**PHASE I**

**Applicant Organization and Contact Information:**

**Contact 1:** David Linnard Wheeler

**Contact 2:** Kenneth Frost, James Woodhall, Chakradhar Mattupali, and David Crowder

**DUNS #:** 04-148-5301

**Federal Tax ID #** 91-6001008

**Title:** Development of late blight forecasting models for the Pacific Northwest

**Multi-State Project:** Yes. Oregon and Idaho. Potato production in the Pacific Northwest does not respect politic boundaries. Potato seed come from across the US. Similarly, diseases spread regionally across the Pacific Northwest. Finally, existing agricultural infrastructure is designed to operate across state lines. As such scientists and support from Idaho and Oregon are required to address disease forecasting needs in Washington. The role of the project in Idaho and Oregon will be to support spore trap and weather data infrastructure required to develop and maintain the forecasting system.

**Project period: Start date:** October 1st 2021; **End date:** September 1st 2024.

**Does your project support R&D?** Yes.

**Funding Category:**

* Innovative technologies or Pest Management

**Funding Priority:**

* Control pests and diseases

**Project Summary:**

Include a project summary of 250 words or less suitable for dissemination to the public. A Project Summary includes:

* The name of the applicant organization that if awarded a grant will establish an agreement or contractual relationship with the State Department of Agriculture to lead and execute the project,
* A concise outline of the project’s outcome(s) and objectives, and
* A description of the general tasks to be completed during the project period to fulfill this goal.
* Late blight of potato, caused by *Phytophthora infestans,* causes annual yield losses in the Pacific Northwest. The objective of this project is to minimize losses and fungicide applications by developing disease forecasts for producers in the PNW. Scientists at Washington State University, the University of Idaho, and Oregon State University propose to develop forecasts with disease intensity, pathogen abundance, phenology, and weather data. To accomplish this objective, late blight intensity data will be collected from cooperating producers and ground-truthed by the PIs. Pathogen abundance and weather data will be collected from strategically distributed spore traps and weather stations, respectively. Phenology data will be collected by producers. Disease intensity data will be modeled as a function of pathogen abundance, phenological, and weather data with classical and machine learning models. The model(s) that perform best will be used for forecasts. Site-specific forecasts will be delivered electronically to producers weekly during the growing season. Expected outcomes of this research include (i) site-specific late blight forecasts and weekly management recommendations, (ii) improved fungicide stewardship, (iii) identification of factors that influence late blight epidemics, and (iv) extension and peer-reviewed publications. The effectiveness of the first two expected outcomes will be measured with surveys. In the short term, accurate and site-specific forecasts should help reduce both yield losses due to late blight and fungicide applications. In the long-term, late blight forecasts and fungicide stewardship should enhance the sustainability of potato production in the PNW.

**Project Purpose**

* Provide the specific issue, problem or need that the project will address.
  + The PNW produces over 50% of potatoes in the United States (NASS, 2020). Unfortunately, the potato industry is often threatened by diseases like late blight. For example, in 1998 the cost of potato losses, fungicide applications, and other management activities in Washington alone was $22.3 million (Johnson et al. 2000). These losses translate to $35.3 million in 2020. Moreover, late blight is a reoccurring problem that threatens potato crops annually. Currently, annual late blight forecasts for WA are issued by the primary PI using weather forecasts from only 3 weather stations in WA. As a result, growers in areas of Washington with different weather patterns may apply excessive fungicides because forecasts are not always accurate for target locations or the surrounding areas. Similarly, the late blight forecasts for Idaho and Oregon are issued via different forums. As such, producers that operate across political boundaries need to consult multiple forecasts to determine when to apply fungicides. Thus, this project addresses the following issues with current late blight forecasts: (i) spatial scales are limited within states: site-specific forecasts for potato production areas in Washington, Oregon, and Idaho are not available to growers in a single forum; (ii) temporal scale are too coarse: forecasts for Washington were formulated to predict yearly epidemics but growers need weekly recommendations to minimize losses; (iii) pathogen abundance data is not always included: many late blight forecasting models assume the pathogen is present in fields where it might be absent. resolve these issues and for the PNW
* Describe the approach to addressing the issue.
  + To address this issue, the PIs propose to develop weekly and site-specific late blight forecasts for potato producing regions of the PNW. More specifically, localized weather data will be combined with pathogen abundance data from spore traps to build models that accurately predict late blight outbreaks for sites throughout the potato producing regions of Washington, Oregon, and Idaho. The existing spore trap network led by Co-PI Woodhall in Idaho will be extended and new traps will be installed in strategic locations in both Washington and Oregon. Weather data and pathogen abundance data will be used to train and test models that predict late blight epidemics at all sites for each week of the growing season. Finally, forecasts and recommendations will be issued by single forum. Achievement of our expected outcomes will be gauged by surveys and publication of extension and peer-reviewed manuscripts.
* Describe the relevance and importance to the specialty crop industry.
  + Potatoes are a specialty crop in Washington state. The sustainability of potato and other specialty crops in the PNW depends on prudent fungicide stewardship.

**Objectives**

* Provide at least one but no more than three objectives that this project hopes to achieve.
  + Develop site-specific late blight forecasts for potato producing regions of Washington, Oregon, and Idaho.
  + Deploy late blight forecasts electronically.

**Project Beneficiaries**

* Provide an estimate of how many specialty crop industry members will be benefiting from this project and provide a justification for your number?
  + For Washington state alone, approximately 300 producers and 36,000 employees (Capital Press, 2016) will benefit from the application of fewer fungicides.
* Who are the specialty crop beneficiaries of the project and how will they be directly benefiting from the outcomes of this project?
  + Crop producers are the beneficiaries this project. Potato producers will benefit from achieving competitive yields while reducing the resources needed to apply fungicides. Likewise, employees will benefit from reduced exposure to fungicides and prolonged efficacy since the risks of fungicide resistance should decrease with less usage. Similarly, nearby producers of other crops will also enjoy the prolonged efficacy of fungicides.

**Socially Disadvantaged and Beginning Farmers (not scored)**

* If you answer yes to your project benefitting either a socially disadvantaged or beginning farmer, explain how your project benefits either and or/both.
  + No.

**Is your project continuing the efforts of a previously funded SCBGP project?**

* + No