Modelling Biosecurity Risk

Presentation to workshop on ‘Validation of uncertain ecological models with imprecise data’, Centre Interfacultaire Bernoulli, Lausanne, Switzerland, 15 -19 September 2014.

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Australia is free of many pests and diseases that cause problems elsewhere. An extensive biosecurity system, implemented by the Department of Agriculture, strives to maintain this advantage in the face of increasing movements of people and goods. The Risk-Return Resource Allocation (RRRA) project was initiated to help the department make decisions about the allocation of resources to biosecurity activities taking into account the expected impact on biosecurity risk.

The project has built a stochastic model of the Australian biosecurity system. The model aims to be comprehensive. It covers all means by which a pest or disease might enter Australian and all organisms of biosecurity concern. By necessity, the model sacrifices detail for comprehensiveness, but the modular design allows detail to be added as required. The RRRA model estimates cost and risk for a user-specified investment scenario. Cost refers to the dollar amount spent by the department in a 12-month budget cycle. Risk refers to the expected long-term loss resulting from pests and diseases that enter Australia during that 12-month period. Six separate estimates of risk are provided: risk to agricultural industries, risk to domesticated and companion animals, risk to the environment, risk to infrastructure and produced goods, risk to human health and risk to social systems.

The model enables decision makers to compare two or more proposed investment scenarios with respect to cost and biosecurity risk. The model operates in a ‘what-if?’ mode rather than seeking an optimal solution. This is because the model cannot anticipate all possible investment options. In many cases, the model will need to be modified to incorporate a new proposal. ‘Validation’ in this situation means providing evidence that the model is a useful aid to decision-making.

Version 1 of the RRRA model does not include any explicit measures of uncertainty. Preliminary results have been accompanied by limited sensitivity analyses. Options for handling uncertainty have been provided through work commissioned from the Centre of Excellence for Biosecurity Risk Analysis. The options are being considered with the intention to implement at least some of them within the next few months. Ideally, a decision-maker should be able to gauge, within the context of particular decision, how much confidence can be placed in the model results.

The presentation will outline the mathematical basis of the RRRA model and how it describes 57 entry pathways and 56 organisms of biosecurity concern. It will include a review of the types and sources of data and the associated uncertainties. Options for handling uncertainty will be discussed and advice sought from the workshop participants.