

OPTIMAL CONTROL ON A SIMPLE MODEL OF COFFEE BERRY BORER INFESTATION

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Coffee is an important cash crop for many developing countries. Coffee production is affected by many pests. We are particularly interested in the coffee berry borer (CBB) *Hypothenemus Hampei*, which is considered as the most important pest economically. The CBB is a small insect that feeds and reproduces inside the coffee berries, causing considerable damages resulting in a deterioration of the berry quality and reduced yields. Mature females are responsible for the dispersal of the population: they emerge from the berries to colonise and lay their eggs in new berries, while males and juvenile stages remain inside the berries. The main control methods to decrease CBB infestation are pesticides, but also cultural practices, biological control and trapping. Our global aim is to design and assess the efficiency of control strategies, with a focus on alternatives to pesticides.

To tackle this issue, we formulated a control problem, based on a dynamical model that describes the CBB infestation of coffee berries and the berry availability during a cropping season. We aim at maximising the yield at the end of the cropping season, while minimising the control costs as well as the CBB population at the end of the season. The first two terms aim at maximising the grower's profit. The last term is introduced to reduce the CBB infestation for the next season. We give necessary optimality conditions and numerical simulations are provided to illustrate our results.