# CIRCULAR ECONOMY IN RURAL AREAS OF THE CZECH REPUBLIC – TRENDS AND CHALLENGES

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**Abstract**

The shift towards a more ecological lifestyle is also changing society's relationship to agriculture within rural areas. The implementation of circular technologies in agricultural production can be a clear proof of this. Circular economy is no longer just about waste-free technologies; in essence, it is a complete change in business models, the introduction of ecological design, including the extension of product lifespan. Circular economy is also about the introduction of renewable energy sources and the establishment of transparent cooperation with suppliers and customers. Waste from the agricultural sector meets the required standards of renewable resources for the decentralized production of energy commodities (especially electricity and heat) and the subsequent creation of an energy mix. For these reasons, the issue is also closely related to energy decentralization, resource diversification, and the reduction of the Czech economy's independence from fossil resources. In the context of supporting important economic interests of the state, a synthesis of economic, ecological, social, and security effects can be observed. In this context, the article demonstrates the multifunctional importance of agriculture and the entire rural area for the national economy.

**Key words:** circular economy in agriculture, energy mix, rural area

**JEL Code:** Q57, R11

## Introduction

The shift towards an ecological lifestyle is changing society's relationship with rural areas and the agricultural sector. The implementation of circular technologies in agricultural production can be a clear proof of this. The circular economy is no longer just about waste-free technologies, it is essentially a complete change in business models, the introduction of ecological design, including the extension of product lifespan. Following the example of natural ecosystems, it proposes closing material flows in functional and never-ending cycles, drawing energy from renewable and sustainable sources, and creating sustainable products

and services (Bag et al., 2021). Materials that would become waste in the current linear economy are reused or recycled. Although the emphasis is primarily on material recovery and recycling, supporting the energy recovery of biowaste can also play a significant role as a way to achieve waste management goals. The circular economy is also about the introduction of renewable energy sources and setting up transparent cooperation with suppliers and customers.

Waste from the agricultural sector meets the required standards of renewable resources for decentralized production of energy commodities (especially electricity and heat) and the subsequent creation of the energy mix. For these reasons, the issue is also closely related to energy decentralization, resource diversification, and reducing the independence of the Czech economy from fossil resources. In the framework of supporting important economic interests of the state, a synthesis of economic, environmental, social and security effects can be observed (Šetek. & Petrách; 2017). In this context, the article demonstrates the multifunctional importance of agriculture and the entire rural area for the national economy. Based on the facts cited above, the importance of rural and regional economies is growing in addition to the circular economy. Within these economies, conditions for the development of social entrepreneurship are also created and, in essence, it represents a modern concept in solving some social and economic issues facing developed countries at the beginning of the 21st century. Using the example of the Czech Republic, social entrepreneurship takes on many forms. A large part of them are enterprises that employ people with difficult access to the labor market.

# 1 Processing methods

The functioning existence of the economic system in the rural area is associated with institutions that support the provision of stable economic growth, the important determinants of which are interconnected regional, social and environmental aspects. This is the starting point of an interconnected regional, social and environmental policy, as an integral part of public economic policy. The appropriate quality of life of the population also develops from its level. Institutions and communities within regions, cities and municipalities are also participating subjects in the quality of life.

For the above reasons, analytical and comparative methods prevail in the processing. These are applied to the development of the interconnection of the circular and social economy with regard to the importance of applying the principle of subsidiarity (to rural policy). At the same

time, the fact of the development of the aforementioned interconnection is compared with the theoretical concepts of human capital.

# 2 Results

## 2.1 Initial philosophy of the issue

In connection with the objectives of the European Green Deal, the phenomenon of energy self-sufficiency is gaining importance in the Czech economy and throughout the European Union. An integral part of the aforementioned economic, environmental, social and security concept is the search for alternative sources, to which the application of circular technologies in rural areas can contribute. In essence, it is the energy use of biowaste, which is naturally related to agricultural plant and animal production (Cecchi & Cavinato, 2015). As part of its specific technological process, agricultural production produces a wide range of biowaste, which includes the processing of biomass from forest waste into wood chips, residues from agricultural production, but also household waste - common municipal biowaste, industrial residues of sugar, starch or some types of fruit, waste from fields and gardens, residues of unconsumed food and feed. From the point of view of economic and ecological efficiency, the aforementioned biowaste is a suitable raw material for the production of energy commodities, such as primarily wood chips and biogas. Subsequently, the products created in this way can be used primarily for the production of electrical and thermal energy or biofuels as a substitute for fossil fuels in transport (Walmsley et al., 2019). The basic strategic goal of every national economy is considered to be ensuring maximum independence from the import of energy raw materials from abroad and, within its capabilities, achieving at least partial energy self-sufficiency (Šetek et al., 2025). However, the energy system must also be perceived comprehensively within the dichotomy - domestic - foreign source and also as an intermediate level within the European Union, etc. This is logical, since dependence on another member state of the European Union will probably be safer from a geopolitical point of view than it was on the Russian Federation. Traditional energy sources based on massive sources of electricity from coal and nuclear power were at their peak by the end of the 20th century, green sources from the sun and wind were considered more of a supplement.

The Czech and European power industry is working within the framework of a strategy to strengthen energy security in an ecological direction. This results in the shutdown of large non-green power plants and their replacement with ecological production, including through circular technologies. The established method of producing energy commodities in

the form of associated agricultural production activities within rural settlements represents an ideal way of fulfilling the sustainable development strategy, i.e. focusing on economic, environmental and social goals (Donéeová, 2024). At the same time, this method contributes to strengthening energy self-sufficiency. The transition to sustainability represents a fundamental change in the social environment, in which the existing social, economic and technological structures are transformed into a new, more sustainable order. One of these radical transitions is the transformation of an economic system using fossil resources into a system based on renewable resources – the transition to a bioeconomy.

## 2.2 Use of biowaste in rural areas

Renewable resources represent a wide range of raw materials and technologies, and the main goal of their use is to replace fossil (non-renewable) resources, especially coal, oil and natural gas. These are wastes mainly from agricultural production and the food industry as part of renewable resources, which are particularly suitable for decentralized production of energy commodities (especially electricity and thermal energy), which of course requires their greater construction near settlements. This leads to the inevitable interaction of the investor with local agricultural enterprises and residents. For this reason, the dislocation of circular technologies within the region depends on the technology of local business entities on the one hand and consumers on the other. Within the framework of the circular economy, it is a wide technological use of renewable resources for the production of energy commodities. It is the energy use of the entire range of biowaste in agricultural (plant and animal) production, and possibly also in the food industry (Yildizbasi, 2021). In this context, conditions are also created in terms of economic efficiency within the framework of circular technologies for cogeneration, i.e. combined production of electrical and thermal energy in municipalities of interest. Compared to classic large-capacity sources of electricity production (such as nuclear, thermal or, for example, hydroelectric power plants), circular producers are much more flexible and efficient (Balaman et al., 2018).

For the above reasons, the implementation of the circular economy in the production of strategic energy commodities also allows for adaptation to local conditions in the regions, which significantly increases the efficiency of the energy transformation. The lower need for transmission contributes to higher efficiency of the entire system and offers the possibility of using any available energy, including renewable energy. This simultaneously meets

economic, ecological and social goals within the regions and requirements in the context of sustainable development within the national economy.

### 2.3 Community energy in rural areas using the example of the Czech Republic

Electricity sharing represents the possibility of sharing the generated electricity to other points of consumption of the producer or other persons, under commercial conditions set by the parties to such sharing (for a fee or free of charge). Connection to renewable energy sources within the framework of a circular economy reduces dependence on fossil fuels and increases the energy sovereignty of local communities. In addition, it brings economic benefits for all involved in this system. The purpose of community energy is to support the decentralization and democratization (increased involvement of smaller players) of the energy sector, increasing the involvement of renewable energy sources, increasing energy efficiency and measures against energy poverty, especially at the level of households and small and medium-sized enterprises. In this context, energy communities represent the possibility of consumer participation in energy production, i.e. joining with other consumers and jointly investing in a community production plant and effectively using the energy produced (Donéeová et al., 2024). This call is intended for the public sector (especially municipalities and associations established by them such as voluntary associations of municipalities, microregions, etc.), the business sector (only natural persons doing business, small and medium-sized enterprises), the household sector (especially owners or tenants of apartment units, family houses, apartment buildings, housing cooperatives) and the civic sector (especially associations, churches, foundations, etc.)

Thanks to renewable sources, energy is becoming a local product that is produced and consumed in one place. This new dimension brings the benefits and ease of energy obtained also by technological processes within the circular economy closer to people, and gives the possibility of energy independence and economic insecurity in uncertain times. Last but not least, it is necessary to highlight the benefits of this clean energy for the environment. Community energy is a future based on renewable sources, owned not by large companies, but by small groups of citizens or associations of municipalities. Municipalities can directly contribute to the development of community energy in cooperation with local citizens or companies. An energy community thus represents an independent legal entity and a non-profit nature; energy business must not be its main activity. The energy produced in the sources involved in the community will be shared among its participants - with good legislation, it

will be possible to use the public distribution network. Members will then be able to use cheap electricity produced within the community (for example, surplus photovoltaics from a school building) instead of expensive electricity purchased from the network. In these cases, there is an ideal space for municipalities, which can invest in their own sources (especially biogas stations) within the framework of a circular economy and offer the electrical and thermal energy produced in this way to users in rural areas.

## 2.4 Energy cooperatives in rural areas

According to foreign experience, energy cooperatives or civic projects of the Western European style, where renewable energy sources (including circular ones) are operated by a group of citizens, farmers and local entrepreneurs, are still an integral part of community energy, and are still being awaited. However, energy cooperatives represent a rich tradition in the production of electricity within the Czech economy, dating back to the early 20th century. At that time, the gradual electrification of European rural areas took place and electricity began to be used in agricultural production. Many cooperative power plants were already aware of the limited reserves of coal resources, and therefore often used the energy of watercourses. Czechoslovakia, the first republic, was one of the most cooperatively developed countries in the world and in 1948 there were over 2,000 cooperative power plants operating in the country.

The aforementioned cooperatives can be characterized as autonomous and democratic associations of natural and legal persons created for the purpose of producing and distributing energy. Their goal is to ensure the supply of affordable sustainable energy and also to involve community members in local development. In simple terms, an energy cooperative can be described as a consumer-led power plant. Members jointly invest the share needed to purchase, install and operate renewable energy sources. They become co-owners of the source and consumers of the energy produced and sell any surpluses either to other residents of the municipality and the surrounding area or to the grid. The sales revenue is then distributed back to them in a proportional amount and any additional profit usually goes to the cooperative fund, from which community activities are financed, such as the care of public space, cultural events, educational activities, charity projects, etc. (Koirala et al., 2016). Economic, environmental and social needs are thus intertwined. The “cradle” of energy cooperatives is Scandinavia, from where this method of energy production is spreading to other countries. The cooperative principle in energy is used outside the Nordic countries,

especially in the United States of America, and is also beginning to be promoted in Australia, Germany, Canada, the United Kingdom and many other economies (Heras-Saizarbitoria, Sáez, Allur, & Morandeira, 2018). In the Czech context, cooperative ownership and cooperative management take many forms, but cooperatives have not yet been applied in the renewable energy sector. Foreign experience and domestic traditions from the first half of the 20th century are clear evidence of the advantages of cooperative energy.

### 2.5 Rural development in the context of implementing circular technologies

In the context of the implementation of circular technologies for the production of energy commodities in agricultural enterprises within the countryside, there are three main approaches to its development: exogenous development, endogenous development and mixed exogenous - endogenous development. The exogenous model of rural development is based on interventions from the outside, it tends to be exported outside the region. On the contrary, the endogenous model is based on development within the region, using local impulses and local resources. The benefits of this model are preserved in the local economy (Woods & McDonagh, 2011). Following this division, we also distinguish between exogenous and endogenous development factors. Exogenous factors determine the framework, they are not influenceable actors, but they still affect rural development (location, environment, legislation, etc.). Exogenous factors cannot function effectively without endogenous ones, and the most important role is played by local development actors who influence the character of the countryside with their activities. In addition, there are other actors acting in different ways – they can support development or, on the contrary, hinder it (act in a contradictory way).

From the above context, it is therefore necessary to introduce the theory of production districts within the institutional theory of regional development. It sees the source of prosperity in a high-quality social, cultural and institutional structure and a non-hierarchical system of cooperation of small businesses (Faltová Leitmanová et al., 2021), as is the case with agricultural producers of energy commodities. In addition, this approach attributes success to a collective sense of belonging, traditional values and trust. The theory of learning regions follows, which considers learning to be a key ability for the competitiveness of regions. When each region has certain relational assets at its disposal – specific abilities and skills of a non-transferable nature that are important for its development. Knowledge and the ability to innovate are key for regional growth. The emphasis is on non-transferable knowledge, which is acquired through experience and participation in a specific matter and is

also tied to the institutional characteristics of the territory through a network of contacts (Faltová Leitmanová et al., 2023). This is mainly about creating favorable environmental conditions for the implementation of innovations. The environment here means a network of relationships (between companies and their surroundings), but also the framework for the activities of companies (institutional structure, political culture, social values, etc.). The role of the public sector here does not consist only in distributing financial resources, but is seen mainly in the role of an intermediary, moderator and also an important co-creator of consensus.

## Conclusion

The implementation of the circular economy in the production of energy commodities also allows for adaptation to the conditions of rural areas, which significantly increases the efficiency of the energy transformation. The lower need for transmission to rural areas contributes to higher efficiency of the entire system and offers the possibility of using any available energy, including renewable energy. This simultaneously meets economic, environmental and social goals within the regions and requirements in the context of sustainable development within the national economy.

The implementation of the circular economy requires in practice the participation of stakeholders who have the ability to transfer knowledge and can integrate these principles in the territorial districts and localities of the rural area. There are many important actors in it who play a key role in supporting and implementing economic strategies. This also means applying specific production processes by the professional community and integrating them into the specific context of the rural area.

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