

PHC2023/08: Accurate potato virus forecasts: developing new models to guide sustainable management of potato crops in Scotland.

Background and knowledge gap: The potato industry is worth £250 million to the Scottish economy. Within these Scottish seed potatoes account for 77% of the GB seed potato production, generating £55 million worth of export income. Scottish seed potatoes have a worldwide reputation for high seed health. Scotland has previously been recognised as a Community Grade region in the EU and continues to apply stricter health standards than are currently in operation there. Potato-infecting viruses such as Potato Leafroll virus (PLRV – causal agent of leafroll disease) and Potato virus Y (PVY and other related virus species which are causal agents of mosaic disease) are an important concern for potato production worldwide and in Scotland. A combination of factors such as climate change, loss of pesticide actives and a lack of effective alternative Integrated Pest Management (IPM) options is impacting significantly on the sustainability of potato production and over the past five years, virus health in Scottish seed potato crops has declined significantly, from over 90% of the crop being free of symptoms at inspection to less than 60%.

The drivers of virus infection are complex and include very localised effects, such as aphid species prevalence, sources of inoculum (e.g., groundkeepers and neighbouring crops), weather, and these along with differences in varietal susceptibility and symptoms expression are significant contributors to virus health status. Current linear regression models of virus incidence prediction operate on national and regional scales and are no longer accurate as they do not offer sufficient resolution to tackle localised virus health issues.

Developing predictive models which are detailed enough to integrate landscape-scale patterns with localised parameters driving virus-vectors-crop interactions in their environment/ecological niche is an important knowledge gap that needs to be addressed. Such models should improve virus health risk prediction and in helping in identifying local and broader factors influencing seed potato virus health. This would aid both growers and seed health certification scheme managers in designing a risk-based approach for seed crop management. For example, it would enable certification agencies to target actions in a risk-based fashion (such as post-harvest virus testing for crops that could pose a virus health risk), and for growers it would help them to design customised IPM measures, relevant to the grade of seed potatoes produced.

PVY and PLRV are the most economically important potato viruses so the availability of accurate local virus incidence predictive models for these should offer relevant options for a greener and sustainable agriculture by minimising and targeting the use of aphicides.

Impact: Developing higher resolution virus health modelling in seed potato crops will contribute to a better understanding of virus population epidemiology and provide more accurate prediction of virus incidence at the local and national level. This in turn will aid the certification systems through more targeted and efficient inspections and will help growers target interventions (including aphicides)

Plant Health Centre

C/o James Hutton Institute, Invergowrie, Dundee DD2 5DA

Phone: +44 (0)1382 568 905

Email: info@planthealthcentre.scot; Web: www.planthealthcentre.scot

more effectively. Impacts arising include better seed health and environmental and economic benefits arising from more integrated practices.

Objectives and research required for this call:

- Engage with stakeholders to understand the current impact of PLRV and PVY on the potato industry (this should include members of the SABViR consortium to access evidence gathered at a stakeholder virus summit hosted by SAC consulting in association with PHC in December 2023)
- Review current models to understand what is already available and identify their strengths and weaknesses.
- Develop new models to forecast national virus incidence of PLRV and PVY (this should incorporate evidence from the 2023 virus summit for stakeholders).
- Identify key parameters (which could include local aphid vector abundance, potential source of inoculum, landscape, varietal resistance, crop management)
- Develop high resolution models for PLRV and PVY which integrate “local” parameters. This should incorporate evidence from the December 2023 virus summit and include an additional workshop or equivalent engagement with stakeholders to guide the development of the models.
- Assess the potential of these models to inform adapted local risk-based management strategies for improved virus health to key end users (i.e., certification agencies, growers, stakeholders). This should be informed by the outcomes of a workshop or equivalent engagement with stakeholders.
- Engage with relevant stakeholders to inform them of the new models and how they can be used and make recommendations for knowledge exchange to achieve maximum impact from the new models.

Deliverables required from individual project:

- Develop and run/facilitate knowledge exchange stakeholder workshop(s) or equivalent (details of potential attendees and follow up knowledge exchange should be provided in application).
- Develop new models of interactions between potato viruses, aphid vectors, climate and local environment factors to provide accurate virus forecasts to inform sustainable crop management.
- To make new models available for use on a user-friendly platform on the PHC/SASA website for use by certification agencies, growers, stakeholders and Scottish Government policy.

In addition, the PHC anticipate all commissioned projects will provide:

- Final Report with executive summary on investigations, to contain key sources, analysis, findings, recommendations for implementation and further work, if appropriate (30 pages maximum of text and figures, excluding appendices and references). Cover image(s) with associated photo credits should also be supplied.

Plant Health Centre

C/o James Hutton Institute, Invergowrie, Dundee DD2 5DA

Phone: +44 (0)1382 568 905

Email: info@planthealthcentre.scot; Web: www.planthealthcentre.scot

- Brief policy summary (2 pages maximum) explaining how the work has contributed to filling evidence gaps and the context in which the findings can be used by policy makers and practitioners.
- Presentation at Scotland's Plant Health conference and any other relevant stakeholder meeting(s) to disseminate findings and contribution to other KE output such as the PHC virtual poster room or blogs.
- 200 words lay summary for project overview at outset, and of findings at completion (for website and newsletter).
- Slide deck of the key project findings.

Meetings

- Project meetings throughout project lifecycle to include PHC manager, PHC Sector Lead, Scottish Government policy contact and commissioning stakeholder.
- Meeting/s with relevant PHC Impact Officer and Communications Officer to plan dissemination of project findings and impact strategy.
- Attendance at briefing discussion with PHC Steering group to discuss findings and next steps.

Indicative key dates:

- Deadline for submission of applications: **12pm on 21st December 2023**
- Project start: **1st March 2024**
- Overview of plans and project start-up meeting with PHC Directorate: **15th March 2024**
- Final report and policy summary: **29th November 2024**
- Project outputs signed off by PHC Sector Lead: **6th January 2025**

Detailed milestones to be confirmed by bidder.

Date all work needs to be completed by: 29th November 2024

Maximum funding available exclusive of VAT¹ (where applicable) and including any knowledge exchange activities: £35,000

Submitting an application form

Applicants should use the PHC Application form when applying for projects and must ensure they are able to accept the PHC Funding Terms and Conditions before submitting an application.

Completed applications should be submitted to info@planthealthcentre.scot for evaluation **by 12pm on 21st December 2023**. Successful applicants will be notified by **19th January 2024**, and we may request further clarification on any aspect of the application prior to contract award. You should highlight any potential conflicts of interest in your proposal.

Plant Health Centre

C/o James Hutton Institute, Invergowrie, Dundee DD2 5DA

Phone: +44 (0)1382 568 905

Email. info@planthealthcentre.scot; Web: www.planthealthcentre.scot

Please contact the Centre Manager if you have any queries (info@planthealthcentre.scot). Answers to any non-confidential questions will be published on our website.

Review of application

Applications will be reviewed by a panel selected from the PHC Directorate, Scottish Government, PHC partners and/or commissioning stakeholders, as appropriate.

Expectations for section 1 of the application form:

Expectation	Descriptor
Duration	The proposed duration will align closely to the details provided in the anticipated timescales section of the specification.
Staff time and effort	The proposed allocation of staff time and effort is appropriate and includes all deliverables. The proposal must also provide a commitment that named staff members will be available to work on the contract if the bid is successful.
Project costs	The estimated breakdown of project costs is realistic and inclusive of all deliverables.

Expectations for section 2 of the application form:

Expectation	Descriptor
Background	The proposal should include an introduction which demonstrates a clear understanding of the project requirements. This should include the need for this research; the project aim; and how the proposal will address this aim.
Proposed methodology and outcomes	The proposal should demonstrate a high quality and workable methodology, including: how the evidence will be identified, reviewed and assessed, consulting relevant stakeholders and/or experts where appropriate, to address the key questions and produce the deliverables in the timescales required.
Milestones	The project milestones are logical, practical and include all deliverables.
Project Management	The staff, resources and expertise are appropriate for conducting the proposed project. The proposal should name the project lead.
General and specific topic expertise and experience	The proposal should provide details of individual staff members who will work on this project and demonstrate how they will meet the project requirements, specifically: <ul style="list-style-type: none"> - general research experience and expertise - specific experience and expertise relevant to the call
Risk	The proposal should provide a risk assessment matrix detailing any risks identified in relation to the delivery of this contract, and proposed mitigation measures to minimise their probability and impact, focused particularly on risks to completion on time.

¹ Please note that costs should be submitted net of VAT recovered by the applicant. Applicants should seek advice on appropriate VAT treatment of proposed funding.