Ecotoxicological risk assessment of agriculture intensification in Argentinean cropping lands using a fuzzy-logic based model

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Introduction
Current agricultural models have an increasing dependence on non-renewable resources that have significant implications for the ecosystem health. Pesticides are considered one main impact factor that affects both the structure and functions of agroecosystems. We assessed the environmental pesticide risk (1992-2005) of cropping systems in the Inland Pampa (Argentina) using a fuzzy-logic model. Here, the traditional mixed cropping systems were being replaced by permanent agriculture. However, there is no clear awareness of the ecotoxicological risk associated with these land use changes.

Methods – The model
A fuzzy-logic-based expert system were developed. Thresholds and membership functions were developed by means of expert opinion. The input variables are:
1) Crop (S1 or S2) showed a significant increment from 1992 to 2000 and a subsequent reduction from 2000 to 2005 (Spearman rank correlation, P < 0.05). However, there is no clear awareness of the ecotoxicological risk associated with these land use changes.

Results: crop yield and risk over mammals and insects
Results showed that harvested yield increased significantly in all crops during the period studied (P < 0.05). In 1992 base yield, spring soybean (S1) showed the highest increment and sunflower (S2) the lowest. All crop yields increased during the time period analyzed. The multivariate CART analysis determines a final model configuration with 10 non-renewable resources that have significant implications for the ecosystem health. Pesticides are considered one main factor in the ecotoxicological risk. We assessed the environmental pesticide risk (1992-2005) of cropping systems in the Inland Pampa (Argentina) using a fuzzy-logic model. Here, the traditional mixed cropping systems were being replaced by permanent agriculture. However, there is no clear awareness of the ecotoxicological risk associated with these land use changes.

Classification and regression tree (CART): the structure
The multivariate CART analysis determines a final model configuration for the ecotoxicological risk (1992-2005) of cropping systems in the Inland Pampa (Argentina) using a fuzzy-logic model. Here, the traditional mixed cropping systems were being replaced by permanent agriculture. However, there is no clear awareness of the ecotoxicological risk associated with these land use changes.

Conclusions
These preliminary results indicated that higher yield in all crops analyzed was associated to higher ecotoxicological risk. We have further work to be conducted to improve the fuzzy-logic ecological model by including variables such as lower toxicological risk or other chemical pesticide characteristics (i.e. soil persistence, solubility).

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