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CIRCULAR ECONOMY AS AN ALTERNATIVE TO BETTER USE OF NATURAL/ECONOMIC RESOURCES AND TO CONTRIBUTE TO SUSTAINABLE DEVELOPMENT GOALS: A CASE STUDY IN PIG FARMING

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Abstract: Economies across the planet face a context of scarcity of raw materials and environmental problems, and the need to use resources more efficiently is evident. One possibility is the transition from Linear Economy to Circular Economy, since this model allows the return to the productive chain reflected by the same or other product sectors. In order to foster this transition from the environmental economic model, the Federation of Industries of Minas Gerais (FIEMG), launching the Circular Economy Program in Industrial Districts which aims to identify collective business opportunities within an Industrial District (DI), highlighting if Granja Barbosa, a company in the swine sector located in Minas Gerais. This article aims to describe and analyze the adoption of the assumptions of Economy mapping circular as actions incorporated by the farm, as well as the environmental and economic benefits of these as well as contributions to the Sustainable Development Goals- SDG. As methodological tools, we used an on-site visit and an interview with the entrepreneur on aspects related to the practices of activities aimed at recycling, regenerating, sharing, optimizing and exchanging waste. In addition, it uses the Circular Transition Indicators (CTI) developed by the World Business Council for Sustainable Development (WBCSD, 2020), adapting the model used in the investigation by Fadel (2021). As a result, gains can be seen in all the actions analyzed, such as a reduction of 87.75% in the monthly consumption of electricity using the property, which highlights the importance of the environmental economic model and motivates its adoption by similar or even similar colleagues.
Keywords: Sustainable Development, Linear Economy, Circular Economy, Sustainable Development Goals.

INTRODUCTION

Economies across the planet face a context of scarcity of raw materials and accentuated environmental problems, the need to use resources more efficiently, and whenever technically and economically possible, use as resources those wastes that do not can be avoided.

Rethinking the production cycle and the flow of materials in the productive supper was not always a concern. For a long time, the motto was centered only on the linear economy based on extracting, producing, consuming and throwing away. However, this model is beginning to be threatened due to the limited availability of natural resources. Future projections indicate incompatibility between current production and consumption levels and availability of natural resources for future generations. In a world with exponential population growth, 9 billion people are expected to be reached by 2050 and with expectations of increased use of raw materials in the coming decades, it is inferred that the current society's trajectory of unsustainability will continue (LEITÃO, 2015).

Faced with this emergency, a new approach to the economic development model of countries and the operation of companies is essential, which puts economic rationality in balance and sustainability with environmental demands. One possibility for favoring this balance is the Circular Economy, which consists of a model that allows rethinking economic practices, promoting the development of new relationships between companies, which become simultaneously consumers and suppliers of materials that are reincorporated into the production cycle (EMF, 2015). It is understood that the Circular Economy model represents one of the dimensions for the implementation of the Sustainable Development Goals established at the Assembly of United Nations that

form the central axis of the 2030 Agenda, guiding actions in the three dimensions of sustainable development - economic, social and environmental (NU, 2020).

With the objective of describing and analyzing the adoption of the Circular Economy premises and pointing out its relationship with the Sustainable Development Goals, this article was developed that mapped actions incorporated by a pig farm from Minas Gerais participating in the Circular Economy Program promoted by the FIEMG (Federation Minas Gerais State Industries) in the region.

For this purpose, it was chosen as methodological instruments the on-site visit and interviewing the entrepreneur on aspects related to the practices of activities aimed at recycling, regenerating, sharing, optimizing and exchanging waste. In addition, the Circular Transition Indicators (CTI) developed by the World Business Council for Sustainable Development (WBCSD, 2020) were used, adapting the model used in the investigation by Fadel (2021), which quantifies aspects such as cost reduction, increase in revenue, amount of reuse, recycling, exchanges and waste sharing.

This article is organized in the following parts: Introduction, theoretical basis for the study, methodology adopted for the research, presentation of results and discussions and final considerations and bibliographical references.

LITERATURE REVIEW

Agribusiness is currently a relevant component for the country's economic growth and, as such, there is growing pressure on natural resource reserves to maintain demand for consumer goods in developed and developing countries. In 2019, the sum of goods and services generated in agribusiness reached BRL 1.55 trillion or 21.4% of the Brazilian Gross Domestic Product (GDP). Among the segments, the largest portion is in the agricultural sector, which corresponds to 68% of this value (R$ 1.06 trillion), with livestock corresponding to 32%, or R$ 494.8 billion. In Minas Gerais, the second most populous state in the country and the third largest GDP in Brazil, the agribusiness GDP corresponds to 36% of the state GDP and as observed in the national scenario, agribusiness was mainly driven by the livestock sector, whose GDP in 2019 advanced 8.51% (CEPEA, 2019).

Among the activities related to livestock, pig farming is, without a doubt, an important activity from a social and economic point of view. However, its activity is considered by the environmental control agencies as an "activity potentially causing environmental degradation", being classified as having great polluting potential (OLIVEIRA, 2002). Furthermore, current swine farming, like any economic activity, does not allow for non-technical management, requiring a detailed analysis of zootechnical data and their economic issue, as well as a global vision of the entire internal and external production process. In other words, it requires planning, monitoring and evaluation from the producer. In the current scenario presents a significant reduction in profit margins, which makes producing economically efficient, an imperative. As feed expenditures represent 70% on average of production costs, factors such as crop failures, increased exports of grains, competition from other livestock sectors lead to a considerable increase in these. The selling price per kg of pigs is determined by internal issues (income, competition, seasonality, consumer demand, among others) and by external issues (exports).

Given the growing pressure caused by agribusiness on natural reserves, Unidos (2020) emphasizes that the scarcity of

resources is aggravated by the current linear economic model and that even with the adoption of short-term solution measures to minimize impacts, continuing with this model will culminate in a collapse in the resilience of ecosystems

In this regard, it should be noted that even before the Industrial Revolution, a movement that began in the 18th century, industries used a linear production system that consists of removing, using and discarding. Resources are removed from the environment, used to manufacture certain products and, after being used, are discarded. However, a system that is based on consumption and not on the restorative use of non-renewable resources causes a considerable loss of value and negative effects on the production chain, in addition to its environmental impacts.

One of the evidences of the emergence of this context were the Sustainable Development Goals established by the General Assembly of the United Nations, which defined the 2030 Agenda, which contains the most relevant aspects to be managed by nations on an urgent basis (UN, 2020)

Several studies and analyzes reveal that the current linear model used to exploit the planet's natural resources has proven unsustainable because of the limited amount of available resources. Given the perspectives of unsustainability of this model, from the 1970s onwards, the concern with the scarcity of natural resources has grown, noting that such resources are finite or subject to restrictions imposed by the speed of renewal or by the availability of land for population supply (WEETMAN, 2019). This unsustainability, according to Leitão (2015), will persist in society since it is expected that in 2050 the mark of 9 billion people will be reached and with expectations of an increase in the use of raw materials in the coming decades (WBCSD, 2012).

In this context, the concept of Circular Economy began to emerge in the 20th century, but only in the last few decades has this model been given greater prominence. Based on the article by Cavalcanti (2010), it is clear that the theme of Ecological Economy or Circular sparks important reflections, both from the perspective of the environmental bias, as well as from the economic perspective. What is highlighted is that, although the benefits needed for environmental sustainability may seem, paradoxically, nonsensical, it may have as an opportunity the possibility of better economic returns for business. For this author, the subject does not contemplate Ecology and Economics in a cool way, but should encompass the interactions between environment and economy. This approach is justified and intensified by the writings of other authors such as Amato Neto (2015, p. 3) who states that "the management of production and the economy that always thought, in a linear way, in the production chain, until the arrival of goods and services to consumers, now need to run to guarantee the return ticket", which may involve the win-win probability of achieving savings by favoring the circular transformation of waste into input. This process is called transumo by Calvalcanti (2010).

One way to reduce environmental impacts and overcome resource scarcity would therefore be the transition to an Ecological Economy. It is economics that goes beyond our normal conceptualizations of scientific disciplines and tries to integrate and synthesize many different disciplinary perspectives, that is, it incorporates actors other than the human (EMF, 2015). This initiative dialogues as an alternative to the implementation of Sustainable Development Goals (SDGs) such as: action for global climate change, accessible and clean energy, and responsible consumption and production.

Therefore, more than reducing consumption, it is understood that it is necessary to review the entire production chain, rethinking the creation of products so that they can be reused as inputs after they have already been used. Although little explored, this conception is not new. The leading Austrian economist, 1974 Nobel Prize in Economics, Frederick von Hayek, argued in the London School of Economics magazine, Economica, in the early 1940s, that neither goods nor money, not even food, can be defined by their physical qualities, and yes only in terms of the opinions that economic agents have about it. This debate gained relevance in 2012 and 2013 when the Ellen MacArthur Foundation published two excellent reports, both showing the material and energy inefficiency of what is produced today, and suggesting paths for this transformation (Abramovay, 2014). According to this Foundation (2015), the circular economy is restorative and regenerative in principle. Its objective is to maintain products, components and materials at their highest level of utility and value for the longest period, differentiating the technical and biological cycles.

It is noticed that the discussion permeates the question of how to generate the economic flow in an intelligent way, using reason and, in particular, the purpose of saving and, simultaneously, living better. There is no way to admit that one wants to deal with physical things, with artifacts that combine matter and energy, without considering the implications that result from this in terms of the environment (Cavalcanti, 2010). In an evolving interconnected world, science has concentrated the search for knowledge in many different directions, but has omitted or paid little attention to the production of ideas on how to formulate and solve problems that arise from the interactions between human beings and the natural sphere.

Therefore, it demands a constant confrontation between nature and society, environment and economy, with uncertainties, urgencies and new frontiers. The current linear model based on extracting, transforming, producing, using and discarding loses in scope, as it begins to be threatened due to the limited availability of natural resources and the planet's limits in terms of the capacity to assimilate the pollution generated, as points out Leitão (2015) corroborating the perspective of Cavalcanti (2010).

Under these circumstances, the adoption of a circular flow that aims to optimize the use of resources, reducing waste, proves to be extremely effective from an environmental as well as an economic point of view. It refers to a new combination that is more adequate and requires innovation, revisiting here the Creative Destruction defended in 1949 by Schumpeter when he said that the economic flow destroys existing structures, bringing new, more innovative and emerging ones, destroying the previous ones that are no longer effective. Innovation, based on a new sustainability paradigm, appears as a means to generate economic growth, social well-being and ecological restoration within the limits of ecosystems is one of the challenges of the 21st century.

The EMF (2015) highlights and synthesizes the three principles that underlie the concept of Circular Economy, which are: (a) Preserve and improve natural capital by controlling finite stocks and balancing the flows of renewable resources, this principle refers to the dematerialization of products and services, as well as the enhancement of natural capital which stimulates the flow of nutrients within the system and creates the necessary conditions for regeneration such as soil. (b) Optimize resource yields by circulating products, components and materials at the highest level of utility at all times, both in the

technical and biological cycles. Thus, in the circular model, products and processes are designed for remanufacturing, renovation and recycling, so that technical components and materials continue to circulate and contribute to the economy. (3) Encourage system effectiveness by revealing and reducing negative externalities from the outset, which includes mitigating damage to systems and areas such as food, mobility, housing, education, health and entertainment, and managing externalities such as use from land, air, water and noise pollution and the release of toxic substances.

Considering these principles and, although the idea of Ecological Economics seems to be a novelty, what makes it, currently, so evolved for a generalized adhesion, are the innovative technologies that allow it to materialize, which would have been impossible years ago. This is because a residue is now considered a resource, that is, something that has a potential for use, valorization and that can and should be at the origin of a new product, generating sustainability and economy.

This transformation changes the economic logic because it replaces production with adequate and sufficient use of resources where it is desired to reuse what is possible, recycle what cannot be reused, fix what is broken and remanufacture what cannot be fixed (STAHEL, 2015). This model is highly attractive not only from an environmental point of view, but mainly from an economic point of view, involving the most varied sectors, organizations and governments.

In this context, the disciplines of ecology and economics that placed themselves – or still are placed by some – as extreme points of the scale, demand synchrony. The paradigm that the first takes care of only the world of nature, excluding humans, while the second considers only human reality, should be updated. Due to this synchrony, opportunities are envisioned for companies through the reduction of inputs used and production costs, lower cost of waste disposal, attraction of conscientious consumers, financing possibilities, new markets, etc. In addition, the understanding that waste can often be a resource, and circular business models lead to a management that values it, inserting it into a value chain (CNI, 2019). Technology, through innovation, is believed to be a way to make this dialogue viable and to favor sustainability in its broadest sense, which incorporates the environment, economy and society. There is, therefore, no sense in this confrontation. Ecological economics applies the tools of liberal economics to environmental problems. It takes care of the environment, but its purpose is to internalize it in the economic calculation, counterbalancing them as unique goals.

METHODS

For this case study, a pig farm from Minas Gerais was selected that is part of the Circular Economy Program promoted by the FIEMG (Federation of Industries of the State of Minas Gerais) initiative. FIEMG carried out its Pilot Project of the Circular Economy Program in Industrial Districts in this region of Minas Gerais, taking into account its maturity, 44 years since its implementation and the number and size of industries in the district, with 23 companies in its delimitation, in addition to 31 companies in its area of influence (TONACO, 2020). It is worth noting that learning from this pilot has resulted in several other initiatives in industrial districts.

The pig farm is located in the area of influence of Industrial District I, about nine kilometers from the industrial region of the municipality. The main activity carried out by the enterprise is pig farming with a maximum housing capacity of 6750 animals, characterized as a medium-sized enterprise

with medium polluting potential, therefore classified as a class 3 enterprise in accordance with the Normative Deliberation of the Environmental Policy Council of Minas Gerais 217/2017. In addition, there are also other activities, namely: extensive cattle raising in 112.7 ha of pastures, production of animal feed with 20t/day for own consumption and develops industrial waste composting with a useful area of 0, 5 there, which receives the waste from cattle collected in the confinement area and the solid fraction from the treatment of liquid effluent from the swine industry. The liquid fraction, after treatment consisting of an anaerobic biodigestion phase, followed by a stabilization pond, is used for fertigation of pasture areas. (SUPRAMCM, 2019). The enterprise has a total enterprise area of 133.69 ha, being subdivided into 107.48 ha of pastures, grassland with 5.18 ha, area and permanent preservation corresponding to 6.47 ha, pig sheds and accesses/roads totaling 5.26 ha, waste tank for fertigation with 1.33 ha, composting area with 0.42 ha, biodigestor system with 4.61 ha and cattle confinement area which corresponds to 2.85 ha.

The pig production system is composed of three subsystems. The first consists of the formation of the feed, considered as input to the system. The second, located in the middle, is called swine production. The third, waste treatment. The composition and amount of waste vary according to the management adopted, age of animals, food, temperature, methods used to collect and store waste, humidity and amount of water used to clean the facilities (MAPA, 2016).

To survey, describe and analyze the circular practices implemented by the farm, as well as relate them to the Sustainable Development Goals, an on-site verification was carried out in the enterprise, in which an interview was carried out with the owner, as well as participant observation aiming at the objective visualization of the activities developed in the enterprise.

The interview sought to identify actions aimed at activities to recycle, regenerate, share, optimize and exchange waste. In addition, the Circular Transition Indicators (CTI) developed by the World Business Council for Sustainable Development (WBCSD, 2020) were used, adapting the model adopted in the studies by Fadel (2021), with the quantitative aspects of each action contemplating the following results: cost reduction, increased revenue, reduced use of virgin raw materials, reuse of effluents, reduced water consumption, recycling and reuse of waste, and diversion from landfills.

RESULTS AND DISCUSSIONS

This section presents the actions related to the Circular Economy developed by the enterprise, which are organized in: Fertirrigation with effluents from the biodigester; Energy generation from biogas generated in the biodigester; Heating the crèche bays by burning biogas; Installation of pacifiers for supplying water to swine; Use of rainwater catchment system; Reduction of the water depth in the breeding sheds; Incorporation of food industry waste into animal feed; Mechanized composting of waste;

FERTIGATION WITH BIODIGESTER EFFLUENTS

The project has a treatment system consisting of a set of physical and biological mechanisms, with a homogenization chamber for the raw effluent, biodigester, concrete lined tank and waterproofed by geomembrane at the exit of the biodigester for stabilization and a pond. The solid phase is removed and the residue is sent for processing in composting. In addition to the activity's waste, it disposes of effluents received from other companies.

Among third-party effluents, effluent treatment sludge, biodegradable kitchen and canteen waste, etc. stand out. Therefore, the primary treatment is carried out through a process of anaerobic decomposition in the biodigester. Secondary treatment is done by a set of temporary storage tank and optional pond that act following the biological treat.

The first stage of the biological treatment consists of a biodigester that allows the reproduction of anaerobic bacteria that act in the degradation of the high organic load of the swine effluent. According to analyzes carried out in October 2020, the efficiency of BOD removal from the biodigester was 77%, in order to complement the treatment, a subsequent biological treatment unit was added through a facultative pond.

At the exit of the biodigestor there is a passage tank where the temporary storage of the effluent that leaves the biodigestor takes place and is pumped to the facultative pond, which is located 436 meters from the tank. Detention time in this tank was stipulated for six days. This temporary storage tank serves as a passage for the effluent prior to its pumping to the optional treatment pond located more than 400 meters away, which is totally waterproofed by a high-density polyethylene (HDPE) geomembrane.

Even undergoing biological and physical treatment and being a process of significant contribution to the decarbonization of the activity, since it converts methane gas (CH4) into energy, the effluent is applied with caution, respecting the dosage and intervals of adequate application in order to avoid problems such as soil salinization, soil compaction by clay dissociation, surface sealing, fly proliferation, among others. Thus, considering the needs of brachiaria pasture, as well as the availability of nutrients in the soil and the nutrient supply by the treated effluent, the property reaches the application level through the formula of the DEA/UFV method, which exemplifies the implementation of attention of responsible production – SDG 12.

ENERGY GENERATION FROM BIOGAS GENERATED IN THE BIODIGESTER

With the anaerobic treatment of the effluent in the biodigester, an average of about 18,000m³ of biogas is generated monthly, which is formed by a mixture of gases, normally constituted by approximately 65% of methane (CH4) and the remainder by carbon dioxide (CO2) and some other gases such as nitrogen, hydrogen, carbon monoxide among others in lower concentrations (COLDEBELLA, 2008).

Thus, it was verified the potential of electric energy generation with this by-product of the effluent treatment with the installation of a generator that is able to supply the operation of the farm facilities, except for the feed factory, which provided a reduction of 4000Kwh to 490Kwh, which corresponds to 88% of the utility's electricity consumption. It can be seen, therefore, that together with decarbonization, the company explores renewable sources for energy production, trying to create, in this way, new forms of energy production that enable the reduction of the use of exhaustible natural resources, which shows an implementation alternative of clean energy.

HEATING THE CRÈCHE BAYS BY BURNING BIOGAS

One of the factors that strongly influence the survival and zootechnical performance of pigs is temperature. In view of this criticality, part of the biogas generated in the biodigester by the anaerobic treatment is burned, converting methane gas into oxygen dioxide and is channeled and sent to nurseries - rooms where young piglets are handled - whose ideal temperature at this stage is around 28

at 30°C. It should be noted that methane is a greenhouse gas with global warming potential about 20 times greater when compared to carbon dioxide and is responsible for 20% of global warming (EPA, 2007). With the implementation of this Circular Economy action, there was a reduction of about 8.33% in the costs of electricity consumption, as well as a reduction of about 3.3 tons per year in CO2 emissions, thus allowing to contribute to the mitigation of climate problems and the implementation of a clean energy source - SDG 13 and SDG 7.

INSTALLATION OF PACIFIERS TO SUPPLY WATER TO PIGS

Without access to quality water, animals do not feed properly and productivity drops. On the other hand, the consumption of water and other inputs in pig farming has a strong environmental impact, whether because of its use as a natural resource, or because of the impact on the volume of waste generated in the production cycle. Therefore, this feature is among the main concerns of the swine farmer.

In order to mitigate water consumption on the farm, the traditional drinking system for animals was replaced by pacifiers, which release water only when the animal demands it, which favored a reduction in water consumption of about 500m³ /month, which can be indicated as an alternative to pig farming that aims at sustainable and responsible production - SDG 12 and energy generation - SDG 07.

USE OF RAINWATER CATCHMENT SYSTEM

Saving and reusing water has been a growing concern for enterprises. Such attention has driven actions that range from reusing water from the production process in cleaning outdoor areas to capturing rainwater.

With this in mind, the studied farm developed a rainwater catchment system, aiming to reduce the use of water in the artesian well. This system, which comprises approximately 400m² of the unit's area, washes the company's floors and equipment, as well as being used as part of consumption for animal watering. The implementation of this system saves about 1200L/week of water and presents itself as another possibility to reach SDG 12.

REDUCTION OF WATER DEPTH IN BREEDING SHEDS

The use of a thin layer of water in swine sheds is an old tradition that is based on the search to bring comfort to the animals, keep the pens cleaner and achieve lower production costs than slats. The thermoregulation favored by the adoption of water depths occurs through thermolysis and the conduction and convection processes, which tends to benefit feed consumption and weight gain.

The farm, when expanding its finishing sheds, opted for a construction with a configuration that allows a water depth 30% smaller than the conventional one, which is about 7 cm. With this improvement implemented, there was a saving of about 2400L/week of water, thus, a contribution to SDG 12

INCORPORATION OF FOOD INDUSTRY WASTE INTO ANIMAL FEED

The Food and Agriculture Organization of the United Nations – FAO, estimates that the world production of agro-industrial residues reaches 1.3 billion tons per year, realizing that 1/3 of the food potentially destined for human consumption is wasted, either as waste, from processing or as waste in the production chain (FAO, 2013). The use of agro-industrial residues in new production chains is a great opportunity for the sustainable use of these residues.

The farm has its own feed factory to supply the food needs of the pigs, whose production capacity is 20t/day. In recent years, it has received non-standard food residues from three food industries located in the region for incorporation into the feed produced on the property. On average, there was a saving of around 50t/month in the consumption of virgin raw material for the production of feed, which represents an action that cooperates with the Sustainable Development Goal related to responsible production. Furthermore, a production with a reduction of approximately 10% in costs with the purchase of this input. In addition, the incorporation of residues from the food industry improves the quality of the feed and its palatability and, as a consequence, there is an improvement in feed conversion, that is, in the conversion.

MECHANIZED COMPOSTING OF WASTE

Composting is a process of controlled aerobic decomposition and stabilization of organic matter under conditions that allow the development of thermophilic temperatures, resulting from a heat production of biological origin, obtaining a stable final product, sanitized, rich in humic compounds and whose use in the soil, does not pose risks to the environment (VALENTE, et. al., 2009), therefore, it is considered a technique that enables the proper use of household, agricultural and agribusiness organic waste, minimizing environmental contamination.

In order to properly treat the solid fraction of waste originating from the passage through the ecofilter, the farm adhered to the compost, leaving an organic compost as the final product. After participating in FIEMG's Circular Economy Program in Industrial Districts, the farm invested in a mechanized composting project to, in addition to continuing with its own waste composting processes - ie cattle waste and solid phase of swine effluents - dispose of waste from other partner industries and also adherents to the program.

Due to this interaction process between the farm and the agrifood industries in the region, residues such as non-compliant foods for industrial production have been transformed into organic compost; residues from canteens and restaurants and biological sludge in an effort to produce responsible and contribute to mitigate climate effects -SDG 12 and 7. These residues enter a "blend" together with chopped grass and swine and cattle waste and are composed of , approximately 45 days, being aerated by automated machinery, following temperature and humidity control. Approximately 150m³ of compost are produced monthly, which is used for the farm's own use.

The Circular Economy actions developed by the farm were summarized below, as well as their economic and environmental benefits (table 1).

CONCLUSIONS

The circular economy brings a new possibility for organizations that look to sustainability as a strategic resource. In recent years, the consumer's view has become more critical, not only in relation to the product and the cost/benefit/quality ratio, but also observing the company's image in terms of social and environmental responsibility. In order to raise awareness about the conscientious use of natural resources, consumers, at least a good part, are turning to companies that follow the concepts of sustainability and prioritize actions aimed at the circular economy.

Added to this is the desire of organizations to comply with current environmental legislation and also to be able to exploit economic gains favored by the adoption of the

Action	Classification	Environmental Benefit	Economic Benefit
Fertigation with biodigester effluents;	Regeneration and Cycling	Reuse of 2480m³/month of effluents	70% increase in monthly revenue.
Energy generation from biogas generated in the biodigester;	Regeneration	Reduction of 87.75% in the utility's electricity consumption	Reduction of 87.75% in monthly costs.
Aquecimento das baias da creche com a queima do biogás	Regeneration		Reduction of 8.33% in monthly costs.
Installation of pacifiers for supplying water to swine;	Regeneration and Optimization	Reduction of 500m³/month in water consumption.	--
Use of rainwater catchment system.	Regeneration and Optimization	4.8m³/month reduction in water consumption	--
Reduction of the water depth in the breeding sheds;	Regeneration and Optimization	2400L/wk. of water.	--
Incorporation of food industry waste into animal feed;	Regeneration and Optimization	Reuse of 50t/month of food industry waste	20% reduction in monthly costs
Mechanized composting of waste;	Regeneration, exchange and sharing Recycling	140t/month of organic waste	15% increase in monthly revenue.

Table 1: Summary of Circular Economy Actions in the farm participating in the Circular Economy Program promoted by FIEMG.

Source: (Prepared by the author).

circular economy by detaching from the linear economy which, especially, has also presented different small examples of contributions of how it can favor the achievement of some of the Sustainable Development Goals (SDGs).

In this way, it was noticed in the case studied that the farm sees a balance between the environmental, social and economic pillars, allowing the investments made for the project to develop in an environmentally correct manner, to be recovered either financially or by acceptability and reputation /social respect. In several strategies adopted by the same, the simultaneous sensitivity to environmental decarbonization and the economic and social pillars was identified.

It is worth highlighting the importance of diversifying these actions taken by the farm, since when the company adopts circular processes in the areas of water efficiency, atmospheric emissions, waste and effluent management and actions to reduce virgin raw material, the greater the chances of carry out the transition from the linear economy to the circular economy if compared to a management that prioritizes only one of these aspects. For example, its entrepreneurship in employing the two main alternatives for the energy use of biogas can be evidenced, which are the conversion into electrical energy and the thermal use.

As it contributes to the a in the actions described and analyzed, it was identified that all were permeated with investment in technological knowledge in order to fulfill objectives such as: recycling materials; returning recovered biological resources to the biosphere; share assets; dematerialize waste; adopt energy generated by renewable materials and increase product and process performance/efficiency.

The sustainability of the projects is a subject that still has a lot to offer, but its concepts need to be disseminated among organizations, either through programs such as the Circular Economy Project or through incentives from the government and the community, which each year makes more aware and demanding of environmental responsibilities.

As challenges, we can point out the difficulties related to the availability of researches on the theme's ecological economy and circular economy, as well as the cultural change of the business community. These should be extensively investigated, especially in academic curricula, to encourage future professionals to adopt environmental responsibility measures in their projects. It is necessary to understand that the goals of organizations need to be reflected on the reality of the planet.

Finally, even knowing that this consensus of objectives can be difficult to adhere to in a natural and broad way, the central reflection that should serve as a driving force for changing human behavior in its decisions about evolution and progress is that the best option is one that allows achieving the desired ends, considering the scarcity of resources. Therefore, there is the right to believe and corroborate Cavalcante (2010) that business behavior should be, in the medium and long term, conditioned by scarcity.

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