

les dossiers d'**AGROPOLIS** INTERNATIONAL

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Agronomy

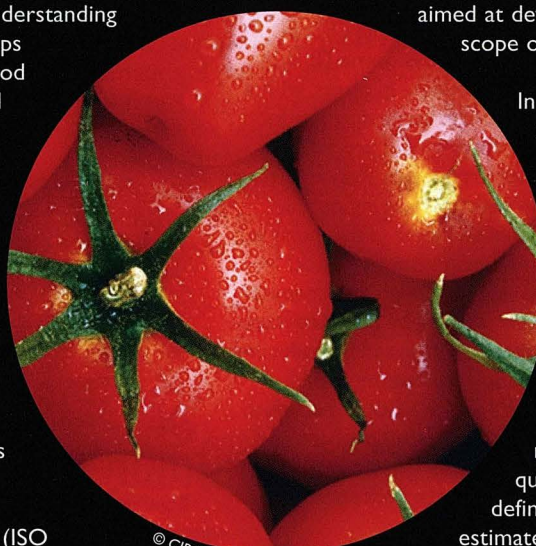
Crops and cropping systems

Comprehensive environmental assessment of agricultural and food products—a case study of fruit and vegetables

Environmental impacts of human societies are mainly associated with the food function. Understanding and, if possible, quantifying relationships between modes of production and food consumption and their environmental impacts (climate change, ecotoxicity, eutrophication, water use, etc.) are essential for making the necessary changes. Streamlined comprehensive assessment tools are required for environmental labelling of products consumed in France, as stipulated under the *Loi Grenelle 2* (domestic or imported products), or for increasing the ecological performance (impact per produced unit) of production systems in developing countries.

The life cycle analysis (LCA) method (ISO 14040-14044, 2006) is a powerful conceptual framework for overall environmental assessment of different functions necessary to humans, based especially on the function (and functional unit), life cycle of a function (see figure below) and multicriteria evaluation concepts. However, using it for agricultural and food product systems in the tropics is very recent and poses many methodological and scientific challenges. CIRAD's PERSYST department has decided to devote research to meeting this new challenge, and biomass-energy subsectors, tree crops, agrifood production, organic waste recycling in agriculture, irrigated crops such as rice, animal and horticultural

production are now the focus of ambitious LCA projects aimed at developing specific methods for this new scope of application.



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In this setting, the HortSys research unit focuses studies on environmental impacts associated with implementation of the nutritional function of fruits and vegetables. This function is crucial for balancing peoples' diets in industrialized and developing countries. A research initiative is currently being set up on vegetables (case study on tomato) and tree products (citrus and mango). The goal is especially to develop methods that take the nutritional quality of products into account when defining functional units, that provide reliable estimates of direct emissions in the field, and that can assess the water footprint and toxicity, and the error range in results.

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▲ Tomatoes in Réunion.

◀ Simplified diagram of the lifecycle of a food product 'from the cradle to the grave'.

environmental services. The stability and resilience of these functional communities to climate change and altered land-use patterns are studied in different Mediterranean and tropical soil-climate conditions, in collaboration with national agricultural research centres and universities in developing countries. These experimental approaches are closely associated with a modelling approach devoted to formalizing biological and biogeochemical

processes that govern soil-plant interactions and to predicting flows in agroecosystems.

The UMR is based in France (Montpellier) and in several tropical countries in West Africa (Senegal, Burkina Faso), Central Africa (Congo), Madagascar, Southeast Asia (Thailand) and Latin America (Brazil, Costa Rica). The main agroecosystems studied include cereal and legume cropping systems, and tree crop

stands for forestry (eucalyptus and maritime pine), agroforestry (coffee) and latex (natural rubber) production.

Annual and perennial legumes are introduced and managed in mixed-species stands under a range of different soil-climate and agricultural conditions, especially in low input systems. ...