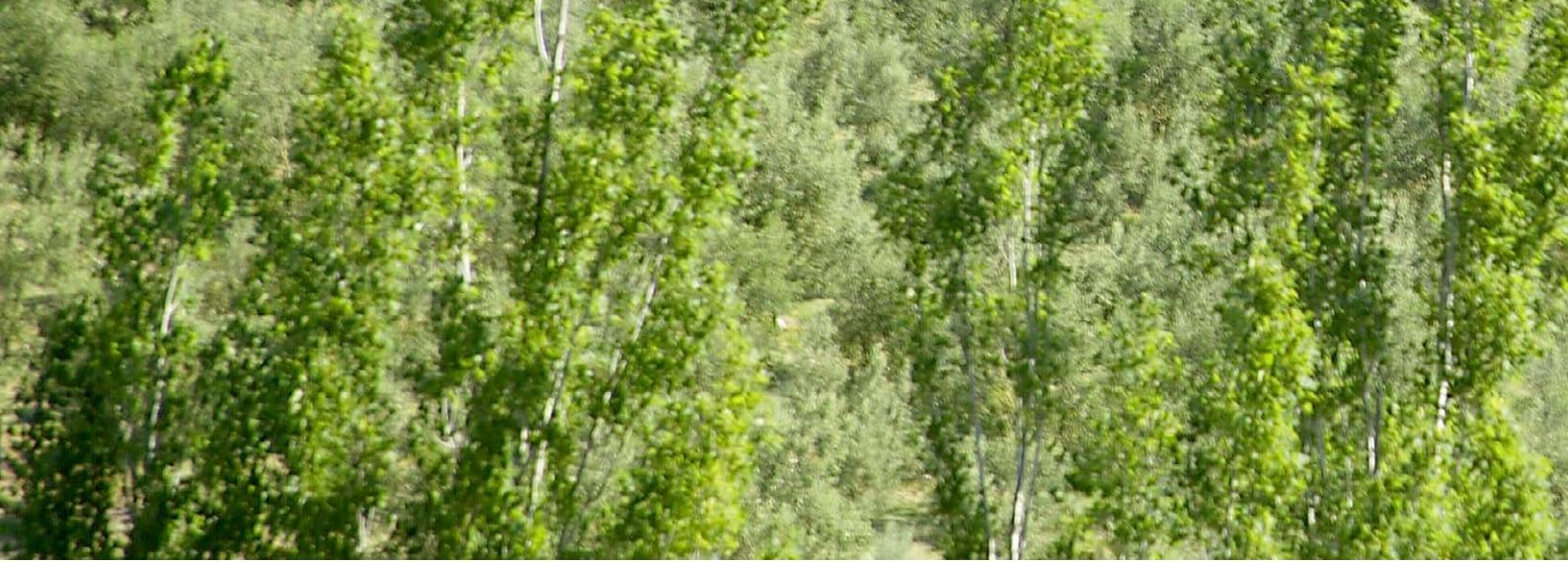

Facing up to pest, weed and disease incursions as the world warms

A warming climate is likely to bring fresh waves of biosecurity invasions, opening the door to new exotic pests, weeds and diseases once kept out by cooler temperatures. Potential establishment of subtropical pests and seasonal species is of greatest immediate concern to New Zealand, along with organisms already recognised as high risk.

Climate is, however, only one of several factors affecting the arrival of new biosecurity invaders. Import pathways, border management and host suitability may also change as temperatures rise in the decades ahead.

The news is not all bad. A changing climate will create opportunities for new crop types to be grown commercially in some sectors and necessitate the use of new species such as methane grasses in northern pastures and drought-resistant forage plants in eastern areas. Primary production industries could therefore benefit from working with the Ministry for Primary Industries to ensure that biosecurity systems adequately protect these future crops.

These were among the main results of a major 2015 study summarising potential impacts of climate change on pests, weeds and diseases of relevance to New Zealand's biosecurity systems.

Supported by SLMACC, the study represents the best current information from experts across Crown research institutes (AgResearch, Scion, Manaaki Whenua Landcare Research, Plant and Food Research and the National Institute of Water and Atmospheric Research (NIWA)) and Lincoln University.

Their 2015 report, *Effects of climate change on current and potential biosecurity pests and diseases in New Zealand,* also concluded that the pest status of many species currently present may change significantly in a warming future.

"In particular, currently innocuous 'sleeper' weeds, pests and diseases may become problematic due to changing ecological interactions with host plants and natural enemies, or shifts in their own phenology," said scientist John Kean of AgResearch.

"While not a major focus of this review, this area would benefit from further research."

The report's analysis of historical trends in value of New Zealand imports suggested that north-east Asia was likely to dominate pest import pathways in the future, with increasing risks associated with India, South America and other emerging economies.

Changes in climate, shipping routes, increased tourism, the commodities traded and international pest distributions were likely to shape future border biosecurity risks. Further research in this area might clarify how future trade trends will affect biosecurity risk.

Species distribution models based on climatic requirements (for example, the CLIMEX model) may be

useful for projecting future ranges of pests, weeds and diseases.

A preliminary examination of 24 arthropod species (12 already present here, 12 currently absent) suggested potential range increases for most. This also showed that lower temperature limits may be useful as a general indicator of the likelihood of establishment in New Zealand.

To project future New Zealand climates from 1990 to 2090 under a range of greenhouse gas emissions scenarios, NIWA used general circulation models from a variety of sources. The results were downscaled to a 0.05° arc, an approximately 5 × 4 kilometre grid of 11,491 points covering New Zealand.

An online database of CLIMEX models was created for the study, allowing for current and future climates under various general circulation models and carbon dioxide emission scenarios. Results were presented in a meaningful way that facilitates their use for biosecurity risk analysis.

Other useful tools open to researchers working in this area include climate matching between New Zealand and the world under current and future climates.

“This has been done previously, but not with the high resolution climate data now available, not on a meaningful sector-by-sector basis, and not with the results made readily available for exploration by risk analysts,” said John.