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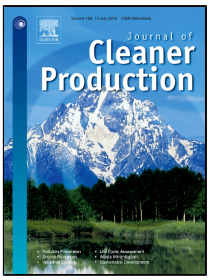

Integrated assessment of economic and environmental consequences of shifting cropping system from wheat-maize to monocropped maize in the North China Plain

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Integrated assessment of economic and environmental consequences of shifting cropping system from wheat-maize to monocropped maize in the North China Plain

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Abstract: Monocropped maize is being discussed as a possible alternative to the conventional wheat-maize cropping system in order to conserve water in the North China Plain. To evaluate the economic and environmental consequences of converting cropping systems, wheat-maize, monocropped maize systems with and without irrigation are compared through a joint use of economic analysis, emergy evaluation and life cycle assessment in this study. According to the economic analysis results, the wheat-maize system has higher grain yield and levels of economic profit but a lower ratio of income to costs compared to monocropped maize systems with and without irrigation. The emergy evaluation results show that monocropped maize systems have higher levels of sustainability. Their environmental loading ratios are 8.16%-26.7% lower and the emergy sustainability indexes are 10.20%-30.52% higher than those of wheat-maize system, respectively. The life cycle assessment results reveal lower potential environmental impacts for monocropped maize systems and their total potential environment impact indexes are 39.59%-40.30% lower than that of wheat-maize system. These results indicate monocropped maize will be an effective measure to resolve the current issue of environmental pressures caused by the conventional wheat-maize system in the North China Plain.

Highlights:

1. Integrated assessment of cropping system shifting.
2. Economic analysis, emergy and life cycle assessment are conducted.
3. Monocropped maize is an option to replace wheat-maize system in the North China Plain.

Key words: cropping system shifting; economic analysis; emergy; life cycle assessment; North China Plain

1. Introduction

Groundwater depletion is one of the top challenges humanity faces for its future development, and it is a particularly serious problem in the North China Plain (NCP). Excessive extraction of groundwater for cropping irrigation in the NCP, where groundwater renews slowly,