803/F

Eco-costs of different methods of paddy cultivation in the Kalutara District: An application of Life Cycle Assessment

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Paddy cultivation is well established in nine out of 15 agro ecological regions of the wet zone of Sri Lanka. Kalutara District plays a major role in paddy cultivation and farmers predominantly follow conventional methods in paddy cultivation. However, there is an emerging trend to adopt organic farming due to better prices for rice of traditional varieties grown without chemical inputs. The goal of this study was to compare cost of environmental impacts of paddy cultivation practiced under conventional and organic methods. The study used life cycle assessment (LCA) as a tool and eco-costing method. The study was conducted using input output data from 156 farmers for the 2014 Yala season. The functional unit used in the study was 100 kg of paddy at the farm gate. First, all emissions and the consumption of resources connected to different processes were listed in a Life Cycle Inventory (LCI). Six indicators for environment impacts; global warming; eutrophication; human toxicity; terrestrial eco-toxicity; freshwater aquatic toxicity; depletion of abiotic resources and atmospheric acidification were considered. These impacts were then converted to monetary values adopting the eco-costing method to compare the environmental damage cost of the two systems.

The results indicate that the value of global warming potential of inorganic cultivation is 717 Rs/kg CO_2 eq followed by 323 Rs/ kg SO_2 eq of acidification, and 1105 Rs/kg PO_4^{3-} eq of eutrophication. Values for organic paddy cultivation for the above indicators are respectively, 181 Rs/kg CO_2 eq, Rs/kg SO_2 eq, and 260 Rs/kg PO_4^{3-}. The total damage cost of human, freshwater, and eco toxicity from conventional cultivation is 3,334,093 Rs/kg DBeq. The total damage cost of organic cultivation is only Rs.770 which is only a minute fraction when compared to the total damage cost of Rs.30,146,801 in conventional cultivation. The study demonstrates that the eco-cost method is an appropriate tool in determining the environmental cost between comparable production systems by incorporating the LCA tool. It further reveals that the adoption of an organic system is environmentally more profitable than the conventional cultivation of rice.

Keywords: Global warming, damage costs, chemically intensive farming, organic farming, environmental impacts

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