P.54 - Using a GMDP framework to help design collective disease management strategies

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Due to spore dispersal, collective strategies should be more efficient than individual strategies to control crop diseases. However, the large-scale and multi-factorial processes involved in the development of pathogen populations make it difficult to design such strategies on a long-term basis. The Graph-based Markov Decision Process (GMDP) framework has recently been developed for the modeling and the sequential optimisation of controlled spatio-temporal processes. It is well adapted to disease management in agriculture: spatial interactions are easily modeled and spatialised decisions can be designed by optimisation. Furthermore, integrated control methods can be taken into account. However, the GMDP framework relies on few assumptions that do not fit directly in classical epidemiological or agronomical models: spatio-temporal dynamics are stochastic, the space units are crop fields (higher resolution would be intractable) and the time step frame is that of decision (yearly) rather than daily, weekly, or monthly. In this paper, we use the example of phoma stem canker on oilseed rape in order to describe how agronomical and epidemiological knowledge can be used to adapt a model of epidemic dynamics into the GMDP framework. We present a GMDP model for the design of an optimal sequential choice of actions, in terms of producers' income and specific resistance durability. The GMDP framework appears to be a promising method to help design innovative spatially distributed cropping systems.