Design of indicators of circular economy as instruments for the evaluation of sustainability and efficiency in wastewater from pig farming industry

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Circular economy intends to turn waste into resources that can be reintroduced into the production process, eliminating the negative externalities from it. The impact of pig manure on the environment is one of the main challenges in agriculture. The high amount of pig manure coming from the pig farming industry complicates the management of this type of effluents, leading to a serious impact on the environment, as it pollutes the soil, the water, and the air. The concept of the indicator of circular economy was introduced to evaluate the degree of approximation of the pig manure treatment process to the circular economy model. In light of this, these indicators showed the possibility of obtaining 0.97 m3 water h-1, 49.40 kg biofertilizer h-1, and 5.33 m3 biogas h-1 per 1 m3 pig manure h-1 treated, allowing us to assess the minimization of waste generation and the efficiency of the use of resources. By applying an anaerobic digestion process to treat pig manure, reductions of water and natural gas consumptions were 47.01% and 5.33%, respectively, which leads to a reduction in emissions of 171.98 kg CO2 h-1. Consequently, pig manure can be considered as a technological nutrient that is reintroduced into the productive system, enabling the recovery of energy, water, and biofertilizer contained therein.

Circular economy

Energy

Indicator

Pig manure

Technological nutrient

Wastewater

Anaerobic digestion

Economics

Effluents

Fertilizers

Gas emissions

Indicators (instruments)

Manures

Nutrients

Sustainable development

Wastewater

Anaerobic digestion process

Circular economy

Degree of approximation

Energy

Impact on the environment

Negative externalities

Pig manures

Recovery of energies

Industrial economics

anaerobic digestion

design method

economic instrument

emission control

energy efficiency

environmental economics

environmental impact assessment

environmental indicator

industrial waste

resource use

sustainability

technological change

wastewater treatment

Suidae