

Validation of I-Phy_{palm}, an Indicator of Pesticide Pollution Risk: Method and Preliminary Results

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ABSTRACT

One agri-environmental indicator of the INDIGO® assessment method, I-Phy, assesses the environmental impact of pesticide use (Bockstaller et al., 2008). Wohlfahrt et al. (2009) adapted this indicator to create I-Phy_{palm}, for the cultivation of oil palm. I-Phy_{palm} is composed of four components: three assess the risk of pollution of ground water (through leaching), surface water (through run-off, erosion, and drift), and the atmosphere (through drift and volatilization), and one is related to the rate of pesticide application. The overall score (range = 0-10, with ≥ 7 meaning “sustainable”) results from aggregating the scores of each module using fuzzy-logic mathematics. Validation of this indicator is underway and will be based on results of a dedicated trial in a mature oil palm plantation in Sumatra (Indonesia). A specific rate of glyphosate (11 g plot⁻¹) was applied to plots (18 × 18 m) having a variety of ground conditions: three slopes (5, 15, 25%) and three systems to manage vegetative ground cover. Glyphosate concentrations in run-off water were measured, and glyphosate losses in run-off water were calculated. Glyphosate losses ranged from 1.0-36.1 g.ha⁻¹ (mean = 10.7 g.ha⁻¹). The export coefficient of glyphosate varied from 0.3-10.1% (mean = 3.1%). A modified version of the indicator was created by aggregating modified versions of the surface-water and rate components using the same fuzzy-logic rules. A validation matrix was created by comparing the scores of I-Phy_{palm} to measured pesticide losses. Work is in progress to validate the indicator in a wider range of situations.