

**AGRICULTURAL SECTOR IN THE CONTEXT
OF GREEN MODERNIZATION OF ECONOMY**

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DOI: <https://doi.org/10.30525/978-9934-26-193-0-5>

Abstract. Integration processes that cover the agricultural sector determine the vectors of agricultural production, the state of ecosystems, climate change and environmental degradation, exacerbated by their uneven distribution and increasing pollution, imbalance of development, overcoming which exceeds the capabilities of individual states and need to respond to through broad international cooperation. The study identified the need for a green course, characterized by complex environmental, economic and social interrelationships; the experience of the European Union countries in the direction of green restructuring is analyzed; the importance of the impact of climate change on the development of agricultural production is outlined; key EU documents on the path of green modernization are described; the necessity of resource-saving development is substantiated. Emphasis was placed on the need to intensify efforts to introduce a circular economy to counter the negative effects of climate change and crises.

Based on the situation when key indicators of green growth are included in the most important documents of the country's development, but they are not calculated due to lack of appropriate standards of statistics and accounting, which increases the inability to conduct comparative analysis against regional and global results. This makes it difficult to use them in decision-making on green modernization at all levels and to inform the public. It is substantiated that the strategic directions of the transition to a circular model of agricultural production development, the Ukrainian government together with business and civil society, it is advisable to develop separate roadmaps or action plans with clear directions of expected results. In the presence of clear European guidelines for modernization, it is necessary to use financial support instruments as much as possible. The implementation of closed-loop models in practice will stimulate increased

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environmental responsibility and economic efficiency of agricultural production, will improve the overall environmental situation and will be key steps in environmentally oriented development of the agricultural sector.

The aim of the article is to analyze the transformation processes in the agricultural sector, which are caused by climate change, depletion of natural assets and justification of the importance of green modernization of the economy of agricultural production. Realization of the purpose has led to the decision of research tasks: to substantiate necessity of formation of change of a paradigm of development of agrarian sector, to analyze tendencies of introduction of green modernization in the EU countries, to prove expediency of necessity of transition to model of green economy. Domestic agricultural sector, and to ensure the economic and environmental security of the country, because only a circular, resource-saving economy is able to ensure sustainable economic development without harming the environment.

Methodology: the research methodology is based on the dialectical method, which involves the connection of theory and practice, the principles of knowledge of the real world, the determinism of phenomena and processes of interaction between external and internal. The following research methods were used: system-structural; abstract-logical; comparative. Results: According to the results of the study, the degree of modernization of the country's agricultural sector to the EU requirements for a green economy, the European dimension of "green" growth in agriculture, substantiated the feasibility and need for resource-saving agricultural development.

1. Introduction

Modernization of the world economy, the need for balanced development of the world economy, slowing the growth of world trade, all these factors necessitate a fundamentally new approach to economic activity in the agricultural sector of the economy. The urgent problem today is the development of models of "green" growth, along with the need to build the country's potential for greening the agricultural sector; development of systemic long-term measures, which is updated in connection with the aggravation of environmental problems; expanding access to "green" technologies and investments and transferring practical management experience to interested countries and organizations. As a result, the

assessment of the state of implementation of the “green” direction of development of the agricultural sector of the economy in the context of resource-saving development and the circular model needs to be addressed.

Deepened integration into the EU, the main vector of which is the green economy and green growth, the implementation of the Millennium Development Goals, directs all sectors of the economy to seek new forms of use of natural capital. In addition, to ensure the sustainable development of the world economy, it is necessary to introduce ways to counter the slowdown in global economic growth. It is worth noting that modernization models are based on resource-saving, balanced development, rather than increasing production, with significant social protection.

Significant attention is paid to the problems of green economy development by scientific schools of the Institute of Regional Studies of the National Academy of Sciences of Ukraine, the Institute of Market and Ecological and Economic Studies of the National Academy of Sciences of Ukraine, the Institute of Agrarian Economics of the National Academy of Sciences of Ukraine, the Institute of Agroecology University, National University of Food Technology, Odessa State Ecological University, Sumy State University and Sumy National Agrarian University, this is confirmed by a significant number of studies. It should be noted that the scientific reports and reports of the European Commission, the Organization for Economic Co-operation and Development (OECD), the United Nations Environment Program (UNEP).

The aim of the article is to analyze the transformation processes in the agricultural sector, which are caused by climate change, depletion of natural assets and justification of the importance of green modernization of the economy of agricultural production. Realization of the purpose has led to the decision of research tasks: to substantiate necessity of formation of change of a paradigm of development of agrarian sector, to analyze tendencies of introduction of green modernization in the EU countries, to prove expediency of necessity of transition to model of green economy. Domestic agricultural sector, and to ensure the economic and environmental security of the country, because only a circular, resource-saving economy is able to ensure sustainable economic development without harming the environment.

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2. Theoretical foundations of green modernization

Over the last hundred years, many concepts of economic growth have been developed. The main emphasis is on identifying certain aspects of the mechanism of economic growth, its individual factors. This is necessary, especially to develop measures to accelerate economic growth and development. But no less important is a clear definition of their nature. Without this, it is difficult to outline the directions and means of progressive transformation, and to identify ways of further transformation.

Scholars identify several economic processes, such as economic growth, modernization, economic development and social development. Economic growth is a quantitative change in the production system of the country (industry, enterprise), which is expressed in an increase in GDP (GNP) or net product (gross income). Economic growth can occur in some cases without a qualitative change in production systems, which has traditionally been defined as extensive economic growth, in others – accompanied by qualitative improvements in the structure and functions of the production system at one level or another. According to existing terminology, this is intensive economic growth.

Under economic development, understand the purposeful, progressive change of composition, location and interaction of elements, levels and quality of functioning of the production system, increasing its efficiency. Close to the concept of economic development is the modernization of production, which consists in updating the structure and functions of the production system. If these are progressive changes that increase the efficiency of the production system, then such modernization is an integral part of economic development.

There is a complex dialectical connection between economic growth and economic development as quantitative and qualitative changes in

the economy. Economic growth is presented in three variants: positive – with an increase in production; neutral – without changing the volume of production; negative – with a decrease in production. The most common are growth options: based on or in combination with development; without development; with regressive development.

Development as a qualitative improvement of production is more common: in combination with economic growth – with growing demand; with a decrease in production – with a decrease in demand; without economic growth – with stable demand. However, any other option is possible, including the most unfavorable: reducing production with regressive processes at the level of development of the production system.

Thus, summarizing the above, and based on classical economic theory, we note that current models of management expose society to a significant risk of inhibiting growth. Most often, this risk arises from wasteful use of natural capital and neglect of balance in agro-ecosystems. Limited or apathetic implementation of measures aimed at preserving natural capital will inevitably lead to increased costs for its replacement. It is also important that changes in agro-ecosystems and their ability to sustain growth are not necessarily directed in a direct and predictable way. Therefore, in order to avoid the decline of the current level of welfare of the population, new models of production and consumption are needed, as well as fundamentally different approaches to defining the concept of “growth” and measuring its results [11; 31, p. 35–38].

The course of “green” growth has the potential to support economic and social development and is able to provide conditions under which natural assets can continue to provide material goods and services, on which the economy and human well-being depend to a large extent.

At the same time, it should be emphasized that the green transformation of the economy can bring many positive results, such as increased productivity and innovation, the creation of new jobs and markets, as well as new budget revenues. Moreover, ensuring greater resilience to climate change, security of water and energy resources, and the proper functioning of agroecosystems, ie achieving green ecological growth goals, reduces the likelihood of drastic environmental changes that can cause economic and social shocks.

It should be emphasized that to ensure the effectiveness of the green course, national economic policy should stimulate innovation, investment

in sustainable management of natural capital and the withdrawal of higher and long-term profits and benefits from its use [2].

During the transformation processes in Ukraine, it was not possible to increase the economic potential. Some recovery in economic activity in 2016 is insignificant. Instead, resources, capital and time were lost during the structural, energy crisis and pandemic that led to the unsustainable development of the national economy. In turn, the geopolitical conflict, which has lasted for more than eight years, narrows the opportunities for effective development. Ukraine still needs systemic institutional and deep structural reforms, launch of large-scale eco-innovation and technological transformations [14].

As you know, economic growth is understood as changes in the real volume of national production based on the positive dynamics of gross national product.

However, the increase in production is always combined with the depletion of natural resources and environmental pollution, as a result of which the world economy of the XXI century is affected by global environmental problems.

Economic growth is closely linked to the problem of economic development. Economic development can be defined as the transition from one state of the economy to another – qualitatively new, more advanced, based on innovation, structural and institutional changes. Economic growth can occur in the absence of economic development, while economic development is impossible without economic growth. This means that “economic development” is a broader concept than “economic growth” and includes it as the most important condition. Therefore, economic development is determined by traditional factors of economic growth that provide it, ie supply factors, factors of demand and distribution, but it covers a much wider range: the development of science, technology, information services, political and socio-economic factors, and environmental factors, which in the complex are sources of economic development [22].

Today’s environmental and economic problems have become the basis of sustainable development and as a result of the “green” economy. Consideration of the economy as a complex organized and self-reproducing system, where it is necessary to determine the mechanisms of its organization, is being transformed. Note that the modern development of the economy is

characterized by a complex ecological and economic relationship, where the necessary condition is a coordinated interdependence of economic and environmental interests to address ways to adapt to new economic conditions. Scientists have drawn attention to the fact that free or minimal evaluation of a huge number of natural goods and services is the main problem of economic development. When we destroy free nature, it leads to enormous damage. Thus, what has no price or value does not exist for the economy. More than 90% of natural goods and services have no price or valuation, so they do not exist. That is why humanity and all individual countries continue to destroy nature.

However, today the economy of the regions is developing mainly in the direction of self-development, and has a relatively separate reproductive system of management and administration and practically pursues its own export policy. Involving a significant number of countries in the transformation processes of the world economy requires the joint efforts of the governments of these countries and international organizations in order to regulate their development on a global scale [21].

Thus, the transformation processes are manifested in the growing dependence of the economies of the world community, due to the intensive international movement of goods and services, capital flows, rapid and widespread use of new technologies.

3. Experience of EU countries on the path of green transformations

It should be emphasized that the EU Strategies and Framework for Research and Technological Development towards Green Modernization have undergone a long evolution of their development. Work is currently under way in Brussels on a new EU strategy – Europe 2030 and the EU's 9th Framework Program for Research and Technological Development.

The success of the new EU program can contribute to the further development of pan-European cooperation in science and innovation and to building relationships with key partners. Overcoming the crisis within the EU can be achieved through the development of European innovation policy, which is formed at several levels. According to preliminary data, the EU in 2030 will be characterized by funding projects with high “social impact” and education”. The EU faces the challenge of transitioning to a low-carbon economy, sustainable production and consumption, the so-called cyclical

economy, which was presented to the European Commission in a 1976 report and actively promoted in 2012 by the McKinsey Agency. With this in mind, in 2015 the European Commission developed an appropriate action plan [6].

Through the transition to a “cyclical economy” and other “transformations”, the EU is operating successfully in global markets, paving the way for sustainable development and digitalisation. At the same time, artificial intelligence technologies play an important role in digitalization. Member States manage to develop a common policy on these technologies, and all projects allow for high social benefits [6; 9].

In addition, the European Commission has adopted a new EU Biodiversity Strategy to 2030 and the related Action Plan – a long-term plan for nature protection and restoration of degraded ecosystems (from 20.05.2020, COM (2020) 380 final).

In the context of the COVID-19 situation, the biodiversity strategy aims to increase society’s resilience to future threats, such as the effects of climate change, forest fires, food security or disease outbreaks.

The Strategy also emphasizes that the COVID-19 pandemic makes the need to protect and restore nature even more urgent. “A pandemic is an awareness of the connection between our own health and the health of ecosystems. The risk of occurrence and spread of infectious diseases increases with the destruction of nature. Protecting and restoring biodiversity and well-functioning ecosystems is a key factor in increasing our resilience and preventing the emergence and spread of future diseases” strategy said. One of the benchmarks for recovery will be The European Green Deal. The strategy contains specific commitments and actions to be implemented in the EU by 2030, including: creating a larger network of protected areas on land and at sea, creating new and expanding existing protected areas; at least 30% of the land and 30% of the sea must have a conservation status; at least one third of protected areas – 10% of land and 10% of marine waters must be under strict protection; special attention should be paid to virgin and ancient forests, peatlands, meadows, wetlands; It is important to create ecological corridors to prevent genetic isolation, ensure species migration and maintain ecosystem health [23].

The EU’s 2030 Biodiversity Strategy emphasizes key commitments to 2030:

1. At least 30% of the land and 30% of the EU’s marine waters are legally protected and connected by ecological corridors as part of the Trans-European Eco-Network.

2. At least one third of the EU's protected areas shall be strictly protected, including all virgin forests remaining in the EU and old-growth forests.

3. Effective management of all protected areas is ensured, clear conservation objectives and measures are defined and proper monitoring is carried out.

Thus, the EU Nature Recovery Plan is a set of specific commitments and actions to restore and sustainably manage degraded ecosystems in the EU by 2030. Reducing pressure on habitats and species, ensuring sustainable use of all ecosystems, restoring nature, limiting soil compaction, overcoming pollution and invasive alien species, the plan will create jobs, align economic activities with nature and help ensure long-term productivity and value of natural capital. The main vectors are as follows:

1. The EU's legally binding targets for nature restoration, to be proposed by 2021, are subject to impact assessment. By 2030, large areas of degraded and carbon-rich ecosystems will be restored; habitats and species show no deterioration in conservation trends and status; and at least 30% achieve favorable conservation status or at least show positive trends.

2. Decrease in the number of pollinators changes to increase.

3. The risk and use of chemical pesticides is reduced by 50%, and the use of more dangerous pesticides – by 50%.

4. At least 10% of agricultural land has a high degree of landscape diversity.

5. At least 25% of agricultural land is managed by organic farming, and the use of agri-environmental methods is significantly increasing.

6. Three billion new trees have been planted in the EU, in full compliance with environmental principles.

7. Significant progress has been made in the remediation of contaminated soil.

8. At least 25,000 km of free-flowing rivers have been restored.

9. The number of Red List species threatened by invasive alien species is reduced by 50%.

10. Loss of nutrients from fertilizers is reduced by 50%, which leads to a reduction in the use of fertilizers by at least 20%.

11. Cities with at least 20,000 inhabitants have an ambitious Urban Greening Plan.

12. No chemical pesticides are used in sensitive areas, such as EU urban green spaces.

13. Negative impacts on sensitive species and habitats, including the seabed through fishing and mining, are significantly reduced to achieve good environmental status.

14. By-catches of all sensitive species shall be eliminated or reduced to a level that allows species to be restored and preserved.

At the same time, it should be emphasized that in order to achieve these goals, the European Commission will create a new European biodiversity governance framework. A new monitoring mechanism will be introduced to assess progress and corrective action. Particular attention will be paid to measures to stimulate and remove barriers to environmental decision-making, as this can lead to significant opportunities for business and employment in various sectors and is a key to innovation for economic or social needs.

Logically, the question arises about combating biodiversity loss, which must be supported by sound science. Investing in research, innovation and knowledge sharing will be key to data collection and the development of the best environmental solutions. The Commission will promote the new Biodiversity Knowledge Center in close cooperation with the European Environment Agency [23].

Significant public and private investment at national and European levels is needed to overcome biodiversity loss and restore ecosystems. This will mean maximizing the use of all relevant EU funding programs and instruments. To meet the needs of this strategy, including investment priorities for Nature 2000 and environmental infrastructure, at least € 20 billion a year must be set aside for nature spending. This will require mobile private and public funding at national and EU level, including through a number of different programs in the next long-term EU budget. As nature restoration will make a major contribution to climate goals, a significant part of the 25% of the EU budget devoted to climate action will be invested in biodiversity and nature-based solutions [14; 23].

Along with the Biodiversity Strategy, the European Union has presented an ambitious strategy to reduce greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. It will affect all areas of the economy – from home heating to transport.

The European Commission has adopted a package of proposals that should reduce greenhouse gas emissions in the EU by 2030 by at least 55% compared to 1990 levels.

The strategy calls for Europe to become the world's first climate-neutral part of the world by 2050. The EU will transform all areas of its economy. Until now, Europe has focused on reducing emissions in several sectors, and now climate neutrality extends to the entire economy.

The following measures are envisaged for this: It is proposed to accelerate the transition to green energy so that by 2030 40% of energy is produced from renewable sources. To this end, it is proposed to encourage the abandonment of fossil fuels and the transition to green technologies through tax incentives.

It is proposed to set stricter standards for the transport industry for greenhouse gas emissions: new cars should reduce them by 55% from 2030 (compared to this year), and from 2035 all new cars should be zero emissions. To this end, in particular, it is proposed to expand the network of charging stations on EU roads.

It is proposed to tighten the country's energy saving commitments, in particular by requiring the public sector to modernize its premises to reduce energy consumption and costs for taxpayers. It is also proposed to introduce the world's first carbon tax on imports of certain products. This ensures that reducing emissions in Europe will help reduce emissions around the world instead of displacing carbon-intensive production outside Europe.

One of the main vectors is the expansion of the emissions trading system. Producers' payments for environmental pollution have risen to record levels, and there are fears that these costs will be passed on to consumers [2; 3].

Thus, all countries of the world are thinking about how to restructure their economy so that it is social and inclusive, provides growth and is climate-neutral. This is the goal of the European Green Deal, which is currently being implemented by the European Union.

4. Green modernization is the basis of sustainable development

The economic growth of the world economy in the last decade has posed the problem of a sharp increase in the consumption of natural resources. However, as the economy grows, so does the burden on the environment. Combining economic growth and environmental security is impossible without

modernizing the economy. In addition, when considering the possibility of implementing the standards and practices of the world community, it is necessary to take into account the fact that our country has the richest natural resources and is one of the largest exporters of agricultural products. For this reason, the problems of depletion of natural assets are not yet clearly manifested, while there is a rapid deterioration of the ecological state [4; 18]. Global climate change poses high environmental risks and threats to humanity. The dynamics of global CO₂ emissions show that the world economy has reached a critical level of carbon saturation. And for the last 11 years (since 2009) the growth of CO₂ emissions in the world in some years has outpaced the growth rate of GDP (primarily due to China, India, Russia, Japan) [28].

This process is becoming more and more widespread every year, creating a threat to socio-economic development for a number of countries. Combating climate change in developed and developing countries has begun to require urgent action to achieve unprecedented economic, social and technological change. The amount of resources attracted by world trade increased from 19 billion tons in 2005 to 25 billion in 2018. The UN estimates that by 2050, 9 billion people will consume about 140 billion tons of depleted resources a year – three times more than now. For the modern economy, 60 billion tons of raw materials (22 kg/person/day) are extracted annually. At the same time, the number of resources in the world reached its limit, and as a consequence of rising prices and increasing volatility in agricultural markets [18].

Scholars argue that the main paradigm for the development of the world economy in the 21st century is sustainable development. The following key documents can be highlighted here: The World Conservation Strategy, Our Common Future, The Agenda for the 21st Century, Towards a Green Economy: Ways to Sustainable Development and Poverty Eradication, and The Global Green New course, “Sustainable Development Agenda 2030”, EU Green Agreement (see Table 1).

Given such positions and the urgency of comprehensive expansion in the Ukrainian agricultural sector, the current trends in achieving sustainable development goals, need to expand the scope of research on the current state of agricultural production. It should be noted that resource-saving transformations based on sustainable green growth, environmental protection and inclusive process, as well as taking into account the specifics of national development, are the most effective in this direction.

Key documents of green modernization of the economy

	The name of the document	Contents of the document
1	UN Stockholm Conference on the Environment (1972) "Environmental Action Plan"	health care and welfare of the population; protection of soils and waters and combating desertification; education, professional training and information support of nature protection; protection of the oceans, protection of vegetation, wildlife and genetic resources, problems of energy resources and energy conservation.
2	"World Conservation Strategy" (1980), presented by the International Union for Conservation of Nature and Natural Resources	The very concept of "sustainable development" first appeared in a report where it was defined as the modification of the biosphere and the use of human, financial, reproducible and non-reproducible natural resources to meet human needs. In order for development to be sustainable, it is necessary to take into account not only economic, but also social, environmental and cultural factors in the long run.
3	"Our Common Future" (1987), prepared by the World Commission on Environment and Development (Brundtland Commission)	The conclusions of this Commission laid the theoretical, methodological and conceptual basis for the decisions taken within Rio 92 on the need for civilization to reach the level of sustainable development. The concept of sustainable development became the theoretical basis for human development for the next two decades.
4	1992 United Nations International Conference on the Environment "Agenda for the XXI Century"	Adoption of the main principle of policy and action of UN member states – "meeting the needs of modern times should not undermine the ability of future generations to meet their own needs."
5	Johannesburg World Summit on Sustainable Development (2002) (South Africa)	The Johannesburg Declaration on Sustainable Development has been adopted
6	United Nations Environment Program (UNEP) Global Green New Report (2009)	The three-general purpose is formulated: comprehensively contribute to the recovery of the world economy, preserving existing jobs and creating new ones, while protecting the interests of the most vulnerable groups; reduce carbon emissions and prevent the destruction of ecosystems by directing the economies of different countries on the path of environmentally friendly and sustainable development; to ensure sustainable and comprehensive economic growth and the achievement of the Millennium Development Goals.

Chapter «Economic sciences»

(End of Table 1)

	The name of the document	Contents of the document
7	UNEP Report “Towards a Green Economy: Ways to Sustainable Development and Poverty Eradication” (2011)	The term “green” economy is formulated. UNEP identifies several priority areas for a green economy: efficient use of natural resources; protection and increase of natural capital; pollution reduction; low carbon emissions; prevention of loss of ecosystem services and biodiversity; income and employment growth
8	United Nations Conference on Sustainable Development Rio de Janeiro (Rio + 20) (2012)	Through the efforts of leading countries, a strategy has been developed to reduce poverty, promote social justice and ensure environmental protection measures [10]..
9	In the framework of the 70th session of the UN General Assembly in New York, the UN Summit on Sustainable Development and the adoption of the Agenda for Development after 2015 (2015)	Approved new guidelines for development “Transformation of our world” Sustainable Development Agenda 2030 “17 Sustainable Development Goals and 169 tasks were approved.
10	European Green Deal December 2019	A significant part of the program is the transformation of agriculture: a strategy for sustainable use of chemicals and reduction of CO2 emissions. A number of transformations are envisaged, in particular for rural areas, modernization and changes in approaches to the work of agricultural enterprises, a package of climate laws, development of bioenergy, renewable energy and eco-products.
11	EU Biodiversity Strategy 2030 and related Action Plan of 20.05.2020, COM (2020) 380 final)	In the context of the COVID-19 situation, the biodiversity strategy aims to increase society’s resilience to future threats, such as the effects of climate change, forest fires, food security or disease outbreaks. The strategy contains specific commitments and actions to be implemented in the EU by 2030, including: the creation of a larger network of protected areas on land and at sea, the creation of new and expansion of existing protected areas. at least 30% of the land and 30% of the sea must have conservation status. It is important to create ecological corridors to prevent genetic isolation, ensure species migration and maintain ecosystem health.
12	Farm to Fork Strategy, May 2020	provides for the transformation of food policy and a significant increase in the share of organic farming

Source: compiled by the author using sources [11; 17; 23]

If we analyze the Green Deal strategy, as well as EU policy documents on the circular economy and agriculture (Farm to Fork), we will see that many elements of these policies are already being implemented in Ukraine [9; 13].

For example, in the field of circular economy, Ukraine is already moving to EU standards and requirements for the disposal of electronic equipment, eco-design and eco-labeling. Relevant EU directives and regulations are part of the so-called “industrial visa ban” – the ACAA agreement. Or remember the new Law on Public Procurement, which came into force on April 19 last year. It opens up opportunities for the development of “green” and “life cycle” procurement. This is the main tool to encourage the production of more climate-friendly products. Expanding access to secondary resources is also important for the circular economy.

5. Resource-saving development of the agar sector

The concept of resource conservation is interpreted in scientific papers as conservation and savings. Resource conservation is an organizational, economic, scientific, technical, practical and informational activity that accompanies all stages of the life cycle of facilities and aims to ensure minimum consumption of matter and energy per unit of final product, given the current level of technology and the least impact on man and natural systems [15, p. 17–22]. The concept of resource conservation is based on the tendency to care for natural resources.

At the same time, there is another approach to the interpretation of resource conservation, which is associated with savings (savings) of different types of resources [20, p. 1–14; 26, p. 8–19].

Summarizing the above, it was stated that the development of a resource-saving economy has become an integral paradigm of almost all developed countries, even with sufficient natural resources.

Resource-saving economy – modernization of existing basic industries, increasing their perception of innovation (using the unrealized opportunities of the third, fourth and fifth technological modes) for basic activities [4]. Climate change and resource-saving economy are determining factors influencing the scale and prospects of eco-innovation as a factor in greening Ukraine’s economy, as well as levers and tools to stimulate eco-innovation policy to reduce the gap with European countries in implementing the economic part of the Association Agreement. Ukraine and the EU.

Based on the analysis of interpretations of leading scientists and practitioners on the development of resource-saving economy Musina L., Kvashi T., Polovnikova S., Taran V. it has been proven that economic growth and resource-saving economy are complementary strategies. The growing popularity of the green economy is associated with numerous crises – especially climate, environmental, financial and economic, which determined the need to find alternative ways of development [12, p. 12–31].

Analysis of the G-20 Resource Efficiency Dialogue, Resource Efficient Europe, Europe 2020 Strategy, Circular Economy Strategy, Horizon 2020 Research and Innovation Framework Program makes it possible to state that the relationship between these policy documents is aimed at transformation. In a resource-saving economy that relies on systemic innovation in response to growing challenges from resource constraints and climate change [7].

Of particular note is the rather new document COP26 Main Climate Summit: (2021) [1], which outlined the most likely threats to the global economy: the effects of climate change, cyber threats and economic instability. Climate risks, sustainable development and new technologies that reduce the burden on the environment are key factors that necessitate the modernization of economic growth. It should also be noted that the pandemic has significantly complicated the implementation of the main goal of the UN – to prevent temperatures from rising by more than 1.5 degrees. The summit announced \$ 4.1 billion in financial assistance to developing countries to develop green economies. At the same time, it is emphasized that a number of countries have committed themselves to achieving climate neutrality by the middle of the millennium, while many countries have given up coal and cities are pursuing carbon neutrality.

The European Green Course continues to be a key vector in shaping and developing the EU's climate and environmental policies. The European Commission has approved the Circular Economy Action Plan, the EU Industrial Strategy. In the field of climate, a draft European climate law was presented, public consultations were launched within the framework of the European Climate Pact and on updating the targets for reducing greenhouse gas emissions for 2030. The EU institutions have also worked on the protection of biodiversity and the renewal of agricultural policy, which are one of the key areas of the course. However, the COVID-19 pandemic has made adjustments in this area – the adoption of planned strategies has been postponed.

At the same time, the European institutions are unanimous about the inevitability of reforms under the European Green Course, despite urgent measures to overcome the coronavirus and economic crises. Actions on specific environmental issues caused by the pandemic are being adjusted, guidelines on waste transportation in the EU and waste management in the context of the coronavirus crisis have been published [1; 9; 13].

In Ukraine, the depletion of natural resources, increasing harmful effects on human health, environmental pollution, negative structural changes in the economy, which increase the share of naturally exploiting and polluting industries, are factors that accelerate transformational changes. These processes are evidenced by the inability of modern models to take into account the effects of complex causal relationships between economic assets and natural capital, the inability to ensure their productive use and reproduction [27, p. 120–127]. The application of measures to combat climate change, the introduction and scientific justification of modernization potential and the promotion of new forms of economic cooperation, focuses the attention of scientists on the transition to a closed-loop economy (circular economy).

Against the background of transformation processes is the formation of a new economic model of circular (circular) economy as a type of management aimed at resource and energy conservation, regenerative clean production, circulation and consumption, reuse of raw materials, resources and waste, which are considered resources for the next production cycle.

The Ellen MacArthur Foundation's Towards a Circular Economy-I report (promoting the principles and ideas of the circular economy around the world) highlights the important benefits of the circular economy and sets out the following objectives: and design. In a circular economy, products are designed to be easily reused, disassembled, and fully recovered – or recycled – with the understanding that it is the reuse of vast amounts of material recovered from products that have reached the end of their life cycle. At the same time, there is no extraction of new resources, is, thus laying the foundations for economic growth.

In addition, the circular economy emphasizes the use of renewable energy and the elimination of toxic chemicals that can harm reuse, and aims to eliminate waste through advanced and innovative design of materials, products, systems and, therefore, business models [29, p. 19; 30].

According to the Ellen McArthur Foundation (the initiator of this model), the transition to a “circular” model of consumption will save \$ 700 billion a year in the consumer goods sector in European countries; by 2025, increasing the level of recycling and reuse of waste could create an additional \$ 1 trillion for the global economy. Most EU countries (Denmark, Sweden, the Netherlands) have national strategies for the development of the circular economy and have already experienced significant benefits from its implementation [25].

In turn, the practice of unbalanced agriculture is unfavorable for the environment. Generalization of research on the use of waste in agriculture, taking into account the recommendations of the Framework Draft Law on Waste Management and proposals on compliance with EU waste law (see Table 2), is now fully focused on the circular economy, where the key principle is to avoid waste and maximum increase in the possibility of their reuse [8; 19].

Agricultural waste management must comply with the principles of the five-step hierarchy of waste, the polluter pays principle – the producer of agricultural waste is responsible for waste management costs, and the principle of self-sufficiency and proximity, ie creating a comprehensive network of waste disposal facilities based on best available technologies [8; 16].

This can also be reproduced by the “pyramid” (Figure 1): according to the waste hierarchy, the highest priority is to prevent waste generation (the main part), followed by the optimal use of waste as a resource. Next in the hierarchy – the restoration of nutrients (nutrients) and their use to restore soil fertility. Less important is the use of biomass for energy. The least desirable option is burial (top).

Preference will be given to ways in which simultaneous recovery of nutrients and energy recovery are cost-effective.

The agro-industrial complex can operate without waste at all, as the latter can be converted into feed, compost, fuel or raw materials for the chemical industry. Advantages of avoiding the formation of waste on the farm: reducing the amount of raw materials to be purchased, saving time and money on waste management, reducing environmental damage, compliance of the farm with the requirements of environmental legislation [16].

Use of waste in agriculture*

Wastes of plant origin	
Waste into energy	Stimulating the use of agricultural waste biomass for energy production (introduction of economic instruments); Support for energy production by anaerobic decomposition plants (option – “green tariff”);
general requirements	New requirements for storage, transportation and treatment of agricultural waste, including vegetable origin;
Composting	Introduction of incentives for composting of agricultural waste; Establishing requirements for the quality of compost and raw materials for compost; Establishing requirements for the introduction of compost into the soil;
Incineration	New requirements for vegetable waste incineration;
Waste in the feed	Introduction of mechanisms for providing subsidies for the collection and transportation of plant waste suitable for the production of feed for animal fattening;
Animal waste	
general requirements	Establishing requirements for treatment, recycling, recovery and disposal of animal by-products;
Composting	Stimulating the introduction of composting of agricultural waste; Establishing requirements for the quality of compost and raw materials for compost; Establishing requirements for the introduction of compost into the soil; Establishing requirements for the introduction of animal excrement into the soil; Establishment of veterinary and sanitary requirements for the use of animal by-products; Creation of a network of regional facilities for environmentally friendly processing of animal waste; Establishing requirements for the development of animal excrement management plans for farms with breeding facilities: poultry (40 thousand places and more); pigs (1 thousand seats and more, for sows – 500 seats and more); cattle and small cattle (1 thousand places and more); rabbits and other fur animals (2,000 or more).
Fertilizers means to improve yields, agrochemistry	
	Establishing requirements for the composition and quality of organic fertilizers; Establishing requirements for the use and storage of agrochemicals that meet EU requirements

Source: [4; 19]

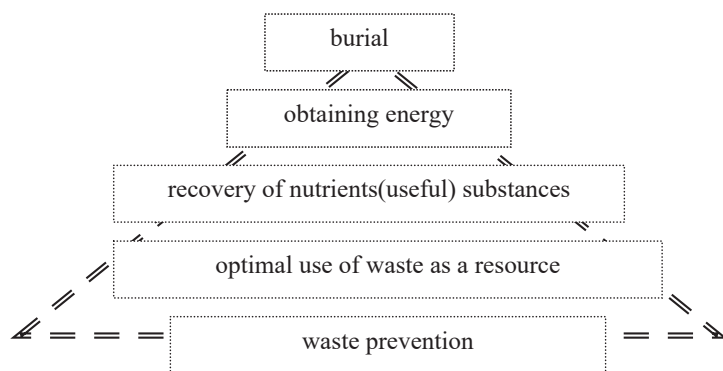


Figure 1. Pyramid of agricultural waste management

The European Union has ambitious plans to develop organic agricultural production and reduce the use of pesticides and fertilizers. This is a great advantage for Ukraine, as 468 thousand hectares of land have organic status. The EU aims for the status of organic land to be 25%, currently in the country about 1%. But at the same time in absolute numbers – this is the tenth place among European countries. The development of organic agriculture depends entirely on our trade with the EU, 70% of exports of organic products are EU countries.

In 2022, it is planned to complete the implementation of our system of control over organic production and ensure its recognition in the EU. This will greatly simplify trade and strengthen confidence in Ukrainian products. However, in Ukraine pesticides are used 1.35 kg per hectare with EU targets of 1.55 kg.

Therefore, the integration of agriculture between Ukraine and the EU aims to ensure better quality of agricultural products and efficiency of agricultural production, rather than reducing the use of chemicals. Farmers are fully prepared to implement the goals of the Farm to Fork policy in order to achieve these goals in the most effective way [9; 13].

Given that the closed-loop economy is a fundamentally new model that will have economic, environmental and social effects for both domestic enterprises and to ensure economic and environmental security of the country, because the circular economy is able to ensure sustainable economic

development without harming the environment. environment [10, p. 41–57]. The national waste management strategy is not a way of restructuring the Ukrainian economy from a straightforward to a closed one, but only its initial stage. With the transition to a closed-loop economy, there is a need to introduce new, resource-saving and environmentally friendly business models.

To date, scientists emphasize the classification of models of management in a circular economy, which provide a cycle of resources. This classification was developed by the international consulting agency Accenture as one of the results of the study “Circular Advantage: Innovative Business Models and Technologies to Create Value in a World without Limits to Growth” [29].

Thus, the essence of the circular economy is as follows, its desire to repeat the natural system, where everything that is produced or used is completely processed in the middle of the system so that there are no environmental problems.

Green modernization, a planned transition to closed-loop models in the agricultural sector, will not only make a profit for farmers, but also prevent pollution of air, water and land resources with harmful substances, while providing favorable conditions for human life. With the strategic directions of transition to a circular model of agricultural production development, the Ukrainian government together with business and civil society should develop separate roadmaps or action plans with clear directions of expected results. In the presence of clear European guidelines for modernization, it is necessary to use financial support instruments as much as possible. The implementation of closed-loop models in practice will stimulate increased environmental responsibility and economic efficiency of agricultural production, will improve the overall environmental situation and will be key steps in environmentally oriented development of the agricultural sector.

6. Conclusions and prospects for further research

1. The processes of modernization of the economy of agricultural production are characterized by increasing requirements for environmental protection, which is a necessary requirement for green growth. Thus, the environmental factor has become an integral part of economic growth, but not the source of growth. Green growth is an integral condition for the sectoral greening of agricultural production, ie it is a powerful factor in restructuring the economy on the path of green modernization.

2. Strengthening the requirements for control over the state of the environment and the quality of agricultural products encourages agricultural producers to transition to a closed-cycle economy, a circular economy and the transition to organic production.

3. The priority for the country is to meet the requirements of the free trade area with the EU in the field of agricultural production, which can be realized by increasing the export of safe agricultural products. This area of trade relations creates stability and competitiveness in the European market. However, existing progress remains volatile. Given the current realities, the EU cannot effectively influence the introduction of green growth in the country to meet today's challenges, it is the will of the country itself.

4. Long-term prospects for modernization and sustainable development of the country are not able to resolve territorial disputes, which significantly reduces the opportunities and motivation to implement green growth goals.

5. Resource-saving transformations, as an integral part of economic growth, ensure the sustainable development of the agar sector .Current and promising strategic and policy documents do not fully cover current trends in the implementation of greening policies and the transition to a green economy in the industry, including the introduction of resource-saving, energy efficient, safe and environmentally friendly technologies for agricultural production and agriculture. climate change, the contribution of agriculture to greenhouse gas emissions and the implementation of measures to reduce them, etc.

6. The solution to these problems depends on strengthening the requirements for the conservation of resources with the provision of green growth, which effectively meets the needs of society without depletion, degradation and pollution of nature. Thus, with a sound approach, a systematic transition to closed-loop models in the agricultural sector will accelerate integration processes, propose appropriate measures focused on the capabilities of economic entities in the agricultural sector.

7. Based on the situation when key indicators of “green” growth are included in the most important documents of the country's development, but they are not calculated due to lack of appropriate standards of statistics and accounting, which increases the impossibility of comparative analysis against regional and global results. This makes it difficult to use them in decision-making processes at all levels and to inform the public. However,

the use of an expanded system of green growth indicators or a system of key indicators (core/key indicators) will allow strategic planning to assess the processes of economic modernization. The definition of OECD Green Growth Indicators under the EU4Environment (2019) program will allow Ukraine to monitor green growth, which is the subject of further research.

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