BIOECONOMY: OPPORTUNITIES FOR A BIO-BASED AND SUSTAINABLE FUTURE

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Growing world population, scarce resources and ongoing climate change present industry and society with major challenges. In the future, we will require new economic forms to maintain our prosperity and to enable responsible handling of our resources. One key issue accordingly emerges: how can we combine economic growth with sustainability? Article considers Bioeconomy as a way which can help us to find answers to this question with economy and ecology links.

Key words: *sustainable development, bioeconomy, sustainable agriculture, bioeconomy strategy*

In 2015, the United Nations formulated 17 Sustainable Development Goals (SDGs). The goals are intended to help end poverty, protect the planet and achieve prosperity for all. But the biggest hurdle to achieving the sustainability goals is therefore the application and implementation of new research results. Because although science has already gathered vast amounts of data for instance for a more efficient and sustainable agriculture or waste avoidance or biobased production approaches, there is an obvious lack of implementation of these results almost everywhere - in industry as well as in everyday life. By the use of biological resources, it enables bio-based and sustainable economic growth. Bioeconomy will play a prominent role in future-oriented sustainability policy. It is systematically based on the efficient and sustainable use of renewable biological raw materials. In this way, bioeconomy offers a pioneering and promising alternative to an economy based until now on fossil fuels – for which the resource basis is slowly but surely being depleted. Bioeconomy have to link our countryside, agriculture and forestry with the focal issues on the political agenda of the government. The successful continuation of the assurance of supplies of raw materials for the current economy, the protection of our climate and environment and not least the responsible supply of a growing human population with sufficient and healthy food: the successful mastering of these crucial challenges is not feasible without a bio-based economy. Bioeconomy, however, is not a new development. For thousands of years, agriculture and forestry delivered renewable resources and energy for the economy. Fossil raw materials came into being over millions of years. They are the legacy of the creation of our planet with its wonderful and tremendous diversity. And this biodiversity is much too precious to be depleted within only a few generations.

Considered separately, financial, food, fuel and climate crises are serious problems. Together, their impact is gradually becoming more dangerous and even catastrophic for the world economy. Currently, the world is facing many complex challenges including adaptation to and mitigation of climate change; rapid urbanization; increased demand for natural resources; growing

human food, water and energy insecurity; increased natural disasters; and the resolution of violent conflicts. Most of these challenges have a precise land dimension: unequal access to land; insecurity of tenure; unsustainable land use; and weak institutions for land administration, and dispute and conflict resolution. Responding to these challenges is particularly difficult since land resource. Definitely, land is the single greatest resource in most countries, and land-based resources are natural capital at the disposal of societies - acting as a central ingredient in development choices. Also, it is a basic factor of economic production as well as a basis for social, cultural and religious values and practices. Agriculture in Ukraine including fisheries and forestry is the mainstay of the economy, contributing about 12 percent of the GDP and providing employment for about 18 percent of the population.

Table 1

Ukraine % World Production Source: FAS/USDA

Commodity	Value	World Value	% of World	Market Year	Released Date
Oil, Sunflowerseed	6,235 (1000 MT)	19,106 (1000 MT)	32.63 %	2018/19	09/2018
Oilseed, Sunflowerseed	15,000 (1000 MT)	49,829 (1000 MT)	30.1 %	2018/19	09/2018
Meal, Sunflowerseed	5,989 (1000 MT)	20,515 (1000 MT)	29.19 %	2018/19	09/2018
Cherries (Sweet&Sour), Fresh	219,800 (MT)	3,346,191 (MT)	6.57 %	2018/19	09/2018
Walnuts, Inshell Basis	113,000 (MT)	2,069,670 (MT)	5.46 %	2017/18	10/2017
Barley	7,600 (1000 MT)	142,726 (1000 MT)	5.32 %	2018/19	09/2018
Rye	400 (1000 MT)	10,528 (1000 MT)	3.8 %	2018/19	09/2018
Oilseed, Rapeseed	2,600 (1000 MT)	71,699 (1000 MT)	3.63 %	2018/19	09/2018
Wheat	25,500 (1000 MT)	732,998 (1000 MT)	3.48 %	2018/19	09/2018
Corn	31,000 (1000 MT)	1,068,999 (1000 MT)	2.9 %	2018/19	09/2018

(Source: FAS USDA)

The economy of Ukraine largely depends on exports, and almost a third of our exports are agricultural products. This means that the welfare of Ukrainians, economic stability (and, of course, the dollar exchange rate) is now largely determined by how much corn, wheat, sunflower oil, cheese and other agricultural products our country can sell to other states.

Table 2

Ukraine % World Exports Source: FAS/USDA

Commodity	Value	World Value	% of World	Market Year	Released Date
Meal, Sunflowerseed	4,600 (1000 MT)	7,214 (1000 MT)	63.76 %	2018/19	09/2018
Oil, Sunflowerseed	5,600 (1000 MT)	9,792 (1000 MT)	57.19 %	2018/19	09/2018
Corn	25,000 (1000 MT)	161,713 (1000 MT)	15.46 %	2018/19	09/2018
Barley	4,300 (1000 MT)	28,539 (1000 MT)	15.07 %	2018/19	09/2018
Oilseed, Rapeseed	2,450 (1000 MT)	17,460 (1000 MT)	14.03 %	2018/19	09/2018
Walnuts, Inshell Basis	75,000 (MT)	754,500 (MT)	9.94 %	2017/18	10/2017
Wheat	16,500 (1000 MT)	181,394 (1000 MT)	9.1 %	2018/19	09/2018
Rye	30 (1000 MT)	355 (1000 MT)	8.45 %	2018/19	09/2018
Oilseed, Sunflowerseed	100 (1000 MT)	2,311 (1000 MT)	4.33 %	2018/19	09/2018
Dairy, Butter	35 (1000 MT)	894 (1000 MT)	3.91 %	2018	07/2018

(Source: FAS USDA)

Sustainable development, as a movement, was officially set off by the United Nations Conference on the Human Environment in 1972 and the term was further popularized by World Commission on Environment and Development which was chaired by Norwegian Prime Minister Gro Harlem Brundtland in 1987. It was defined as "a development that meets the needs of the present without compromising the ability of future generations to meet their own needs" in the Brundtland Report of the World Commission on Environment and Development. Sustainable development emerged as a concept among the academics in the 1960s, much obliged to the photograph famously known as "Earthrise" taken by astronaut William Anders during the Apollo 8 mission in 1968 that created a collective awareness of the environment [Mcintosh, 2015].

What is Agricultural Sustainability? What the meaning we include in understanding of agricultural sustainability? There are many different views and definitions, many different terms are used for designation of agricultural sustainability, such as: ecological agriculture, permaculture and organic agriculture, green agriculture, ecological, low-cost, biodynamic, environmentally-sensitive, community-based, wise-use, farm-fresh and extensive. There is continuing and intense debate about whether agricultural systems using some of these terms qualify as AgSustainable. Systems high in sustainability are making the best use of nature's goods and services whilst not damaging these assets. The key principles in sustainability understanding are:

- Sustainability is not a point with a scientific optimum.
- Sustainability is an evanescent socio-political space.

Sustainable agriculture refers to the system of agricultural production and distribution, which:

- Achieves the integration of natural biological cycles and control measures in accordance to climate change.
- Optimizes resources management.
- Protects and helps to regenerate soils, renews and increases its fertility.
- Reduces non-renewable resources using; and purchased production resources.
- Promotes using of alternative energy sources.
- Provides high-quality food products, affordable pricing and beneficial to human health and nutrition.
- Provides sufficient and reliable income for farms.
- Promotes opportunities for family farming and farming communities.
- Minimizes adverse impacts on health, safety, wildlife, water quality and the environment in general.

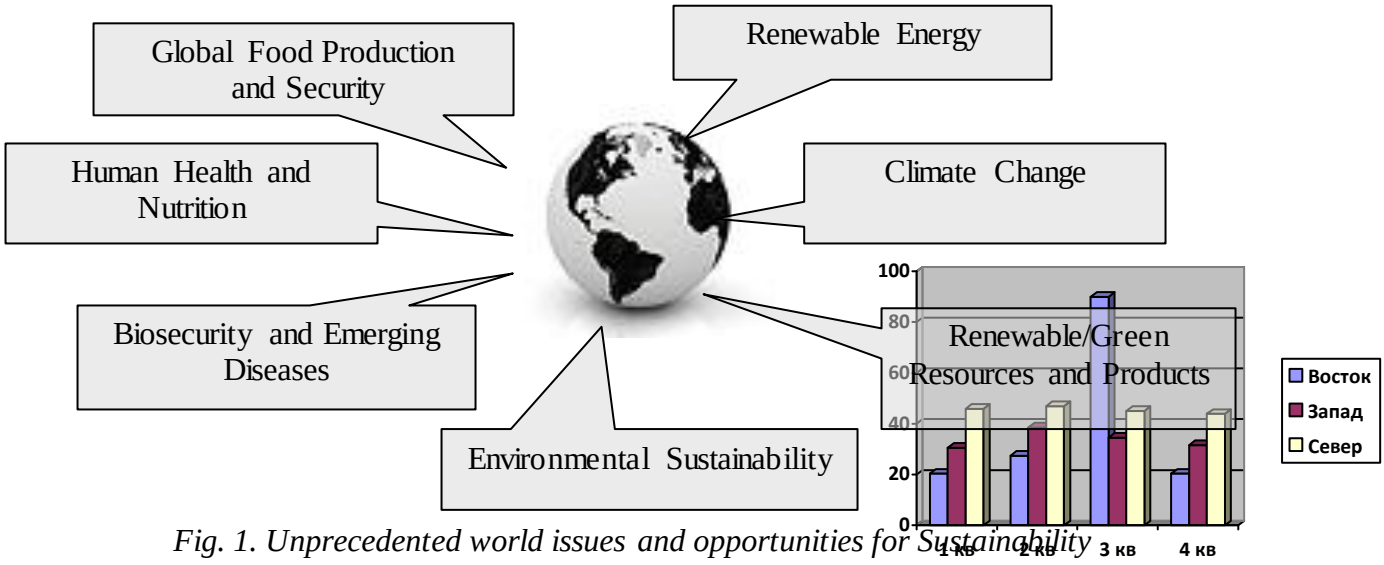

Fig. 1. Unprecedented world issues and opportunities for Sustainability

What "pillars" of the Board of Directors fulfill each of these criteria?

It's important to promote Agricultural Sustainability development that has an impact on the local environment and the ability of future generations to thrive. Therefore the main directions to develop, redevelop, and remodel in ways that incorporate sustainable design principles:

- Food Security, Production and Human Health;
- Environmental Quality and Sustainability;
- Advanced BioEnergy and BioBased Products.

The idea of agricultural sustainability does not mean ruling out any technologies or practices on ideological grounds. If a technology works to improve productivity for farmers, and does not harm the environment, then it is likely to be beneficial on sustainability grounds. Agricultural systems emphasizing these principles are also multi-functional within landscapes and economies. They jointly produce food and other goods for farm families and markets, but also contribute to a range of valued public goods, such as clean water, wildlife, carbon sequestration in soils, flood protection, groundwater recharge and landscape amenity value.

As a more sustainable agriculture seeks to make the best use of nature's goods and services, so technologies and practices must be locally adapted and fitted into place. These are most likely to emerge from new configurations of social capital, comprising relations of trust embodied in new social organizations, new horizontal and vertical partnerships between institutions, and human capital comprising leadership, ingenuity, management skills and capacity to innovate. Agricultural systems with high levels of social and human assets are more able to innovate in the face of uncertainty. There are main thematic areas:

- Sustainable land and water management system
- Rural infrastructure and trade related capacities for improved market access

- Improved food production to reduce hunger including emergencies and disasters that require agricultural support
- Agricultural technology development, dissemination and adoption Sustainable use of forestry, fisheries and livestock resources
- Cross-cutting issues: policy formulation and review, agricultural statistics, M&E, women in agriculture, agrotourism, youth in agriculture and farmer health

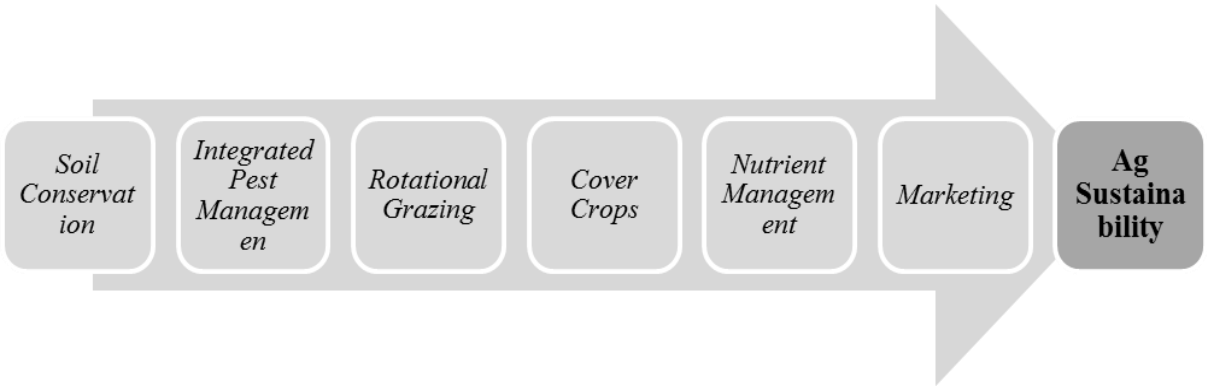

Fig. 2. *Elements of Sustainable Agriculture*

Agriculture can negatively affect the environment through overuse of natural resources as inputs or through their use as a sink for pollution. Such effects are called negative externalities because they are usually non-market effects and therefore their costs are not part of market prices. Negative externalities are one of the classic causes of market failure whereby the polluter does not pay the full costs of their actions, and therefore these costs are called external costs. Externalities in the agricultural sector have at least four features:

- their costs are often neglected;
- they often occur with a time lag;
- they often damage groups, whose interests are not well represented in political or decision-making processes;
- the identity of the source of the externality is not always known.

For example, farmers generally have few incentives to prevent pesticides escaping to water bodies, the atmosphere and to nearby nature as they transfer the full cost of cleaning up the environmental consequences to society at large. In the same way, pesticide manufacturers do not pay the full cost of all their products, as they do not suffer from any adverse side effects that may occur. Partly as a result of lack of information, there is little agreement on the economic costs of externalities in agriculture. Some authors suggest that the current system of economic calculations grossly underestimates the current and future value of natural capital. Such valuation of ecosystem services remains controversial because of methodological and measurement problems, and because

of its role in influencing public opinions and policy decisions. The great success of industrialized agriculture in recent decades has masked significant negative externalities, many of which arise from pesticide overuse and misuse. There are also growing concerns that such systems may not reduce food poverty. Poor farmers, at least whilst they remain poor, need low-cost and readily available technologies and practices to increase local food production. At the same time, land and water degradation is increasingly posing a threat to food security and the livelihoods of rural people who occupy degradation-prone lands. Some of the most significant environmental and health problems center on the use of pesticides in agricultural systems.

Two things are now clear from evidence on the recent spread of agricultural sustainability:

- some technologies and social processes for local scale adoption of more sustainable agricultural practices are increasingly well-tested and established;
- the political conditions for the emergence of supportive policies are least well-established, with only a very few examples of real progress.

Targeted country dialogues between government, the private sector, and civil society could help identify and remove the barriers preventing investment into AgSustainability and offer suggestions for private finance and business models – as well as policy changes and public finance tools – that are needed to unlock private investment. Ukraine's economy is the world's fifth most energy-intensive in the world, and energy efficiency is a major opportunity for low-carbon investments across multiple sectors. Over two-thirds of the country's infrastructure is outdated due to a lack of modernization since the Soviet era, and energy efficiency measures are financially attractive. For example, the payback time of changing an inefficient boiler to an efficient one is typically less than two years, and internal rates of return can be over 50 percent for such projects.

Ukraine has an abundance of natural resources due to its size, and the investment potential for power generation from renewables like biomass, solar PV, and wind energy is considerable. Unfortunately, the country faces a complex geopolitical situation (Ukraine's wind potential in the Crimea), which hinders the expansion of its renewables sector. Although Ukraine faces several economic and bureaucratic problems, in 2016 the country climbed 13 spots in the World Bank's Doing Business rankings to 83 out of 189 countries. There are also many investment opportunities to help the country meet its new climate commitments, including renewable energy, energy efficiency and climate-smart agriculture.

About renewable energy in Ukraine: IFC estimates that $3 billion will be invested in green buildings by 2020. Data availability to assess the opportunities for low-carbon transportation investments in Ukraine are scarce but IFC estimates a $10 billion investment opportunity for this sector. Existing national priorities in transport emphasize improving the investment climate in this sector by increasing standards and regulations, enhancing public governance efficiency,

refurbishing railways infrastructure facilities, and renewing the transport fleet. Ukraine has a strong industrial sector. The steep increase in natural gas prices in Ukraine has put pressure on energy-intensive sectors, such as cement and steel production, which are quite sensitive to price fluctuations. Due to the high level of energy intensity and the presence of outdated technologies, Ukraine's potential for industrial energy efficiency measures is significant; it is estimated to be $2 billion by 2020. Ukraine adopted a National Renewable Energy Action Plan in October 2014, which sets a target to increase the share of renewables in its final energy consumption to 11 percent by 2020. Renewable energy development in Ukraine is expected to continue, albeit at a slower pace.

Bioeconomy is on the advance globally. Many countries have by now enacted bioeconomy strategies, including the USA, Canada, Germany, Great Britain, Finland, Sweden, Brazil, Argentina and South Africa. Bioeconomy is considered a highly promising concept for renewal of the economy, as well as a key basis for innovation policy. In accordance with their technological strengths and their access to biological raw materials, the various countries have established various focal points in the areas of innovation, bioenergy and the like. In order to better network the activities existing in Europe, bioeconomy enjoys priority within the framework of the eighth EU Framework Programme, Horizon 2020.

The biggest hurdle to achieving the sustainability goals is therefore the application and implementation of new research results. Because although science has already gathered vast amounts of data for instance for a more efficient and sustainable agriculture or waste avoidance or biobased production approaches, there is an obvious lack of implementation of these results almost everywhere - in industry as well as in everyday life.

Concluding the narrative about the sustainable development of world agriculture, I would like to note that the task of increasing the sustainability of the agricultural business does not have a simple solution. This process requires manufacturers to find the right combinations of those tools that are available.

"There is no single right way to increase the sustainability of agriculture." Agricultural producers should consider all possible mechanisms of influence, as in any other business, "the president of the plant protection department, BASF Markus Heldt, summed up the discussion.

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БІОЕКОНОМІКА: МОЖЛИВОСТІ ДЛЯ БІОЛОГІЧНОГО І СТАЛОГО МАЙБУТНЬОГО.

Анотація. Зростаюча чисельність населення світу, обмеженість ресурсів і поточну зміну клімату ставлять перед промисловістю і суспільством серйозні проблеми. В майбутньому нам будуть потрібні нові економічні рішення для підтримки нашого процвітання і управління нашими ресурсами. Відповідно, виникає одне ключове питання: як ми можемо поєднувати економічне зростання зі стійкістю? Стаття розглядає біоекономіка як спосіб, який може допомогти нам знайти відповіді на це питання за допомогою економічних і екологічних зв'язків. Завдяки використанню біологічних ресурсів беспечівает біо-стійкий і економічне зростання. Біоекономіка буде відігравати важливу роль в політиці сталого розвитку, орієнтованої на майбутнє. Вона заснована на ефективному та сталому використанні відновлюваної біологічної сировини. Таким чином, біоекономіка пропонує новаторську і перспективну альтернативу економіці, заснованої досі на копалин видах палива, для яких ресурсна база повільно, але вірно виснажується. Біоекономіка повинна пов'язувати нашу сільську місцевість, сільське господарство і лісове господарство з основними питаннями стратегії уряду. Успішне продовження забезпечення поставок сировини для нинішньої економіки, захисту нашого клімату і навколишнього середовища і не в останню чергу відповідального пропозиції зростаючого населення з достатнім і здоровим харчуванням: успішне освоєння цих найважливіших проблем неможливо без біоекономіческой економіки. Ключові слова: сталий розвиток, біоекономіка, стале сільське господарство, стратегія біоекономікиКлючові слова: стале сільське господарство, збереження сільського господарства, збереження ґрунтів, родючість ґрунтів, управління ґрунтами, програма.

БИОЭКОНОМИКА: ВОЗМОЖНОСТИ ДЛЯ БИОЛОГИЧЕСКОГО И УСТОЙЧИВОГО БУДУЩЕГО

Аннотация. Растущая численность населения мира, ограниченность ресурсов и текущее изменение климата ставят перед промышленностью и обществом серьезные проблемы. В будущем нам потребуются новые экономические решения для поддержания нашего процветания и управления нашими ресурсами. Соответственно, возникает один ключевой вопрос: как мы можем сочетать экономический рост с устойчивостью? Статья рассматривает Биоэкономику как способ, который может помочь нам найти ответы на этот вопрос с помощью экономических и экологических связей. Благодаря использованию биологических ресурсов беспечивается био-устойчивый и экономический рост. Биоэкономика будет играть важную роль в политике устойчивого развития, ориентированной на будущее. Она основана на эффективном и устойчивом использовании возобновляемого биологического сырья. Таким образом, биоэкономика предлагает новаторскую и перспективную альтернативу экономике, основанной до сих пор на ископаемых видах топлива, для которых ресурсная база медленно, но верно истощается. Биоэкономика должна связывать нашу сельскую местность, сельское хозяйство и лесное хозяйство с основными вопросами стратегии правительства. Успешное продолжение обеспечения поставок сырья для нынешней экономики, защиты нашего климата и окружающей среды и не в последнюю очередь ответственного предложения растущего населения с достаточным и здоровым питанием: успешное освоение этих важнейших проблем невозможно без биоэкономической экономики. Ключевые слова: устойчивое развитие, биоэкономика, устойчивое сельское хозяйство, стратегия биоэкономики

BIOECONOMY: OPPORTUNITIES FOR A BIO-BASED AND SUSTAINABLE FUTURE

Annotation. Growing world population, scarce resources and ongoing climate change present industry and society with major challenges. In the future, we will require new economic forms to maintain our prosperity and to enable responsible handling of our resources. One key issue accordingly emerges: how can we combine economic growth with sustainability? Article considers Bioeconomy as a way which can help us to find answers to this question with economy and ecology links. By the use of biological resources, it enables bio-based and sustainable economic growth. Bioeconomy will play a prominent role in future-oriented sustainability policy. It is systematically based on the efficient and sustainable use of renewable biological raw materials. In this way, bioeconomy offers a pioneering and promising alternative to an economy based until now on fossil fuels – for which the resource basis is slowly but surely being depleted. Bioeconomy have to link our countryside, agriculture and forestry with the focal issues on the political agenda of the government. The successful continuation of the assurance of supplies of raw materials for the

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