



Ensuring future resilience to pests and diseases

- a multi-disciplinary approach



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What will the Scottish arable and horticultural sector look like in 10 years' time and how resilient will it be to pests and diseases?

Workshops with agriculture stakeholders to characterise future drivers of change based on analysis of past events



Five STEEP factors used as a framework:

Social	Technological	Economic	Environmental	Political
<ul style="list-style-type: none"> Costs of living. Dietary health and education. Labour changes. Social media. Food production. Training and farmers networks. Demographics in farming population. 	<ul style="list-style-type: none"> Next generation genomics. G.E. and advanced plant breeding. Research and Development. Precision AG. Robotics. IPM. Novel crops/novel pests. AI, big data, forecasting. 	<ul style="list-style-type: none"> EU market. Investment in infrastructure. Supermarkets dynamics. Changes in food prices. International trade. Farmers profitability. Agricultural support. 	<ul style="list-style-type: none"> Extreme weather events. Pollution levels. Net zero targets 2045. State of nature and biodiversity loss. Novel pests and disease. Changes in land use. Rewilding and forestry. 	<ul style="list-style-type: none"> Net zero, Biodiversity, Food security. Climate target. Devolution (legislation independence). Agricultural policy. International trade, Brexit. Geopolitics. Societal pressures (NGOs etc).

Which of the STEEP drivers of change are most uncertain?

= 'Critical Uncertainties'

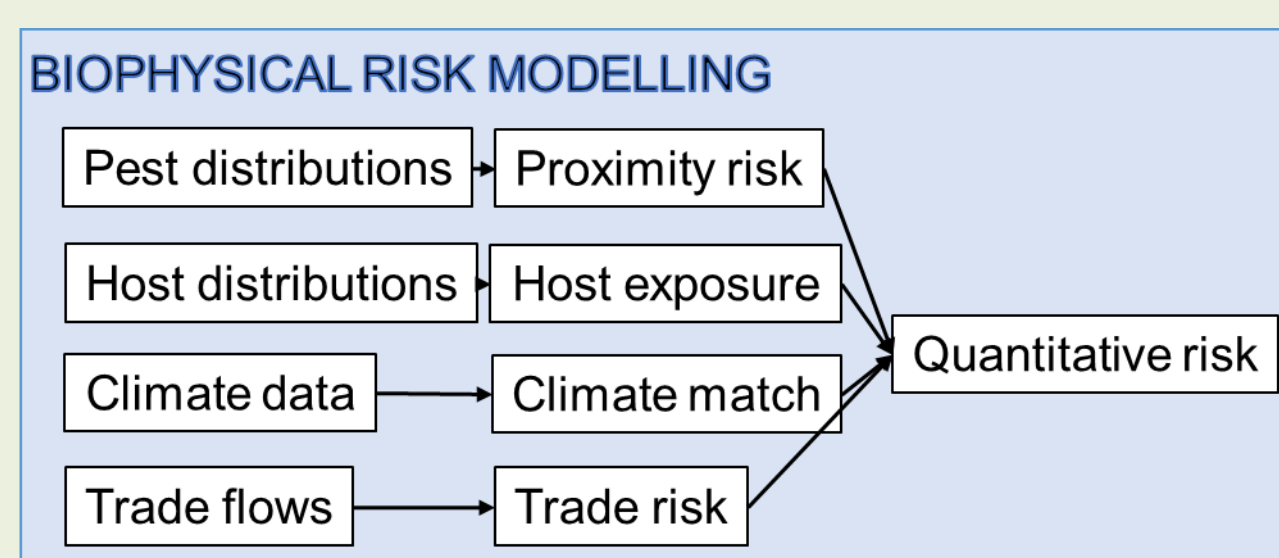
Stakeholders asked to assess 'what if?' these 'critical uncertainties' happened, and what are the better and worse case scenarios

Used to build these morphological boxes*

*Don't worry about the detail

Critical uncertainty	Plausible Level 1	Plausible Level 2	Plausible Level 3
Food production. Disconnection between people and land farming.	Strong connection between people and food production (i.e. through local markets). Willingness to pay for higher quality food. Willingness to pay for surveillance. More diverse crops. More resilience.	Consumers education on diets and food production is fragmented and lack of understanding.	Total disconnection between food production. If people where their food comes from is lost, then there is no interest in food and diseases. Perception of difficult to social changes in food. Low influence on food.
Diets and consumer education	High awareness of food production and more demand for healthy food and better quality is demanded.	Consumers education on diets and food production is fragmented and lack of understanding.	Consumers are not interested in food production. Complete lack of understanding.
Precision Agriculture. AI Tools	Increase in the use of precision targeted farming. Controlled use of pesticides prevents resistance developing in pests.	No change from current circumstances.	Resistance development.
Gene editing	GE is banned and does not represent an option in Scotland.	GE continues to be in state of uncertainty.	GE is accepted in Scotland.
Changes in Food prices & Food Affordability	Costs of living and production are very cheap. More home grown food and more control with less pests. Higher standards.	Costs of living/production food is affordable. Consumers have a choice to think of quality = less pests, land management to help reduce pressure. Differences between cereals and fruit = reduced inputs may not cause a diminution of crops.	High cost of living/production expenses. Reliance on imp. more exposure to plant pests/diseases. Costs of production are high shrinks and more need to re imports.
Farmers profitability, Economic instability, resilience.	Farmers are economically fragile, but slow reversal of profitability declines from 2020s starts to improve farmers' economic resilience.	Farmers are economically fragile and decline from 2020s continues at the same rate.	Farmers are economically fragile decline from 2020s accelerate very vulnerable farming.
Extreme weather events & Climate warming, weather unpredictability	Weather becomes warmer and drier. Longer period of exposure/crop damage. Less pressure from slugs, rust, fungus - with warmer, drier weather. Ability to grow a wider variety of crops = more resilience. Invasive species from continent. Opportunity to learn from other countries.	More extreme events, flooding, drought. Longer periods of exposure/crop damage. More difficult to manage unpredictability. Difficult to predict crop drought and flooding. Sudden plant pest and pathogen infestations.	Weather becomes warmer & Range of new pests and pathogens. Wet weather if harder to manage. Longer periods of attack crop.
Weather annual variation	Better systems in place to predict weather extreme events, creating a more resilient system.	Extreme weather events higher frequency but more predictability.	Weather events unpredictable, extremely high.
International trade, Geopolitics (Brexit), EU/UK policy divergence, other parts of the world)	Protection regime/restriction increased. Fewer pests and better information if system is effective. Less use of chemicals. Different impact on food quality, higher prices. More diversification.	UK has some limited restrictions/protection. Scotland could voluntarily introduce restrictions. Divergence between Scotland and the rest of the UK (with threats and opportunities). Fewer pests.	UK has no restrictions / protection. Risk of entry of non-resilient. More pressure to remove con. minimum production on market. Pressure to aim for commodity market. More pests = increase pest.
Net zero targets 2045	Targets set for reduction of pesticides, GHGs, fertilisers and other targets are achieved at 50%.		Targets set in reduction of pesticides, GHGs, fertilisers and other targets are missed, and none are achieved.

'How severely would your scenario be impacted?' by pests and pathogens predicted to pose a risk to Scottish agriculture. Stakeholders were asked to imagine that three pests and diseases, predicted as threats from biophysical modelling, are well established in Scotland in 2033.



Morphological boxes used by stakeholders to develop 'better not best' and 'worse not worst' case scenarios

'Scotland's own vision'

'Agriculture elsewhere'

'Scotland feeds the world'

"Crisis is Scotland's opportunity"

Stakeholders' recommendations to mitigate against future pest and disease threats

- Invest in R&D and in the people involved in farming
- Review future chemical and biological control products
- Help growers invest in monitoring and prevention
- Educate consumers on the impact of their food choices
- Access to credit or assurance schemes to buffer losses and maintain viability

Read the full report:



Participatory research with stakeholders to test integrated pest management methods

Collaborative trials with farmers and agronomists to test **new cropping practices, crop varieties, pesticide alternatives, biological controls and pest monitoring tools** to control emerging pests in soft fruit and potato crops



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This work was supported by the Underpinning National Capacity (Pest collections project) and Strategic Research Programme (Project JHI-A1-2: Integrated Crop Protection) funded by RESAS. Special thanks to the stakeholders who participated in the scenario planning activities and the farmers and growers collaborating with us in IPM research trials.

