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Biological Treatment for Liquid Waste Generated in Livestock Processes

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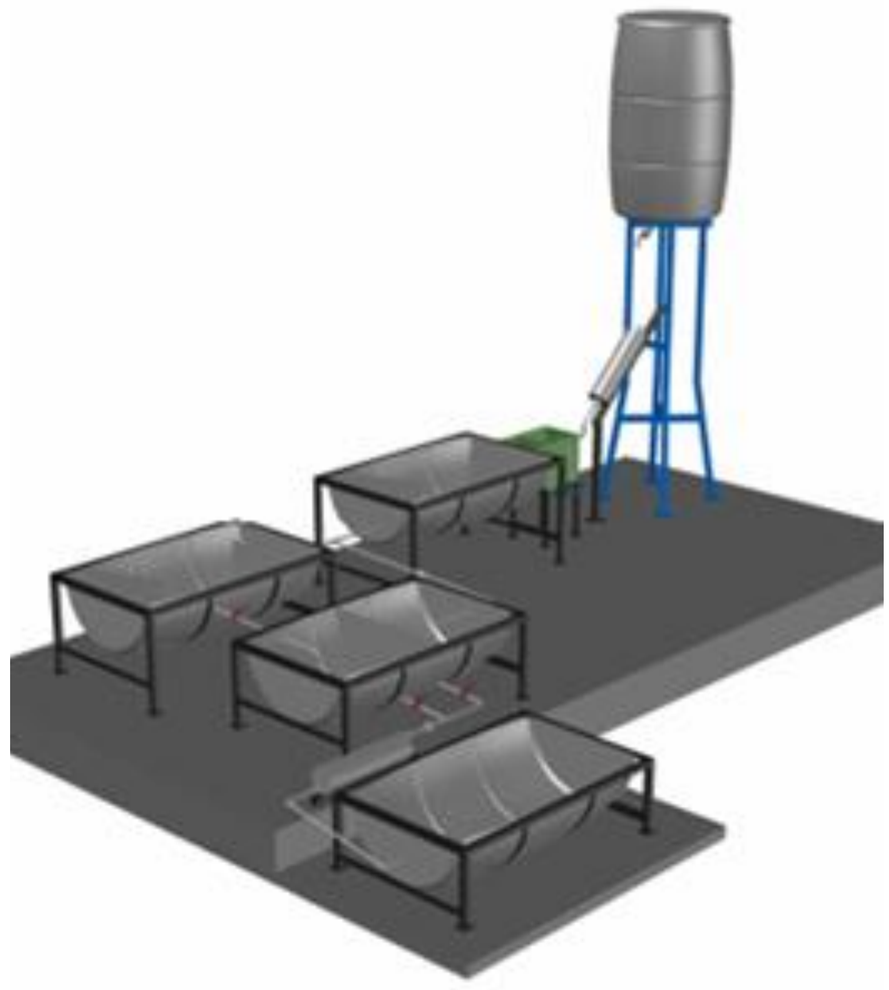
Introduction

In the year 2015 in Jalisco Mexico 135'862,891 heads of livestock were counted, including poultry, cattle, goats, pigs and sheep (Servicio de Información Agroalimentaria y Pesquera, 2016) which has influenced in some way the index of environmental pollution since in the same year an average of 4'124,344 tons of excrements were generated, both solid and liquid, which have the surplus of these wastes must be treated so that they have an adequate quality to be dumped in bodies of water, reused in the cleaning of corrals or used in the form of irrigation. impacted the environment with water pollution, production of greenhouse gases and soil deterioration due to excess nutrients.

Theoretical Framework

In Mexico, biodigesters are used that are fed with the liquid and solid waste generated by different livestock activities. This equipment contributes to the reduction of greenhouse gases (GHG) that are generated if the excreta are left in the open air, and it also produces biogas that can be used in different ways; At the same time, a liquid by-product is generated that is used in part as fertilizer but sometimes it is not possible to take full advantage of it since large amounts of it are generated and it cannot be directly disposed of in bodies of water due to the amount of organic matter it contains. For this reason, the surplus of these wastes must be treated so that they have an adequate quality to be dumped in bodies of water, reused in the cleaning of corrals or used in the form of irrigation.

There are different methods for the management and treatment of liquid and solid waste from livestock farms, including mechanical separation, compost production, and aerobic and anaerobic digestion (Gómez et al. 2011). For liquid waste, biological filters have been used which have proven to be effective in the treatment of this type of waste. Reed beds have also been proposed which are capable of removing contaminants from effluents, in addition to swamp treatment systems (Agribon, 2003).



Methodology

A treatment system was designed and built at laboratory level, which consists of different stages that are filtration, activated sludge reactor, subsurface wetland and maturation pond.

The parameters evaluated were those considered within the Mexican regulations (NOM-001-SEMARNAT-1996) for discharges into water bodies.

PARAMETER	BEGINNING	FINAL
BOD (ppm)	3,546.20	121
COD (ppm)	8,015.04	997.3
Dissolved oxygen (ppm)	0.236	6.5
Fats and oils (ppm)	14.4	2.2
Total Nitrogen (ppm)	807	214
Total Phosphorus (mg/L)	11.41	420
Sedimentable solids (mg/L)	3	0
Total suspended solids (ppm)	320	230
pH	7,6	8,6
Temperature (°C)	25	25
Conductivity (mV)	1856	520
Escherichia coli (NMP/mL)	3	ND
Salmonella	Absent in 25 mL	ND
Helminth eggs	Negative	ND

Results

The combination of treatments resulted in the removal of 96.6% BOD, 87.6% COD, 84.7% fats and oils, 73.4% total nitrogen, 100% sedimentary solids and 28.1% total suspended solids, the only parameter that increased was total phosphorus.

Conclusions

The treatment system was effective and should be further studied in order to reach scalability and to be able to treat more waste. It is recommended to continue researching the causes of the increase of phosphorus and its possible solutions.

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