Conference ISEM 2009 Ecological Modelling for Enhanced Sustainability in Management

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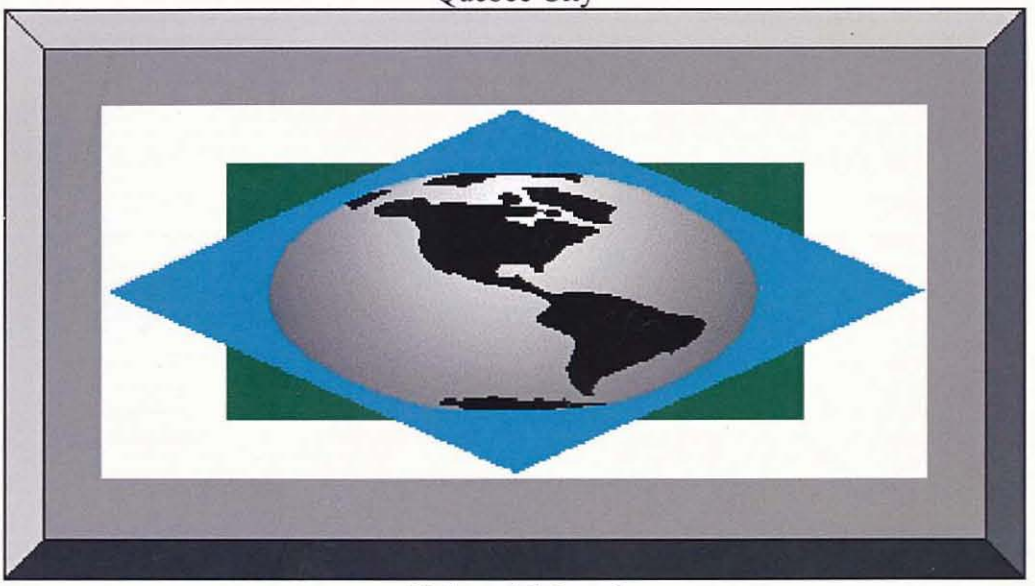

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Conference handbook

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ELSEVIER

Linking cropping system and food web models to assess agroecosystem community stability: example of litter macrofauna in banana systems

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Declining biodiversity in ecosystems can alter their functioni and performance. In order to maintain ecosystem services to society, scientists and decision makers need predictive tools to help forecasti ecosystem functionality when changes are applied.. In the age of computational ecological modelling, new frameworks remain to be built to simulate not only natural but also manipulated ecosystems such as in agriculture. Recent research shows that food web structures of agroecosystems play a major role in agronomical performance, stability, and resilience, in particular the case of biological control of pests. As a result, food web structure appears as an essential component to be studied when designing new cropping systems. Here, we present an example of linkage between a cropping system model, accurate for describing the soil-plant relations, and a trophic web model, adequate for describing interactions between communities. The SIMBA model describes plant growth and yield, plant stage dynamics, nitrogen and water balance. We described the food web in the litter of a banana agroecosystem with a multi-trophic Lotka-Volterra model. The SIMBA model was used to simulate the dynamics of plant biomass of the cultivated crop and the associated crop. Different functional groups and the structure of the community were defined and calibrated using ^{15}N and ^{13}C stable isotopes and literature data. We simulated different dynamics of cultivated and associated crop biomass, corresponding to a newly planted and established (7 years after planting) banana field. Then, we assessed the stability and complexity of the food web at the equilibrium. These simulations allow testing theoretical hypotheses related to primary productivity dynamics (driven farmers) and the food web stability. This linkage also permits researchers to tackle more applied issues like control of crop pests in agroecosystems.

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