Enhanced In-Season Nitrogen, Pest, and Irrigation Management for XXXXX Potato Cropping Systems.

**PROJECT** **#8** **TITLE**

**DURATION** **OF** **PROJECT**

**Start** **Date**:

10/1/2022

**End** **Date**:

09/29/2024

**PROJECT** **SUMMARY**

XXXXX State University is seeking funding to support the project entitled *Enhanced* *In-Season* *Nitrogen,* *Pest,* *and* *Irrigation* *Management* *for* *XXXXX* *Potato* *Cropping* *Systems*. Specifically, this project will improve the competitiveness of XXXXX agronomists and potato growers by developing and implementing technology-based methods to improve in-season potato crop pest sampling, tissue sampling and soil moisture measurement practices in XXXXX and subsequent data interpretations that drive in-season agronomic recommendations to improve environmental and economic sustainability outcomes. Currently, practices are primarily driven by a given agronomist’s experience and general observations, known history of production fields, and other factors that are difficult to quantify. However, new data resources (i.e. ever-expanding and publicly available earth observation satellites) and digital tools exist that could be used to improve agronomic data collection practices and data interpretation. Working with industrial stakeholders, this project aims to develop and implement data collection, analysis, and visualization methods integrated with robust mobile data platforms. From this effort, the XXXXX potato production industry will have a technologically integrated set of tools to improve and modernize potato crop pest sampling, tissue sampling and soil moisture data collection and interpretation.

**PROJECT** **PURPOSE**

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PROVIDE THE SPECIFIC ISSUE, PROBLEM OR NEED THAT THE PROJECT WILL ADDRESS

This project seeks to develop and deploy methods to improve potato crop in-season Nitrogen fertilizer and irrigation management recommendations. Over the past decades, in-season potato nitrogen applications have shifted to a “spoon feeding” approach where nitrogen is applied in smaller doses (typically weekly) during the growing season to reduce nutrient losses to the environment and improve yield and quality outcomes [1]. Regular (i.e. weekly) tissue sampling and field scouting are also common practices where tissue samples are collected, and soil moisture observations are observed from a single “point” location using soil moisture sensors equipped with telemetry. Agronomists also visually scan the crop as they are constantly on the lookout for many types of insect and fungal pests. In many cases, pest scouting, tissue sampling and soil moisture observations are limited to very small areas due to resource constraints and are collected at the same spatial areas for the entire growing season. Agronomists base their fertility, pesticide, and irrigation recommendations on these data with the hope that the data are representative of the much larger field area.

Many potato pest infestations result in disease outbreaks that extract a significant economic toll because of deleterious impacts on crop yield and quality. For example, agronomists constantly try to monitor a growing potato crop for various fungal pathogens that require fungicide treatments once infestations exceed certain observed thresholds (i.e. number of leaves exhibiting symptoms, etc.). Agricultural fields in XXXXX typically exhibit

much subfield variability in terms of the crop vegetation moisture content due to soil and topographical changes across fields. This variability makes it challenging for agronomists to accurately scout and gauge infestation thresholds as fungal needed for accurate recommendations.

Additionally, nitrogen applications are typically conducted by injecting fertilizer products into irrigation systems where the water serves as an efficient carrier to maximize efficiency and nutrient delivery to the plant. Although these practices have resulted in improved economic and environmental sustainability for XXXXX potato cropping systems, the interdependence of irrigation water and nitrogen inputs introduces new challenges given ever-changing dynamics relative to subfield soil and topographical variability and oft occurring inefficient spatial

distributions modern irrigation systems. **Figure** **1.** **A** **basemap** **image** **of** **a** **typical** **agricultural** **field** **in** **southern**

**XXXXX.** **This** **field** **was** **cultivated** **to** **potatoes** **in** **2021.**

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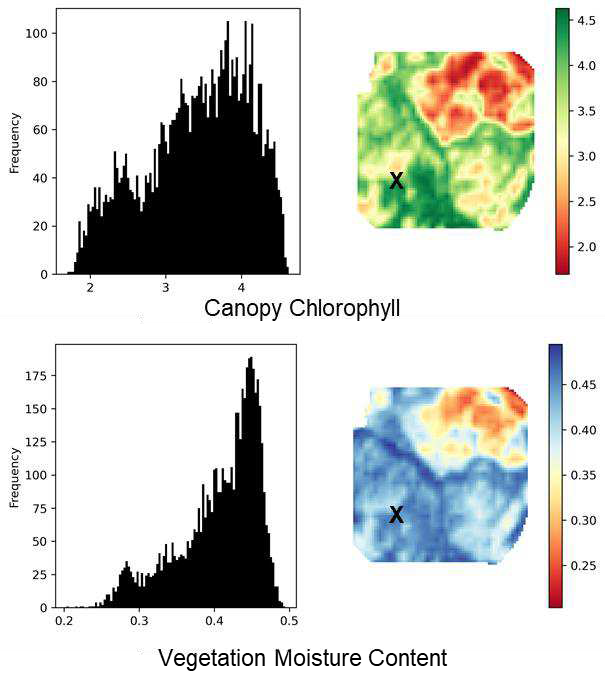
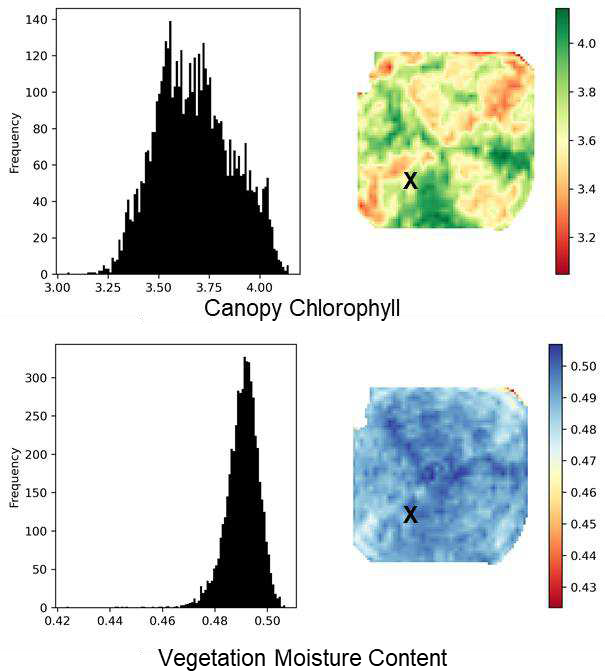
Consider the field in eastern XXXXX shown in Figure 1 cultivated to potatoes in 2021. From the image, it is easy to discern that a center pivot provides the irrigation water and that the center pivot is equipped with a corner armature system that provides additional spatial coverage to the four field corners. These systems are very common in XXXXX given the high cost of agricultural land and the grower's desire to utilize as many cultivated acres as possible to remain profitable. Using publicly available satellite imagery resources, it is possible to measure and visualize the spatial patterns of two metrics driven by in-season nitrogen and irrigation inputs: crop canopy chlorophyll and vegetation water content [2,3].

Figure 2 shows the spatial patterns for both canopy chlorophyll and vegetation water content on July 4, 2021. It is visually apparent that the spatial patterns are similar and likely associated with naturally occurring topographic and soil

variability. At this point in the growing season, tissue and

moisture sampling activities are more likely to be spatially correlated (based on subfield

**Figure** **3.** **(above)** **Canopy** **chlorophyll** **and** **vegetation** **moisture** **content** **data** **derived** **from** **remotely** **sensed** **satellite** **imagery** **collected** **on** **July** **4,** **2021.** **The** **spatial** **patterns** **and** **data** **distributions** **indicate** **high** **correlation** **between** **the** **potato** **crop** **canopy** **chlorophyll**

topography and/or soil variability). If tissue samples were collected in the area denoted by “X”, it is possible the data represent an “average” of the field for both nutrient and moisture states. However, when reviewing the spatial patterns approximately 4 weeks later on August 3, 2021 in Figure 3, it is clear that the subfield patterns have changed. The crop canopy chlorophyll patterns now reflect more of a wedge pattern that

**Figure** **2.** **(left)** **Canopy** **chlorophyll** **and** **vegetation** **moisture** **content** **data** **derived** **from** **remotely** **sensed** **satellite** **imagery** **collected** **on** **August** **3,** **2021.** **The** **spatial** **patterns** **and** **data** **distributions** **indicate** **less** **correlation** **between** **the** **potato** **crop** **canopy** **chlorophyll** **and** **moisture** **content** **when** **compared** **to** **approximately** **4** **weeks** **earlier.**

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indicates reduced crop chlorophyll activity associated with irrigation of the field corners. This is likely due to the increased irrigation water draw when the corner armature is extended that effectively dilutes each water-applied nitrogen application. Conversely, the vegetation moisture content pattern is much more uniform, likely the result of a variable rate drive on the irrigation pump that is capable of increasing water production as demand increases. Now tissue samples and soil moisture observations in the sampling area “X” are more divergent and impacted by multiple types of bias. If the agronomist is not aware of these divergences, their recommendations could be misaligned from actual field needs. This leads to one of two outcomes - over- or under- applications of nitrogen fertilizer leading negatively impacting economic and environmental sustainability outcomes.

References

Kleinkopf, G.E. and D.T. Westermann. 1987. Scheduling nitrogen applications for Russet Burbank potatoes. University of XXXXX Current Information Series, No. 637.

Clevers, J.G., Kooistra, L. and Van den Brande, M.M., 2017. Using Sentinel-2 data for retrieving LAI and leaf and canopy chlorophyll content of a potato crop. Remote Sensing, 9(5), p.405.

Gao, B.C., 1996. NDWI—A normalized difference water index for remote sensing of vegetation liquid water from space. Remote sensing of environment, 58(3), pp.257-266.

PROVIDE A LISTING OF THE OBJECTIVES THAT THIS PROJECT HOPES TO ACHIEVE

The overarching goal of this project is to develop and implement technology-based methods to improve potato crop pest scouting, tissue sampling and soil moisture measurement practices and subsequent data interpretation that drive in-season agronomic recommendations to improve environmental and economic sustainability outcomes. Specifically, a mobile platform will be designed and implemented with trained agronomists that will integrate their field scouting data with advanced imagery analytics focused on potato crop canopy nitrate and moisture content status to enhance potato agronomy decisions. Working with an industrial partner responsible for agronomic recommendations for multiple potato growers in southern XXXXX, the specific objectives will be achieved:

Objective 1 - Identify at least 3 XXXXX potato grower industry partners from which individual potato fields will be tracked for 2 growing seasons.

Objective 2 - Develop a data plan detailing all sources of data, resource needs, acquisition practices, and storage requirements.

Objective 3 - Implement a mobile geospatial digital infrastructure to support data collection and visualization on mobile devices.

Objective 4 - In accordance with the data plan, collect data and maintain documentation on any deviations due to unforeseen circumstances.

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Objective 5 - Demonstrate technologically integrated set of tools to improve and modernize potato crop pest scouting, tissue sampling and soil moisture data collection and interpretation to industry stakeholders for adoption.

PROJECT BENEFICIARIES

**Estimate** **the** **number** **of** **project** **beneficiaries**: 10-15

**Does** **this** **project** **directly** **benefit** **socially** **disadvantaged** **farmers** **as** **defined** **in** **the** **RFA?** (*Definition* *of* *socially* *disadvantaged* *farmer:* *a* *farmer* *or* *rancher* *who* *is* *a* *member* *of* *a* *socially* *disadvantaged* *group.* *A* *"Socially* *Disadvantaged* *Group"* *is* *a* *group* *whose* *members* *have* *been* *subject* *to* *discrimination* *on* *the* *basis* *of* *race,* *color,* *national* *origin,* *age,* *disability,* *and* *where* *applicable,* *sex,* *marital* *status,* *familial* *status,* *parental* *status,* *religion,* *sexual* *orientation,* *geneti* *c* *information,* *political* *beliefs,* *reprisal,* *or* *because* *all* *or* *a* *part* *of* *an* *individual's* *income* *is* *derived* *from* *any* *public* *assistance* *program.* *.)*

**Yes** ☐ **No** 

**Does** **this** **project** **directly** **benefit** **beginning** **farmers** **as** **defined** **in** **the** **RFA?** (*Definition* *of* *beginning* *farmer* *-* *an* *individual* *or* *entity* *who* *has* *not* *operated* *a* *farm* *or* *ranch* *for* *more* *than* *10* *years* *and* *substantially* *participates* *in* *the* *operation.* )

**Yes** ☐ **No** 

STATEMENT OF ENHANCING SPECIALTY CROPS

By checking the box to the right, I confirm that this project enhances the competitiveness of 

specialty crops in accordance with and defined by the Farm Bill. Further information regarding the definition of a specialty crop can be found at [www.ams.usda.gov/services/grants/scbgp.](http://www.ams.usda.gov/services/grants/scbgp)

CONTINUATION PROJECT INFORMATION

**Does** **this** **project** **continue** **the** **efforts** **of** **a** **previously** **funded** **SCBGP** **project?** **Yes** ☐ **No** 

*If you have selected “yes”, please address* *the* *following:*

DESCRIBE HOW THIS PROJECT WILL DIFFER FROM AND BUILD ON THE PREVIOUS EFFORTS

PROVIDE A SUMMARY (3 TO 5 SENTENCES) OF THE OUTCOMES OF THE PREVIOUS EFFORTS

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PROVIDE LESSONS LEARNED ON POTENTIAL PROJECT IMPROVEMENTS

**What** **was** **previously** **learned** **from** **implementing** **this** **project,** **including** **potential** **improvements?**

**How** **are** **the** **lessons** **learned** **and** **improvements** **being** **incorporated** **into** **the** **project** **to** **make** **the** **ongoing** **project** **more** **effective** **and** **successful** **at** **meeting** **goals** **and** **outcomes?**

DESCRIBE THE LIKELIHOOD OF THE PROJECT BECOMING SELF-SUSTAINING AND NOT INDEFINITELY DEPENDENT ON GRANT FUNDS

By working with an industry stakeholder from project inception to implementation we anticipate that this project will become self-sustaining as it becomes demonstrated and adopted amongst growers in southeastern XXXXX.

OTHER SUPPORT FROM FEDERAL OR STATE GRANT PROGRAMS

The SCBGP will not fund duplicative projects. Did you submit this project to a Federal or State grant program other than the SCBGP for funding and/or is a Federal or State grant program other than the SCBGP funding the project currently?

**Yes** ☐ **No** 

IF YOUR PROJECT IS RECEIVING OR WILL POTENTIALLY RECEIVE FUNDS FROM ANOTHER FEDERAL OR STATE GRANT PROGRAM

**Identify** **the** **Federal** **or** **State** **grant** **program(s).**

# N/A

**Describe** **how** **the** **SCBGP** **project** **differs** **from** **or** **supplements** **the** **other** **grant** **program(s)** **efforts.**

# N/A

**EXTERNAL** **PROJECT** **SUPPORT** **/LETTERS** **OF** **SUPPORT**

*1.* *Describe* *the* *specialty* *crop* *stakeholders* *who* *support* *this* *project* *and* *why* *(other* *than* *the* *applicant* *and* *organizations* *involved* *in* *the* *project).*

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The primary stakeholders for this project are XXXXX potato growers spanning the entire state. In- season pest, nitrogen, and soil moisture scouting and associated data and observations are critical to make informed agronomic decisions impacting both economic and environmental sustainability outcomes. However, technological tools and methods specifically designed for the XXXXX potato industry and tailored to potato crop agronomy needs are vital to modernize these practices. XXXXX potato growers have expressed the need for this research and have expressed support of this project.

Additional stakeholders that will benefit from this proposal are the fresh pack and processing industries that rely on XXXXX potato growers for high yields and quality while minimizing input costs.

**EXPECTED** **MEASURABLE** **OUTCOMES**

SELECT THE APPROPRIATE OUTCOME(S) AND INDICATOR(S)/SUB-INDICATOR(S)

*You* ***MUST*** *choose* *at* *least* *one* *of* *the* *seven* *outcomes* *listed* *in* *the* *SCBGP* *Performance* *Measures,* *which* *were* *approved* *by* *the* *Office* *of* *Management* *and* *Budget* *(OMB)* *to* *evaluate* *the* *performance* *of* *the* *SCBGP* *on* *a* *national* *level.*

OUTCOME MEASURE(S)

*Select* *the* *outcome* *measure(s)* *that* *are* *applicable* *for* *this* *project* *from* *the* *listing* *below.* *DO* *NOT* *change* *the* *measures* *or* *edit* *the* *text.*

* **Outcome** **1:** Increasing Consumption and Consumer Purchasing of Specialty Crops
* **Outcome** **2**: Increasing Access to Specialty Crops and Expanding Specialty Crop Production and Distribution
* **Outcome** **3**: Increase Food Safety Knowledge and Processes
* **Outcome** **4**: Improve Pest and Disease Control Processes
* **Outcome** **5**: Develop New Seed Varieties and Specialty Crops
* **Outcome** **6**: Expand Specialty Crop Research and Development
* **Outcome** **7**: Improve Environmental Sustainability of Specialty Crops

OUTCOME INDICATOR(S)

Provide at least one indicator listed in the SCBGP Performance Measures and the related quantifiable result. Cut and poste relevant indicators EXACTLY and then fill in the blanks. If you have multiple outcomes and/or indicators, repeat this for each outcome/indicator. Performance Measures can be found in the “Application Outcome Measures and Indicators” document on the ISDA SCBG website: https://agri.XXXXX.gov/main/marketing/financial- assistance/XXXXX-specialty-crop-block-grant-program/

# Outcomes and measures

Outcome 4: Improve Pest and Disease Control Processes

* 4.1 Number of stakeholders that gained knowledge about science-based tools to combat pests and diseases 10 .
* 4.2 Number of stakeholders that adopted pest and disease control best practices, technologies, or innovations 5 .
* 4.5 Total number of producers/processors that enhanced or maintained pest and disease control practices 5 . Of those, the number that reported:

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* + 4.5a Reduction in product lost to pest and diseases \_5 .
  + 4.5d Reduction in pesticide use 5 .

Outcome 7: Improve Environmental Sustainability of Specialty Crops

* 7.1 Number of stakeholders that gained knowledge about environmental sustainability best practices, tools, or technologies 10 .
* 7.2 Number of stakeholders reported with an intent to adopt environmental sustainability best practices, tools, or technologies 5 .
* 7.3 Number of producers that adopted environmental best practices or tools 5 .
* 7.4 Number of new tools/technologies developed or enhanced to improve sustainability/ conservation or other environmental outcomes 3 .
* 7.5 Number of additional acres managed with sustainable practices, tools, or technologies that focused on:

7.5a Water quality/ conservation 1,000 .

MISCELLANEOUS OUTCOME MEASURE

*In* *the* *unlikely* *event* *that* *the* *outcomes* *and* *indicators* *above* *the* *selected* *outcomes* *are* *not* *relevant* *to* *your* *project,* *you* *must* *develop* *a* *project-specific* *outcome(s)* *and* *indicator(s)* *which* *will* *be* *subject* *to* *approval* *by* *AMS.* *Please* *consult* *with* *ISDA* *before* *choosing* *this* *outcome* *measure.*

DATA COLLECTION TO REPORT ON OUTCOMES AND INDICATORS

*Explain* *how* *you* *will* *collect* *the* *required* *data* *to* *report* *on* *the* *outcome* *and* *indicator* *in* *the* *space* *below.*

* 1. Number of stakeholders that gained knowledge about science-based tools to combat pests and diseases 10
     + For this indicator we plan to present our project annually in January of 2023 and 2024 at the XXXXX Potato Conference that is held at XXXXX State University. We will record the number of attendees and a copy of the formal attendance record.
  2. Number of stakeholders that adopted pest and disease control best practices, technologies, or innovations 5 .
     + For this indicator our stakeholder partner is driving the need for the tool we are providing and already plans to adopt it across the thousands of acres he manages. He is planning to recruit 4 additional growers from his network to trail testing the application during the project for long term adoption.
  3. Total number of producers/processors that enhanced or maintained pest and disease control practices 5 . Of those, the number that reported:
     + 4.5a Reduction in product lost to pest and diseases \_5 .
     + 4.5d Reduction in pesticide use 5 .

For this measure in year 2 we plan to record at 5 grower fields the results from Year 1 (based on data recorded from the student data collection) and compare to improvements in Year 2 based on

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decisions informed by our data collection and analysis. This includes pest reduction counts and reduced pesticide usage based on our app recommendations.

Outcome 7: Improve Environmental Sustainability of Specialty Crops

* 7.1 Number of stakeholders that gained knowledge about environmental sustainability best practices, tools, or technologies 10.

We plan to present our results at the annual potato growers conference

* 7.2 Number of stakeholders reported with an intent to adopt environmental sustainability best practices, tools, or technologies 5 .

For this indicator our stakeholder partner is driving the need for the tool we are providing and already plans to adopt it across the thousands of acres he manages. He is planning to recruit 4 additional growers from his network to trail testing the application during the project for long term adoption.

* 7.3 Number of producers that adopted environmental best practices or tools 5 .

For this indicator our stakeholder partner is driving the need for the tool we are providing and already plans to adopt it across the thousands of acres he manages. He is planning to recruit 4 additional growers from his network to trail testing the application during the project for long term adoption.

* 7.4 Number of new tools/technologies developed or enhanced to improve sustainability/ conservation or other environmental outcomes 3 .

Our plan is to create 3 key decision support tools for our app

* 7.5 Number of additional acres managed with sustainable practices, tools, or technologies that focused on:

7.5a Water quality/ conservation 1,000 .

We will be sampling and surveying across a minimum of 1000 acres.

**BUDGET** **NARRATIVE** **\*ALSO** **ATTACH** **EXHIBIT** **B** **– LINE** **ITEM** **BUDGET**

*All* *expenses* *described* *in* *this* *Budget* *Narrative* *must* *be* *associated* *with* *expenses* *that* *will* *be* *covered* *by* *the* *SCBGP.* *Applicants* *should* *review* *the* *Application* *Guidelines* *Appendix* *A* *section* *4.7.2* *Allowable* *and* *Unallowable* *Costs* *and* *Activities* *prior* *to* *developing* *their* *budget* *narrative.*

|  |  |
| --- | --- |
| **Budget** **Summary** | |
| **Expense** **Category** | **Funds** **Requested** |
| **Personnel** | 88,528 |
| **Fringe** **Benefits** | 4,657 |
| **Travel** | 2,527.20 |
| **Equipment** | 7000 |
| **Supplies** |  |
| **Contractual** | 25,000 |
| **Other** | 2,700 |
|  |  |
| **Total** **Budget** | $130,412.20 |

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PERSONNEL

*List any of the organization’s employees whose time and effort* *will* *be* *specifically* *identified* *and* *easily* *and* *accurately* *traced* *to* *project* *activities* *that* *enhance* *the* *competitiveness* *of* *specialty* *crops.* *See* *the* *Request* *for* *Applications* *section* *4.7.2* *Allowable* *and* *Unallowable* *Costs* *and* *Activities* *for* *further* *guidance.*

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Name/Title** | **Level** **of** **Effort** **(#** **of**  **hours** **OR** **%** **FTE)** | **Funds**  **Requested** |
| 1 | XXX Faculty | 1 month summer salary  (4 wks at 40hrs/wk) x 2 years | 20,314 |
| 2 | XXX PhD Student | 12 weeks summer 40 hr/wk full time, 32 weeks semester stipendat 19.5 hrs/wk x  2 years | 50,550 |
| 3 | Undergraduate student | 12 weeks at 40 hrs/wk x  2 years | 17,664 |
| 4 |  |  |  |

88,528

**Personnel** **Subtotal**

PERSONNEL JUSTIFICATION

*For* *each* *individual* *listed* *in* *the* *above* *table,* *describe* *the* *activities* *to* *be* *completed* *by* *name/title* *including* *approximately* *when*

*activities will occur. Add more personnel by copying and pasting the existing listing or deleting personnel that aren’t necessary.*

**Personnel** **1:** **XXX** **Faculty** **(XXXXX)**: supervision and project management, workflow and sampling planning, report writing, mobile app design, SOP generation for data collection, and satellite image analysis and coding overview. Project planning to meet industry partner needs.

**Personnel** **2:** **XXX** **PhD** **Student** **(XXXXX):** programming and app development, integration of tools in to data collections and field assessment, training and supervision of student intern, liaison with industry stakeholder, sample and image processing integration.

**Personnel** **3:** **XXX** **Undergraduate** **Student:** data collection and field surveys, communication with team members and stakeholder, data gathering and field testing of application.

# Add other Personnel as necessary

FRINGE BENEFITS

*Provide* *the* *fringe* *benefit rates for each of the project’s salaried employees described in the Personnel section that will be paid with*

*SCBGP* *funds.*

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Name/Title** | **Fringe** **Benefit** **Rate** | **Funds** **Requested** |
| 1 | XXX Faculty | 10.5% (summer fringe rate) | 2,133 |
| 2 | XXX PhD Student | 3.7% | 1,870 |
| 3 | Undergraduate student | 3.7% | 654 |
| 4 |  |  |  |

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4,657

**Fringe** **Subtotal**

TRAVEL

*Explain* *the* *purpose* *of* *each* *Trip* *Request.* *Please* *note* *that* *travel* *costs* *are* *limited.* *In* *the* *case* *of* *air* *travel,* *project* *participants* *must* *use* *the* *lowest* *reasonable* *commercial* *airfares.* *Travel* *expenses* *must* *comply* *with* *the* *State* *of* *XXXXX* *travel* *regulations* *found* *at* [*www.sco.XXXXX.gov*](http://www.sco.idaho.gov/) *.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **Trip** **Destination** | **Type** **of** **Expense** **(airfare,** **car** **rental,** **hotel,** **meals,** **mileage,**  **etc.)** | **Unit** **of** **Measure** **(days,** **nights,** **miles)** | **#** **of** **Units** | **Cost** **per** **Unit** | **#** **of** **Travelers** **Claiming** **the** **Expense** | **Funds** **Requested** |
| 1 | XXXXX farming area – student to collect plant tissues and pest samples over 12 weeks during the growing season | mileage | 2-3 x weekly 60 mile roundtrips to various fields in IF area during growing season x 2  years | 4320 | .585 | 1 | 2527.20 |
| 2 |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |

2,527.20

**Travel** **Subtotal**

TRAVEL JUSTIFICATION

*For* *each* *trip* *listed* *in* *the* *above* *table* *describe* *the* *purpose* *of* *this* *trip* *and* *how* *it* *will* *achieve* *the* *objectives* *and* *outcomes* *of* *the* *project.* *Be* *sure* *to* *include* *approximately* *when* *the* *trip* *will* *occur.* *Add* *more* *trips* *by* *copying* *and* *pasting* *the* *existing* *listing* *or* *delete* *trips that aren’t necessary.*

**Trip** **1** **(Approximate** **Date** **of** **Summer/2023):** 2-3 x weekly 60 mile roundtrips to various fields in IF area during growing season for tissue sampling, pest assessment and crop health review

**Trip** **2(Approximate** **Date** **of** **Summer/2024):** 2-3 x weekly 60 mile roundtrips to various fields in IF area during growing season for tissue sampling, pest assessment and crop health review

CONFORMING WITH YOUR TRAVEL POLICY

By checking the box to the right, I confirm that my organization will adhere to the State of XXXXX 

travel regulations at [www.sco.XXXXX.gov](http://www.sco.idaho.gov/)

EQUIPMENT

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*Describe* *any special purpose equipment to be purchased or rented under the grant. ‘‘Special purpose equipment’’ is tangible, nonexpendable,* *personal* *property* *having* *a* *useful* *life* *of* *more* *than* *one* *year* *and* *an* *acquisition* *cost* *that* *equals* *or* *exceeds* *$5,000* *per* *unit* *and* *is* *used* *only* *for* *research,* *medical,* *scientific,* *or* *other* *technical* *activities.* *See* *the* *Application* *Guidelines* *Appendix* *A* *section*

* + 1. *Allowable* *and* *Unallowable* *Costs* *and* *Activities,* *Equipment* *-* *Special* *Purpose* *for* *further* *guidance*

*Rental* *of* *"general* *purpose equipment’’ must also be described in this section. Purchase of general purpose equipment is not allowable under* *this* *grant.* *See* *Application* *Guidelines* *Appendix* *A* *section* *4.7.2* *Allowable* *and* *Unallowable* *Costs* *and* *Activities,* *Equipment* *-* *General* *Purpose* *for* *definition,* *and* *Rental* *or* *Lease* *Costs* *of* *Buildings,* *Vehicles,* *Land* *and* *Equipment.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **Item** **Description** | **Rental** **or** **Purchase** | **Acquire** **When?** | **Funds** **Requested** |
| 1 | N/A |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |

**Equipment** **Subtotal**

EQUIPMENT JUSTIFICATION

*For* *each* *Equipment* *item* *listed* *in* *the* *above* *table* *describe* *how* *this* *equipment* *will* *be* *used* *to* *achieve* *the* *objectives* *and* *outcomes* *of*

*the project. Add more equipment by copying and pasting the existing listing or delete equipment that isn’t necessary.*

**Equipment** **1:**

**Equipment** **2:**

**Equipment** **3:**

**Add** **other** **Equipment** **as** **necessary**

SUPPLIES

*List* *the* *materials,* *supplies,* *and* *fabricated* *parts* *costing* *less* *than* *$5,000* *per* *unit* *and* *describe* *how* *they* *will* *support* *the* *purpose* *and* *goal* *of* *the* *proposal* *and* *enhance* *the* *competitiveness* *of* *specialty* *crops.* *See* *Application* *Guidelines* *Appendix* *A* *section* *4.7.2* *Allowable* *and* *Unallowable* *Costs* *and* *Activities,* *Supplies* *and* *Materials,* *Including* *Costs* *of* *Computing* *Devices* *for* *further* *information.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** **Description** | **Per-Unit** **Cost** | **#** **of** **Units/Pieces** **Purchased** | **Acquire** **When?** | **Funds** **Requested** |
| Soil moisture monitor | $1000 | 2 | Spring 2023 | 2,000 |
| Tablets | $500 | 4 | Fall 2023 | 2,000 |
| Cloud Repository Storage | $500/yr | 1 | Fall 2022 | 500 |
| Tablets | $500 | 4 | Spring 2024 | 2,000 |
| Cloud Repository Storage | $500 | 1 | Fall 2023 | 500 |
|  |  |  |  |  |

7000

**Supplies** **Subtotal**

SUPPLIES JUSTIFICATION

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*Describe* *the* *purpose* *of* *each* *supply* *listed* *in* *the* *table* *above* *purchased* *and* *how* *it* *is* *necessary* *for* *the* *completion* *of* *the* *project’s objective(s)* *and* *outcome(s).*

Soil moisture monitors x 2 – soil monitors to place to candidate fields to monitor soil moisture conditions. These sensors can be moved between and within fields and will aid researchers in determining variable moisture conditions in a field setting to compare with remotely sensed imagery

Tablets x 8 – Mobile tablets will be provided to stakeholder partners and student intern to collect field based information to feed in to app development and programming in inform sustainable decision making.

Cloud Repository Storage – for quick and efficient data storage and access to sampling results, cloud storage will be required. In addition, this will act to guide sampling protocols and greater ability to share data across mobile devices and improve decision making

CONTRACTUAL/CONSULTANT

*Contractual/consultant* *costs* *are* *the* *expenses* *associated* *with* *purchasing* *goods* *and/or* *procuring* *services* *performed* *by* *an* *individual* *or* *organization* *other* *than* *the* *applicant* *in* *the* *form* *of* *a* *procurement* *relationship.* *If* *there* *is* *more* *than* *one* *contractor* *or* *consultant,* *each* *must* *be* *described* *separately.* *(Repeat* *this* *section* *for* *each* *contract/consultant.)*

ITEMIZED CONTRACTOR( S)/CONSULTANT(S)

*Provide* *a* *list* *of* *contractors/consultants,* *detailing* *out* *the* *name,* *hourly/flat* *rate,* *and* *overall* *cost* *of* *the* *services* *performed.* *For* *pass-* *through* *entities,* *provide* *an* *itemized* *budget* *(personnel,* *fringe,* *travel,* *equipment,* *supplies,* *other,* *etc.)* *with* *appropriate* *justification.*

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Name/Organization** | **Hourly** **Rate/Flat** **Rate** | **Funds** **Requested** |
| 1 | XXXXX Crop Improvement Association – Leaf tissue sampling at $75 per petiole | $75 per petiole or 200 plant samples in year 1 | 15,000 |
| 2 | XXXXX Crop Improvement Association – Leaf tissue sampling at $75 per petiole | $75.18 per petiole or 133 plant samples in year 2 | 10,000 |
| 3 |  |  |  |
| 4 |  |  |  |

25,000

**Contractual/Consultant** **Subtotal**

CONTRACTUAL JUSTIFICATION

*Provide* *for* *each* *of* *your* *real* *or* *anticipated* *contractors* *listed* *above* *a* *description* *of* *the* *project* *activities* *each* *will* *accomplish* *to* *meet* *the* *objectives* *and* *outcomes* *of* *the* *project.* *Each* *section* *should* *also* *include* *a* *justification* *for* *why* *contractual/consultant* *services* *are* *to* *be* *used* *to* *meet* *the* *anticipated* *outcomes* *and* *objectives.* *Include* *timelines* *for* *each* *activity.* *If* *contractor* *employee* *and* *consultant* *hourly* *rates* *of* *pay* *exceed* *the* *salary* *of* *a* *GS-15* *step* *10* *Federal* *employee* *in* *your* *area,* *provide* *a* *justification* *for* *the* *expenses.* *This* *limit* *does* *not* *include* *fringe* *benefits,* *travel,* *indirect* *costs,* *or* *other* *expenses..* See Application Guidelines Appendix A section 4.7.2 Allowable and Unallowable Costs and Activities, Contractual and Consultant Costs for acceptable justifications. Contracts must also conform to State of XXXXX procurement standards. That information can be found at https://purchasing.XXXXX.gov/

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**Contractor/Consultant** **1**: XXXXX Crop tissue sampling for potato plant leaf samples – will inform our decision making app on the variable rate of plant health across a field for targeted assessment to improve nutrients, water, pesticide and other applications.

**Contractor/Consultant** **2:**

**Contractor/Consultant** **3:**

**Add** **other** **Contractors/Consultants** **as** **necessary**

CONFORMING WITH YOUR PROCUREMENT STANDARDS

By checking the box to the right, I confirm that my organization followed the same policies and procedures 

used for procurements from non-federal sources, which reflect applicable State and local laws and regulations and conform to the Federal laws and standards identified in 2 CFR Part 200.317 through.326, as applicable. If the contractor(s)/consultant(s) are not already selected, my organization will follow the same requirements.

See XXXXX specific procurement standards at https://purchasing.XXXXX.gov/

OTHER

*Include* *any* *expenses* *not* *covered* *in* *any* *of* *the* *previous* *budget* *categories.* *Be* *sure* *to* *break* *down* *costs* *into* *cost/unit.* *Expenses* *in* *this* *section* *include,* *but* *are* *not* *limited* *to,* *meetings* *and* *conferences,* *communications,* *rental* *expenses,* *advertisements,* *publication* *costs,* *and* *data* *collection.*

*If* *you* *budget* *meal* *costs* *for* *reasons* *other* *than* *meals* *associated* *with* *travel* *per* *diem,* *provide* *an* *adequate* *justification* *to* *support* *that* *these* *costs* *are* *not* *entertainment* *costs.* *See* *Request* *for* *Applications* *section* *4.7.2* *Allowable* *and* *Unallowable* *Costs* *and* *Activities,* *Meals* *for* *further* *guidance.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** **Description** | **Per-Unit** **Cost** | **Number** **of** **Units** | **Acquire** **When?** | **Funds** **Requested** |
| Publication fees | 2,700 | 1 | Sept 2024 | 2,700 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

2,700

**Other** **Subtotal**

OTHER JUSTIFICATION

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*Describe* *the* *purpose* *of* *each* *item* *listed* *in* *the* *table* *above* *purchased* *and* *how* *it* *is* *necessary* *for* *the* *completion* *of* *the* *project’s*

*objective(s)* *and* *outcome(s).*

For wide dissemination of project results across the scientific community we plan to publish our work in an open source journal.

For information dissemination across the grower community we plan to present and demonstrate our results at the yearly Potato School Conference held at XXXXX State University (no charge or travel fees required)

PROGRAM INCOME

*Program* *income* *is* *gross* *income—earned* *by* *a* *recipient* *or* *subrecipient* *under* *a* *grant—directly* *generated* *by* *the* *grant-supported* *activity,* *or* *earned* *only* *because* *of* *the* *grant* *agreement* *during* *the* *grant* *period* *of* *performance.* *Program* *income* *includes,* *but* *is* *not* *limited* *to,* *income* *from* *fees* *for* *services* *performed;* *the* *sale* *of* *commodities* *or* *items* *fabricated* *under* *an* *award* *(this* *includes* *items* *sold* *at* *cost* *if* *the* *cost* *of* *producing* *the* *item* *was* *funded* *in* *whole* *or* *partially* *with* *grant* *funds);* *registration* *fees* *for* *conferences,* *etc.*

|  |  |  |
| --- | --- | --- |
| **Source/Nature** **of** **Program** **Income** | **Description** **of** **how** **you** **will** **reinvest** **the** **program** **income** **into** **the** **project** **to** **solely**  **enhance** **the** **competitiveness** **of** **specialty** **crops** | **Estimated** **Income** |
| N/A |  |  |
|  |  |  |

**Program** **Income** **Total**

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