

RURAL TOURISM AS A PLATFORM FOR THE IMPLEMENTATION AND POPULARIZATION OF BIOENERGY AND BIOECONOMY

The article considers the possibilities of integrating scientific experience in the field of bioenergy and bioeconomy into the practice of rural tourism. The potential of agrotourism facilities as educational platforms for demonstrating environmentally sustainable technologies is analysed, contributing to developing a green economy, energy efficiency and eco-education among the population.

In the current global climate change and energy challenges, bioenergy and bioeconomy are priority scientific and technological development areas. At the same time, rural tourism as a form of alternative tourism is gaining popularity as a means of recreation and as an educational and cultural platform. Integrating the results of scientific research in the bioenergy field into rural tourism opens up new horizons for the sustainable development of rural areas.

Bioenergy includes the production of energy from biomass, agricultural waste, manure, crop residues, etc. Bioeconomy encompasses a broader approach based on the sustainable use of biological resources. Partner scientific institutions, in cooperation with agricultural enterprises, develop technologies that are not only efficient but also environmentally friendly. Rural estates, farms and agro-tourism complexes can be sites for:

- implementation of mini-biohydropower plants;
- demonstration of energy-saving technologies;
- demonstration of the principles of the circular economy in action;
- Eco-education excursions for tourists and schoolchildren.

Such activities contribute to the environmental education of citizens and raise awareness of renewable energy.

Universities, research institutes, and international projects can act as consultants and developers of methodological materials and training programs for farm owners. With the support of grant programs, it is possible to finance pilot facilities that combine the functions of tourism, education and demonstration of the latest technologies.

Universities, research institutes and international projects play an important role

in introducing innovations in rural tourism, in particular in the direction of bioenergy and bioeconomy. The first step in this process is to form an intersectoral partnership between scientific institutions, agro-estate farms and local governments. This can be implemented through the signing of memoranda of understanding and the creation of working groups, which include bioenergy specialists, ecologists, educators and tourism managers.

One of the key areas of such interaction is the development of methodological materials and educational programs for agro-estate owners. They can include manuals, video tutorials and interactive instructions on the installation of bioenergy systems (such as biogas plants or biomass boilers), as well as recommendations for energy-efficient arrangement of rural estates in accordance with the principles of the bioeconomy. Universities can organize face-to-face or distance learning courses for farmers and owners of agro-tourism facilities.

Special attention deserves the attraction of grant funds to finance pilot projects. Scientific institutions, together with communities, can prepare applications for support from international programs, such as Erasmus+, Horizon Europe, and USAID, as well as participate in national and regional competitions. This will allow the implementation of demonstration facilities based on agro-estate farms, where solar panels, biogas systems or ecological treatment plants will be installed.

Such facilities can be used not only as economic units, but also as educational and tourist locations. They can be used to conduct green tours, internships, master classes, summer schools for students, schoolchildren and tourists. Visitors will be able to get acquainted with eco-technologies, participate in practical classes, study elements of bioeconomy and the history of traditional agriculture.

In order to popularize such initiatives, it is advisable to create a digital platform or mobile application, which will present a map of agricultural estates with bioenergy components, educational materials, virtual tours and a function for booking ecological routes. Such a platform will contribute to the dissemination of positive experiences, the involvement of new participants and the raising of awareness of the benefits of bioenergy and bioeconomy in the context of sustainable rural development.

There are already successful cases in the European Union where rural communities create eco-farms with bioenergy installations and organise thematic tours. Ukrainian initiatives are still limited, but have significant potential, especially in cooperation with universities with scientific experience in this area.

In the European Union, rural communities are actively implementing bioenergy

technologies in agritourism activities. In particular, in Italy, the ComER project is being implemented, aimed at creating renewable energy communities (Renewable Energy Communities). These communities unite citizens, enterprises and local authorities for the joint production and consumption of energy from renewable sources, such as biomass and solar energy.

In Poland, rural tourism is supported at the state level, with an emphasis on preserving the natural environment and ethnocultural traditions. Polish agritourism farms often combine the provision of tourist services with the implementation of environmentally friendly technologies, including the use of bioenergy installations for heating and energy supply.

In Ukraine, examples of combining rural tourism with bioenergy are also emerging. Thus, in the Khmelnytskyi region, communities received funding for growing energy crops, which can become the basis for the development of agritourism facilities with a demonstration of bioenergy technologies.

In the Kyiv region, near Obukhiv, a conference was held on the possibilities of bioenergy for Ukraine's energy independence. Participants had the opportunity to visit an energy willow plantation and a biofuel boiler house that heats a local hospital. Such facilities can become part of ecotourism routes, combining an introduction to bioenergy technologies and recreation in the countryside.

In addition, green tourism is actively developing in Ukraine, particularly in the Carpathian region. The Izki eco-resort offers tourists an introduction to environmentally friendly farms that use energy-efficient technologies and renewable energy sources. Tourists have the opportunity to participate in agricultural work, taste local products, and get acquainted with traditional crafts.

These examples demonstrate the potential for integrating bioenergy and bioeconomy into rural tourism in both Europe and Ukraine. Collaboration between scientific institutions, local communities and tourism operators can contribute to the sustainable development of rural areas, increasing energy efficiency and preserving cultural heritage.

Rural tourism is a promising platform for the implementation of scientific achievements in the field of bioenergy and bioeconomy. Such synergy contributes to the ecological modernisation of rural areas, activates regions' scientific and educational potential, and forms a conscious attitude towards using natural resources.