

Response to reviewers' comments: Previous submission (On-Farm Research Grant 2021)

- As the grower is learning the decision-making skills to determine irrigation scheduling how many acres will be involved?

Total 50 acres will be involved (information added in the proposal)

- During the growing season will the grower be updated on whether or not the irrigation decisions are in line with the soil moisture data?

Yes, grower will be kept updated on his compliance with the soil moisture data and suggestion will be provided, accordingly.

- It begins to but falls short of any new optics, lens, or viewpoint. In my opinion the framework is in the document, but details were lacking to articulate any new direction that could make a transformative (positive) impact

Details regarding the framework are provided now in the revised proposal. The main focus of the project is to develop capacity of the grower to use SIS. Therefore, an element of simplicity is kept in the proposed project.

- The lack of goal/objective statements is usually a fatal flaw for a proposal. Simply stating these (definitively) would vastly improve the proposal.

Goals and objectives are added in the revised proposal.

- Currently the project lacks this two-way exchange

Outreach plan has been improved to ensure two-way exchange in the proposed project.

- There was no mention of data security or data privacy. These issues should be resolved and a system should be in place prior to collecting data on a stakeholder's enterprise (no matter how big or small that enterprise may be)

Data privacy statement has been added in proposal under Statement of Proposed Solution section.

- Where is the assessment of learning?

The assessment of learning will be conducted through structured interview with the farmer twice during the project duration. Assessment of learning of webinar participants will be conducted through a survey.

- The following statement puts work that should be done by TAMU onto the grower "Grower can analyze the impact of past events both at temporal and spatial scale ..." This action is the purpose of the scientific research project and in no way should be outsourced onto the grower. A cooperative approach would also be relevant, but growers should not be burdened, in any way, by research (particularly vulnerable growers)

The proposal has been revised to make sure that grower is not burdened with any kind of analysis. The original idea is to develop grower's capacity to make necessary decision and for that purpose, the growers will be educated on data-driven decision making.

- -Soil moisture sensors have many known problems with inaccuracy, but can be extremely useful if the overall system is designed well. The proposal has no details on the design, only promises to apply a commercial device and thus there is much risk (given the lack of information provided)

Uncertainties in data due to inaccuracy of a sensor cannot be ruled out. Therefore, the project proposes use of more than one source of data (i.e., in-situ and remote sensing) to make sure that uncertainty is reduced in decision making. The design details are now provided in the revised proposal.

- some in-person field days as they should be possible by the end of the 2 year project.

In-person field days are not proposed due to Covid-19 related risks.

- Are there any interactions which involve two-way information exchange? For example, it is not clear if the stakeholder asked for, or needs, this tool

The outreach plan has been revised to ensure two-way information exchange. The stakeholder (farmer collaborator) has mentioned the need of scientific irrigation scheduling during extension meetings in the past.

- Add another webinar at the half-way point so there can be two-way information exchange with time to make corrections/amendments to the final product prior to delivery.

Another webinar has been added in the outreach plan at the end of first growing season.

- Given the lack of face-to-face, perhaps even more than two virtual meetings can take place to increase the meaningful value of the project.

Multiple virtual meetings have been proposed under the outreach plan.

- It is unclear why vegetative indices are shared with the grower every 5 to 16 days period, but the soil moisture data is hoarded until year 2. The assumption that vegetative index is somehow easier to understand than whether the soil is wet/dry at a particular depth is counter-intuitive

The approach has been revised. Soil moisture data will be available to farmer from day one after the installation of sensors. Later the farmer will start receiving vegetation indices; during first growing season, once a month, and during second growing, weekly/bi-weekly.

- However, there is no assessment as to whether the outcomes are indeed met (see list below). How will these outcomes be assessed and subsequently evaluated? The growers increase understanding (outcome 1 in table) The growers feel confident (outcome 2 in table) The audience learns (outcome 3) The audience is motivated (outcome 4).

Mechanism to assess the outcomes has been added in the outreach plan.

- More than 50% of the budget is allocated to the PI, yet there is only one interaction with growers (at the end). The budget should be modified to better maximize value to the stakeholder(s)

For each project year, one month's PI salary is requested. PI will be in contact with grower throughout the project duration. PI will keep providing suggestions for scheduling irrigation based on soil moisture and vegetation indices data on recurring basis. PI will address growers' questions and will request feedback from the grower related to experience of using SIS. PI will also assess grower's improvement in knowledge and capacity to use SIS. Details are provided under outreach plan.

- What is the rough per acre costs of using these technologies? If the costs outweighs the savings for the farmer, why would he/she implement? Most importantly, why only one sensor?

Per acre cost depends on the number of sensors installed per farm. The main motivation of the vegetable farmers in the Lower Rio Grande region to install soil moisture sensors is to maximize the benefits of drip irrigation as vegetable are highly sensitive to water stress and precise application of water is crucial for good quality harvest. Two sensors are included now under the revised proposal. Soil moisture sensor manufacturer is providing the sensors on discounted rates.

- Soil type can vary greatly within a field...if only one sensor is used, then the data would be misleading if there are various soil types.

Two sensors will be installed in the experimental plots to address the issue of soil type variation.

- Is the subscription cost \$750/year per sensor? This is not explained. If so, the cost of CropX sensors would not make economic sense if multiples are required.

The subscription cost has been reduced to \$250 per sensor.

- Has an initial study been done on which soil sensing tech has the most bang for the buck return for farmers?

Most of the studies conducted in the past point towards the use of in-situ soil moisture sensing to provide farmers with best value of their money.