

## **Pest and disease control function of agrobiodiversity at the field scale**

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Among agrobiodiversity enhancement options, the planned introduction and management of plant species diversity (PSD) in agroecosystems is a promising way of breaking with “agrochemistry” and moving to “agroecology”. Besides agronomic and economic benefits, PSD may reduce pest and disease impact via several causal pathways. We report on instances pest and disease regulation processes in tropical cropping systems, emphasizing the soil and field levels. We thus studied the influence of soil organic matter quantity and quality on the status of Scarab beetles associated with upland rice in Madagascar, in view of minimizing their role as pests and optimizing their function as ecosystem engineers in multiple species-based Direct-seeding, Mulch-based Cropping (DMC) systems. We also studied in West Africa the various host plants of sorghum panicle-feeding bugs, in order to manage these pests (and grain molds they transmit) via a combination of trap cropping and cycle rupture, and the potential of several trap crops for managing the tomato fruitworm (and in a subsidiary way the cotton white fly and the TYLC-transmitted disease) on okra. Although processes studied primarily operate at the field level, results obtained stress the need to take into account larger scales, both spatial and temporal. This approach is developed in the Cirad Omega3 project which builds on tropical case studies, representing a broad range of PSD scales and deployment modalities according to a typology of pests and pathogens based on life-history traits the most amenable to manipulation by PSD. Further to results aiming at immediate impact, more generic results are expected, after formalizing the ecological processes studied, namely decision-making rules which will help set up models to predict the impact of PSD on pests and pathogens with similar life-history traits.

### **Biographical sketch**

Dr. Ratnadass holds *Ingénieur agronome* (MSc, 1982) and *Docteur-Ingénieur* (PhD, 1987) degrees in Crop Protection from the National Institute of Agronomy, Paris, and a *Habilitation à diriger des recherches en Sciences* (DSc, 2007) of the National Institute of Applied Sciences/University of Lyons. Currently (since 2008), head of the Agroecology team of CIRAD’s HortSys (Horticultural Systems) research unit, Coordinator of CIRAD’s Omega3 (“Optimization of ecological mechanisms of pest and disease management for sustainable improvement of agrosystem productivity”) project, and Principal Scientist in Integrated Pest Management (IPM) at the ICRISAT Sahelian Center (Niamey, Niger). Formerly (from 2001-2007). Head of CIRAD’s SCRiD (Sustainable Rice Cropping Systems) Cooperative Research Unit in Madagascar. Extensive experience in IPM in Africa and the Indian Ocean (with 26 years of long-term assignments in Côte d’Ivoire, Central African Republic, Mali, Madagascar, Niger) on cereal, legume, root & tuber, and fruit & vegetable crops, with emphasis on post-harvest entomology, host plant resistance, soil biology, plant-derived pesticides and stimulo-deterrent diversionary approach.