Finding the Suitable Agriculture Circular Economic Models in the Mekong Delta, Vietnam

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ABSTRACT

Economic research on circular economy is in great demand since this novel system is intentionally designed to outperform the traditional linear economy with respect to sustainability; however, a wide gap between the intention and applied models persists owing to the incomplete theoretical background and practical guidelines. Circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling, recovering materials in production/distribution and consumption processes, with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations. This paper firstly aims to develop a conceptual framework of circular economic (CE) and its applications particularly to developing countries which share contextual similarities with Vietnam. Precisely, CE is look like a cyclical lake or closed-loop ecosystem to increase green productions and consumptions, whereas the traditional linear extract-produce-use-dump economy is as a flowing river. In addition, it explored a business model to enhance the acceptance of farmers to circular economics in organic fertilizer. The target of this paper is to seek a possibility of circular models applying to the Mekong Delta of Vietnam. The study highlights some unambiguous benefits of circular economy in favour of sustainable development in three domains including economy, society, and environment.

The research results assessed the economic implications of and the reasons for adopting circular economics model in organic fertilizer. Conclusion and managerial implications are drawn from the analysis pointing the improvement of farmers' perception on applying circular economic model in organic fertilizer.

Keywords: organic fertilizer, circular economic, Mekong Delta

INTRODUCTION

One of the key components of the circular economy in the Mekong Delta is the promotion of sustainable agriculture practices, including the use of organic fertilizers and the adoption of crop rotations. These practices help to reduce the use of harmful chemicals and improve soil health, which in turn supports more resilient and productive farms.

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Another important aspect of the circular economy in the Mekong Delta is the promotion of waste reduction and recycling. This includes initiatives to promote composting and the recycling of materials such as plastic and metal. There are also efforts to develop new products and markets for recycled materials, which can help to create new economic opportunities and reduce the region's dependence on imported resources.

In addition, there are several initiatives aimed at promoting sustainable tourism in the Mekong Delta. These include efforts to develop eco-tourism opportunities that highlight the region's natural beauty and unique cultural heritage, while also supporting local businesses and communities.

Overall, the circular economy in the Mekong Delta is helping to create a more sustainable and resilient economy that supports the long-term well-being of the region's people and environment.

Agriculture is a major contributor to the economy of the Mekong Delta region and has played an important role in the socio-economic development of the region and the country as a whole. However, the exploitation of natural resources in the "linear" direction of the brown economy has resulted in environmental degradation, soil, water and air pollution, depletion of aquatic resources, reduction of biodiversity, deforestation, affecting human health and ecosystems (Sanh and Nhan, 2016; Ministry of Natural Resources and Environment, 2018; World Bank, 2019; Binh et al., 2021; Phuong et al., 2021; Binh) et al., 2022; Le et al., 2022). This has resulted in significant environmental challenges such as soil, water, and air pollution, depletion of aquatic resources, deforestation, and loss of biodiversity.

These environmental challenges have had negative impacts on the health and well-being of the region's people and ecosystems, and have threatened the long-term sustainability of the agricultural sector. In response to these challenges, there has been growing interest in adopting more sustainable and circular approaches to agriculture, which seek to minimize waste and maximize the reuse of resources.

For example, some initiatives in the region have focused on promoting sustainable agriculture practices such as organic farming, crop rotations, and integrated pest management. These practices help to reduce the use of harmful chemicals, improve soil health, and increase the resilience of farms in the face of climate change and other environmental pressures.

There are also efforts to promote more sustainable forestry and fisheries practices in the region, which seek to minimize the impacts of these sectors on the environment and promote the conservation of natural resources.

The adoption of more sustainable and circular approaches to agriculture, forestry, and fisheries in the Mekong Delta region is crucial for promoting the long-term socio-economic development of the region while also protecting its unique ecosystems and natural resources.

A CONCEPTUAL FRAMEWORK OF CIRCULAR ECONOMY AND ITS LIMITATIONS

A Development of an Ecological Economics Framework of CE

This section aims to develop a conceptual framework of CE and its applications particularly to developing countries which share contextual similarities with Vietnam. Precisely, CE is look like a cyclical lake or closed-loop ecosystem to increase green productions and consumptions, whereas the traditional linear extract-produce-use-dump economy is as a flowing river (Stahel, 2016; Goyal et al, 2018; Korhonen et al., 2018). Kirchherr and Piscicelli (2019) visualised the levels of circularity and the transformation from the linear to circular economy with 10Rs strategies (Figure 1).

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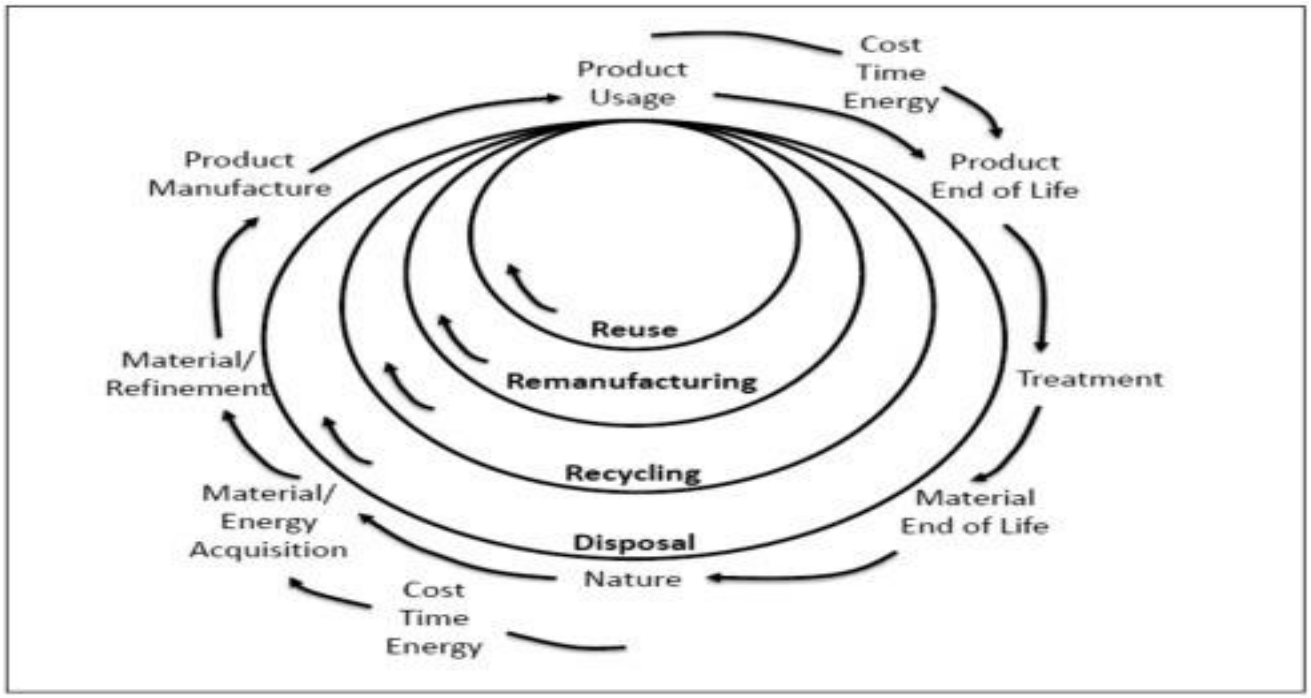
Figure 1. Shifting from linear to circular economy

Source: Kirchherr and Piscicelli (2019)

Figure 1. Circular Economy System



Source: Korhonen et al. (2018)

Analogously, Korhonen et al. (2018) simply described CE with the four closed-loops of reuse, remanufacturing, recycling, and disposal (Figure 1). They summarised the benefits of CE in favour of sustainable development as described in Figure 2. CE help us improve economic, social, and environmental

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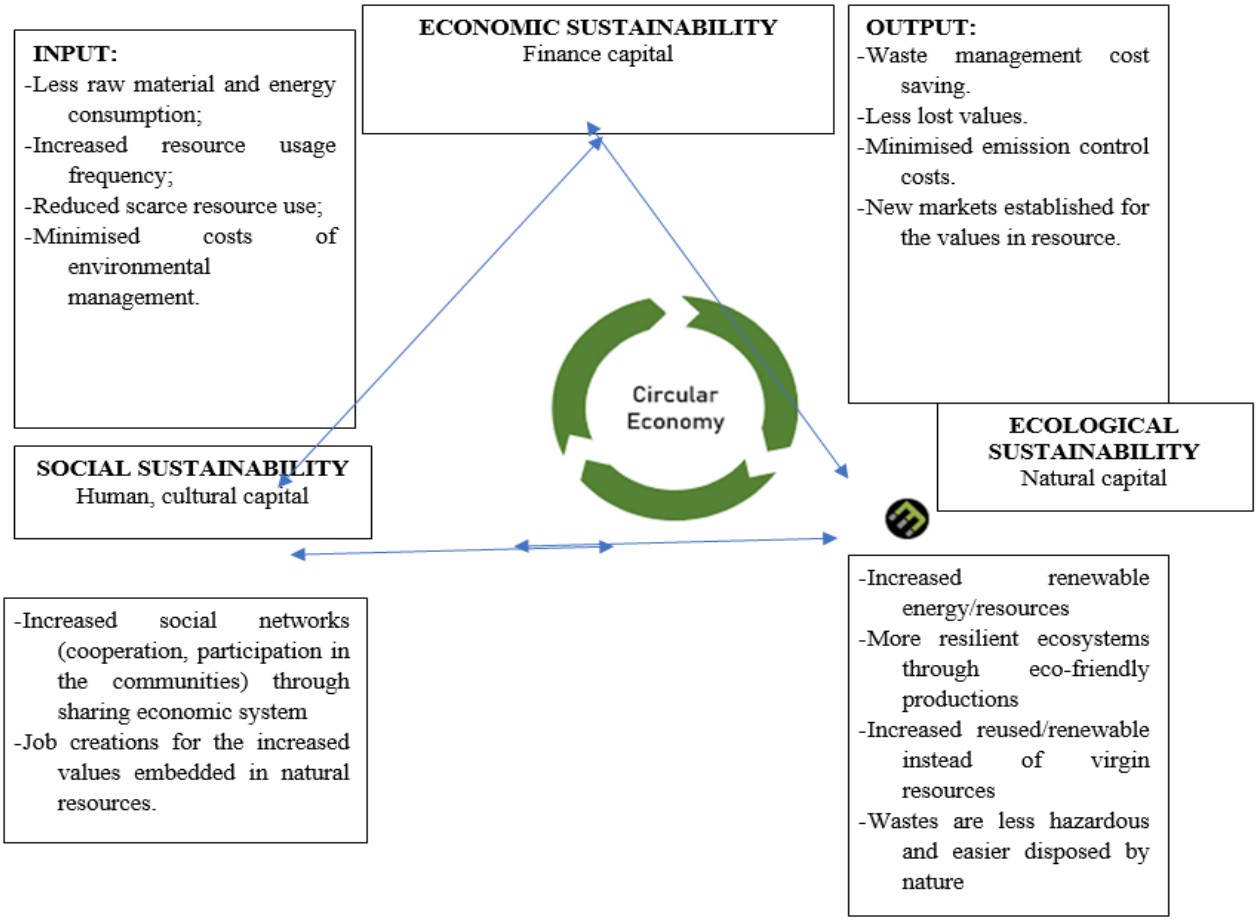
well-beings. With the first pillar (i.e. the economic sustainability), CE doubles the economic gains from both the inputs and outputs of the economy. The economy could improve the resources used owing to reduced virgin material and non-renewable energy consumption, reuse the resources and materials as many times as possible rather than just only one time as in the linear economy. The exploitation of scarce resource is also minimised. As a consequence, the cost of environmental management decreases. When it comes to the output side, with repairing, reusing, refurbishment and recycling activities, the economy saves on the costs of waste management and leaking values products. The less the wastes the less the cost of emission (e.g. CO_2) control. CE also creates new markets for trading the increased values in resources.

For the social dimension, CE enriches the intangible capitals. It increases the social networks through cooperation and participation activities and thus, fosters the sharing economic systems. Labour markets are restructured with more job opportunities for increased values embedded in natural resources (e.g. reverse logistics systems to collect old products for repair, or refurbishment) (Korhonen et al. 2018).

Finally, CE rehabilitates and recovers nature, meaning that it boosts the natural capital or sustains the eco-systems. Extension in the use of renewable resources but decrease in virgin resource imply that the natural resources are used and reused many times rather than single-inputs as in the linear economy. Therefore, the extraction of natural resource is kept at the minimum levels. Meanwhile, the wastes are properly collected, classified, and reused as the new inputs for other production schemes, thereby being less hazardous and disposed easier in nature (Korhonen et al. 2018).

Figure 2. Benefits of Circular Economy



Source: Korhonen et al. (2018)

Thus far, three principles for building a CE including (i) elimination of waste and pollution, (ii) product and material circulation, and (iii) nature regeneration are articulated (EMF, n.d.). The first principle requests us to shift our mindsets of design, insofar as it alters the current take-make-waste system and treat waste as a design flaw or make it circular. For a target of waste free economy, any production system ought to care about the

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following characteristics: reduction (by sharing, maintenance), reuse, repair, refurbishment, remanufacture, and recycle. The second principle is to circulate products and materials at their highest value, meaning that they are kept in use and then transformed into raw materials after use. The third principle, regeneration of nature is as a consequence of the first and second one. By eliminating waste, and circulating broken products, nature is extracted at the minimum level and thus, increasingly rehabilitated and regenerated. Therefore, CE benefits the ecosystems and resolves the problems of climate change.

Kirchherr et al. (2017) and Kirchherr et al. (2018) noted that a comprehensive transformation, not just a bit of adjusting the status quo, to achieve a feasible CE is paramount. The CE system requires the following four critical criteria: (1) more advanced technologies that help productions cleaner and more eco-friendly; (2) producers should change their business models and play roles. An example is to develop the reverse logistics system for reusing and recycling glass bottle after use; (3) novel governmental policies supporting green productions/consumptions; (4) consumers' cultural change from throw-away to reuse and recycle habits. Kirchherr et al. (2018) and Korhonen et al. (2018) argued that the above criteria are also the barriers to applications of CE however.

Weaknesses of the Circular Economy Model

Ritchie and Freed (2021) commented that many hurdles need to be solved to make a particular production process circular owing to the complexity of the systems with a number of factors contributing to every stage of the process. The shortage of guidance available for CE practice is so acute that we are puzzling how and where to start a particular business model. Its weaknesses explain the reasons why the linear economy dominates at the current time. Additionally, proper education, and resource scarcity for CE are considerable obstacles to the growth of CE. Finally, the vague regulations and insufficient support from the authorities hamper the application of CE model.

Agyemang et al. (2019) similarly pointed out three weaknesses from stakeholders' perspective, that is, unawareness, financial constraint, and inadequate expertise to transit to CE. The absence of strong institutional support is another impediment to CE implementation as well (Rata et al. 2018). In addition, insufficient accreditation and certification towards reused products hamper the application of 3R (reduce, reuse, recycle) principles. As consumers, we are paradoxical: on the one hand, we appreciate the CE theoretically, but on the other hand request to use brand new instead of remanufactured or reused products. The waste management sector shows another extent that the implication of CE negatively impacts on the livelihoods of informal scavengers – an integral part of recycling system of broken products.

THE MEKONG DELTA OF VIETNAM WITH CIRCULAR ECONOMY

Brief Description of the Economy of Mekong Delta of Vietnam (VMD)

The Mekong Delta is also facing challenges due to climate change, sea level rise and impacts of hydropower and irrigation projects from countries upstream of the Mekong River (Government, 2017; Binh and Tien, 2021). ; Binh et al., 2021; Ministry of Natural Resources and Environment, 2021). Therefore, for the sustainable development of the Mekong Delta, a new approach is required. Circular economy is an approach that has been used in the world since the 1990s towards solving problems related to resource degradation, environmental pollution and ecological imbalance caused by environmental pollution. caused by a linear economy (Binh et al., 2021). However, the concept of the local economy is still relatively new in Vietnam in general and the Mekong Delta in particular. This article will introduce and compare the concept of C-economics with linear economy, analyze the legal framework of CE in Vietnam and the potential of applying CE in agriculture in the Mekong Delta towards reducing pollution, contributing to the goal. Green growth and sustainable development of the Party and State have set out.

As a part of the Vietnamese economy, VMD achieves considerable socioeconomic progresses since Doi Moi (1986). These are: (1) spurring income per capita, and decreasing the poverty rate concurrently; and (2) becoming the most important contributor of the agricultural sectors to the gross domestic products. Nonetheless, the region faces the overarching problems of environmental risks consisting of pollution, climate

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change, subsidence (Kondoff et al. 2022), in addition to weaknesses of driving forces of economic development related to skilled workforce, infrastructure and institutions.

An unambiguous achievement is the poverty eradication. According to the Government's poverty criteria, the poverty rate has decreased from 37% to approximately 6% in the period 1998–2018. However, VCCI – Fulbright (2021) proved that such achievements of poverty reduction could be stalled in the following decades due to the impact of climate change, Covid-19 endemic disease, and the unfavourable economic environment.

The development of VMD currently faces three challenges, that is, poor infrastructure, low quality of labour force, and weak institutions and policies (VCCI – Fulbright 2021). The natural conditions (e.g. climate change impacts) become worse is an additional difficulty for the region to seek the feasible way of sustainable development. Regarding labour and employment, the whole region currently has about 10.5 million workers, accounting for nearly one-fifth of the total social labour force. However, the percentage of trained workers (about 13%) is even lower than both the Central Highlands and the Northern mountainous on average. This is a notable disadvantage in transforming labour structure, employment and improving labour productivity for the region. VCCI – Fulbright (2021) also raised an alarm of insufficient capital investments in and upgraded technologies for agricultural and aquatic productions in the region. The main reasons behind this weakness are attributable to an incompatibility between the requirement of modern technology applications and human resources, and a lack of motivation for innovation in agricultural sectors with the workforce redundancy.

When it comes to the environmental problems, Hòa (2021) claimed that catfish farms solely in VMD emit ten million cubic meters of the contaminated water directly to the environment without any treatments, more than 50 thousand tons of active nitrogen, and 16 thousand tons of active phosphorus ingredients annually. In addition, the VMD agricultural economy are the attributor of nearly 2000 tons of active snail-killer ingredients, 200 tons of herbicide, and 1200 tons of insecticide ingredients. Given these environmental degradation issues, Hoa (2021) commented that CE could be the model for the improvement of the VMD economy.

The ultimate concern about the success of CE in the context of Vietnam and VMD is the economic cost of converting value form waste (Lan, 2022). The CE consists of closed-loops that uses the waste of one cycle for the inputs of another one. The amount of waste is forecast to double in the next 15 years, only one-tenth of which are recycled. This is an insignificant proportion compared to the countries that have been implementing CE. The amount of plastic waste and plastic bags nationwide currently accounts for about 8–12% of domestic solid waste. If on average about 10% of plastic waste is not reused but completely discarded, the amount of plastic waste and plastic bags discharged into the environment is approximately 2.5 million tons annually. The high rate of waste makes it difficult to manage the collecting and recycling waste resources.

Potentinal models of Circular economy in MD

To apply circular economy principles to rice production in the Mekong Delta, several potential solutions can be considered:

Reduce food waste: In Vietnam, up to 30% of rice is wasted, which not only represents a significant economic loss but also contributes to greenhouse gas emissions. Circular economy principles can be applied to reduce waste by using rice byproducts as animal feed, or utilizing leftover rice for products such as rice bran oil, rice flour, and rice vinegar.

Improve supply chain management: By reducing intermediaries and improving supply chain management, farmers can receive a higher income for their rice production. This can be achieved through the adoption of digital technologies that enable farmers to connect directly with buyers, or through the development of cooperatives that help farmers negotiate better prices for their rice.

Adopt sustainable rice production practices: The Mekong Delta is facing environmental challenges such as soil erosion, water pollution, and saltwater intrusion, which threaten the long-term sustainability of rice production. Circular economy principles can be applied by adopting sustainable rice production practices that reduce environmental impacts, such as reducing water use, using organic fertilizers, and adopting conservation tillage practices.

Mango is one of the key fruit trees in the Mekong Delta, with a total area of approximately 23,000 hectares (GSO, 2019). To apply circular economy principles to mango production, the following potential solutions can be considered:

Utilize mango waste: Mango processing generates a significant amount of waste, including peels, seeds, and pulp. These byproducts can be used to produce animal feed, compost, and biofuels.

Develop value-added products: Mango can be processed into a range of value-added products such as dried mango, mango juice, and mango jam, which can increase the income of farmers and create employment opportunities in rural areas.

Adopt sustainable mango production practices: To reduce the environmental impact of mango production, circular economy principles can be applied by adopting sustainable production practices such as integrated pest management, reducing pesticide use, and using organic fertilizers.

The Mekong Delta is one of the largest aquatic product producing areas in Vietnam, with a total area of approximately 820,000 hectares for aquaculture (GSO, 2020). To apply circular economy principles to aquatic product production, the following potential solutions can be considered:

Utilize aquaculture waste: Aquaculture generates a significant amount of waste, including fish feces, uneaten feed, and dead fish. These byproducts can be used to produce fertilizers, animal feed, and biogas.

Develop value-added products: Aquatic products can be processed into a range of value-added products such as fish sauce, dried fish, and shrimp crackers, which can increase the income of farmers and create employment opportunities in rural areas.

Adopt sustainable aquatic product production practices: To reduce the environmental impact of aquatic product production, circular economy principles can be applied by adopting sustainable production practices such as reducing water use, using natural feed, and adopting eco-friendly aquaculture techniques.

In conclusion, applying circular economy principles to key commodities in the Mekong Delta can not only contribute to the sustainable development of the region but also create economic opportunities for farmers and rural communities.

CONCLUDING REMARKS

It is important to note that the circular economy model is not just an economic framework, but also an environmental and social framework. The aim of the circular economy is to reduce waste, conserve resources, and create a sustainable and resilient system that benefits society as a whole. While the economic benefits of the circular economy are important, it is also crucial to consider the environmental and social benefits. This includes reducing pollution and greenhouse gas emissions, preserving biodiversity, promoting social equity, and enhancing resilience to climate change and other environmental challenges. The circular economy model should be viewed as a holistic approach to sustainable development that incorporates economic, environmental, and social considerations.

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REFERENCES

1. Agyemang, M., Kusi-Sarpong, S., Khan, S. A., Mani, V., Rehman, S. T., & Kusi-Sarpong, H. (2019). Drivers and barriers to circular economy implementation: An explorative study in Pakistan's automobile industry. Management Decision, 57(4), 971–994. https://doi.org/10.1108/MD-11-2018-1178

2. Domi, S. & Belletti, G. (2022). The role of origin products and networking on agritourism performance: The case of Tuscany. Journal of Rural Studies, 90, 113–123. https://doi.org/10.1016/j.jrurstud.2022.01.013
3. Minkman, E., Nguyen, H. Q., Luu, T., Dang, K. K., Nguyen, S. L., Du, H., Huizer, T., & Rijke, J. (2022). From national vision to implementation: governance challenges in sustainable agriculture transitions in the Vietnamese Mekong Delta region. Regional Environmental Change, 22(2). https://doi.org/10.1007/s10113-022-01898-z.
4. Garschagen, M., Diez, J. R., Nhan, D. K., & Kraas, F., 2012. Socio-Economic Development in the Mekong Delta: Between the Prospects for Progress and the Realms of Reality. In F. G. Renaud & C. Kuenzer (Eds.), The Mekong Delta System-Interdisciplinary Analyses of a River Delta (pp. 83–132). Springer.
5. Phillip, S., Hunter, C., & Blackstock, K. (2010). A typology for defining agritourism. Tourism Management, 31(6), 754–758. https://doi.org/10.1016/j.tourman.2009.08.001
6. Piñeiro, Arias, J., Dürr, J., Elverdin, P., Ibáñez, A. M., Kinengyere, A., Opazo, C. M., Owoo, N., Page, J. R., Prager, S. D., & Torero, M. (2020). A scoping review on incentives for adoption of sustainable agricultural practices and their outcomes. Nat Sustain, 3, 809–820. https://doi.org/10.1038/s41893-020-00617-y
7. Ranta, V., Aarikka-Stenroos, L., Ritala, P. & Mäkinen, S.J. (2018). Exploring institutional drivers and barriers of the circular economy: A crossregional comparison of China, the US, and Europe. Resources, Conservation & Recycling, 135, 70–82.
8. Ritchie, K. J., & Freed, E. C. (2021). Circular Economy. New Jersey: Wiley.
9. Stahel, W. R. (2016). The circular economy. Nature (London), 531(7595), 435–438. https://doi.org/10.1038/531435a
10. The Ellen MacArthur Foundation. (n.d). Circular economy introduction. https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview
11. Zhu, J., Fan, C., Shi, H. & Shi, L. (2019). Efforts for a circular economy in China: a comprehensive review of policies. Journal of Industrial Ecology, 23(1), 110–118