AN APPLICATION OF DYNAMIC PROGRAMMING FOR THE CONTAINMENT OF PESTS AND ALIEN SPECIES INVASIONS IN AGRICULTURE.

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Exotic populations are becoming a nuisance in natural ecosystems while pests in agriculture have always represented problems in view of the damage that they induce to crops. Mathematical models for ecosystems evolution can be formulated via suitable dynamical systems, in which these damaging agents are represented by time dependent variables. In several cases it it possible to assess the ultimate system's behavior and further, to link the various outcomes via bifurcations. Here we consider a few specific ecological situations for which the analytic determination of the steady states and the transcritical bifurcations among them is available. In this setting it is possible to force the system to move from an undesired equilibrium to a more convenient one, by acting on the system parameters. As these actions entail human effort of some kind and therefore a related cost, it is desirable to determine a strategy for which the sought outcome is attained at the minimum cost. Dynamic programming provides the means to tackle this problem, allowing the detection of the cheapest path bringing the system from the current configuration to the expected goal. We propose and describe an algorithm for this purpose.