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Articles

CIRCULAR ECONOMY VS. SUSTAINABILITY OF AGRIBUSINESS

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Abstract

The circular economy is becoming an increasingly discussed concept being an alternative to the current model of economy based on the unsustainable constant growth built on the unlimited use of resources. The objective of the study will be to outline the circular economy concept with the presentation of attempts to operationalise it from the point of view of the sustainability of agriculture and the whole food sector. We verified a research thesis that the circular economy is one of several concepts enriching and probably likely to replace the EU agricultural and food sector sustainability in the future. An eclectic approach has been applied, using the method of literature studies, documentation method and elements of heuristic methods. The paper is a review study.

Formally, the CE is to constitute a superstructure for the CAP and sustainability practised within it, more and more schematic and fossilised. The basis for enhancing the sustainability, improving the efficiency and competitiveness of the EU agriculture and the whole food should be, in the first place, broadly understood innovation and creativity.

Keywords: circular economy, sustainability of agriculture, finance of agriculture, food chains, innovation policy.

JEL codes: Q14, Q15, Q18.

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Introduction

The circular economy (CE) is becoming an increasingly discussed concept being an alternative to the current model of economy based on the unsustainable constant growth built on the unlimited use of resources.

However, it should be pointed out that the circular economy concept is quite vague due to the enormous number of research definitions and approaches. At the same time, there are still few practical examples, despite the growing interest on the part of policymakers. China and the EU are leaders in developing strategies and regulations aimed at accelerating the transition of individual sectors to the circular economy.

For several years, the European Commission (EC) has been taking steps aimed at transforming the EU economy into the circular economy. To date, it has been focused on reducing the amount of waste, and especially plastics, generated in the EU. Also, with regard to the Common Agricultural Policy, the EC points to a need to promote the implementation of the circular economy concept in agriculture. According to the EC, the closed cycle economy can foster the rural and agricultural development.

In the case of agriculture, the implementation of the circular economy solutions requires, firstly, determining the economically and environmentally optimal closed cycles, as well as significant inputs on developing and implementing innovative solutions. At the same time, it should be remembered that the effective cycle cannot be within the agricultural sector only, but must also cover the remaining links of the food chain, which requires cooperation with both the food industry and trade or catering services.

The concept of agriculture functioning within the framework of the circular economy is similar to that of Agriculture 4.0, which must be characterised by environmental care and the significant application of innovative technologies for the purpose of more effective and more environment-friendly use of resources in the agricultural production.

With regard to the possibility of implementing the circular economy system in agriculture, it is worth referring to the Porter hypothesis, which claims that environmental regulations can make companies and economies more competitive on an international scale by encouraging them to implement environmentally friendly innovations that would not have happened without pressure of the environmental policy instruments. From this point of view, the state policy can accelerate the process of changing the paradigm of the functioning of the entire economic system.

The objective of the study will be to outline the circular economy concept with the presentation of attempts to operationalise it from the perspective of sustainability of agriculture and the whole food sector. For this analysis, we adopted a research thesis that the circular economy is one of several concepts enriching and probably likely to replace in the future EU agricultural and food sector sustainability. An eclectic approach has been applied, using the method of literature studies, documentation method and elements of heuristic methods. The paper is a review study. First, the circular economy concept will be outlined, and then the selected problems related to the

operationalisation of this concept will be presented, in relation to both the agricultural sector and the food industry (as part of food chains). Difficulties in operationalising the Creating Shared Value (CSV) concept will be considered and the associations with the optimal optimism concept will be theoretically taken into account.

Circular economy concept

The circular economy concept[1] is one of several broadly discussed ideas which are to serve sustainability (D'Amato et al., 2017). The CE concept is an alternative to the unsustainable economy model based on the constant growth and unlimited use of natural resources. It aims at reconciling the environmental issues with the economic development (Heshmati, 2015).

The CE concept is derived from a number of disciplines, which include, *inter alia*: environmental economics or industrial ecology (Ghisellini, Cialani and Ulgiati, 2016). The simplest way to describe this concept is to use three terms: restriction, reuse, recycling (Su, Heshmati, Geng and Yu, 2013).

It should be added that the CE concept is still unclear. The debate takes place even on its definition. Kirchherr, Reik and Hekkert (2017) identified as many as 117 different definitions. Nevertheless, the aforesaid multiplicity of definitions may be treated as the norm at the initial stage of the development of an idea or concept Moreover, it is poorly linked to the sustainable development. Currently, the CE concept, on the one hand, is considered as a method of protecting the environment and, on the other, as a new model of economic development that gives a chance to accelerate it. However, it can be expected that the further development of this concept will lead to its clarification. It can be assumed that the CE concept will be a "framework in which the society will create a multi-sectoral policy supporting various initiatives in the individual parts of the chain that will enable the transition from the linear model to the more sustainable production and consumption model" (Jurgilevich, 2016, p. 12).

The transformation of the economy towards the CE is a difficult process. At present, the major barriers to the implementation of this concept include:

- Lack of incentives due to the fact that current prices of resources used do not include external costs associated with their use.
- Lack of resources for investments in circular economy-related technologies.
- Lack of pressure on the part of the public.
- Lack of the coherent policy to support the transformation of the economy.

The practical implementation of the concept requires revolutionary technologies, as well as changes in the functioning of many markets and sectors of the economy, which is a very difficult task due to economic and social costs. However, there are many initiatives to promote the CE idea. Also, some countries' actions related to the creation of a strategy to rebuild the economy towards the CE are conducive to popularising this concept and the interest in developing solutions serving its implementation.

[1] In the English-language literature, two definitions are used: circular economy and close-loop economy.

In line with the principle of conditional optimism, creativity and innovation should be supported by a system of economic incentives and well-thought regulations, so that the boundaries of growth and development could be gradually shifted in a sustainable way. The best condition for voluntary acceptance of sustainability by economic entities is the cost-effectiveness of such a strategy for them. The Porter-Kramer CSV concept is compatible with it. The food industry, because of its lower subsidisation, has a clear advantage over agriculture and can even force the necessary adaptations in it. We can refer to the relationship between the rate of climate change and innovation progress (Box 1). It is worth noting that the issue of the aforementioned relationship between the rate of climate change and innovation progress was also referred to by William Nordhaus[2].

Box 1

Relationships between the rate of climate change and innovation progress

- Rise in prices of fossil fuels along with their increased extraction rate
  Prices of noble metals (since 1800) – cyclical changes but prices stable in a long term
- Tax on greenhouse gas emissions – first, the rate at a very low level, then growing gradually ⇒
- Encouraging innovations resulting in the reduction in greenhouse gas emissions and general environmental pollution level ⇒
- Opportunity of popularisation of the CE

Source: own study.

Circular economy and agriculture

The application of the rules on the CE functioning in agriculture is becoming an increasingly important issue (Donia, Mineo and Sgroi, 2018). As regards agriculture, the CE rules refer to the following elements:

- Agricultural production conducted based on a minimum level of external inputs.
- Reduction in negative externalities.
- Valorisation of waste from agriculture (Ward, 2017).

This means a need to adapt agricultural practices that need to minimise production inputs and take account of environmental care. At the same time, the agricultural benefit is to be the creation of the agricultural waste market, which looks set to be an additional source of sector revenue.

In relation to both agriculture and many other sectors of the economy, the CE is associated with numerous benefits. They include:

[2] It should be added that in 2018 Paul Romer and William Nordhaus were awarded with the Nobel Prize in Economic Sciences.

1. Environmental benefits:
   - Limitation of material and energy inputs;
   - Limitation of waste and emissions of pollutants.
2. Social benefits:
   - Economics of sharing – increased cooperation;
   - Possibilities of creating new jobs.
3. Economic benefits:
   - Reduction in costs of used raw materials and energy;
   - Reduction in costs related to management of waste and emission of pollutants.
4. Image benefits:
   - Development of new markets.

However, the implementation of the CE concept also entails numerous limitations. Korhonen, Honkasalo and Seppälä (2018) point to the following problems:
1. Thermodynamic: cyclical systems use resources and generate waste.
2. Systemic: problems are shifted to other stages of the lifecycle of products.
3. Rebound effect, also known as Jevons paradox.
4. Related to the dependence from the path and already incurred inputs.
5. Related to management within and among economic entities.
6. Social, cultural and political.

Attention should be paid to the problem of competition for resources, in particular for land, between the agricultural production for food purposes and for other needs. In the case of the bioeconomy concept, what is growing is the demand for different types of biocomponents, which can largely originate from the agricultural sector (Breure, Lijzen and Maring, 2018).

In view of this, an important element of inclusion of agriculture and the whole food system in the CE is to reduce food waste at all stages of the food chain, the more that currently 1/3 of food is wasted worldwide (Vilariño, Franco and Quarrington, 2017).

It can be concluded that there are already practical forms of pursuing agricultural activities which are conducive to implementing the CE in the agricultural sector. These include, *inter alia*:
- Precision farming – agriculture using geolocation for farm management. The objective is to maximise the productivity of inputs, thus limiting the resource consumption.
- Digital farming (e-farming, smart farming, agriculture 4.0) – the next stage of agricultural development after precision farming, which uses its technologies, and additionally smart webs and data management tools. The objective is to automate sustainable processes in agriculture.

These forms of agricultural activity are focused on the issue of reducing production inputs. Other aspects of the CE in agriculture seem to be more difficult to implement. This applies, in particular, to the emergence of the market for animal waste. It should be noted, however, that agriculture can be the recipient of waste from other sectors of the economy, e.g. the recipient of water from wastewater treatment plants.

It should be added that the implementation of the CE concept, incl. for example, precise farming in Central and Eastern Countries (CEECs), requires structural changes in the agriculture: either a significant concentration of the agrarian structure or horizontal integration. The role of modern and more energy-efficient and material-saving technologies and the decreasing costs of their application may be beneficial for the implementation of CE concept in agriculture. Limiting losses and waste may improve economic results, competitive position and image of enterprises. State interventionism may be limited to the selected number of entities, taken criteria for providing financial assistance, including repayable assistance, as for example in rural development programs.

The EU and circular economy

The issue of transforming the EU economy into circular economy is increasingly underlined in various EU policy areas, including within the framework of the reform of the Common Agricultural Policy. For the first time, the CE issue appeared in the EU documents in 2014, when waste reduction actions were launched and the EC Communication "Towards a circular economy: A zero waste programme for Europe" was presented (European Commission, 2014). In 2015, the EU CE-related action plan was adopted (European Commission, 2015). It assumes, *inter alia*, a significant reduction in waste by 2030, including plastics by 55%. In 2018, the "European strategy for plastics in a circular economy" was announced (European Commission, 2018a).

According to the opinion of the European Commission „the transition to the circular economy represents a unique opportunity to transform and guarantee the more sustainable development of our economy, better achievement of climate goals and protection of global resources, creation of local jobs and achievement by Europe of competitive advantage in the world where profound change is happening" (European Commission, 2018b).

The CE issue also appears in the EC documents relating to other areas of the economy, such as industry (European Commission, 2017b) and agriculture (European Commission, 2017a) as an opportunity to develop these sectors. The EC communication on the reform of the CAP indicates that the circular economy offers opportunities to create new jobs and to diversify and increase revenues. It was, therefore, concluded that the CAP should support the development of the CE. This concept was also mentioned in the context of striving for reducing food waste and loss, where attention was paid to stimulating the development of new production practices and technologies and shaping consumer patterns. The same issues relating to the CE in the CAP are set out in the preamble to the draft Regulation on the strategic plans for the CAP 2021-2027 submitted by the EC in 2018 (European Commission, 2018c).

Changes in the EU economy so as to transform it according to the CE concept are a difficult and expensive process. So far, the European Union's activities in this area are focused on reducing waste generation, including, in particular, plastics. However, drawing attention to the CE in sectoral policies, as an element of new conditionalities and development opportunities, creates opportunities to develop measures aimed at reducing the negative environmental impact of the economy.

Food industry, food chains and the CE

Given that agriculture is related to processing under food chains, the comprehensive approach to the CE should include supply chains in the food economy, i.e. food chains. The proactive use of the closed loop supply chains (CLSC) is one of the strategies leading to their sustainability (Sgarbossa and Russo, 2017). The CLSC models work as networks, added value is generated by the continuous trade in resources (which is enabled by logistical innovations). The CLSC models adapt well to the specificities of the food sector (perishability of raw materials, large amount of post-production waste, high energy and water consumption). New loops in chains relate, firstly, to the recovery of resources (i.e. electricity, biogas production and water treatment...), and secondly, to product returns.

On the one hand, the vulnerability of increasingly complex and extended supply chains to risk is growing (Giannakis and Papadopulos, 2016), on the other hand, the economic challenge is globalisation, popularisation of outsourcing and offshoring or the development of information technology, automation (ICT), robotics, and artificial intelligence. The holistic sustainability (taking into account both economic/financial, environmental and social aspects) should be perceived as a major challenge for the development of supply chains. In sustainable food chain management strategies, which also refer to the CE concept:

- There is a need for an advanced assessment of suppliers in terms of their risk and efficiency, as well as a focus on the production of sustainable products;
- The design of final products should take into account the lifecycle of products;
- A deeper visibility of the role of loopbacks on material flows is necessary.

Circular economy versus Creating Shared Value (CSV) concept and its operationalisation in the food industry

The operationalisation of the CSV concept as an attempt to make Corporate Social Responsibility (CSR) closer to the operating conditions of real companies is a quite difficult challenge in economic, organisational and technological terms. It is necessary to include the economic activity in the account of costs and externalities of economic activity, CSV goes deeper into the market and organisations (Porter and Kramer, 2011).

Table 1 shows that the operationalisation of the CSV concept can take various forms, ranging from the satisfaction of social needs of poorer populations (e.g. Nestle) to technological innovations in agribusiness (Dow-Agro Sciences).

Table 1

CSV in the food industry – examples

Entity	Scope of undertaken CSV steps
Nestle	• Satisfaction of social need without sacrificing the goals of enterprises was one of crucial concepts (conceptualisation phase) • Activation of the agricultural population in developing countries e.g. more and more sustainable supply chains of milk production in Pakistan • Supporting the development of municipal infrastructure in rural areas (access to intakes of good quality drinking water) related to Nestle investments • Creation of milk producer clusters – some provinces in India
Dow Agro Sciences	• Development of the line of Omega-9 rape and sunflower oils, with the zero content of trans fats and with the very low level of saturated acids. Since 2005, Omega-9 oils have eliminated nearly 454 million tonnes of trans fats and 113 million tonnes of saturated fats from the American market
The EcoVadis Global CSR Risk & Performance Index	• In-depth CSR+ measurement, also covers the enterprises: Food and Beverages (applies to Europe, no companies from Poland)
Poland – SM Ryki	• Modern lines for whey condensation, modern membrane wastewater treatment plant, additionally, CSR ideas such as promotion of active lifestyle (running), promotion of low-fat products (e.g. Rycki Light cheese)

Source: own study based on Nestle Creating Shared Value, 29.01.2018, Nestle, Creating Shared Value and meeting our commitments 2018 Progress report, https://www.nestle.com/sites/default/files/asset-library/documents/library/documents/corporate_social_responsibility/creating-shared-value-report-2018-en.pdf; http://www.smryki.pl/; https://www.ecovadis.com/; www.dow.com.

Final remarks

- The CE is an attempt to modernise the concept of modern economic units, referring to biogeochemical cycles (e.g. matter cycle). May it not end as other initiatives of this type in the EU.
- Formally, the CE is to constitute a superstructure for the CAP and sustainability practised within it, more and more schematic and fossilised. May it be a stimulating impulse to provide it with the new content and dynamics.
- The basis for enhancing the sustainability, improving the efficiency and competitiveness of EU agriculture and the whole food should be, in the first place, broadly understood innovation and creativity. The Porter hypothesis shows that the environmental aspects do not have to be internalised using subsidies.
- Non-agricultural links of the food chain still are searching for business models which will include the issues of sustainability in a voluntary manner, as a tool to improve the competitiveness and flexibility. The Porter-Kramer CSV concept and the Romer's conditional optimism principle are a good starting point for such searches.

References

Breure, A.M., Lijzen, J.P.A., Maring, L. (2018). Soil and land management in a circular economy. *Science of the Total Environment, 624*(2018), pp. 1125-1130.

D'Amato, D., Droste, N., Allen B., Kettunen M., Lähtinen K., Korhonen J., Leskinen P., Matthies B.D., Toppinen A. (2017). Green, circular, bio economy: A comparative analysis of sustainability avenues. *Journal of Cleaner Production, 168*(2017), pp. 716-734.

Donia, E., Mineo, A.M., Sgroi, F. (2018). A methodological approach for assessing business investments in renewable resources from a circular economy perspective. *Land Use Policy*, 76, pp. 823-827.

European Commission (2014). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Towards a circular economy: A zero waste programme for Europe", COM(2014)398.

European Commission (2015). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Closing the loop – An EU action plan for the Circular Economy", COM(2015)614.

European Commission (2017a). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "The Future of Food and Farming", COM(2017)713.

European Commission (2017b). Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee, the Committee of the Regions and European Investment Bank "Investing in a smart, innovative and sustainable Industry A renewed EU Industrial Policy Strategy" COM(2017)479.

European Commission (2018a). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A European Strategy for Plastics in a Circular Economy", COM(2018)28.

European Commission (2018b). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a monitoring framework for the circular economy, COM(2018)29.

European Commission (2018c). Proposal for a Regulation of the European Parliament and of the Council establishing rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulation (EU) No. 1305/2013 of the European Parliament and of the Council and Regulation (EU) No 1307/2013 of the European Parliament and of the Council, COM(2018)392.

Ghisellini, P., Cialani, C., Ulgiati, S. (2016). A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *Journal of Clean Production*, 114, pp. 11-32.

Giannakis, M., Papadopoulos, P. (2016). Supply chain sustainability: a risk management approach. *International Journal of Production Economics, 171*(4), pp. 455-470.

Heshmati, A. (2015). *A Review of the Circular Economy and its Implementation*. IZA Discussion Papers, No. 9611. Bonn: Institute for the Study of Labor (IZA).

Jurgilevich, A., Birge, T., Kentala-Lehtonen, J., Korhonen-Kurki, K., Pietikäinen, J., Saikku, L., Schösler, H. (2016). Transition towards Circular Economy in the Food System. *Sustainability 8*(1), p. 69.

Kirchherr, J., Reike, D., Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation & Recycling, 127*(2017), pp. 221-232.

Korhonen, J., Honkasalo, A., Seppälä, J. (2018). Circular Economy: The Concept and its Limitations. *Ecological Economics*, 143, pp. 37-46.

Nestle, Creating Shared Value and meeting our commitments 2018 Progress report, https://www.nestle.com/sites/default/files/asset-library/documents/library/documents/corporate_social_responsibility/creating-shared-value-report-2018-en.pdf.

Porter, M.E., Kramer, M.R. (2011). The Big Idea: Creating Shared Value. *Harvard Business Review*, 89, pp. 2-17.

Sgarbossa, F., Russo I. (2017). A proactive model in sustainable food supply chain: Insight from a case study. I*nternational Journal of Production Economic*s, Vol. 183, Part B, January 2017, pp. 596-606.

Su, B., Heshmati, A., Geng, Y., Yu, X. (2013). A review of the circular economy in China: moving from rhetoric to implementation. *Journal of Cleaner Production*, 42, pp. 215-227.

Vilariño, M.V., Franco, C., Quarrington, C. (2017). Food loss and Waste Reduction as an Integral Part of a Circular Economy. *Frontiers in Environmental Science*, 5, 21, pp. 1-5.

Ward, S. (2017). The 'circular economy' applied to the agri-food sector. Paper presented at the conference "Harnessing Research and Innovation for FOOD 2030: A Science Policy Dialogue" 16 October 2017, Brussels.

www.dow.com

www.ecovadis.com/

www.smryki.pl/pl/strona-glowna/

GOSPODARKA O CYKLU ZAMKNIĘTYM A ZRÓWNOWAŻENIE AGROBIZNESU

Abstrakt

Gospodarka o cyklu zamkniętym staje się coraz powszechniej dyskutowaną koncepcją stanowiącą alternatywę dla obecnego modelu gospodarki opartego na pozbawionym zrównoważenia stałym wzroście bazującym na nieograniczonym wykorzystywaniu zasobów. Celem opracowania będzie zarysowanie koncepcji gospodarki o cyklu zamkniętym wraz z przedstawieniem prób jej operacjonalizacji z punktu widzenia zrównoważenia rolnictwa i całego sektora żywnościowego Weryfikowano tezę badawczą, że gospodarka o obiegu zamkniętym jest jedną z kilku koncepcji wzbogacających, a może kiedyś mogących zastąpić unijne zrównoważenie rolnictwa i sektora żywnościowego. Zastosowano podejście eklektyczne, wykorzystując metodę studium literaturowych, metodę dokumentacyjną i elementy metod heurystycznych. Opracowanie ma charakter studium przeglądowego. GOZ formalnie stanowić ma nadbudowę dla WPR i praktykowanego w niej zrównoważenia, coraz bardziej schematycznego i skostniałego. Podstawą doskonalenia zrównoważenia, poprawy efektywności i konkurencyjności unijnego rolnictwa i całego sektora żywnościowego powinny być w pierwszym rzędzie szeroko rozumiane innowacyjność i kreatywność.

Słowa kluczowe: gospodarka o obiegu zamkniętym, zrównoważenie rolnictwa, finanse rolnictwa, łańcuchy żywnościowe, polityka innowacyjna.

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