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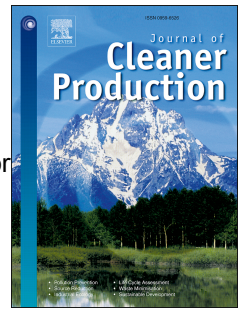

Feebates for dealing with trade-offs on fertilizer subsidies: A conceptual framework for environmental management

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Feebates for dealing with trade-offs on fertilizer subsidies: A conceptual framework for environmental management

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Abstract

Approximately half of today's annual worldwide crop yields can be attributed to the application of mineral fertilizers. Globally, we rely and depend on additional yields as a cornerstone of present and future global food security. In areas with very low nutrient loads, subsidies for appropriate and responsible fertilizer use may help farmers to increase their yields and improve soil fertility. In many countries of the world, fertilizer subsidies are applied as direct payments; however, they have also become an environmental risk factor. We deliberate in what way(s) maximizing the farmer's economic yield conflicts with maximizing societal interests. We show (mathematically) that, from the perspective of a single farmer, under the assumption that crop yields increase monotonically with the application of fertilizers, any fertilizer subsidy provides an economic incentive to increase the application of fertilizer, independent of the amount that has already been applied. We suggest feebate systems (i.e., fee- and rebate-based mechanisms like penalty taxes and subsidies based on a specific reference point) as an economic strategy for regulating both over- and under-fertilization. This acknowledges the various roles that subsidies have played historically, ranging from agricultural systems that have generally over-fertilized, such as urban agriculture in China, Vietnam, or Indonesia, to countries where fertilizer subsidies are provided to compensate for significant land degradation. In order to connect feebates to fertilization based on a sustainable reference, we provide a conceptual, multilevel environmental and sustainability assessment that is linked to conventional and market-based economic means, such as farm-specific feebates or cap and trade.

Keywords

environmental management, agricultural modeling, fertilizer subsidies, externalities, environmental impact, environmental policy, integrated assessment