Using modelling to investigate the effectiveness of national surveillance monitoring aimed at detecting a **Xylella fastidiosa outbreak in Scotland**

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Plant Health

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Introduction

Xylella fastidiosa is a bacterial with over pathogen 500 known host plant species.

Objectives

- Model the potential spread of *Xylella fastidiosa* in Scotland
- Determine the effectiveness of surveillance strategies should one use national surveillance or risk-based surveillance?
- How robust are the findings with respect to the underlying epidemiology?

The disease once was restricted to the Americas but it was discovered in Puglia, southern Italy in 2013. Since then it has spread to and killed millions of olive trees.

There are numerous distinct *Xylella* strains and sequencetypes, and some of these have recently been discovered in new outbreaks in France, Spain, Italy and Portugal, as well as smaller detections Germany, in Belgium The and Netherlands.

Project methods

- The model is based on a stochastic spread model using Puglia data.
- A 200m gridded Scottish landscape was analysed - percentage land cover included urban plus woodland.
- The model considered susceptible (S), \bullet exposed/asymptomatic (E), infected (I) and removed/déad (R) host plant populations.
- *Xylella* dispersal was modelled as a mixture of short and long range to reflect vector behaviour.
- *Xylella* was introduced at either random locations or within a 10km radius of a nursery (data provided by PHC).
- Surveillance was either:

Introduction near nurseries

0.00 0.12

ර 0.09

0.09

0.06

- National grid cell is randomly tested at given intensity.



What are the implications for Scotland and how should surveillance be conducted?

Acknowledgements

This work was funded by the Scottish Government's Rural and Environment Science and Analytical Services (RESAS) Division through the Centre of Expertise for Plant Health.

- Risk-based surveillance is concentrated around nurseries at varying intensities and radii.
- We simulated lab testing of grid cell samples. \bullet

Random introduction

Puglia-like epidemiology

Scottish-like epidemiology



1000 1500 2000 Grid cells inspected per vea

500 1000 1500 2000 Grid cells inspected per yea

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Key results

- Number of detections increase with sampling effort.
- Pure risk-based surveillance only works if the risk is exactly known.
- If the introduction location is unknown then national surveillance works well.
- A mixture of risk-based and national surveillance performs best in most scenarios.
- Lower disease transmission results in lower detectability.
- Qualitatively, the best strategies are robust to the underlying epidemiology.