**Full Proposal Submitted to the NW Potato Research Consortium**

**Title:** Comparison of potato yields, soil health, and pathogen loads in virgin and non-virgin soils.

**Year Initiated:** 2021-22. **Current Year:** 2021-22. **Terminating Year** 2023

**Personnel & Cooperators:**

PIs involved include David Linnard Wheeler, Deirdre Griffin LaHue, and Cynthia Gleason from Washington State University and Kenneth Frost from Oregon State University. Sudha G.C. Upadhaya serves as a research associate in the first PI’s lab. Teal Potter serves as a postdoctoral scholar in the second PI’s lab. All PIs will request funding.

**Funding Request for 2021-22:** **$72,329**

**Introduction: Problem Statement, Research Question(s) & Justification:**

Since potatoes were first grown, growers have likely noticed that the history of a field influences both yield and quality. Fields previously planted with potatoes generally yield less than fields with soils not previously farmed (virgin soils) or fields never planted with potatoes. Indeed, recent conversations with growers indicated that 14-26% greater yields can be achieved from virgin soils compared to nearby non-virgin soils. Despite these observations, over a century of research efforts on this topic has only revealed that the impacts of virgin soils on crop yields vary with the crop, diseases, and environment (**CITATION**).

Researchers have observed the same effect at least since the 1990s (Powelson and Rowe 1993). The purpose of this proposal is to determine what is responsible for these observations.

To identify factors associated with the greater yields observed when potatoes are grown in virgin soil, we propose to conduct a common garden experiment with virgin and non-virgin soils collected from the Northwest. To capture the physical, chemical, and biological factors often associated with changes in land-management practices (Chen et al. 2020; Gómez-Acata et al. 2014; Zhang et al. 2018), we have assembled a team of soil scientists and plant pathologists.

Avoid unnecessary introductions to potato production, importance of the crop, etc.; get to the point as quickly as possible. Provide a statement that clearly defines the problem being addressed by your research and the rationale for this project. Include clear and thorough arguments regarding how the proposed work will build on existing knowledge, previous research, and existing literature on the specific subject. Cite existing literature. Be sure to search the “grey literature” as well, which was sometimes the only way previous commission-funded work was published (e.g. try the research library at <https://www.nwpotatoresearch.com/>). Where appropriate, state how this project relates to other ongoing or recent work in the Northwest. If this is a partially-complete multi-year project, please update this section of the proposal based on, and framed within, your results to date. Figures and photographs are encouraged.

**Goal(s), Hypothesis & Objectives:**

Each proposal should provide a specific GOAL, that is, what the study will accomplish (e.g. “Our goal is to create a potato cultivar with resistance to all known PVY strains that is acceptable to the potato processing market in the PNW”). For projects that need no further information and seek to generate a product (engineering-oriented), objectives should be listed that support the goal (e.g. “1. We will make the crosses to incorporate PVY-resistance gene R1 into a potentially acceptable russet …”) without a hypothesis statement. For projects that are designed to generate information, and not directly a product, one or more HYPOTHESES to be tested should be provided in the alternative or null form. For example, include a statement that begins thus: “We (I) will test the hypothesis that ….” Objectives should be listed that support each hypothesis.

Which objectives will be addressed during this funding year (i.e. during 2021-2022)? If this is a partially-complete multi-year project, be sure to update the objectives section to reflect what has been accomplished so far, and any changes to continuing objectives that were warranted or mandated by that progress.

**Procedures:**

Indicate your approach and procedures to accomplish the objectives. Include as much detail as space allows; it is important to demonstrate to reviewers that the project has been thoroughly planned. Use appropriate language! For example, your writing should be targeted toward college-educated laypeople with little to no knowledge of molecular biology or genetics (if you need help with this, send draft language to Andy Jensen for input well in advance of the deadline). If you intend to follow methods established in published papers, cite the relevant work. Be sure to include in this section information about roles and responsibilities of all collaborators on the project.

**Collaboration:**

DL Wheeler and S GC Upadhaya will collect soils, establish microplots, collect yield and disease data, and analyze data. D Griffin LaHue and T Potter will conduct analyses of soil physical, chemical, and biological properties with support from M Kleber and D Myrold. K Frost will quantify soilborne pathogens from soils. C Gleason and **I Zasada (?)** will conduct the nematode community analysis.

**Anticipated Benefits/Expected Outcomes/Information Transfer:**

What specific impacts will result from this project for producers and/or the industry? Be clear and direct, be realistic, and avoid exaggeration.

**Project Timeline:**

List of activities and stages in the research project for the coming year and/or for the duration of the project.

**Literature Cited:**

All literature listed here should be cited in the body of the proposal, and literature cited in the body of the proposal should be listed here.

**Budget:** Please provide the following in a table format as shown, listing only the budget items appropriate for your project. Add columns or tables as needed to accommodate all scientists/labs seeking funding under this project. Add or subtract footnotes or addenda to the budget table as needed to fully explain your plans or needs. More detail is better than less. Personalize the budget table with the names of each funded scientist at the tops of the columns, delete unneeded rows/columns, and delete these instructions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Scientist/Lab 1 (specify) | Scientist/Lab 2 (specify) | Scientist/Lab 3 (specify) | **Total** |
| **Salaries:** Faculty |  |  |  |  |
| Graduate student |  |  |  |  |
| Other students |  |  |  |  |
| Other labor |  |  |  |  |
| **Employee Benefits (OPE):** Faculty |  |  |  |  |
| Graduate student |  |  |  |  |
| Other students |  |  |  |  |
| Other labor |  |  |  |  |
| Equipment |  |  |  |  |
| Travel: |  |  |  |  |
| Operating Expenses |  |  |  |  |
| Other Expenses |  |  |  |  |
| **Total** |  |  |  |  |

**Anticipated Total Requests in Coming Years: 2022-2023: 2023-2024:**

**Other Support of Project, Anticipated Supporting Grant Applications:**

Please describe other funding and in-kind support that contributes to this work, such as related federal or state grants, internal university grant programs, faculty start-up funds, etc. Also describe plans for submission of federal, specialty crop block grant, or other regional proposals that will support or expand on this project.