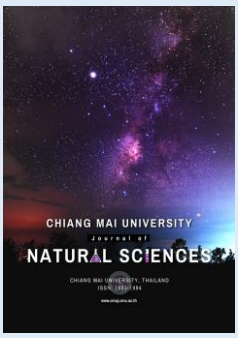

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Research article

Valuation of External Costs of Wet-Season Lowland Rice Production Systems in Northern Thailand

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Abstract This study aims to assess the external costs of environmental impacts associated with the rice production systems using LCA approach and evaluated them into the economic value. The study compared the different chemical and energy use, as well as straw management of the three different rice production systems, included the mainstream conventional rice system, GAP rice system, and the organic rice system in Northern Thailand. The LCA analysis quantified the midpoint and endpoint of five environmental impacts, including climate change, terrestrial acidification, eutrophication, water depletion, and human health damage, from cradle-to-farm gate.

The results of economic valuation revealed that the external costs of the conventional and GAP rice systems have significantly higher than that of the organic system. Most external costs came from the wastewater treatment cost due to the eutrophication mainly arising from the use of chemical fertilizer. Besides, about one-fourth of the total external costs came from the human health damage cost due to the open-air rice straw burning. To reduce the external costs of rice production, the amount of chemical fertilizer use causing eutrophication should be diminished and replaced by applying organic fertilizer from incorporating rice straw into the soil as well as growing a rotational crop after rice cultivation to stop the open-air rice straw burning and reduced the human health damage. The government should encourage rice farmers to the organic rice farming and manage the rice straw without burning because they may have the cost burden, whereas society gains more benefits from less pollution.

Keywords: Economic valuation, Environmental impacts, Life Cycle Assessment, Rice production systems, Thai Good Agricultural Practice

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