Bioenergy initiatives in Ukraine: strategic directions, policies, and future potential

Yakubiv Valentyna
Iryna Hryhoruk

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Bioenergy initiatives in Ukraine: strategic directions, policies, and future potential

Yakubiv Valentyna*
Iryna Hryhoruk**

Abstract

The article deals with the role and importance of bioenergy as a priority area for agriculture sector development. The main problems are outlined. Strategic directions of bioenergy development considering current challenges and demands are suggested. "Green" road map for the bioenergy sector in agricultural enterprises is developed based on highlighted strategic priorities.

A system of indicators is proposed that contribute to the sustainable development of the bioenergy direction of agricultural enterprises. Environmental, social and economic indicators are described. The state support should be aimed at the creation of environmentally friendly and waste-free agricultural production. It will allow Ukraine to become less dependent on energy imports and significantly strengthen economic, energy, and political security.

Keywords: *bioenergy, strategic directions, indicators of sustainable development, state support, agricultural enterprises*

Fundamental and applied research on renewable energy, especially bioenergy,

* Vasyl Stefanyk Precarpathian National University, 57 Shevchenko Str., 76018, Ivano-Frankivsk, Ukraine, yakubiv.valentyna@gmail.com

**Vasyl Stefanyk Precarpathian National University, 57 Shevchenko Str., 76018, Ivano-Frankivsk, Ukraine, ira.hryhoruk@gmail.com

is actively supported both in terms of making a significant contribution to the development of world science and addressing the issue of energy independence and security of different countries. A lot of studies are focused on bioenergy, which means renewable energy resource of biological origin, characterized by certain potential and technologies of production and use. The role and importance of bioenergy for the development of the economy have been repeatedly emphasized in the reports of scientists, experts, practitioners, all those who are in one way or another involved in energy problems.

For many years, bioenergy has been widely considered the most promising solution to energy challenges. Bioenergy policies have been promoted in different countries worldwide [1–4], as well as in Ukraine [5–8].

Ukraine has low activity in the development of alternative energy but has significant potential and the necessary resources. Moreover, Ukraine is well-known for its potential as a supplier of agricultural goods to the EU region. 42 of 60 Mha can be used for crop production [9]. The geographical location close to countries of the European Union and its access to the Black Sea is additionally advantageous to its role as a global supplier of biomass resources. Therefore, the state is frequently identified as one of the most promising suppliers of biofuel feedstock to the EU.

At the same time, there are many problems and obstacles to the development of bioenergy in Ukraine. In particular, the government does not have a holistic strategic vision for the use of bioenergy potential of agriculture, taking into account possible financial, economic, and other risks and threats.

The aim of the article is to suggest strategic directions and state policy for bioenergy development in Ukraine.

As already mentioned, the agrarian status of Ukraine contributes to the introduction of bioenergy in agricultural enterprises, as our state has the necessary

resources［11］. Given the significant prospects for the development of bioenergy in Ukraine, we also analyzed the potential of external conditions in this area, which contribute to or inhibit the boosting of the bioenergy sector in general.

Energy assessment of the available potential of biomass of agricultural origin was conducted, based on the results of which we can state that this source is one of the most promising in Ukraine. However, the strategic orientation for bioenergy sector development must take into account the constraints arising from the principle of sustainability（Fig 1）.

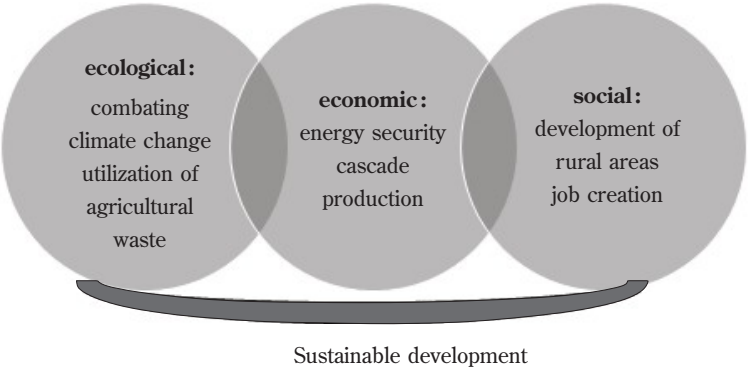

Fig. 1. Strategic priorities for the development of bioenergy direction of agricultural enterprises in terms of sustainable development

The main strategic directions of bioenergy development are the following:

1）Increasing energy production from biomass will have a significant impact on land use. Therefore, land should be allocated for energy crops only when there is a surplus of land.

2）Food security: the demand for food should always take precedence over the energy demand. The view that expanding the use of bioenergy will lead to serious competition with food is not accepted by many experts［11］. According to the FAO［12］, more than 80% of the world's future demand for food and feed will

be met by increasing productivity. Thus, in particular, between 1961 and 2009, the global arable land area increased by about 12%, and agricultural production increased by 150%, due to increased productivity. Therefore, the situation with global food security is constantly improving, as indicated by the steady increase in average food consumption per capita [13]. According to the results of research [14], no correlations were found between food security indices and the share of bioenergy and renewable energy sources in 8 out of 13 countries (from 2012 to 2018).

The agricultural sector does not suffer losses with the development of renewable energy, in particular bioenergy.

However, many European countries' strategies include the principle of "nutrition first", indicating that increasing the production of biomass in agricultural products should first focus on meeting food needs before supplying raw materials for energy purposes.

3) Trade restrictions on exports. Instead of its production, the government of Ukraine annually exports significant amounts of raw materials for biofuel production. It is strategically important to focus on own production with the obligatory observance of the requirements of sustainable development.

4) Reducing the use of traditional types of biomass. Traditional biomass is already a major source of energy in developing countries, primarily for heating and cooking in rural areas. Bioenergy development strategies should include the transition from traditional forms of biomass use to more modern equipment, such as biogas or biofuel boilers.

5) Introduction of mandatory biofuel certification systems. This certification should be the basis for a national system for verifying compliance with sustainability criteria.

6) Priority of energy security issues. Bioenergy helps reduce dependence on

imports. However, in some countries, import dependence may shift from fossil fuels to bioenergy. Therefore, energy security should be carefully considered when developing new bioenergy policies. In the context of energy security, environmental sustainability and energy efficiency are important［15］. The development of bioenergy in agricultural enterprises is one of the important areas to ensure energy security.

7）Development of cascade utilization strategy. Cascade utilization of biomass takes place in a variety of forms and contexts. Cascading is a strategy that aims to use resources or products made from such resources for as long as possible over a given economic cycle. The energy use of agricultural waste is usually at the bottom of the “cascade”, as it is one of the most cost-effective options for the disposal of raw materials.

8）Development of a “green” roadmap that will take into account all the limitations arising from the concept of sustainable development.

A comprehensive study of the conceptual foundations of strategic preconditions for the development of bioenergy based on agricultural enterprises has shown the presence of strategic potential for the development of the sector. However, at present, there are some difficulties related to the economic and legal regulation of the renewable energy market in Ukraine. Therefore, the concept of the development of renewable energy in Ukraine should include the clarification of the economic and legal framework for regulating the activities of economic entities that produce biofuels.

The “green” roadmap for the development of the agricultural sector is a strategically oriented plan aimed at ensuring efficient and sustainable environmental and energy development of the industry. The development of a “green” roadmap is based on the “17 Sustainable Development Goals by 2030”［16］adopted at the UN Summit on Sustainable Development（September 2015）. The document pro-

claims 17 main goals to be achieved to ensure the sustainable development of society. The principles and priorities of the "green" roadmap take into account 5 out of 17 goals of sustainable development, namely: overcoming hunger; good health and well-being; available and clean energy; decent work and economic growth; responsible consumption and production.

Based on the "17 Sustainable Development Goals to 2030" adopted at the UN Summit on Sustainable Development (September 2015) in Ukraine, a draft Strategy for Sustainable Development of Ukraine until 2030 was developed, which defines 8 strategic goals. The priorities of the "green" roadmap for agricultural development in Ukraine, which are based on sustainable environmental and energy development, take into account 4 of the 8 strategic goals of the Sustainable Development Strategy of Ukraine until 2030, namely: first, second, fourth, fifth and sixth goal.

Thus, our proposed "green" roadmap for the development of the agricultural sector provides for the following strategic priorities:

- development of organic production in agricultural enterprises (increasing the share of organic production);

- introduction of innovative technologies of organic production of agricultural products (intensification of production);

- development of bioenergy direction in agricultural enterprises (due to processing of crop and livestock waste);

- entering the international markets of organic agricultural products and increasing the share of exports;

- preservation of eco-balance in the process of using natural resources;

- continuous improvement and increase of efficiency of the system of ecological and energy development of agricultural enterprises.

To implement the above-described strategic priorities of the "green" roadmap

for the development of bioenergy in practice, it is advisable to develop detailed goals and mechanisms for their implementation. At the same time, it should be noted that such detailed goals and mechanisms depend on the specifics, production capacity, financial capacity of specific enterprises, so the process of business planning of these implementations will be specific to each enterprise.

It is important to achieve a high level of efficiency in the development of energy and environmental areas of agricultural enterprises. This means that our proposed “green” roadmap for the development of agricultural enterprises must be highly efficient from an economic, environmental, and energy point of view.

Based on the study, a system of indicators was proposed that would contribute to the sustainable development of the bioenergy direction of agricultural enterprises. Indicators are divided into three groups: environmental, social, and economic (Table 1).

Thus, a comprehensive study of the conceptual foundations of the strategic pre-

Table 1. System of indicators of sustainable development of bioenergy direction of agricultural enterprises

Environmental indicators	Social indicators	Economic indicators
- Ensuring biodiversity - Assessment of the balance of greenhouse gases and their real impact on the environment. The impact of bio-energy systems should be compared with the effects of burning fossil fuels.	- Energy security - Food security - Creation of new jobs - Ensuring consultation with all people involved in making important decisions	- Diversification of the economy of agricultural enterprises - Reducing the cost of production - Increasing the competitiveness of the enterprise - Cost savings on heat and electricity by enterprises with significant amounts of organic waste - Replacement of traditional use of biomass by modern bioenergy technologies

conditions for the development of bioenergy on the basis of agricultural enterprises has shown the importance of focusing on the principles of sustainable development, taking into account all the limitations that follow. The main reasons for the slow development of bioenergy are related to the low level of environmental awareness of producers and consumers and the lack of effective government support.

Given the available potential of the bioenergy direction of agricultural enter-

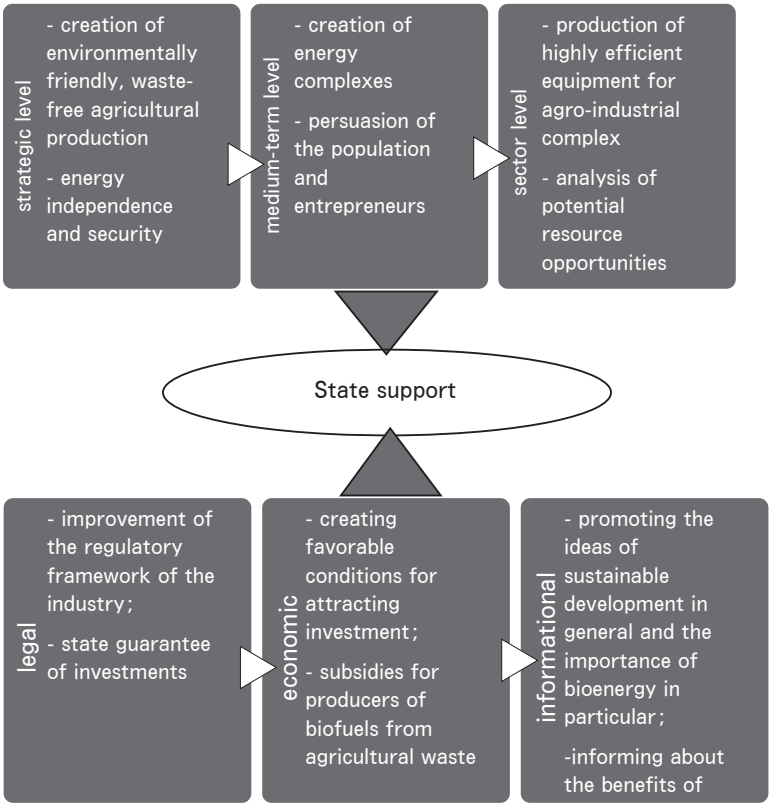

Fig. 2. Priority strategic directions of bioenergy development in agricultural enterprises

prises, it is important to determine the general guidelines for its development (Fig. 2).

Successful development of bioenergy in Ukraine is possible only with the available state regulation and financial and economic support, the creation of state programs for the development of the industry and agricultural enterprises in particular, and information activities to form an ecological type of thinking.

Problems of ensuring sustainable use of nature and the development of modern society force us to reorient traditional views on economic development. Today, agriculture cannot be considered only as a source of agricultural production, as it has much greater potential for development. According to the research results, a “green” road map of bioenergy development in agricultural enterprises is substantiated, which is based on a combination of its two additional directions of development: ecological and energy. The end result should be the creation of environmentally friendly and waste-free agricultural production, which will allow Ukraine to become less dependent on energy imports and significantly strengthen economic, energy, and political security.

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