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Energy and economical evaluation of a biogas generation plant under the Feed-in Tariff scheme in Japan

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In Japan, since the enforcement of the Feed-in Tariff (FIT) scheme for renewable energy (RE) power sources in 2012, the number of solar photovoltaic power sources and other RE power sources connected to power grids has been rapidly increasing. Biogas plants (BGPs) with anaerobic digestion are receiving high attention as facilities for both livestock manure treatment and electric power generation. In addition, the promotion of renewable energy sources by FIT led to BGPs becoming valued for their reduced environmental impact and stability because their energy output is largely unaffected by natural conditions and fluctuates little on a daily basis. The objective of this study is to evaluate an individual BGP which has been in operation since 2000 from the point of view of energy production and economics. In this study, the power balance for a BGP was verified using actual measurement to assess the potential for electricity supply from the plant. The FIT scheme in Japan requires a fermenter and subsequent power generation facilities to be certified based on the idea that a fermenter, a gas holder, and a power generator are part and parcel of a BGP. In this study, the electricity required by fermenters was handled as in-house power and was taken from that generated at the BGP. We used two evaluation methods. First, to estimate how global warming gas varies by BGP systems, we used life cycle assessment. The second evaluation method was made by comparing fossil energy input for constructing, running, and maintaining a BGP with energy outputs in the form of electric power, heat, and digested manure. The energy pay-back time based on the centralized BGP was calculated from the energy inputs and outputs.

Biography

Shiho Ishikawa received a Master's degree in Agriculture from the Rakuno Gakuen University, Hokkaido, Japan in 2004 and a PhD degree in Agriculture from the Hokkaido University in 2015. Following this, after working as an Engineer at a private consulting company, she currently works for Hokkaido University, as an Assistant Professor and the Institute for laboratory where she is involved in several research projects related to smart grids. Currently, she performs research on energy characteristics by using biogas generators for renewable energy resources and control algorithms for demand-side management on farm.

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