Circular Economy and agribusiness sector: Creating long-run benefits for the environment

Ekonomou, George and Halkos, George

University of Thessaly

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George Ekonomou[1, *] and George Halkos[2]

[1] University of Thessaly, Department of Planning and Regional Development.
https://orcid.org/0000-0002-3626-2817

[2] University of Thessaly, Department of Economics
https://orcid.org/0000-0002-2772-5306

Abstract

Climate change and environmental degradation constitute challenging and demanding issues that need mitigation and adaptation strategies and plans, as well as scientific research to test the causality between economic growth and pollution levels. From this viewpoint, the present theoretical approach defines the concept of circular economy in the high-leverage economic sector, which is the agribusiness sector. A circular economy approach can help agribusiness develop its potential in terms of quality and sustainability without losing its economic orientation and perspective. The circular economy assists in becoming competitive, producing eco-friendly products, minimizing materials used and wastes, and protecting the good ecological status of natural resources, such as land and water resources. Management approaches such as the project management methodology and the construction of a circular business model canvas will provide a solid bedrock on which the circular economy projects within the business will create tangible and sustainable results in a sustainable manner. Furthermore, the concept of environmental benchmarking is a valuable tool for comparing the business's environmental performance with those considered leaders or bets in class in the field.

Keywords: Environmental degradation; circular economy; agribusiness sector; sustainability.

1. Introduction

A wide range of today's environmental problems requires a clear and deep understanding of how society and nature interact to make a whole, or more particularly, a system, whereas socio-ecological systems demonstrate multiscale dynamics, unexpected and nonlinear character (Kinzig, 2001; Bennett et al., 2005; Scheffer, 2009).

As the economy develops globally, environmental quality and performance issues appear within the socioeconomic system. In many cases, scientific research and current reality indicate that environmental quality degrades when economic activity develops. For instance, this is the case when elaborating on the Environmental Kuznets Curve or investigating impacts and causalities under the energy or tourism growth nexus discussions.

No one would deny that the economic system (e.g., materials, production, consumption, waste) needs natural resources to function at high rates and provide goods and services in real markets. The first concern, a long-term perspective of managing or allocating resources, differentiates sustainable economies from merely viable economies with strictly monetary terms. The second mostly considers only economic benefits, which might be big but short-term, without respecting the environment and the relevant capacity of exploiting ecosystem goods and services.

A vital concern in a globalized economy is defining particular sub-sectors that potentially affect environmental quality (e.g., tourism, agribusiness, maritime, transportation, industry). Interestingly, this is a core question in the scientific community, which pursues ways to improve human and technical resources and processes, sectoral and organizational, to foster sustainability in the economy (Ekonomou & Halkos, 2023a, 2023b), for instance, a circular sustainable economy. Intense economic activities have changed how nature and the economy interact at the interface of environmental quality and sustainable development (Ekonomou, 2022). In this process, the term 'circular economy' enters the equation.

To keep the momentum active, high-impact industries would not miss the opportunity to determine their position in such a process. For instance, the agribusiness industry constantly seeks ways to develop and grow markets that are by origin, competitive, concerning demand, and compelling in terms of differentiation and change occurring on the supply side. Halkos & Ekonomou (2023) argue that identifying the ecological footprint of high-demand and high-impact sectors is significant to identifying patterns of pollution and 'hot spots' of environmental degradation.

Hence, an opportunity to reveal a sustainable character at the interface of growth (e.g., agribusiness), environment (e.g., natural resources used and inflows), and relevant business and market potential (e.g., optimization of production and increased revenues) is evident. Supportively, researchers (e.g., scientists) and practitioners (e.g., farmers and producers in the case of agribusiness) recognize the necessity to widely elaborate on drivers or core factors that impact the quality of natural resources.

As a direct consequence, they investigate how dominant structural sectors that shape a country's economy, such as agribusiness, influence the performance of the environment within which they function and operate. Notably, one issue that deserves our attention is the issue of ecological footprint, given climate change conditions and solutions. Also, these issues are directly connected with mitigation and adaptation strategies and policies to enhance the attempts towards a 'clear economy' or net zero economy or a decarbonized economy that is supported by relevant eco-friendly infrastructure and processes when making or practicing business.

As stated above, it would be beneficial to establish specific business-oriented processes to combat climate change and relevant crises. These concrete attemptscan provide substantial inputs and insights into decision-making processes. Importantly, they should not leave the heterogeneous nature of the economic system unobserved or unexplored in the presence of potential impacts on environmental quality and improvements.

Supportively, such an attempt should and must deeply examine the interaction of high-leverage industries and businesses like agribusiness and production since both are key market players that perform under an intense heterogeneous bundle of economic activities. In turn, these economic activities can impact the status of environmental degradation differently over the years on different scales and natural schemes.

2. The Agribusiness Sector

The agribusiness sector is connected to all aspects of sustainability, namely the economic, environmental, and social dimensions.

Indicatively, the economic dimension of the agribusiness sector is based on the revenues generated from production to consumption and the thousands of work positions and careers on a global level. In addition, this economic dimension interrelates with other businesses and industries such as food processing, packaging, storage, and transportation.

The environmental dimension of agribusiness is of high importance since it encompasses 'eco-friendly' products, minimizing potential negative externalities generated from the unwise use of natural resources, pesticides, fertilizers, and relevant inflows into the production methods that farmers and producers apply. This sector can also help avoid market failure due to the existence of a non-sustainable business character. Furthermore, fuels used and energy consumed are two important issues that are deeply linked to environmental issues and climate change. Both issues should be further researched to protect land and air quality from a long-term perspective. These issues interrelate with mitigation and adaptation policies. From this perspective, the agribusiness sector can become a leading example in terms of renewables since it can offer biofuels to reduce reliance on traditional sources of energy and fuels (e.g., fossil fuels). Thus, the agribusiness sector can help increase the percentage of renewables in energy demand and relevant energy mix with positive effects on environmental quality.

In social and human terms, the agribusiness sector leads various research efforts and developments in shaping gastronomy and nutrition habits worldwide. The agribusiness sector's cultural dimension is composed of gastronomy events, festivals, local traditions, and history. Also, this sector can advance synergies with other economic sectors, such as the tourism sector, towards a more competitive tourism product enriched with local products that promote sustainability.

It is now evidenced that the agribusiness sector is not merely cultivating the land to gather food products. This is a brief definition of agribusiness and its scope decades ago. Nowadays, the meaning, contribution, and significance of the sector are more complicated, demanding, challenging, multifaceted, and multilevel. Economic growth should be matched with environmental and social benefits. Food production and processing can be a driving factor of rural and regional development in terms of self-sustaining or endogenous development. Sustainability in agriculture should be nurtured with innovation, a circular and recycling economy, and the reuse of by-products for different reasons depending on production needs and demands. Interestingly, food security and nutrition are highly important.

For these reasons, the agribusiness value chain includes an increased number of ‘stakeholders’ and ‘parties of interest,’ the concerted action of which must ensure that sustainability is present in every action taken to offer food products. For instance, using and exploiting natural, human, and technical resources, established functions, methods and operations, inputs, inflows and raw material, processing, outputs, end,and by-products demand efficiency and effectiveness to become sustainable in terms of environmental quality and performance and viable in the context of business objective, goals, and pursues.

Obviously, the concept and content of a recycling economy are among the most interesting and challenging issues in the agribusiness sector since they can help the sector become eco-friendly, lower energy demand, and minimize its ecological footprint. The sector's performance interrelates directly with the quality of life, well-being status, and future prospects for prosperity and safety.

3. Agribusiness and Circular Economy

The circular economy is an economic system. In this system, waste from one process is not discarded directly. Instead, it becomes a resource for other means (Ellen MacArthur Foundation 2024; Pearce, 1989). Applying a circular economy can help avoid potential economic value losses since it exploits wastes as resources for implementing different processes (Nattassha et al., 2020).

One may ask why we must incorporate the notion of the circular economy when practicing agribusiness or what benefits for the businessman, the producer, or the environment result from applying the principles of a circular economy.

The benefits of applying the principles of a circular economy are practical and meaningful in an era of intensively using natural resources and practically exploiting, often unwisely, ecosystem goods and benefits. These ecosystem services comprise four main categories: supporting, provisioning, regulating, and cultural services.

Each category of these services, directly or indirectly, more or less, obviously or less obviously, connects with the agribusiness sector. For instance, food, water, and soil fertility are linked to provisioning services, biodiversity (e.g., plants), and primary production, which is matched with supporting services, whereas pest regulation interrelates with regulating services. Moreover, agribusiness and tourism can advance the benefits of cultural services (e.g., education, recreation, and aesthetic values).

Arguably, when a business applies the circular economy, it can gain and offer benefits as well. Gain in terms of viability in the economic system and offer in the society by preserving and protecting the good ecological status of the ecosystem services that use to function. In both cases, these benefits have a long-term perspective toward a sustainable and prosperous future. More specifically, by practicing circular economy processes, the business can reduce energy demand and end-consumption, reduce greenhouse emissions, use efficiently resources (e.g., water and land), and avoid potential soil degradation by simultaneously increasing margins of revenues. Most importantly, it can achieve greater rates of productivity and profitability within a sustainable business character. Consumers now choose to buy eco-friendly products, demonstrating a higher willingness to pay for environmentally friendly products.

As indicated by Dalto et al. (2023), the circular economy assists efforts to minimize the use of finite resources while promoting the use of regenerative resources. Furthermore, the potential leakage of natural resources can be prevented. One particular issue is the enhancement of reusing to add value to the relevant food system in the sector (Velasco-Muñoz et al., 2021).

The Ellen MacArthur Foundation argues that society pays two dollars in health, environmental, and economic costs for each dollar spent on food. Half of these costs, equaling 5.7 trillion United States dollars for each year worldwide, are due to how food is produced.

On the same wavelength, according to the United Nations Industrial Development Organization, land exploited for agriculture covers 50% of the Earth's habitable surface nowadays. Also, the agriculture sector generates 25 - 30% ofGHGs. Additionally, agribusiness is responsible for 80% of deforestation, 90% of degradation, 80% of loss of ecosystem services and biodiversity,70% of freshwater consumption, and over80% of water pollution (e.g., phosphate and nitrogen).

Specifically, based on the Ellen MacArthur Foundation and the United Nations Industrial Development Organization the agribusiness sector provides the bedrock on which the circular economy can make a difference in terms of dealing with climate change and reaping environmental benefits accompanied by advanced economic performance. The circular model that the sector can follow is composed of two driving dimensions ('cycles'). Each of these dimensions (or components or 'cycles') provides distinct, discrete evidence favoring a circular economy business orientation in the agriculture sector. The first refers to the technical aspects, whereas the second concerns the biological aspects.

The technical aspects include agro-industrial technological advancements and innovations ('cutting-edge technologies'). These technologies can widely help maintain, return, renew, and reuse agri-processing technologies. In turn, they provide fundamental support to achieve agricultural efficiency while minimizing waste and experiencing cost savings in business terms.

The biological contribution of the circular economy in the agriculture sector considers recapturing value from waste by reusing food, utilizing potential by-products from food waste, and nutrient recycling. It should be noted that waste can 'serve' as an input to new product creation. In addition, waste can be used for crop production, food processing, feed, and energy reduction. Also, they can be exploited in the pharmaceutical industries under proper processing.

Importantly, the principles in the agribusiness sector can be summarized in the following phrases that are concise in meaning and clear in explanation (UN, Ellen MacArthur Foundation):

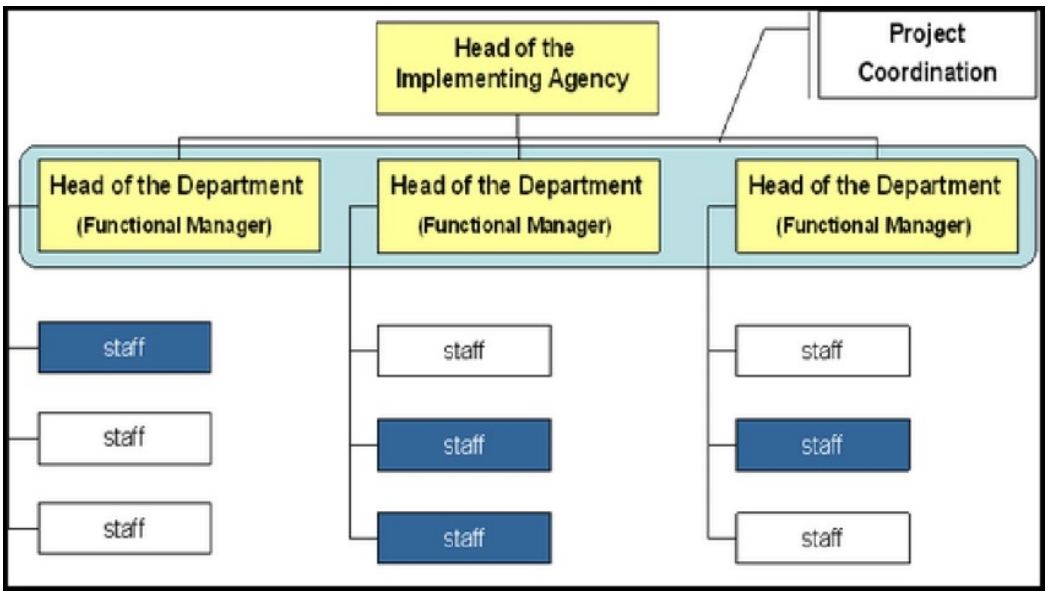
- Replace waste and pollution, for instance, become regenerative.
- Preserve value over time, such as design for durability.
- Avoid using non-renewable sources, for instance, to support natural regeneration.

Furthermore, one particular issue that deserves our scientific attention is incorporating project management in the circular economy in the agribusiness sector. Project management is a methodology for conducting business within the schedule and budget defined in the project plan. It has been claimed that implementing project management practices largely advances resource-efficient allocation and stimulates improvements in continuous cycles (PMI, 2017).Such issues help progress the work smoothly without excessive use of inflows and make appropriate adjustments in the cultivating methods used. Controlling and monitoring a well-organized, well-defined, and well-budgeted project plan in the agribusiness sector can be useful in the context of the circular economy. The project management methodology concerns the organizational structure of the agribusiness firm.

Many organizations are family businesses or follow the 'functional' structural form. Understandingly, an organization's structure concerns the business entity's procedures, functions, processes, and routines. Furthermore, it mirrors extensively how the business or the firm operates in entrepreneurship settings and business ecosystems (e.g., produces, innovates, cooperates, and/or competes).Value creation, customer satisfaction, and flexibility in learning and adapting to changes in terms of customer preferences, needs, and wants (e.g., consumptive models and consumptive behavior) are considered fundamental key success factors that the specific organizational structure can serve. Circular economy projects have a clear orientation towards sustainability. Project management methodology can help optimize resource performance (utilization, efficiency) and avoid delays and time-consuming processes (effectiveness), whereas it highly facilitates, by origin, stakeholder engagement. Figures 1 and 2 illustrate the functional and projectized organizational structure, respectively.

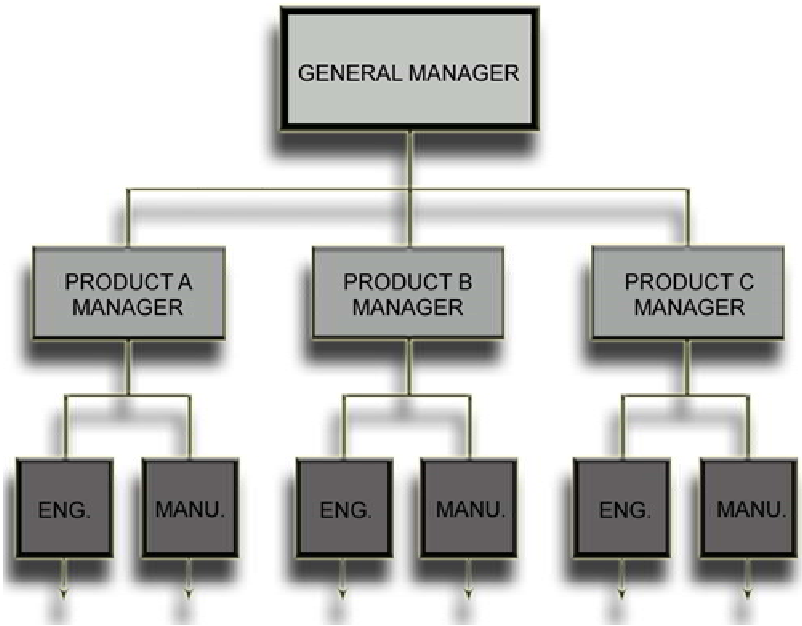
The customer (consumer) is at the top of the product or the region. It is imperative need to identify what the customer needs, why this need, and how we meet this need/demand (time, cost, quality, innovativeness, accessibility, safety, etc.). Multi-dimensional structures were designed and adopted in an effort to shed light on the company's progressive growth and read between the lines concerning the product-market combination and dynamics. Product-market combination requires cooperation and coordination as far as resources (human and technical) are concerned.

Figure 1: Functional organization structure



Source: Oluwole (2010)

Figure 2: The pure product or projectized structure



Source: Kerzner (2006).

The market requires differentiation, segmentation, and trustworthy solutions to establish a 'value-for-money' perspective. Not to mention fierce market competition (e.g., variety of products), technological advances, and the need to optimize resource performance given the fact that a wide range of choices are available. In conclusion, such factors shape a business reality that brings to the surface the need to put into practice an organizational structure that must be dynamic and adaptive in nature and adequate in managing market challenges (e.g., long-term circular economy sustainability projects).

The organizational structure plays a significant role in implementing circular economy programs and initiatives. Organizations in the agribusiness sector should first transmit to the employees the notion and meaning of the concept and then start creating tangible and measurable results that can be considered beneficial not only in numerical terms but also in terms of its social and human dimensions. In this direction, given that sustainable resource management (e.g., land, cultivation, and food management) is an integrated process, the core role of 'systems thinking' lies in preparing strategies for meeting sustainable development objectives.

Mingers & White (2010) view systems thinking as an approach that recognizes a hierarchy among the parts of the system in which relationships or interactions between elements are more important than the elements themselves in determining the behavior of the system and accept that people will act in accordance with differing purposes or rationalities. One would claim the synergies between project management methodology and systems thinking to advance the Environmental, Social, and Governance (ESG) approach, prepare relevant reports, monitor progress, and incorporate environmental benchmarking.

Environmental problems have their routes in human intervention to natural settings and functions and to disposition to create and/or consume more and more in our life cycle. Many efforts have been made to effectively handle, manage, restore, alleviate, and mitigate environmental damages and impacts, whereas interdisciplinary committees pay attention to putting into practice risk assessment models and project quality management.

Benchmarking is a method that encompasses tools and techniques by which the performance of the organization can be measured and compared. It is a method that measures one organization against the recognized best performers in a certain industry (Barkley & Saylor, 2001). More specifically, benchmarking is a method of measuring your organization against those of recognized leaders or best of class, while continuous improvement reflects the never-ending pursuit of excellence (PMI, 2004).

Environmental benchmarking is a methodological approach to see where first-in-class or leaders within the sector are (e.g., performance) and try to close the 'gap.' This approach requires the organization's continuous improvement (e.g., standards, best practices) and monitoring of how relevant 'metrics' are developing through the process. Then, the agribusiness organization will find this approach useful to measure environmental sustainability, for instance, in terms of circular economy, compared to

other firms, primarily in the relevant field (e.g., production of waste and recycling and reusing).

The circular economy has developed as a strategy to meet the two-fold objectives of improving the economic performance of agricultural activity while limiting the effects on the environment by minimizing the inflow of resources and waste generation (Velasco-Muñoz et al., 2022). Connections then can be identified toward environmental integrity and resilience to safeguard the smooth functioning of natural processes and dynamics toward a sustainable economy around the agribusiness system.

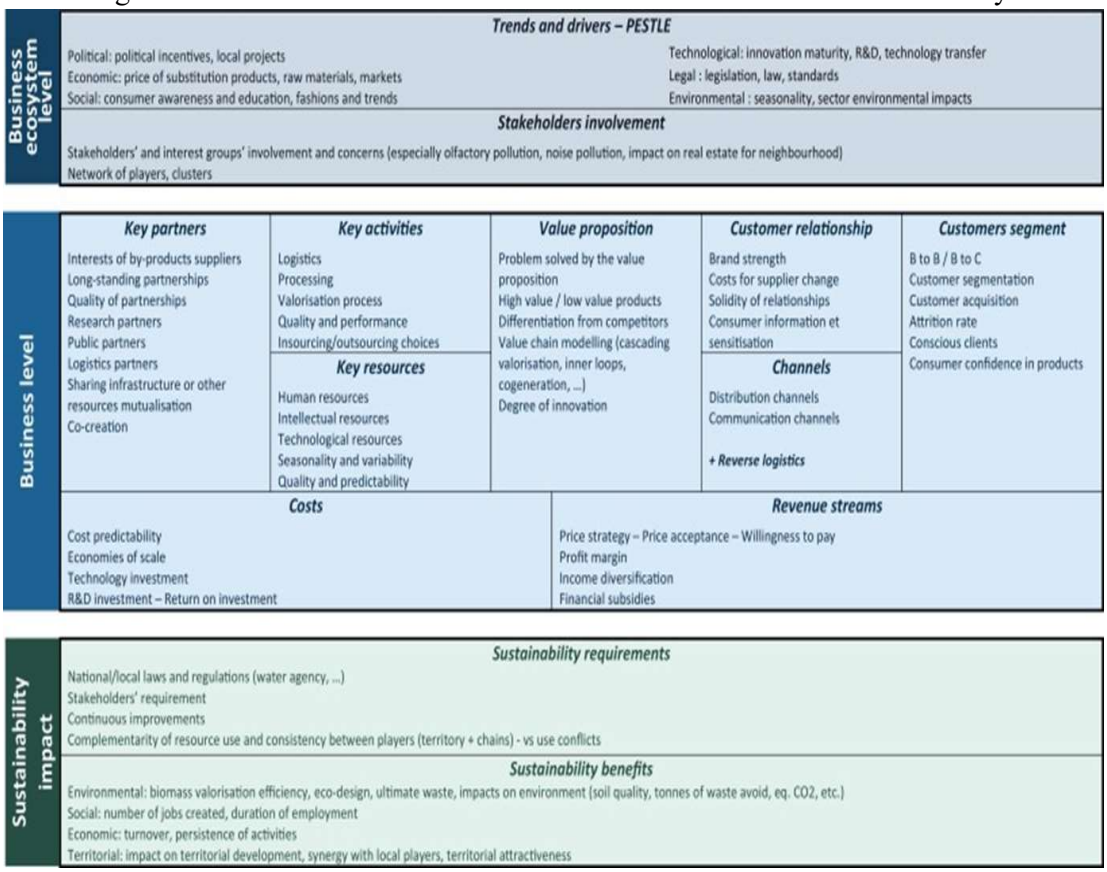
Bearing in mind that today's problems come from yesterday's "solutions" and that the harder you push, the harder the system pushes back (Senge, 1990), it should be vital to mention that sustainable development remains an objective that can be achieved through true and sincere cooperation between scientists and management based on reliable, flexible and consistent frameworks. The key behind the concept is well-developed policies linked to knowledge-oriented strategies so as to achieve results and get things done. Supportively, the investigation of integrating relationships and causalities between economic growth and environmental improvements remains an issue for investigation and academic research since it always advances the identification of pathways that drive, affect, and impact sustainability performance (Halkos, 2003, 2013, 2018; Halkos and Aslanidis, 2023).

4. Circular Business Model Canvas

The circular business model canvas is a document designed to facilitate an organization's or firm's efforts to achieve circular economy goals. The core issue is minimizing waste and protecting the good ecological status of natural resources and the environment. Thus, sectors should keep materials in use and in circulation for a considerable amount of time without losing quality and customer satisfaction. One perspective could be to extend the product life cycle and save resources for future use sustainably. Such a perspective will save additional costs for the business, achieving viability within sustainability, which is the key aspect in front of climate change and potential resource scarcity. For instance, energy, water, and raw materials can be managed better and create higher value for agricultural products in the agribusiness value chain.

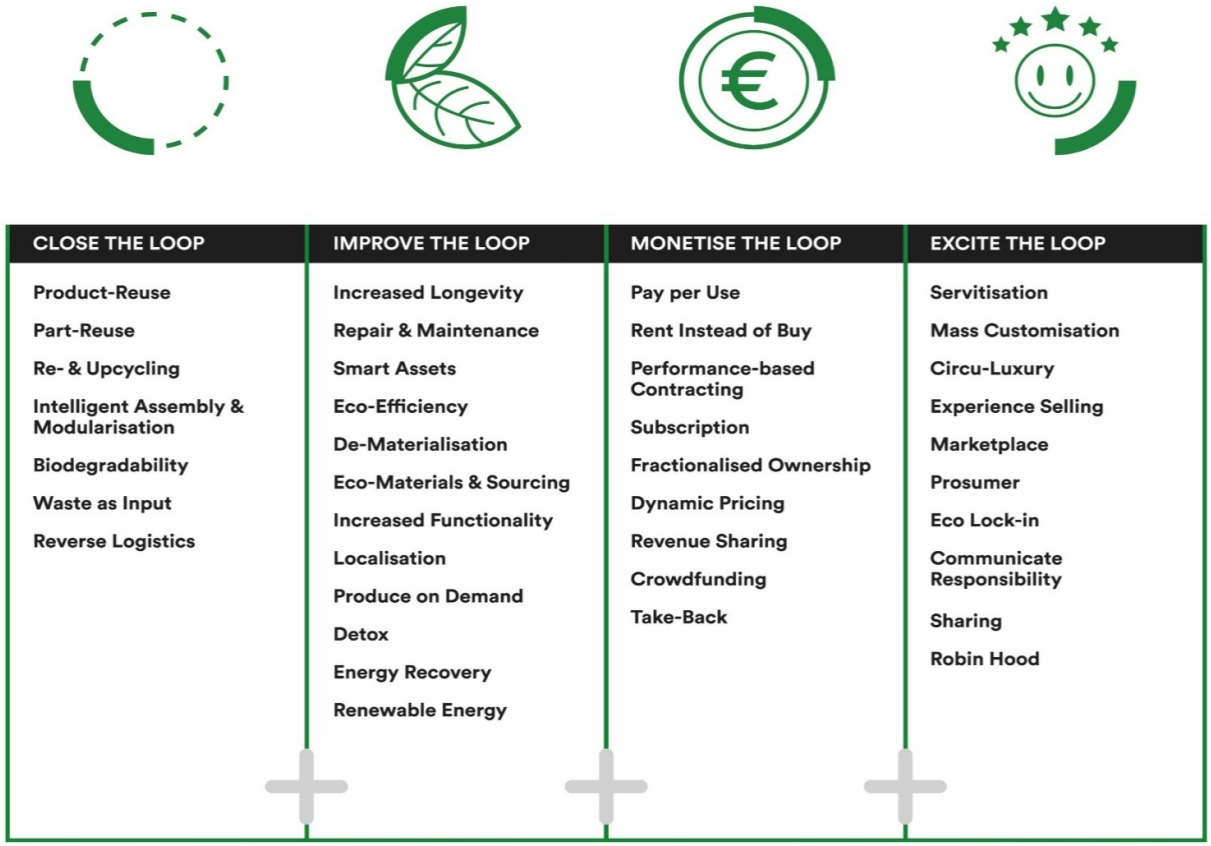
As a last resort, one should note that the core challenge of establishing a circular economy is the required changes at a system level (Yuan et al., 2006; Ellen MacArthur Foundation, 2015). The engagement of all actors related to the value chains (e.g., suppliers, manufacturers, retailers, consumers) is fundamental to reaping benefits (Donner et al., 2020). Figure 3 presents graphically a framework constructed to mirror the circular business model analysis, focused on agro-waste valorization. Moreover, figure 4 presents a Circular Business Model: From Ideation to Implementation from the University of St Gallen.

Figure 3: Framework for circular business model analysis



Source: Adapted from Antikainen & Valkokari, (2016); Donner et al., (2020)

Figure 4: Designing Circular Business Models: From Ideation to Implementation.



Source: https://bmilab.com/blog/2021/01/27/designing-circular-business-models-from-ideation-to-implementation

Conclusions

The sustainable development pillars cover integrating circular economy projects within the agribusiness business model. This perspective creates mutual benefits in humans and society (e.g., employment positions, quality of life), in the economic system (e.g., minimizing costs and becoming viable in the long run), and in the environment (e.g., achieving resource efficiency and protecting natural resources). It goes without saying that consumers prefer products that have been created with eco-friendly practices, and scientific research evidence that these people are willing to pay more to consume the relevant 'green' products.

Furthermore, the current challenging situation of climate change and crisis calls for all business stakeholders to act and perform sustainably in terms of quality by respecting the ecosystem goods and services used to deploy economic activities (e.g., the agribusiness sector). This issue is highly important considering environmental risks and pressures, such as materials and inflows used for food production at the interface of land and water.

he scientific community uses research and data analysis to provide justifications for acting sustainably and creating benefits (e.g., economic and social). Simultaneously, it argues that the good ecological status of natural resources will safeguard economic viability and social well-being with a long-term perspective. Consequently, all efforts should target sustainable development goals, and especially high-impact economic sectors, such as the agribusiness sector, should show the way and lead the initiatives toward sustainability.

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