1. Title of the environmental science or management problem.

*Evaluating the utility and consequences of biodegradable plastic mulching from an agroecological and social perspective*

2. Client, including name, email, phone, and affiliation. If different than proposer. The client is the primary rep­resentative from the client organization and the main point of contact for students.

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(Sistla is lead PI, Williams is co-I)

3. Description of Project(s)

a. Summary of the project goals

California agriculture depends on soil health to remain productive and sustainable in the coming century; it is at the forefront of an attempt to develop incentive programs for farmers and land managers to improve their soils' carbon sequestration capability via innovative management techniques. Given both the significant use of plastic mulching in California’s commercial agriculture and its known deleterious impacts on the environment and human health, understanding the agroecological and social costs and benefits of biodegradable alternatives is a pressing concern. In order to better understand the short and long-term consequences of shifting to biodegradable plastic mulches in key CA cash crops where plasticulture is practiced, the consequences of this technology on agricultural productivity, soil quality, and grower perspectives on adopting biodegradable mulches must be better understood.

Our research will provide fundamental information on the biological, physical, and social considerations that are necessary to be addressed prior to widespread adoption of biodegradable plastic mulches in strawberry cultivation, grape growing, and the CA agricultural sector more broadly. As plastic disposal and plastic mulch removal labor costs increases, identifying plastic alternatives will directly benefit the CA strawberry industry, wine industry, and other agricultural users of plastic mulches.

*The MS student component of the project will focus on working with Dr. Williams to assess farmer perceptions of barriers and benefits to the adoption of biodegradable vs. conventional plastic mulch.*

b. Objectives. What are the science and policy or management questions that need to be answered by the project? Focus on 1 to 3 concrete and achievable objectives.

To understand farmer perceptions of barriers and benefits of adoption of biodegradable versus conventional plastic mulch, as part of an interdisciplinary study, we seek to undertake a combination of surveys administered to a sample of strawberry farmers and winegrape growers throughout California's major strawberry and winegrape growing regions and complete key informant interviews with a subsample of surveyed farmers and agricultural extension agents. We hypothesize that among California strawberry and winegrape growers, economic concerns will outweigh environmental concerns in adopting this technology. However, if biodegradable plastic mulches are found to increase plant or soil quality, this may increase interest in adopting the technology, especially as plastic disposal and labor costs rise.

c. Significance. What is the context for this work? Why is this work important? Who is the target audience/client? Which other people (besides the client) would benefit from the results of this work?

A lack of clear knowledge about the anticipated effects of biodegradable plastic mulches on soil systems was previously identified as a primary barrier to adoption by farmers. We also seek to understand farmer concerns and desires regarding shifts from conventional to biodegradable plastic mulch. While a previous study worked to identify deterrents to adoption among fruit and vegetable farmers in Texas, Tennessee, and Washington, similar research targeting California producers is sparse. Most of the farmers in that study aimed to use, or previously experimented with, biodegradable plastic mulch in cultivation. In addition to a lack of knowledge of the long-term effects to their agroecosystem, a major barrier to adoption was the high cost and uneven breakdown in fields. We anticipate that the decision-making process of these California farmers does not parallel that of the tomato growers, who made up most of the study's survey respondents, because of the high value nature of strawberries, herbs, and winegrapes.

Additional research targeting strawberry farmers throughout the US, including some in California, suggests that despite some experience with biodegradable plastic mulch, most of the California strawberry farmers included in the study were unsure of the impacts of this technology on their agroecosystem. Yet, how this knowledge deficit impacts their likelihood to experiment with biodegradable plastic mulch is uncertain. Therefore, we will assess California specialty crop farmer perceptions of the costs and benefits of converting to biodegradable plastic mulch to better anticipate the potential for widespread adoption of this technology.

d. Where is the project location? In general, how did the problem arise? What has been done to date, if known?

The project will be based out of San Luis Obispo, CA with some field work in CA (travel budget provided).

e. Deliverables. What product(s) would be expected from the project. This will primarily be a short description of the written final report. However other products such as a presentation to the client, hosting a seminar on project results, a completed restoration project, etc. can be suggested.

We expect this research would yield data for a publishable manuscript and the MS student would be involved in stakeholder outreach efforts.

4. Project Funding. Describe what financial support can be provided toward achieving the project

objectives. Funding is not required, however if substantial resources are needed to complete the project then describe what financial commitment can be made. Funding, even small amounts, for travel, student stipends, materials and supplies, or tuition support makes the project more attractive for selection.

All research costs will be covered, a research stipend may be available.

5. Supporting Materials

Full project proposal available upon request.