Maths for Plants and Plants for Maths. Mathematics applied to Agronomy and Crop Protection

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Keywords: Mathematical Modelling, Agronomy, Plant-Insect Interactions, Tropical Crop, Pest Control, Delay Differential Equation, Impulsive Differential Equation, Qualitative Study, Numerical Simulations

Crop Protection, and more generally Food Security, is considered as one of the greatest World challenges in the forthcoming decades. Currently, they are more that 1 billion undernourished people. It has been estimated that up to 40 percent of the world's potential crop production is already lost annually because of the effects of weeds, pests and diseases. This is particularly true in Southern countries. Moreover, taking into account climate change, these losses may increase. That is why it is necessary not only to maintain or improve yields, but also to develop innovative Bioagressors control tools or strategies.

Much has been done, but, in fact, there is also much to do. Multidisciplinary research programs have been developed, in which Modelling plays an important role. However, the word "Modelling" should be considered cautiously. Indeed, there exists numerous (complex) crops models, with many parameters (up to 200!), based on plant growth processes.... They have been (are) implemented in different softwares or modelling platforms, some also include the impacts of Pest and Diseases. Their outputs are mostly based on simulations. In fact, they are so complex that without computers, these models are useless.... Note also that most of the considered crops are temperate crops.

As Mathematics has became essential in numerous domains, like Physics, Mechanics, Chemistry, Epidemiology, and Ecology..., I strongly believe that Mathematics can bring new insights in Agronomy too. One century ago, the first theoretical models were developed in Epidemiology and in Ecology .... In these domains, Mathematical models were useful, and, in fact, are still useful to make steps forward ....

The aim of this talk is to present some applications of Mathematical Modelling in Agronomy, and, in particular, Plant-Pest control, based on ongoing or recent works, particularly on tropical crops....