



Technical and economic analysis of plug-flow anaerobic digester to take advantage of goat manure in smallholder farms

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Accepted for publication on 10th February 2015

The objective of this work was to evaluate technically and economically plug-flow digesters to take advantage of goat manure. There were used two continuous reactors with gasometer in PVC flexible film. One installed at EBDA's Experimental Station, in Jaguarari, Bahia, of 33 m³ which were evaluated from September 2006 to April 2007. The affluent and effluent biochemical, microbiological, and parasitological characteristics were monitored, the biogas production and composition were evaluated, as well as the use of the biofertilizer in elephant grass. The other one, of 8m³, was set in a real smallholder farm that had about 50 goats in Cacimba do Silva (Juazeiro, Bahia), being evaluated from 2006 to 2008. With adequate management, the pollution power of waste reduced significantly. Microbiologically, the efficiency of total and fecal coliforms remotion was above 98%, and the main endoparasite eggs were eliminated after treatment. The biogas production was 0.061 m³ kg⁻¹ of manure. The biogas showed in its composition basically 58 and 34% of methane and carbonic dioxide, respectively. The biofertilizer (pH 7.5) was a great source of nutrients, mainly nitrogen (64 g 100L⁻¹, 80% ammoniacal form) and potassium (214 g 100L⁻¹), increasing forage production, without significant changes in the chemical composition, "in vitro" dry matter digestibility, and mineral content. As economic benefits were considered three situations: A = biogas in substitution to LPG; B = A + biofertilizer in substitution of synthetic fertilizers; C = A + B + carbon credits. The annual production of biogas corresponded for saving in LPG of U\$ 294.53. Biofertilizer was equivalent to synthetic fertilizer in U\$ 262.24. The carbon credits were estimated in U\$ 115.84. In A, B, and C situations, the benefit:cost ratio was, respectively, of: 1.73; 2.95; and 3.56. In loan simulation with interest rate of 5.5% per year and payment from situation A, the payback was at 7th year. After 10 years, the profit was U\$ 1,029.50; 3,328.96, and 4,487.43, in A, B, and C situations, respectively, resulting in increases in the energetic resources and food security for the poorest regions of Brazil.

Keywords: biofertilizer, biogas, carbon credit, manure