Quantitative evaluation of cleaner production and environmental policy toward the co-benefit of greenhouse gas and odor reduction: case study of Tapioca starch industry

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Received: 16 May 2018 / Accepted: 14 September 2018
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Abstract
Chemical components of airborne volatile organic compounds (VOCs) released from a wastewater treatment system of the tapioca industry were identified. Quantitative analysis of the concentrations and the emissions of each chemical were evaluated taking into consideration the difference in atmospheric turbulence over the surface of the wastewater during the day and the nighttime periods. The chamber experiments were performed on-site in order to reflect actual environmental characteristics of the study area. Chemical concentrations were analyzed following the U.S. EPA TO-15 Standard Method. Emissions of each compound were calculated using the box model scheme. It was found that acetaldehyde and acetone were two major compounds of released airborne VOCs from the wastewater treatment system of the tapioca industry. Due to its high organic content, the wastewater treatment facilities of this type of factory generally caused the odor problem to its surrounding communities. These results supported the theory of the co-benefit of managing both local environmental problems and reduction of greenhouse gas emissions from the implementation of cleaner technology in the agro-industry. This methodology can be applied to reveal and quantify the success of other green efforts particularly in the agro-industry businesses.