

## Biogas Production Using Water Hyacinth as a Means of Waste Management Control at Hartbeespoort Dam, South Africa

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**Abstract :** The rapid growth of population in recent decades has resulted in an increased need for energy to meet human activities. As energy demands increase, the need for other sources of energy other than fossil fuels, increases in turn. Furthermore, environmental concerns such as global warming due to the use of fossil fuels, depleting fossil fuel reserves and the rising cost of oil have contributed to an increased interest in renewables sources of energy. Biogas is a renewable source of energy produced through the process of anaerobic digestion (AD) and it offers a two-fold solution; it provides an environmentally friendly source of energy and its production helps to reduce the amount of organic waste taken to landfills. This research seeks to address the waste management problem caused by an aquatic weed called water hyacinth (*Eichhornia crassipes*) at the Hartbeespoort (Harties) Dam in the North West Province of South Africa, through biogas production of the weed. Water hyacinth is a category 1 invasive species and it is deemed to be the most problematic aquatic weed. This weed is said to double its size in the space of five days. Eutrophication in the Hartbeespoort Dam has manifested itself through the excessive algae bloom and water hyacinth infestation. A large amount of biomass from water hyacinth and algae are generated per annum from the two hundred hectare surface area of the dam exposed to the sun. This biomass creates a waste management problem. Water hyacinth when in full bloom can cover nearly half of the surface of Hartbeespoort Dam. The presence of water hyacinth in the dam has caused economic and environmental problems. Economic activities such as fishing, boating, and recreation, are hampered by the water hyacinth's prolific growth. This research proposes the use of water hyacinth as a feedstock or substrate for biogas production in order to find an economic and environmentally friendly means of waste management for the communities living around the Hartbeespoort Dam. In order to achieve this objective, water hyacinth will be collected from the dam and it will be mechanically pretreated before anaerobic digestion. Pretreatment is required for lignocellulosic materials like water hyacinth because such materials are called recalcitrant solid materials. Cow manure will be employed as a source of microorganisms needed for biogas production to occur. Once the water hyacinth and the cow dung are mixed, they will be placed in laboratory anaerobic reactors. Biogas production will be monitored daily through the downward displacement of water. Characterization of the substrates (cow manure and water hyacinth) to determine the nitrogen, sulfur, carbon and hydrogen, total solids (TS) and volatile solids (VS). Liquid samples from the anaerobic digesters will be collected and analyzed for volatile fatty acids (VFAs) composition by means of a liquid gas chromatography machine.

**Keywords :** anaerobic digestion, biogas, waste management, water hyacinth

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