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Expertise of the scientific community

Agronomy
Crops and cropping systems

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▲ *Black Sigatoka* (Mycosphaerella fijiensis) *symptoms on a banana leaf.*

Organized diversity and pest and disease dynamics

Communities of biological organisms living in cultivated terrestrial ecosystems have an impact on their productivity and sustainability, either directly, e.g. pests and diseases, or indirectly, e.g. 'soil engineers' or litter processors. The working hypothesis is that the reintroduction and promotion of biodiversity in relatively nondiversified agrosystems can help to improve the functioning and self-regulation capacities by strengthening the ecological functions, or ecological services, without regular massive pesticide treatments.

Diversity associated with plant communities is a key factor in curbing the development of pests and structuring biological communities via resources and the habitat. The introduction of gaps in monocropping systems has varying effects on pest and disease abundance, dispersion and development. The unit has thus selected several nonhost plants of the nematode banana pest *Radopholus similis,* which could be grown as cash, forage or cover crops. Fallows were found to be efficient in controlling *R. similis,* but promoted spatial dissemination of the weevil *Cosmopolites sordidus* on a farm scale. Studies were thus carried out to investigate the dispersion of this latter pest according to the spatial layout of the cropping system (CS), and a mass trapping campaign was conducted using pheromone traps in fields left fallow for sanitization purposes.

Diversity associated with fauna and flora present in an agrosystem has beneficial impacts on plants and could be essential in improving the biological quality of soils. Soil-eating *Pontoscolex corethurus* earthworms can stimulate banana leaf and root growth, while also having an impact on their nitrogen and mineral nutrition. This associated diversity can also facilitate management of some pests and diseases.

Hampering pest and disease dispersal by changing the spatial layout of CS could be an effective way of controlling their development. This study will be conducted on different scales starting from the simplest systems based on the spatiotemporal organization of a single variety and crop, and then investigating multi-variety and -species mixtures. Potential trophic links between pathogens and other functional entities of the communities will also be studied. The knowledge gained will be integrated into a trophic network simulation model designed to represent the interactions and regulations involved, with the aim of optimizing them and developing more sustainable CS.

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Coconut Research for Development Programme, International Rubber Research and Development Board, etc.), national research structures *(Institut de Recherche Agricole pour le Développement, Instituto del Café de Costa Rica, Empresa Brasileira de Pesquisa Agropecuária,* etc.) and development agencies. Crosscutting research collaborations are under way with other research units on the Agropolis campus.

The UPR thus produces new knowledge in the field of pest and disease biology and ecology, plant epidemiology and sustainable resistance. The findings of these studies are effectively used through the dissemination of new methods for predicting and managing biotic risks and the identification of sustainable resistance to pathogens. The unit's research thus covers the conventional crop protection scope for tropical tree crops generally grown in conditions of very high parasite pressure, which often increases as orchards age. Its unique feature is the multidisciplinary aspect of its research, which combines, epidemiology, population dynamics, genetics, landscape ecology and biostatistics on various terrains and scales ranging from the tree to the landscape. •••