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Advancing risk assessment models for invasive alien species in the food chain: contending with climate change, economics and uncertainty

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A report compiled for the OECD cooperative Research Committee by the independent observer for the meeting, Dr Wayne Martindale

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Pest Risk Maps for Invasive Alien Species: A Roadmap for Improvement

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Figure 1. Conceptual diagram of events that lead to the development of a pest risk map for invasive alien species. Risk analysts maintain communication with decisionmakers and stakeholders throughout the process. As the process completes, models and maps are provided to decisionmakers who are responsible for risk-mitigation decisions. Numbers correspond to recommendations for improvements provided in the text.
Forecasting potato late blight in Norway

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Introduction
Late blight forecasting started in Norway in 1957 (Forsund and Flaaten, 1958, 1959, Forsund 1983) and has been available as a web based service “VIPS” since 2000. VIPS (Acronym for pest warnings) is run by Bioforsk and The Norwegian Agricultural Extension Service.

The VIPS system
The current late blight warning system in VIPS has three elements:
1. Monitoring of early infections (Web-Blight)
2. Negative prognosis
3. Forsund rules

1. Monitoring of early infections (Web-Blight)
9 Local Extension groups participate with regular observations in fixed unsprayed fields and in farmers fields. Data is presented on a map and in a table.

2. Negative prognosis

Validation trials
Several validation trials carried out during 1994-99 showed that the Negative Prognosis and Forsund Rules provided acceptable late blight control in Norway (Hermansen & Amundsen, 2003)
A potato grower in Vestfold county has carried out a "practical" experiment each year in the period 1996-2007 in cooperation with Vestfold Experimental Group and Bioforsk.

The treatments were:
1. "Control" - untreated until first appearance
WHEAT STEM RUST - UG99 (RACE TTKSK)

Wheat stem rust (Puccinia graminis f. sp. tritici) is historically the most damaging disease of wheat. The disease has the capacity to turn a healthy looking crop, only weeks away from harvest, into nothing more than a tangle of black stems and shrivelled grains at harvest. Under suitable conditions, yield losses of 70% or more are possible. Wheat stem rust is highly mobile, spreading rapidly over large distances by wind or via accidental human transmission (infected clothing or plant material).

Wheat stem rust has largely been under control for over three decades due to the widespread use of resistant cultivars. In 1999, a new virulent race of stem rust was identified from wheat fields in Uganda – popularly known as Ug99 after the year and country of discovery. Using North American scientific nomenclature, Ug99 is known as race TTKSK. Ug99 (Race TTKSK) is a cause for concern as it exhibits unique virulence patterns. No other race of stem rust has been observed to overcome so many wheat resistance genes, including the very important gene Sr31. By 2007, Ug99 (Race TTKSK) had spread via wind movements out of East Africa, into Yemen and as far as Iran.

Rust pathogens change rapidly, often by mutation. Six additional variants are now recognized in the Ug99 lineage. All exhibit an identical DNA fingerprint, but differ in their virulence patterns. The Ug99 lineage includes races TTKSK, TTKV, TTKV2, TTKV3, TTKV4, and TTKV5.
CLIMEX and DYMEX

CLIMEX - Software to Predict the effects of climate on species

Climate is one of the major factors limiting the distribution of plants and cold-blooded animals. Using climate information, and knowledge about the biology and distribution of a particular species in its original habitat, CLIMEX enables a rapid, reliable assessment of the risks posed by the introduction of different organisms, and can be used to predict locations to which it could spread.

CLIMEX can also be used to identify possible collection and release sites for biological control agents. Possible changes to the greenhouse effect can be tested.

CLIMEX is currently used by many governments, agencies, universities and schools worldwide to examine the distribution of insects, plants, pathogens and vertebrates for a variety of purposes, including biogeography, quarantine, biological control and impacts of changes in climate and climate variability.

This program was developed by CSIRO Entomology in 1985 and has had numerous successful applications under practical conditions.

Software Highlights

- In-depth interpretation of climatic responses of biological organisms.
- Geographical mapping of responses.
- Seasonal graphing of growth and stress responses.
- Annual indices of responses for organisms in one location.
- Global meteorological database which can be inspected, edited or added to.
CliMond: global climatologies for bioclimatic modelling

CliMond is a set of free climate data products consisting of interpolated surfaces at 10' and 30' for recent historical climate and relevant future climate scenarios. The data is available as monthly climate data, 35 Biodim variables, in CLIMEX format, and as the Köppen-Geiger climate classification scheme. [Download]

Updates
20 years ago, Tim Berners-Lee invented the World Wide Web. For his next project, he's building a web for open, linked data that could do for numbers what the Web did for words, pictures, video: unlock our data and reframe the way we use it together.
livestock’s long shadow
environmental issues and options
PRATIQUE: ENHANCEMENTS OF PEST RISK ANALYSIS TECHNIQUES

The expansion in the global trade of plant material over the last century has led to a steady increase in the rate of entry and establishment of new, economically or environmentally damaging plant pests, diseases and invasive alien species. The threat is likely to further increase as a result of climate change and EU expansion. Recent examples of serious alien pests and diseases that have been introduced include the pathogen responsible for Sudden Oak Death (*Phytophthora ramorum*) and the maize pest, western corn rootworm (*Diabrotica virgifera virgifera*).

Pest risk analysis (PRA) is central to tackling these invaders since it not only provides a procedure to assess the risks of entry, establishment and impacts but can also be used to identify the most appropriate options for the prevention of entry and management of outbreaks.

PRATIQUE will address the three major challenges of PRA:

- The lack of sufficient data required to effectively analyse the risks posed by pests to all member states of the EU
- The need to assess risk and analyse management options in ways that are meaningful, reliable and
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