forest must be maintained as a major sink for CO<sub>2</sub>.

The activities set out in the Timber Promotion Charter continue to be implemented consistently. In terms of non-timber resources, wood can contribute to the raw material base of the bioeconomy: wood produced in short-rotation plantations located on used agricultural land; recycled wood; timber intended for landscape maintenance; and timber imported from sustainable and regulated forestry operations. The importance of targeted information and specialist advice provided to forest owners will continue to grow. Climate change affects both forests as an ecosystem and sustainable wood production. Forests must be adapted to climate change, continue to provide their function of use, protection and recreation, as well as the role of forests in climate protection.

### **Sustainable production with high added value of food of animal origin**

Diversification of animal husbandry, involving the targeted use of genetic potential as well as the conservation of animals in a way that is sustainable and appropriate, both for the species concerned and for the location, allows for the generation of future increases in the added value of animal husbandry and to improve resource management. The use of modern methods of animal breeding (for example, genetic selection) allows to take into account the characteristics of heredity, which are also important for adaptation to changed environmental conditions. Existing genetic diversity within farm animal breeds is used to optimise production processes in product improvement, taking into account animal welfare factors.

### **Optimising existing value added chains and networks and developing new ones**

By optimising the individual value creation chains and by intelligently connecting these chains, it is possible to reduce the consumption of resources and the use of non-renewable raw materials, to mobilise the potential for innovation and added-value, and to improve the economic efficiency of production. In addition, there are opportunities to develop new regional value chains that are also based on new sources of raw materials: ideally, these become value-added networks. Where possible and justified, the aim is to cascade and reuse biomass.

The by-products arising after the processing as renewable resources should be used in the best way - from the point of view of high added-value and waste minimisation. In many cases, there are synergies between different ways of using biomass. For example, feed products are generated as by-products when vegetable oil is produced, or straw is generated in the production of cereals, which (in some cases) can be used as a material or as an energy source. There are already many cases of coupled production: in modern grain and oil mills, sugar mills, and biodiesel and bioethanol plants. Another example of coupled production is are

biorefinery plants. Biorefineries offer the prospect of a more efficient use of biomass, for the supply of materials and energy, compared to currently operating processes. Therefore, the further development of this technology, taking into account sustainability requirements, is an important milestone on the way to the expansion of the bioeconomy.

Along with the current technological development, it is necessary to improve the starting conditions for the establishment of more biorefinery demonstration facilities, with the aim of making the transfer of operations on an industrial scale as quickly as possible. A fundamental prerequisite for this, also with a view to the targeted use of private and public research funding, is a rigorous ecological and economic assessment of biorefinery concepts. For this purpose, gaps in information and available data must be filled. Thus, in addition to current technological developments, it is essential to carry out projects that provide a thorough economic and environmental evaluation of biorefinery concepts, both in comparison with each other and with other biomass uses.

Many companies in the bioeconomy already have methods for assessing the sustainability of production processes; with their help, weak points are identified and their products are promoted among consumers. However, these methods are often not comparable; sometimes they are not even transparent. Uniform calculation and evaluation processes that are transparent and reliable and jointly developed by politicians, science, business and civil society need to be applied. The aim is to achieve reliable assessments of the sustainability of production processes and products and also to enable consumers to choose in favour of a sustainable product. Value chains, especially in the food sector, need to be optimised to minimise losses in the chain from production and transport, storage, processing and marketing, to consumption.

## 3.2. Existing interventions and actions

Table 1 – Examples of actions taken by local actors

**National Science Program "Intelligent Animal Husbandry"** The main goal of the scientific program is to conduct fundamental and applied scientific research to provide the animal breeding sector with innovative methods and means for intelligent and efficient animal breeding with reduced human resources and reduced impact on the environment.

**National scientific program "Healthy foods for a strong bioeconomy and quality of life"** The program aims to provide the necessary conditions for carrying out scientific research, scientific-applied and demonstration activities in the priority areas falling within the priority area of ISIS "Industry for healthy life and bio-technologies". • Production, processing and supply of safe and healthy foods. • Development of a strong regional bioeconomy. • Bioproducts such as functional foods and nutritional supplements. • Biopreparations for the control and production of safe and harmless foods. • Biopreparations for biocontrol and increasing yields in agriculture. • Food quality for a better quality of life. • Green/bio-based economy.

**BIObec: Preparing the creation of Bio-Based Education Centres to meet industry needs and boost the contribution of the bioeconomy to societal challenges**

The aim of the BIObec project is to develop a comprehensive framework for multi-level Bio-based Education Centers (BBECs) flexible enough to meet the current and future needs of industry and the surrounding ecosystem at local, regional, national and/or international levels. BIOBEC will clarify the needs of different regional ecosystems and provide detailed design, economic and financial assessment, management plans for educational training centers as well as plans for lifelong learning programs.

**BE-Rural: strategies and plans for the transition to the bioeconomy to improve agricultural and regional development in the EU**

The main objective of the project is to contribute to the improvement of the bioeconomy in non-urbanised areas with an emphasis on regional strengths. These areas are home to a great wealth of ecosystems and

resources, where the bioeconomy promises employment opportunities in non-urbanised areas and sustainable growth. This transition to the new regional bioeconomy requires the active involvement of a wide range of stakeholders and the sustainable use of agricultural, forest and marine ecosystems. Building on this idea, BE-Rural will create potential for local economies based on natural resources and support the implementation of bioeconomy strategies, plans and business models. This entire project will be focused on the creation of Open Innovation Platforms (OIP) in five selected regions of countries: Bulgaria, Latvia, North Macedonia, Poland and Romania. For Bulgaria, the Stara Zagora region is the focus of the main activities of the project.

#### **BIOSTEP: promoting stakeholder participation and public awareness for engaged governance of the European bioeconomy**

This project, financed by the Horizon 2020 Program, is implemented by a consortium of 9 partners, which also includes the Bulgarian Chamber of Commerce. Its main aim is to raise general awareness and understanding of the bioeconomy, its implications and the benefits of informing and engaging citizens. BioSTEP brings together key stakeholders and policymakers to discuss the steps needed for a comprehensive strategy to weave the bioeconomy into policy-making across many sectors in EU Member States. BioSTEP will also identify and disseminate best practices for public development of national and regional strategies for participation in bioeconomy governance.

#### **DeCarb - Support for clean energy transition in EU coal-intensive regions**

This project is financed under the INTERREG EUROPA program, with the leading partner Agency for Regional Economic Development - Stara Zagora and a consortium of 8 other organisations from countries in the European Union. The overall goal of the project is to exchange experience and transfer good practices on how to make the transition from the era of high-carbon intensive economy to the future of clean energy. Title Rural Development Programme 2014-2020

### **3.3. Recommendations from the MAP**

Bioeconomy affects various economic areas and policies, such as industry and energy policy, agriculture, forestry and fisheries policy, climate policy and environmental policy, in addition to research and innovation policies. In order to ensure a coherent economic policy framework, framework conditions for bioeconomy should be set up in order to ensure the necessary food supply, reduce dependence on fossil raw materials, preserve the climate and sustainable use of renewable resources, while at the same time preserving both biological diversity and the functions performed by soils.

At the same time, the members of the regional MAP unequivocally state that bioeconomy is an economic area that will largely determine how they will develop and what the situation of individual regions will be in the future. This will be the dividing line between areas that are characterised by high added value, high incomes, high economic activity and attractive for capable, qualified and educated personnel and those areas that will lag behind in their economic development, loose human potential and offer worse living conditions for local communities. The main recommendations derived from the regional MAP are related to the possibilities of agriculture and forestry in the Southwest region, on which to build the bioeconomy sectors. The other direction in which the development of the bioeconomy can be built is attracting investments for the implementation locally of part of the bioeconomy technological cycles and its value chain.

#### **3.3.1. Recommendations for future rural policies**

The main part of the recommendations of the members of the regional MAP aimed at starting to materialise the concepts and theoretical statements around bioeconomy. From the discussions held with all interested parties during the work of the regional MAP and from the research that has been conducted, the following

recommendations for measures that should be taken into account in the implementation of rural development policies stood out, namely:

### **Launching pilot projects at the local level in the South-West region with the implementation of appropriate projects in agriculture and forestry.**

Bioeconomy pilot projects are very necessary to visualise the possibilities and real application of bioeconomy. This can illustrate and visualise the real projects and direction in which to develop the regional bioeconomy in the Southwest region. Pilot projects themselves must be selected on a competitive basis, and their selection must be based on how reproducible and replicable the project ideas are in other places in the region. The benefit of pilot projects is that they can count on expert and advisory assistance, as well as attention from the various responsible institutions, which will answer many questions, demonstrate and suggest new ideas.

### **Stimulation of employment, economic growth and competitiveness.**

The development of bioeconomy has potential and opportunities for employment growth and added value. Sustainable, new and innovative products, business models and production processes, as well as agriculture, fisheries and wood production, can promote new economic activities and provide employment for people in different sectors and along the value chain. Agriculture, forestry and fisheries form the backbone of the bioeconomy, providing resources for its various directions. Increasing the productivity and sustainability of the agricultural sector in Bulgaria through environmentally friendly and natural resource-saving biomass production is the basis for dealing with the previously outlined set of challenges and it is a prerequisite for the successful development of the other sectors falling within the scope of bioeconomy. It is necessary to engage the different bioeconomy policy areas and to make efforts to achieve transparent, knowledge-based communication between politics, business, science and civil society. A structured and permanent dialogue at the inter-ministerial level should be initiated. Establish an interdepartmental bioeconomy working group tasked with supporting the exchange of information and coordinating policies adopted by different government departments and governmental levels regarding the bioeconomy to continue to develop this strategy, is advisable. Also, at the political level, a Bioeconomy Council should be established with the participation of representatives of various interested groups and countries.

### **Sustainable production and provision of renewable resources**

The sustainable management of rural areas, forests, sea and other water bodies is a fundamental prerequisite for the production of the necessary raw materials in a way that uses resources sparingly and is in harmony with the objectives of environmental, climate and nature protection. The demand for biomass of plant origin is increasing and the amount of usable agricultural land is decreasing, therefore it is necessary to sustainably increase crop yields. In addition to this, it is extremely important to make sustainable use of water resources, for the necessary provision of food supplies and microbial resources for industrial biotechnology, using microorganisms and algae as a source of raw materials in view of the diverse ingredients they contain.

### **Development of markets, innovative technologies and products**

Creation of a system of coordination and interconnection between research and development activity and implementation of technologies in business. Research and innovation to exploit the potential offered by rapidly developing technologies, products and markets based on renewable resources. As well as faster readiness and greater flexibility in the process of implementation and use of the innovative products by the business.



### **3.3.2. Recommendations for future research agendas**

#### **Research and innovation, partnerships for the exchange and transfer of innovations, development of infrastructure for experimentation and access to it**

Scientific research and innovation are at the heart of the transition from the current use of renewable resources to more diverse uses - for food, industrial processes and products, and also as a biogenic energy source. They are the crucial driver of the bioeconomy. The development of the bioeconomy depends on the use of the latest technologies and leads to greater applied results through an intelligent combination of bio and engineering sciences. Ground-breaking achievements include contributions to biodiversity, the molecular basis and metabolism of organisms. An important place in the bioeconomy system is the innovation environment to help sectors develop their potential for growth and implementation of innovative technologies. Scientific achievements should be accessible to all farmers and foresters, producers and processors, including the smallest ones. It is necessary to promote the exchange of best practices and the transfer of the results of scientific research to farms, as an incentive for their accelerated development. The creation of innovation centres will enable every farmer and forester, producer and processor to benefit from the latest bioeconomy knowledge, experience and technologies related to their products, processes or business models and tailored to their real needs. These centres can facilitate access to bioeconomy technologies.

#### **Training and consultancy for the acquisition of knowledge and skills - training, awareness-raising, consultancy, exchange of experience and good practices to create added value.**

Particularly important for increasing competitiveness in the sector is the development of human capital. The lack of knowledge and competences in areas related to bioeconomy can have a restraining effect on the development of the sector, on the development of new activities and on entering new markets. The lack of qualifications and knowledge is an inhibiting factor that can be one of the main limitations for the further development of the economy in the long term. The participation of the scientific community in international projects is extremely important for the implementation and exchange of information about new approaches to research work. The scientific community in Bulgaria can therefore build a network through participating in these international projects.

## Conclusions

Bioeconomy is related to a wide range of fields that are closely related to the development of innovation and knowledge. Bioeconomy implies the improvement of research and scientific knowledge and the close connection of research with practice. The power of bioeconomy is related to finding a new application and increasing the added value of many of the raw materials and products that have until now been considered waste, as well as in deriving new uses for biological raw materials. Agriculture and forestry have for the past few centuries been the source of raw materials and resources for food, feed, energy and for light and wood processing industries, resulting in production growing and demand growing more slowly, leading to lagging behind the prices of producers and to unsatisfactory incomes for small and medium-sized farms.

Bioeconomy makes it possible to change this, which is also a chance for rural areas and in particular for the South-West region, which has the potential to develop a successful bioeconomy. It is necessary to start with a gradual penetration of the concept and ideas of the bioeconomy from the national and state level to the local and regional bodies and authorities, which will be embedded in their strategic and programming documents. The dialogue between the various stakeholders, in the form of local authorities, science, business, the local public, is necessary to take real and concrete steps for the development of the bioeconomy, and also to strengthen the openness regarding bio-based products and innovations. To achieve the highly specialised and strong network bioeconomy, the big challenge is to find resourceful and innovative people and entrepreneurs to initiate and build bioeconomy activities in rural areas. It is essential to start building and expanding the necessary base of experts in the country and to counter the lack of well-trained specialised staff expected due to demographic changes. Based on this, the following generalisations can be made:

- Both at the European and national level, food security has priority over the production of raw materials for industry and energy. The use of synergies between food production and the provision of raw materials for energy and industry must be supported.
- To pay attention to ways of using waste and production residues that would provide the potential for higher added-value.
- Biomass utilisation pathways should be considered in terms of their interactions and the way networks are formed. Where possible and appropriate, cascade and reuse biomass
- A well-trained and well-informed specialised staff is a mandatory requirement for the competitiveness of the bioeconomy.
- It is necessary to improve the possibilities and conditions for using key technologies and for their realisation on the market.
- The bioeconomy must meet society's increasingly demanding demands on how goods are produced. This applies to the protection of the environment, climate, nature and animals, as well as compliance with social responsibility standards.
- The development of the bioeconomy requires close cooperation between all actors from the political, economic, scientific and environmental spheres, as well as from society as a whole. It is necessary to engage the participation and cooperation of stakeholders from the relevant groups. Regional and decentralised initiatives make it possible to organise regional cycles for bioproducts directly at the relevant place.

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