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The role of agriculture in the circular economy (perspectives for legislation and policy)

1. Contemporary agriculture is affected by global trends connected with rapid anthropogenic environmental changes. Like the whole scale of humanity metabolism (meaning the total set of life-sustaining matter and energy's transformations taking place in the world and resulting from the human activities), the food system (including production but also consumption), is unsustainable. It is settled on the dominant economic development model, also called a linear one-way flow, meaning 'take, make and dispose', with little attention paid to the pollution generated at each step.[1]

Although the problems resulting from this model have been recognised for a long time by many philosophers, sociologists, environmentalists, economists etc., the significant, conceptualised and influencing work regarding the issue occurred in the twentieth century, in 1972, when the Club of Rome published its first report entitled 'The Limits to Growth.'[2] It presented a model based on five variables (world population, industrialisation pollution, food production and resources depletion). The authors concluded that these exponentially growing variables correspond to the only linear ability of technology which aims at increasing the accessibility of resources. Consequently, the linear unlimited production and growth of prosperity is simply impossible in a world with finite resources.

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[1] S. Sauvé, S. Bernard, P. Sloan, *Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research*, „Environmental Development" 17, 2016, p. 53; H. Jun, H. Xiang, *Development of circular economy is a fundamental way to achieve agriculture sustainable development in China*, „Energy Procedia" 5, 2011, p. 1531.

[2] D. H. Meadows et al., *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*, Universe Books, New York 1972.

This report and many other subsequent scholarly works together with signals coming from the economy as well as non-governmental organisations constituted the grounds for the emergence of the 'sustainable development' concept, presented in 1988 by the Bruntland Commission in its Report ('Our Common Future').[3] It is one of the most important contemporary ideas of environmental law and at the same time of the doctrine of economics.

Among alternative concepts, developed within the socio-environmental sustainability debates, the circular economy (CE) framework has recently received increasing attention.[4] It is particularly interesting from the legal perspective because of the current actions of the European Commission fostering EU transition to the circular economy with its recently adopted the Circular Economy Package.

The circular economy is a new research perspective and the attempts of its application in national economies and in the European Union are at still the initial stage. Some countries have already adopted policies focused on the prevention of environmental degradation and protecting scarce resources based on the circular economy (e.g. Germany and Japan).[5] This concept has gained particular interest in China where the circular economy strategy has already been adopted as a national regulatory policy which entailed introduction of numerous regulations and the main act – the Circular Economy Promotion Law passed in 2008.[6]

The initial state of the practical application of this concept results in the fact that the issue has not been the subject of wider and comprehensive legal studies so far. The circular economy concept has its roots in theoretical works of environmental economy,[7] so the literature in this field is quite extensive.[8] Many studies deal with the implementation of the circular economy in China,[9] also in the agricultural system.[10]

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[3] Report of the World Commission on Environment and Development: Our Common Future, p. 16, http://www.undocuments.net/our-common-future.pdf [accessed: 14 July 2016].

[4] A. Murray, K. Skene, K. Haynes, *The circular economy: an interdisciplinary exploration of the concept and application in a global context*, „Journal of Business Ethics" 2015.

[5] B. Su, A. Heshmati, Y. Geng, X. Yu, *A review of the circular economy in China: moving from rhetoric to implementation*, „Journal of Cleaner Production" 2013, no 42, p. 215.

[6] Y. Geng, J. Fu, J. Sarkis, B. Xue, *Towards a national circular economy indicator system in China: an evaluation and critical analysis*, „Journal of Cleaner Production" 2012, no 23, pp. 216–217.

[7] B. Su, A. Heshmati, Y. Geng, X. Yu, op. cit., p. 215. See also point 2 below.

[8] For the review of literature see: P. Ghisellini, C. Cialani, S. Ulgiati, *A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems*, „Journal of Cleaner Production" 2015, no 114, p. 12.

[9] See for example: Y. Geng, B. Doberstein, *Developing the circular economy in China: Challenges and opportunities for achieving 'leapfrog development'*, „The International Journal

This paper examines the relationship between the concept of the circular economy and the agri-food sector from the legal perspective. The aim of this paper is to explore the areas of theoretical and practical application of the circular economy concept to address the above mentioned challenges in the agri-food system and to identify its potential opportunities in order to enhance and optimise sustainability within the European economy using this CE tool.

It should be noted that this study is preliminary and exploratory due to the wide scope and many aspects of the problem, the initial stage of development of the legislation in this field and the limited length of this paper. It attempts to identify some tendencies for the future development of legislation and policy solutions relating to the problem pointed above.

2. The concept of the circular economy cannot be assigned to a particular author or precise date. Several theories have referred to or were based on this idea but all of them gravitate around the same principles, highlighting slightly different aspects or showing them from different perspectives. The idea of circular material flows as an economy model was presented in the 1960s by Kenneth E. Boulding,[11] then in the 1970s it was proposed by Walter R. Stahel and Genevieve Reday-Mulvey as a vision of economy in loops.[12] Walter R. Stahel is also the author of the 'cradle back to cradle' term as a really sustainable solution for using durable goods in a loop and opposite to the idea of a product responsibility 'from cradle to grave'.[13] In 1990, David W. Pearce and R. Kerry Turner,[14] in opposition to the traditional economy features with linear links between economy and environment, proposed a closed-loop of materials in economy as a model leading to achieve a win-win solution.

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of Sustainable Development & World Ecology" 15(3), 2008, pp. 231–239; R. Yong, *The circular economy in China*, „Journal of Material Cycles and Waste Management" 9(2), 2007, pp. 121–129.

[10] ZHU Pengyi, *Strategies for Development of Circular Economy in Agriculture*, „M& D Forum", pp. 9–20; H. Jun, H. Xiang, *Development of circular economy is a fundamental way to achieve agriculture sustainable development in China*, „Energy Procedia" 5, 2011, p. 1531.

[11] K. E. Boulding, *The economics of the coming spaceship earth*, in: H. Jarred, M. D. Baltimore (eds.), *Environmental Quality in a Growing Economy*, John Hopkins University Press, Baltimore 1966, pp. 3–14.

[12] W. Stahel, G. Reday, *Jobs for Tomorrow: The Potential for Substituting Manpower for Energy*, Vantage Press, New York 1982.

[13] It is difficult to state the precise date and language of the first use of the term 'cradle to cradle' by Walter R. Stahel (http://www.product-life.org/en/cradle-to-cradle [accessed: 14 July 2016].

[14] D. W. Pearce, R. K. Turner, *Economics of Natural Resources and the Environment*, Johns Hopkins University Press, Baltimore 1990.

The studies concerning the circular economy explore different aspects of the concept in many methodological approaches (case studies, reviews, scientific reports etc.).[15] Among the concepts rooted in the CE idea there are: the 'cradle to cradle' design philosophy of William McDonough and Michael Braungart, the functional service economy (performance economy) of Walter Stahel, biomimicry (in approach of Janine Benyus), industrial ecology of Rei Lifset and Thomas Graedel, natural capitalism (Amory and Hunter Lovins and Paul Hawken) and blue economy (Gunter Pauli).[16]

What is more, this concept has recently captured an increasing attention not only in political and research areas but it has also aroused public interest. There is no precise definition or the criteria for assessing measures to obtain the goal of the circularity of the economy.[17] The definition of the United Nations (UN) GEO5 report states that material flows in the circular economy are either made up of biological nutrients designed to re-enter the biosphere, or materials designed to circulate within the economy (reused and recycled).[18] The circular economy is then 'a continuous positive development cycle that preserves and enhances natural capital, optimises resource yields and minimises system risks by managing finite stocks and renewable flows'.[19]

The pattern for the CE concept are the processes occurring in the natural environment, where biological nutrients are cycled in natural ecosystems with efficiency, flexibility and adaptability. Adapting this metaphor to an economic system is the goal for the CE concept. It aims to separate prosperity from resource consumption, by consuming goods and services which are not linked with the extraction of natural resources. The use of natural materials could be substituted by reuse and recycling – generally a closed loop of material flow.[20] This vision presumes an industrial system being restorative or regen-

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[15] P. Gisellini, C. Cialani, S. Ulgiati, *A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems,* „Journal Of Cleaner Production" 30, 2015, p. 2 and review of literature there.

[16] Ellen MacArthur Foundation, G*rowth Within: A Circular Economy Vision for a Competitive Europe*, Report June 25, 2015, p. 46.

[17] W. Haas et al., *How Circular is the Global Economy? An Assessment of Material Flows, Waste Production, and Recycling in the European Union and the World in 2005,* „Journal of Industrial Ecology" 19(5), 2015, p. 766.

[18] Global Environmental Outlook 5 (GEO5) 2012 – Environment for the future we want, ISBN: 978-92-807-3177-4, Nairobi: United Nation Environment Program.

[19] Ellen MacArthur Foundation, op. cit., p. 46.

[20] S. Sauvè, S. Bernard, P. Sloan, op. cit., p. 53.

erative by intention and design. It is complemented by the shifts towards the use of renewable energy and elimination of the use of toxic chemicals.[21]

Contrary to linear economy, the circular system considers the externalities of the production process and end-of-life impacts. The by-products and wastes from one industry could be resources for another. This provides synergy of integrated combinations of activities to feed and be fed by one another.[22] Eliminating waste can then be achieved by a prolonged usage of products, recycling and reuse. There are also other issues particularly emphasised in CE, including renewable resources, circular utilisation and a repeated utilisation ratio.[23] However, the circular economy does not operate like a perpetuum mobile, because energy is still consumed and waste is produced, but they are significantly reduced comparing to the current economy model.[24]

It must be emphasised that CE goes far beyond the understanding of recycling as the use of waste to obtain lower value products. It entails a complete reorganisation of production and planning of the value chains in order to make waste one of the subjects to be the resource for another. In this new system, individuals are no longer mere 'consumers', they become 'users' engaged to cooperate with the producers and the retailers.[25]

3. The circular economy seems to be not only a theoretical concept but also a promising strategy to meet the present-day economic and environmental challenges. It also defines the objectives of a sustainable resource use.[26] It was implemented in China as a new approach to deal with the environmental problems of a state of emerging economy.[27] As a result of its potential, the CE concept has recently been incorporated into the European Union policy framework.

It must be emphasised that this concept is well embedded in a wider EU policy context. The 7th Environmental Action Programme: 'Living well with-

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[21] K. Hobson, *Closing the loop or squaring the circle? Locating generative spaces for the circular economy*, „Progress in Human Geography" 40(1), 2016, p. 88.

[22] S. Sauvè, S. Bernard, P. Sloan, op. cit., p. 53.

[23] ZHU Pengyi, op. cit., p. 9.

[24] F. Bonciu, *The European economy: from a linear to a circular economy*, „Romanian Journal of European Affairs" 14(4), 2014, p. 84.

[25] M. Borrello et al., *The seven challenges for transitioning into a bio-based circular economy in the agri-food sector*, „Recent Patents on Food, Nutrition & Agriculture" 8(1), 2016, p. 40.

[26] W. Haas et. al., op. cit., p. 765 and literature there.

[27] See e.g. ZHU Pengyi, op. cit.; M& D Forum, p. 10 and literature there.

in limits of our planet,'[28] which determines the EU's environmental policy goals until 2020 as the basis for citizens' well-being, points out a low-carbon society and a green, circular economy with a resilient ecosystem. The document states: 'Our prosperity and healthy environment stem from an innovative, circular economy where nothing is wasted and where natural resources are managed sustainably, and biodiversity is protected, valued and restored in ways that enhance our society's resilience'. The CE strategy has also its roots in EU strategical documents and existing policy initiatives, such as: Europe 2020 Strategy for smart, sustainable, inclusive growth,[29] Climate and Energy Framework 2030,[30] Roadmap to a Resource-efficient Europe,[31] Bioeconomy Strategy[32] and Communication for an European Industrial Renaissance.[33]

After a long deliberation, following the withdrawal of the first proposal 'Towards a circular economy: A zero waste programme for Europe,'[34] the European Commission adopted a new 'Circular Economy Package' on 2 December 2015, which aims to stimulate Europe's transition towards the circular economy. The package consists of the Action Plan Communication,[35] four legislative proposals on waste[36] and the List of Follow-up Initiatives (Annex).

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[28] Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (COD 2012/0337).

[29] Communication from the Commission: Europe 2020. A strategy for Smart, Sustainable and Inclusive Growth (COM (2010) 2020).

[30] A policy framework for climate and energy in the period from 2020 to 2030 (COM (2014)15).

[31] Communication from the Commission: Roadmap to a Resource Efficient Europe (COM (2011)0571final).

[32] Communication from the Commission: Innovating for Sustainable Growth: A Bioeconomy for Europe (COM(2012)60final).

[33] Communication from the Commission: For a European Industrial Renaissance (COM (2014) 014 final). See also: F. Bonciu, op. cit., pp. 78-91.

[34] Communication from the Commission: Towards A Circular Economy: A Zero Waste Programme For Europe, 2014.09.25 (COM(2014)0398 final/2).

[35] Communication from the Commission: Closing the loop – An EU Action Plan for the Circular Economy, Brussels 2.12.2015 (COM(2015)614final).

[36] Proposal for a Directive of the European Parliament and of the Council amending directive 2008/98/EC on waste (COM(2015)0595 inal – (2015)0275(COD)); Proposal for a directive of the European Parliament and of the Council amending Directive 94/62/EC on packaging and packaging waste (COM(2015)0596 final) – (2015)0276(COD); proposal for a Directive of the European Parliament and of the Council amending Directive 1999/31/EC on the landfill of waste (COM (2015) 0594 final) – (2015) 0274 (COD); proposal for a Directive of the European Parliament and of the Council amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and

The actions anticipated in the strategy consist of regulations, market-based instruments, research and innovations, incentives, information exchange, and support for voluntary approaches in key areas. The aim of this strategy is to create the proper regulatory framework for CE development and 'to give clear signals to economic operators and society at large on the way forward with long term waste targets as well as concrete, broad and ambitious set of actions, to be carried out before 2020.'[37]

The scope of EU strategy is wide because the circular economy requires actions at all interrelated stages of the life cycle of products: from the extraction of raw materials, through material and product design, production, distribution and consumption of goods, repair, remanufacturing and re-use schemes, to waste management and recycling. Additionally, improvements connected with resource and energy efficiency should be made at all stages.

Key actions, adopted or to be performed within this EC plan, target five main areas: production, consumption, waste management, secondary raw materials and innovation, investment and monitoring. They particularly include: funding of over €650 million under Horizon 2020 and €5.5 billion under the structural funds, actions to reduce food waste, development of quality standards for secondary raw materials, measures in the Ecodesign working plan for 2015-2017, a revised Regulation on fertilizers, a strategy on plastics (with special focus on the significant reduction of marine litter) and a series of actions on water reuse.

The important element of the package is the revised legislative proposals on waste which set targets for the reduction of waste. The priority sectors identified in the CE package are: biomass & bio-based products, plastics, construction & demolition, food waste and critical raw materials.

On the circular economy at large, an action plan will identify the key measures across the value chain. The scope of topics and possible areas is wide and concerns the whole value chain. They could include, but are not limited to: materials production and use, product design, distribution, use (consumption) stage, public procurement, labelling and product information, waste management, development of markets for secondary raw materials (e.g. organic fertilizers), improving framework conditions in priority sectors such as sustainable chemical production, bio-economy, extraction of secondary raw materials, food, construction, plastics, critical raw materials (including phosphorus), water use, and improving cross-sectoral cooperation, for exam-

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2012/19/EU on waste electrical and electronic equipment (COM(2015)0593final) – (2015)0272 (COD).

[37] Communication (COM(2015)614 final).

ple by the promotion of industrial symbiosis, repair and reuse and enabling the development of new business models. Illegal flows of waste, including hazardous waste, are also of a particular concern.[38]

Therefore, the following question arises: what is the importance of the legal aspects in the context of the presented EU strategy and its future implementation? The research on the potential implementation of the CE concept indicates that the key barriers to obtain CE goal are also situated in the area of policy and legislation. For example, incoherence between the policy areas in relation to the use of waste resources (some innovative activities are not allowed under current policy rules) or 'waste' status limiting the potential of materials to be used as a fertiliser have been observed.[39]

There is no doubt that a transition towards a circular economy needs a broader vision and the scope of action and not only a reform of the waste system. The objectives are: promotion of new economic thinking, a smarter use of resources and more sustainable production and consumption patterns. What is more, policy and regulation actions should be reinforced by market-based instruments, support for innovation and incentives for change.[40] Such a vision corresponds to a broad and comprehensive concept of the CE which seeks for radical alternative solutions and covers the entire life cycle of any process. Regeneration should be understood as improvement of the entire living and economic model instead of narrow solutions such as material or energy recovery.[41] The cultural change is also needed to develop the circular economy in the agri-food system. It is particularly important in the context of food waste and food losses.

4. The potential of agriculture in the contribution to the circular economy is unquestionable. Agriculture is based on natural cycles, where key factors for the production are natural and renewable, like land, water, nutrients, soil, wind and solar energy, biodiversity. It should also be perceived in a wider perspective of agriculture being the part of bio-economy[42] and the whole agri-

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[38] See Communication (COM(2015)614final).

[39] EIP-AGRI Workshop 'Opportunities for Agriculture and Forestry in the Circular Economy' Workshop report, 28-29 October 2015, p. 12-13 (https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_vs_circular_economy_final_report_2015_en.pdf [accessed: 14 July 2016]).

[40] A. Hedberg, R. Pardo and T. Daryoush, *Towards a sustainable European economy*, „European Policy Centre, Policy Brief" 13 October 2015.

[41] P. Ghisellini, C. Cialani, S. Ulgiati, op. cit., p. 2.

[42] The bio-economy embraces the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy. Next to agriculture, it comprises

food chain. It is worth mentioning that among the bio-economy sectors, it is agriculture where reliance on natural resources and cycles as primary inputs and need for resource-efficiency are particularly clear. These two conceptual terms: the circular economy and bio-economy are linked because both of them refer to resource-efficiency and require innovation and new business model.[43] The bio-economy focuses on the production and use of renewable biological resources and their conversion into value added products (food, feed, bio-based material and bioenergy). However, an important difference is, contrary to the CE concept, that bio-economy can be linear or circular, and consequently, it is not sustainable by default.[44]

The goal of the circular economy in the agri-food system would then be not only to prevent the waste of food but also to support a continuous flow of matter and energy by taking advantage of the natural mechanisms on which the agriculture is based.[45]

Circular economy in agriculture covers many topics and actions such as: balancing the flows of renewable resources to obtain the preservation and enhancement of natural capital, optimising (not maximising) natural resource efficiency by circulating products, materials and components, fostering effectiveness within wastes and detrimental practices and encouraging interaction among people.[46]

Circular economy solutions could address the problem of imbalanced nutrient flows which occurs in Europe (particularly in the areas with high concentrations of livestock). The structural development of industrialised agriculture results there in excess manure which cannot be used because soil is already saturated with nutrients and it is worsened by separation of animal and plant production.[47] The potential solutions to these problems could be: recovering nutrients form manure, recovering and reusing nutrients in sewage

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forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries. (See: Communication from the Commission 'Innovating for Sustainable Growth: A Bioeconomy for Europe', SWD (2012) 11 final (COM(2012)60final), p. 16.

[43] There are also other paradigms related to this topic for example sustainable development or the relocation paradigm (See: C. Lamine, *Sustainability and Resilience in Agrifood Systems: Reconnecting Agriculture, Food and the Environment*, „Sociologia Ruralis" 55(1), 2015, pp. 41-60).

[44] EIP-AGRI Workshop, op. cit., p. 4.

[45] M. Borrello et al., op. cit., p. 40.

[46] EIP-AGRI Workshop, op. cit., p. 6.

[47] A. Jurgilevich et al., *Transition towards circular economy in the food system*, „Sustainability" 8(69), 2016, pp. 4–5.

sludge, but also supporting local farms and de-specialised agricultural holdings.

The contemporary challenges in water usage could also be addressed through circular economy solutions in the agricultural sector. They include water efficiency measures and the reuse of treated wastewater (also from other industries) not only for irrigation but also as water for livestock, cleaning water for hydroponics and aquaponics.[48]

Fostering the integrated, 'de-specialised' farming system is also proposed as a solution which leads to the closing of the cycles (not only in the aspect of nutrient flows) in the agricultural sector. Valorisation and an alternative use of products which are presently treated as waste and discarded could create the possibilities of second life for waste and by-products of the agricultural sector in such areas as animal feed, bioenergy or improving the soil quality. Agri-food residues could also be used as input in such innovative solutions like biorefineries to transform (through enzymes and bacteria) biological substances into proteins, sugars, plastics, medicines and fuels.[49]

It must be emphasised that the circular economy concept goes far beyond reducing waste. It is rather to optimise the whole agri-food systems at its all stages. The goal is sustainable production (use of productive land) and consumption. The scope of activities supporting this goal is very wide. They include: smart agriculture and local food supply chains such as direct sale from farmers, the Community Supported Agriculture, food circle buying clubs, or seasonal food box subscriptions.[50]

The last but not least very important aim of the circular economy concept is to overcome the phenomenon of food wastage.[51]This should be achieved by the holistic approach (through the whole food supply chain), contrary to the existing policies which focus on waste management.[52]

5. The question then occurs, how this potential of the agri-food sector is taken into account in the EU strategy on the circular economy which was adopted in December 2015. Undoubtedly, the CE package includes agricultural

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[48] A. Graber, R. Junge, *Aquaponic Systems: nutrient recycling from fish wastewater by vegetable production*, „Desalination" 246(1), 2009, pp. 147–156.

[49] M. Borrello et al., op. cit., p. 40.

[50] A. Jurgilevich et al., op. cit., p. 7.

[51] For more information on legal aspects of preventing food wastage, see for example K. Leśkiewicz, *Legal aspects of counteracting wastage of food*, „Agricultural Law Review" 2015, no 2, pp. 119-133.

[52] A. Jurgilevich et al., op. cit., p. 10.

issues, touches contemporary challenges of sustainable farming and shows areas where the potential of agriculture can be used to obtain the CE goals.

As it has been pointed out, EU circular economy strategy is not detached. The EU CE package is to bring together a series of existing policies and tools in a coherent way. It is a part of resource efficiency agenda of the European Union contributing to the broader strategic objectives of the Europe 2020 strategy. The existing EU policies and tools that are focused on agriculture, have already touched the problem and support obtaining the goals of the circular economy in this sector. First of all, they encompass such measures and tools as: the Common Agricultural Policy, rural development programmes and the EIP-AGRI, or the research and funding support provided through the Horizon 2020 programme.[53]

Concerning the problem of applying the concept of circular economy to the whole agri-food system and the role of agriculture, it can be observed that there is no single, coherent overarching food policy within the European Union. On the other hand, because of the complexity of food systems, they cannot be defined solely in normative terms. Moreover, the policy measures should also integrate socio-cultural values and consumer perspectives.[54]

The EC action plan for the Circular Economy relates to agriculture in a few aspects. Two out of five priority areas (food waste and biomass and bio-based products) are closely linked to agriculture. What is more, the action plan focuses on the areas of implementation and indicates, among other things, the boosting of the market for secondary raw materials and water reuse, and this aspect is closely related to farming.

A distinct and important category of secondary raw materials, related to agriculture, are recycled nutrients. The European Commission has identified the problem of hampered circulation of fertilisers based on recycled nutrients. It should be mentioned that farming is the main driver of the global phosphorus cycle, whereas phosphate rock belongs to critical raw materials listed by the European Commission[55] because of their high economic importance for the EU and vulnerability to supply distortion.[56]

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[53] EIP-AGRI Workshop, op. cit., p. 4.

[54] J. Smih et al., *Addressing policy challenges for more sustainable local-global food chains: policy frameworks and possible food* „Futures", „Sustainability" 8(299), 2016, pp. 3–5.

[55] Communication From The Commission: On the Review of the List of Critical Raw Materials for the EU and the Implementation of the Raw Materials Initiative, COM(2014)297.

[56] See: T. Nesme, P. J. A. Withers, *Sustainable Strategies Towards a phosphorus circular economy*, „Nutrient Cycling in Agroecosystems" 104(3), 2016, pp. 259–264.

The next issue, related to the possible agriculture contribution to the CE, is the reuse of treated wastewater in safe and cost effective conditions. In this area there is still a lot to be improved in the context of water-efficiency measures.[57] Actions taken in this area can also contribute to the more effective recycling of nutrients and substitution of solid fertilizers.

Taking into account the prospects for recycling of agricultural (but also forestry and food) waste and residues for bioenergy and biomaterials, the EU action plan highlights the advantages of these bio-based materials. The EU supports and encourages the agricultural sector, while enhancing transparency in all aspects of its development, and ensuring high sustainability standards.[58]

There are numerous measures and they have been listed in the Annex to the Communication which applies to agriculture. Among them are measures:

– regarding the market for secondary raw materials: a proposal for a revised regulation on fertilisers; proposed legislation setting minimum requirements for reused water for irrigation and groundwater recharge; promotion of safe and cost-effective water reuse, including guidance on the integration of water reuse in water planning and management; inclusion of best practices in relevant BREFs, and support investments and innovation (through the European Innovation Partnership and Horizon 2020);

– regarding food waste: development of a common methodology and indicators to measure food waste; creating a platform to examine how to achieve SDGs goals on food waste; share best practice and evaluate progress; clarifying relevant EU legislation related to waste, food and feed in order to facilitate food donation and utilisation of former foodstuffs for animal feed;

– regarding biomass and bio-based materials: cascading use of biomass and support of innovation; coherence and synergy with the circular economy when examining the sustainability of bioenergy under the Energy Union; assessment of the contribution of the 2012 Bioeconomy Strategy to the circular economy and possible review.

Some of them are already in progress, for example: among the EU actions to promote the further uptake of water reuse at EU level – An Inception Impact Assessment of the legislative initiative on minimum quality re-

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[57] For example it is estimated that only 40 per cent of irrigation water actually reaches plants. (M. Esposito, T. Tse, K. Soufani, *Is the circular economy a new fast-expanding market*, „Thunderbird International Business Review" 2015, Version of Record online: 14 OCT 2015, DOI: 10.1002/tie.21764, p. 3.

[58] See also B. Kretschmer et al., Technology Options for Feeding 10 Billion People. Recycling Agricultural, Forestry & Food Wastes and Residues for Sustainable Bioenergy and Biomaterials, Brussels 2013, http://www.europarl.europa.eu/stoa/ [accessed: 14 July 2016].

quirements for reused water in the EU (possible type of initiative: a regulation on minimum quality requirements for reused water in agricultural irrigation and aquifer recharge)[59] or a draft regulation to boost the use of organic and waste-based fertilizers (Regulation on the making available on the market of fertilizing products).[60]

6. To conclude, the circular economy constitutes a useful term to conceptualise the path for the development of agriculture and whole economy as well, to face contemporary challenges and target environmental issues. It seems to be more precise than the ambiguous concept of sustainability but simultaneously sustainable per se (contrary to bio-economy). At this point, the area of future scientific research can be indicated, which can investigate the relation and possibility of linking these two terms.

The agricultural sector has a significant potential in the framework of the circular economy, and it has been confirmed (however indirectly) in the EU's strategy on circular economy, too. It is not only because of immanent features of farming activities – the reliance on biological cycles but it also results from the scale of wastage generated in the agri-food supply chain (e.g. the amount of food produced for global human consumption which is wasted is estimated to be as high as one third or even a half [61]) and a wide range of opportunities for bio-waste to become inputs of new production (comparing to other waste streams).

The above considerations indicate and confirm the potential of circular economy measures to address contemporary challenges of agri-food system as well. Consequently, it may form a valuable paradigm for agriculture development, too.

The circular economy concept constitutes a useful tool for building a regulatory and policy framework, also for the agricultural sector. It has a synergistic effect when combined with other complementary EU strategies, for example the environmental or the Common Agricultural Policy, too. However, taking into account an early stage of the CE strategy adoption, it is difficult to

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[59] See http://ec.europa.eu/smart-regulation/roadmaps/docs/2017_env_006_water_reuse_instrument_en.pdf [accessed: 14 July 2014].

[60] Proposal for a Regulation of the European Parliament and of the Council laying down rules on the making available on the market of CE marked fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 (SWD/2016/064 final – 2016/084 (COD)).

[61] M. Borrello et al., op. cit., p. 40.

predict its significance for EU agricultural policy, and what is more important – its effectiveness.

Finally, this concept seems to be a promising and interesting field of legal studies, particularly because it has developed to the implementation stage in the EU.

THE ROLE OF AGRICULTURE IN THE CIRCULAR ECONOMY (PERSPECTIVES FOR LEGISLATION AND POLICY)

Summary

Among concepts developed within socio-environmental sustainability debates, the circular economy framework has recently received increasing attention. It is particularly interesting from the legal perspective, because of the current actions of the European Commission fostering EU transition to the circular economy, with recently adopted a Circular Economy Package.

The aim of the article is to explore areas of theoretical and practical application of the circular economy concept to address contemporary challenges in agri-food system and identify its potential opportunities in order to enhance and optimise sustainability within the European economy by using this CE tool. It is pointed out that circular economy constitutes a useful term allowing to conceptualise the path for development of agriculture and whole economy as well, to face contemporary challenges and target environmental issues. The agricultural sector has a significant potential in the framework of circular economy, which has also been confirmed (however indirectly) in the EU's strategy on circular economy.

IL RUOLO DELL'AGRICOLTURA NELLA ECONOMIA CIRCOLARE (PROSPETTIVA GIURIDICA E POLITICA)

Riassunto

Tra le concezioni elaborate nell'ambito di una discussione riguardante lo sviluppo socio-ambientale sostenibile, la formula di un'economia a circuito chiuso (circular economy, CE) gode di un crescente interesse. Essa è particolarmente interessante dal punto di vista giuridico viste le misure adottate attualmente dalla Commissione europea per promuovere la transizione dell'Europa verso un'economia circolare, con in prima linea il c.d. pacchetto sull'economia a circuito chiuso adottato di recente.

L'obiettivo dell'articolo è di esaminare i campi di applicazione teoretica e pratica della concezione dell'economia circolare con la finalità di risolvere i problemi dei moderni sistemi agro-alimentari e di identificare potenziali opportunità al fine di rafforzare e ottimizzare lo sviluppo sostenibile dell'economia europea con gli strumenti derivanti da

questo concetto. Nello studio si indica che essa è utile per concettualizzare il percorso di sviluppo dell'agricoltura e di tutta l'economia, ma anche per affrontare attuali sfide e obiettivi ambientali. Il settore agricolo possiede notevoli potenzialità nell'ambito dell'economia circolare, il che è stato anche confermato (benché indirettamente) nella strategia dell'Ue.