

# Mitigating CO<sub>2</sub> emission in dairy farm by bioenergy production using animal manure

Xing Fan<sup>1</sup>, Bin Chen<sup>2\*</sup>

1 Institute of Environment and Ecology, Shandong Normal University, 1 Daxue Road, Ji'nan 250358, China

2 School of Environment, Beijing Normal University, Beijing 100875, China (Corresponding Author)

## ABSTRACT

With the urbanization, the dairy farming system is undergoing industrialization to meet the growing demand for dairy products. Industrial farms have been reported to increase milk production per unit area because of the high breeding density and improve feed use efficiency of dairy cow, which may reduce the environmental impact intensities, such as non-CO<sub>2</sub> emission in producing one unit of milk. However, industrialization also increases the energy input due to the use of mechanized equipment and thus increases CO<sub>2</sub> emission. Anaerobic digestion of cow manure to produce biogas and using the digestate to produce bioenergy crops are cleaner ways for fossil energy saving. In this study, by combining field survey, model simulation and scenario analysis, we calculated the mitigation potentials of fossil energy consumption and CO<sub>2</sub> emission in milk production using bioenergy production technologies in an average-sized industrial dairy farm, compared with milk production without bioenergy production technologies. Then, we estimated the manure excretion and CO<sub>2</sub> equivalent emissions released from manure management from China's dairy farming systems in 2017, and calculated the mitigation potential of CO<sub>2</sub> emission if all dairy cow manure were treated by biogas fermentation plus waste nitrogen for bioenergy crops production. The cost-benefit of manure management with bioenergy production technologies was also analyzed to explore the economic potential of the manure management with bioenergy production technologies.

**Keywords:** dairy production, energy consumption, bioenergy production, CO<sub>2</sub> emission

Selection and peer-review under responsibility of the scientific committee of CUE2020

Copyright © 2020 CUE