**Retrospective Soil Health Economic Calculator (R-SHEC) Questionnaire**

**For “Soil Health Successful” Tree Nut Growers**

(Those growing almonds, pistachios, &/or walnuts who have implemented conservation cover, cover crops, composting, mulching, &/or nutrient management for at least 4 years & no more than 15 years)

**Tree Nut Version**

**Updated: May 30, 2024**

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# **Orchard Info & Determining Study Area**

*This section can be completed on its own to first determine if the grower’s soil health practices can be analyzed in the Tree Nut R-SHEC, and if the grower has the necessary data. Review the R-SHEC User Manual and the Soil Health Economic Case Study “Introduction” document before completing this questionnaire. You can also complete* [*an online survey*](https://forms.office.com/Pages/ResponsePage.aspx?id=9DZ9usq8W0ODzin3qwZEyDBRL9a82pZJnZ8q_GzyXuxURElFOTZCVzRQWFBOV09BTkkwWEgzSjRDVi4u) *to quickly determine if the study area in question qualifies for a R-SHEC partial budget analysis. You can find these resources in our Toolkit:* [*https://farmlandinfo.org/rshec-toolkit/*](https://farmlandinfo.org/rshec-toolkit/)

**Tree nut type (almonds, pistachios &/or walnuts):**

**Name of orchard:**

**Name of grower:**

**Total orchard acres:**

**Orchard address**:

**County:**

**Watershed:**

**Annual precipitation:**

**Grower Phone number:**

**Grower Email**:

**Name of****Interviewer:**

1. **In order to determine if the tree nut R-SHEC Tool will work for the grower’s situation, answer the following bulleted questions (Y/N):**

* Does the grower grow one or more of these tree nuts and not others: almonds, pistachios, &/or walnuts?
* For the applicable tree nuts, does the grower implement one or more of the listed soil health practices: compost application, conservation cover, cover crops, mulching, &/or nutrient management?
* Did the grower implement these practices when the trees were at full-bearing age (5-7 years old) in order to separate natural tree growth and those soil health practice benefits on tree health?
* Does the grower have a study area where they can provide details on field operations before adoption of the soil health practice being analyzed (benchmark management scenario) with an understanding of what changed due to adoption of soil health practices?
* Is the grower able to report average chemical/nutrient machinery type/frequency, nutrient input rates (N, P, K, other), chemical input rates and costs, compost & mulching costs, & average yield and what changed due to soil health practices?

**If any of the answers to these questions are “no,” the tree nut R-SHEC may not be appropriate for your study area. Otherwise, continue with the questionnaire.**

1. **Is your orchard organic** (Y/N)?
2. **List below all operating units (i.e. blocks) on the orchard and associated soil health practices. Identify which block best qualifies to be the focus of this case study.** *(See example in the first gray row for guidance.)*

# **Table 1: Orchard Blocks and Timeline of Soil Health Practice Use**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Orchard Blocks** | | | **Soil Health Practice Info**  *(conservation cover, cover crops, compost application, mulching, &/or nutrient management)* | | **Mark “X” next to the block selected as study area** |
| **Tree nut(s)\*** | **Year Trees Planted** | **Acreage** | **SH Practices and Current Acreage** | **Year Initiated each SH Practice** |
| *E.g., walnuts* | *2014* | *20* | * *Cover crop – 20* * *Mulching – 20* | * *2022* * *2023* | *X* |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**\*Note**: In the updated tree nut R-SHEC, the user only identifies the crop type in the yields table.

1. **Economic Benefits –** Please briefly describe any economic benefits the grower has observed from adopting soil health practices:
   1. **How did grower conclude that the above benefits are attributable to soil health practices?**
   2. **What other factors may have influenced economic benefits other than the adopted soil health practices?**
2. **Environmental Benefits –** Please briefly describe any environmental and soil health benefits that the grower has observed from adopting soil health practices:
3. **Complete Table 2 for the Study Area benchmark and current management activities for the partial budget analysis**. Indicate grower’s **benchmark** (pre-soil health practice adoption) and **current** (post-adoption) management activities. Include as much detail as possible.

# **Table 2: Study Area Benchmark and Current Management**

|  |  |  |
| --- | --- | --- |
| **Soil Health Practices** |  | **Description of Study Area Tree Nut Orchard Management Activities by Practice** |
| **Nutrient Management** | **Benchmark** |  |
| **Current** |  |
|  |  |  |
| **Cover Cropping/ Conservation Cover** | **Benchmark** |  |
| **Current** |  |
|  |  |  |
| **Mulching** | **Benchmark** |  |
| **Current** |  |
|  |  |  |
| **Compost Application** | **Benchmark** |  |
| **Current** |  |

**Space for any notes relating to Table 2:**

1. **Learning activities:** The R-SHEC Tool calculates a per acre cost for learning activities associated with implementing soil health practices. This value is based on an hourly rate of $29.23 (U.S. Bureau of Labor Statistics, 2024; see R-SHEC Tool “Prices” tab, or PDF copy) combined with the number of hours per year spent on learning activities. **For each practice you are using, please estimate how much time you spend each year enhancing your knowledge about adopted soil health practices and what types of learning experiences you engage in (e.g., workshops, field days, meetings, reading articles, internet research).** Use Combined Practices Learning Activities only when you cannot separate hours spent by practice. Do not enter hours for individual practices if using the Combined Practices Learning Activities. If you would prefer to use your own labor rate, please report below as well.
   * 1. Nutrient Management Learning Activities (hrs/yr): \_\_\_\_\_\_\_\_
     2. Cover Crops Learning Activities (hrs/yr): \_\_\_\_\_\_\_\_\_\_
     3. Mulching Learning Activities (hrs/yr): \_\_\_\_\_\_\_\_\_
     4. Compost Application Learning Activities (hrs/yr): \_\_\_\_\_\_\_\_\_\_
     5. Combined Practices Learning Activities (hrs/yr): \_\_\_\_\_\_\_\_\_\_
     6. **OPTIONAL –** Grower’s Reported Labor Hourly Rate ($/hr): \_\_\_\_\_\_\_\_
2. **2023 Fertilizer and Crop Prices:** To estimate the economic effects of adopting soil health practices, the R-SHEC Tool uses five-year national average prices for fertilizer and California statewide average prices for almonds, pistachios, and walnuts. If you would like to use your own prices, enter them below. Otherwise, the R-SHEC will use national average values for the partial budget analysis. (See R-SHEC Tool “Prices” tab for sources, or PDF copy; enter farmer-provided, preferred prices in “Orchard Info” tab).
   1. Nitrogen ($/lb): \_\_\_\_\_\_\_\_\_\_ (Five-year (2019-2023) National Ave. = $0.63/lb)
3. Phosphorus ($/lb): \_\_\_\_\_\_\_\_\_\_ (Five-year (2019-2023) National Ave. = $0.61/lb)
4. Potassium ($/lb): \_\_\_\_\_\_\_\_\_\_ (Five-year (2019-2023) National Ave. = $0.54/lb)
5. Other fertilizer prices ($/lb) – include type and description:

1. Almonds ($/lb): \_\_\_\_\_\_\_\_\_\_ (Five-year (2019-2023) California Average = $2.11/lb, $4.92/lb organic)
2. Pistachios ($/lb): \_\_\_\_\_\_\_\_\_\_ (Five-year (2019-2023) California Average = $2.76/lb, $3.98/lb organic)
3. Walnuts ($/lb): \_\_\_\_\_\_\_\_\_\_ (Five-year (2019-2023) California Average = $0.71/lb, $1.66/lb organic)

# **Study Area Economic Impacts** **of Soil Health Practices**

This part of the interview covers the economic changes – both costs and benefits – that grower has experienced with the adoption of soil health practices on their orchard. We want you to provide responses for the Study Area selected in Section I. Information collected here will be input into the Excel-based R-SHEC Tool to conduct a partial budget analysis. An economic partial budget analysis is a cost-benefit analysis that isolates the costs and benefits associated with the evaluated soil health practice(s). Any changes that are not related to the soil health practices are not evaluated.

**Section II is divided between the soil health practices and combined practices effects. Complete only sections that pertain to current soil health practices on your Study Area as identified in Table 2 above.** **For each practice, please tell us how the operation worked pre-adoption (benchmark setting) and post-adoption (current setting).** You will notice that each practice section asks similar or the same questions about changes in machinery operations, yield, nutrient use, pesticide use, and erosion. It is alright to leave questions blank if you are unsure. Also, take advantage of using the optional “Other Costs and Benefits” table in each section to capture field operation changes that don’t fit well in the other tables, yet there is an attributable $/ac change estimate. It can be useful to reference the UC Davis crop budgets if you need help quantifying these other costs and benefits: <https://coststudies.ucdavis.edu/current/commodities>.

**If grower finds it difficult to attribute field operation changes to individual soil health practices, you should use the “Combined Practice Effects” section** to provide estimates for these changes attributable to the use of practices in combination.

# **NUTRIENT MANAGEMENT**

**TIP:** *If a particular effect cannot be attributed solely to a change in nutrient management activities for soil health, the user can enter it on the Combined Practice Effects section.*

**NM.1.** **Describe benchmark Nutrient Management activities** (e*.g., machinery, number of applications, volume, type, soil testing type and frequency)*:

**NM.2.** **Describe current Nutrient Management activities:**

**NM.3.** **Describe in table below the initial year, initial acreage, and current acreage for the Study Area’s current Nutrient Management activities** (e.g., leaf sampling, soil sampling, split application, etc.):

**Table NM.1: Timeline of Study Area Current Nutrient Management (NM) Activities**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Current NM Activity** | **Initial Year** | **Initial Acreage** | **Current Acreage** | **Additional Description/Notes** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**NM.4.** **If applicable, what made you increase acreage of each NM strategy from your initial acreage to your current acreage?**

**NM.5.** If grower’s fertilizer application machinery changed due to a change in their Nutrient Management activities, complete the following tables by **listing** **fertilizer machinery/implements used before (benchmark) and after (current) adopting new Nutrient Management activities**. See example in the first gray row for guidance.

(*Note, review the list of machinery and associated costs included in the R-SHEC Tool to determine the machinery that most closely matches your equipment. A PDF list is available.* *DO NOT include implements used to spread manure or compost* *as that will be provided in the Compost Application section.)*

**Table NM.2a: Benchmark Fertilizer Machinery – Before Change in Nutrient Management Activities**

|  |  |  |  |
| --- | --- | --- | --- |
| **Benchmark NM Machinery** | **Size** | **Passes per Year** | **Fertilizer Type** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Table NM.2b: Current Machinery – After Change in Nutrient Management Activities

|  |  |  |  |
| --- | --- | --- | --- |
| **Current NM Machinery** | **Size** | **Passes per Year** | **Fertilizer Type** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

* **Record any descriptions about change in Nutrient Management activities for soil health:**

**NM.6: Complete table below if grower observed a yield decrease or increase on average due to change in Nutrient Management activities. Try to avoid outlier low or high yield years due to weather impacts.** We suggest only entering changes in yield below if nutrient management is the only soil health practice analyzed, otherwise enter yield impacts in the Combined Practice Effects tab. (*The example illustrates that the average benchmark yield of 2,700 lbs/ac increased by 270 lbs/ac (+10%) due to change in Nutrient Management activities.)*

**Table NM.3: Observed Change in Average Yield due to Change in Nutrient Management Activities**

|  |  |
| --- | --- |
| **Benchmark Average Yield (lbs/ac) Before Adopting NM** | **Change in Average Yield due to Adopting NM**  **(+/- lbs/ac or % change)** |
|  |  |

* 1. **Is this estimated or reported yield?** \_\_\_\_\_\_ Estimated \_\_\_\_\_\_ Reported (e.g., from processor)
  2. **Add any comments about yield impacts due to change in NM:**

**NM.7: Identify in table below any reductions or increases** **in volume of nutrients applied (N, P, K, Micronutrients**) due to a change in Nutrient Management activities. *(The example illustrates a reduction of 30 lbs/ac of N associated with a change in Nutrient Management activities.)*

**Table NM.4: Reductions or Increases in Volume of Nutrients Applied due to Change in Nutrient Management**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Nitrogen (N)**  **Reduction or Increase (lb/ac)** | **Phosphorous (P) Reduction or Increase (lb/ac)** | **Potassium (K) Reduction or Increase (lb/ac)** | **Micronutrient Cocktail Reduction or Increase (lb/ac) & Price ($/lb)** | **Additional Notes** |
|  |  |  |  |  |
|  |  |  |  |  |

* **Record any descriptions about this change:**

**NM.8. Complete the table below if grower switched from one form of Nitrogen to another** (e.g., Granular Urea to UAN 32)

Table NM.8: Change in Form of Nitrogen and Resulting Change in Price and Amount Applied

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Form of N** | **Price ($/lb)** | **Pounds Applied (lb/ac)** |
| **Benchmark** |  |  |  |
| **Current** |  |  |  |

* **Record any descriptions about this change:**

**NM.9. Complete table below if grower switched from one form of Potassium to another** (*e.g., Potash to Potassium Sulfate*):

Table NM.9: Change in Form of Potassium (K) and Resulting Change in Price and Amount Applied

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Form of K** | **Price ($/lb)** | **Pounds Applied (lb/ac)** |
| **Benchmark** |  |  |  |
| **Current** |  |  |  |

* **Record any descriptions about this change:**

**NM.10. Identify in table below any reductions or increases in pesticides due to a change in Nutrient Management activities by providing the benchmark cost/acre (include chemical and application costs) for each pesticide category *before* grower changed Nutrient Management activities and an estimate of the percent reduction or increase in cost or quantity *due to* changing Nutrient Management activities.** (*The example illustrates a 5% reduction in fungicide due to change in Nutrient Management activities.)*

Table NM.10: Reductions or Increases in Pesticides due to Adopting Nutrient Management

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Herbicides** | | **Insecticides** | | **Fungicides** | |
| **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* **Record any descriptions about this change:**

**NM.11. If grower previously or is currently receiving financial assistance for implementing Nutrient Management, please complete table below** (*see example in the first gray row for guidance.*) ***Note:*** *Any financial assistance payments listed are not included in the partial budget analysis because cost-share is temporary and not received by all but can be noted in the footnote of PBA table in the case study.*

Table 6: Financial Assistance History for Nutrient Management

|  |  |  |  |
| --- | --- | --- | --- |
| **Start Year and Ending Year** | **Source of Funding** | **Payment per Acre** | **Acres Enrolled** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**NM.12. Describe in table below any other benefits, costs, or changes in activities that were not needed or added when grower changed their Nutrient Management activities.***Please convert cost estimates to dollars per acre.*

Table NM.12: Other Benefits, Costs, or Changes in Activities Due to Change in Nutrient Management Activities

|  |  |  |
| --- | --- | --- |
| **Description of Other Benefit(s)** | **$/acre** | **Acres Affected** |
|  |  |  |
|  |  |  |
| **Description of Other Cost(s)** | **$/acre** | **Acres Affected** |
|  |  |  |
|  |  |  |
|  |  |  |

# **COVER CROPS or CONSERVATION COVER**

This section focuses on the costs and benefits of adopting either cover crops or conservation cover in the grower’s orchard. Cover crops are re-established each year with a new seeding whereas conservation cover is permanent multi-year cover grown from seed or resident vegetation. The R-SHEC Tool is setup to only analyze the switch from no cover to planting a cover. The R-SHEC Tool does not analyze switching of cover crop species, changes in establishment methods, nor changes in termination methods, etc.

**TIP:** *If a particular effect cannot be attributed solely to adoption of cover crops, the user can enter it on the Combined Practice Effects section.*

**CC.1. Please indicate whether grower adopted Cover Crops or Conservation Cover within the Study Area (or describe in “other” if grower switched from one to the other):**

**\_\_\_ Cover Crop \_\_\_ Conservation Cover \_\_\_\_ Other:**

**CC.2. What is grower’s history of using Cover within the Study Area (add any notes as well):**

a. **First Year Adopted:** \_\_\_\_\_\_\_\_\_\_\_ b. **First Year Acreage:** \_\_\_\_\_\_\_\_\_\_\_ c. **Current Acres:** \_\_\_\_\_\_\_\_\_\_\_

**CC.3. Complete table below about current Cover management in the Study Area** *(see example in grey row.)*

Table CC.3: Cover Type, Seeding Rate, Establishment Interval, and Cost Information

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cover Type**  **(list all species in a mix)** | **Cover Seeding Rate (lb/ac)** | **Current Acres of Cover Planted\*** | **Cover Seed Cost ($/ac)** | **Establish-ment Interval (years)** | **Establish-ment Cost ($/ac)** | **Termination Cost ($/Ac)** | **Maintenance Costs**  **($/ac)** | **Other Costs (describe, $/ac)** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

*\*Sum of Current Acres of Cover Planted cannot exceed the Current Acres in Cover as indicated in Question CC.2.*

* **Describe grower’s cover crop management practices:**

**CC.4. Complete table below if grower observed a yield decrease or increase due to adopting Cover in the Study Area. Try to avoid outlier low or high yield years due to weather impacts.** We suggest only entering changes in yield below if Cover is the only soil health practice analyzed, otherwise enter yield impacts in the Combined Practice Effects tab. (*The example illustrates that the change in average yield increased by 200 lbs/ac after adopting Cover.*)

Table CC.4: Observed Average Yield Change due to Adopting Cover

|  |  |
| --- | --- |
| **Benchmark Average Yield (lbs/ac)**  **before Adopting Cover** | **Change in Average Yield due to Adopting Cover**  **(+/- lbs/acre or % increase/decrease)** |
|  |  |
|  |  |

* 1. **Is this estimated or reported yield?** \_\_\_\_\_\_ Estimated \_\_\_\_\_\_ Report from Processor
  2. **Add any comments about weather impacts (drought year or wet spring) on yield:**

**CC.5. Identify in table below any reductions or increases in nutrient inputs (N, P, K, Micronutrients) due to adopting Cover.** *(The example illustrates a reduction of 30 lbs/ac of N in the season following a legume Cover Crop.)*

Table CC.5: Reductions or Increases in Primary Nutrients due to Adopting Cover

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **N Reduction or Increase (lb/ac)** | **P Reduction or Increase (lb/ac)** | **K Reduction or Increase (lb/ac)** | **Micronutrient Cocktail Reduction or Increase (lb/ac) & Price ($/lb)** | **Additional Notes** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

* **Record any descriptions about this change:**

**CC.6. Identify in table below any reductions or increases in pesticide inputs due to adopting Cover by providing the benchmark cost/acre (include chemical and application costs) for each pesticide category *before* grower adopted Cover and an estimate of the percent reduction or increase *due to* adopting Cover.** If cost of cover crop termination with pesticides is included in Table CC. 3. above, do not enter increased cost in this table. (*The example illustrates a 15% reduction in insecticide use following a Cover Crop.)*

Table CC.6: Reductions or Increases in Pesticide Costs due to Adopting Cover

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Herbicides** | | **Insecticides** | | **Fungicides** | |
| **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* **Record any descriptions about this change:**

**CC.7. If grower observed a reduction in soil erosion due to adopting Cover, please answer the following questions, or if grower cannot associate a reduction in soil erosion with Cover solely, use the Combined Practices Effect section:**

* 1. **Please describe any changes grower may have visually observed in erosion on their orchard:**
  2. **Please estimate the Number of Acres that saw a reduction in the rate of sheet and rill erosion**: \_\_\_\_\_\_ ***Note:*** *This could be the entire area where grower planted Cover in cases where slopes are relatively uniform throughout or, if the area is comprised of a combination of relatively flat areas and steeper ground, the acreage could be the portion encompassed by the steeper ground.*
  3. **Please provide grower’s observed/estimated reduction in sheet and rill erosion:** \_\_\_\_\_\_ **Tons/Acre/Year**

***Note:*** *Enter tons of reduced erosion results modeled using any sediment reduction tool, such as the Nutrient Tracking Tool; enter the erosion reduction value from RUSLE-2 analysis if undertaken by grower’s advisor; or any value that seems reasonable based on soil including zero.*

* 1. **Is mechanical erosion repair a typical part of the Study Area operation?** (Y/N) \_\_\_\_\_\_\_\_
     1. If yes, has adopting Cover reduced the need for erosion repairs? (Y/N) \_\_\_\_\_\_\_\_
     2. If yes, please provide:
        1. An estimate of the **total annual DECREASE in mechanical erosion repair cost** due to adopting Cover within the Study Area: - \_\_\_\_\_\_\_\_ **$/year**
        2. A **description** of the mechanical erosion repair activities within the Study Area that used to be carried out on an annual basis, and how/why the activities changed:

**CC.8. If grower previously received or is currently receiving financial assistance for growing Cover, please complete table below** (*see example in the first gray row for guidance*.)

*Note: Any financial assistance payments listed are not included in the partial budget analysis because cost-share is temporary and not received by all but can be noted in the footnote of PBA table in the case study.*

Table CC.7: Financial Assistance History for Adopting Cover

|  |  |  |  |
| --- | --- | --- | --- |
| **Start Year and Ending Year** | **Source of Funding** | **Payment per Acre** | **Acres Enrolled** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**CC.9. Describe in table below any other benefits, costs, or changes in activities that were not needed or added due to adopting Cover** (*e.g., improved air quality during harvest, improved cross pollination from bees, or improved orchard access for early season management*):

Table CC.8: Other Benefits, Costs, or Changes in Activities due to Adopting Cover

|  |  |  |
| --- | --- | --- |
| **Description of Other Benefit(s)** | **$/acre** | **Acres Affected** |
|  |  |  |
|  |  |  |
| **Description of Other Cost(s)** | **$/acre** | **Acres Affected** |
|  |  |  |
|  |  |  |

# **MULCHING**

This section covers the economic costs and benefits of adopting Mulching as a soil health practice (or adjusting the mulching practice to benefit soil health more.) Mulching generally refers to recycling orchard prunings by chipping and leaving prunings on the orchard ground.

**TIP:** *If a particular effect cannot be attributed solely to mulching, the user can enter it on the Combined Practice Effects section.*

**M.1. What is grower’s history of mulching within the Study Area (add any notes as well):**

a. **First Year Adopted:** \_\_\_\_\_\_\_\_\_\_\_ b. **First Year Acreage:** \_\_\_\_\_\_\_\_\_\_\_ c. **Current Acres:** \_\_\_\_\_\_\_\_\_\_

**Notes on where mulching is applied (e.g., tree rows, alleys, or both):**

**M.2. Complete following tables with benchmark and current mulching-related activities in the Study Area**. (*Note, review the University of California Davis almond orchard budgets included in the R-SHEC Tool to help you determine costs if needed; alternatively find pistachio and walnut budgets as well here:* [*https://coststudies.ucdavis.edu/current/commodities*](https://coststudies.ucdavis.edu/current/commodities)*)*

Table M.1a: Benchmark Activities – Before Adopting Mulching

|  |  |  |
| --- | --- | --- |
| **Benchmark Activities** | **Cost ($/acre)** | **Additional Notes/Description** |
| Collecting prunings from the field |  |  |
| Burning |  |  |
| Transport to chipping facility |  |  |
| Other (please describe): |  |  |
| Other (please describe): |  |  |

Table M.1b: Current Activities – After Adopting Mulching

|  |  |  |
| --- | --- | --- |
| **Current Activities** | **Cost ($/acre)** | **Additional Notes/Description** |
| In-field chopping in place |  |  |
| Other (please describe): |  |  |
| Other (please describe): |  |  |

* **Record any descriptions about this change:**

**M.3. Complete table below if grower observed a yield decrease or increase due to adopting Mulching in the Study Area. Try to avoid outlier low or high yield years due to weather impacts.** We suggest only entering changes in yield below if Mulching is the only soil health practice analyzed, otherwise enter yield impacts in the Combined Practice Effects tab. (*The example illustrates that the average benchmark yield 2,700 lbs kernel/acre increased by 10% due to adopting Mulching.*)

Table M.2: Observed Change in Average Yield due to Adopting Mulching

|  |  |
| --- | --- |
| **Benchmark Average Yield (lbs/ac)**  **before Adopting Mulching** | **Change in Average Yield due to Adopting Mulching**  **(+/- lbs/acre or % increase)** |
|  |  |
|  |  |

* 1. **Is this estimated or reported yield?** \_\_\_\_\_\_ Estimated \_\_\_\_\_\_ Report from Processor
  2. **Add any comments about weather impacts (drought year or wet spring) on yield:**

**M.4. Identify in table below any reductions or increases in nutrient inputs (N, P, K, Micronutrients) due to adopting mulching.** *(The example illustrates a reduction of 30 lbs/ac of N in the season following mulching.)*

Table M.3: Reductions or Increases in Primary Nutrients due to Adopting Mulching

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **N Reduction or Increase (lb/ac)** | **P Reduction or Increase (lb/ac)** | **K Reduction or Increase (lb/ac)** | **Micronutrient Cocktail Reduction or Increase (lb/ac) & Price ($/lb)** | **Additional Notes** |
|  |  |  |  |  |
|  |  |  |  |  |

* **Record any descriptions about this change:**

**M.5. Identify in table below any reductions or increases in other pesticide inputs due to adopting Mulching.** Provide the benchmark cost/acre (include chemical and application costs) for each pesticide category *before* grower adopted Mulching and the observed/estimated percent increase or decrease in cost per acre *due to* adopting Mulching. (*The example illustrates a 15% reduction in insecticide use following a Mulching.)*

Table M.4: Reductions or Increases in Pesticide Costs due to Adopting Mulching

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Herbicides** | | **Insecticides** | | **Fungicides** | |
| **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* **Record any descriptions about this change:**

**M.6. If grower observed a reduction in soil erosion due to Mulching, please answer the following questions, or if grower cannot associate a reduction in soil erosion with mulching solely, use the Combined Practices Effect section:**

* 1. **Please describe any changes grower may have visually observed in erosion on their orchard:**
  2. **Please estimate the Number of Acres that saw a reduction in the rate of sheet and rill erosion**: \_\_\_\_\_\_\_\_

***Note:*** *This could be the entire area where grower has been Mulching in cases where slopes are relatively uniform throughout or, if the area is comprised of a combination of relatively flat areas and steeper ground, the acreage could be the portion encompassed by the steeper ground.*

* 1. **Please provide grower’s observed/estimated reduction in sheet and rill erosion**: \_\_\_\_\_\_\_\_ **Tons/Acre/Year**

***Note:*** *Enter tons of reduced erosion results modeled using any sediment reduction tool, such as the Nutrient Tracking Tool; enter the erosion reduction value from RUSLE-2 analysis if undertaken by grower’s advisor; or any value that seems reasonable based on soil including zero.*

* 1. **Is mechanical erosion repair a typical part of the Study Area operation?** (Y/N) \_\_\_\_\_\_\_\_
     1. If yes, has Mulching reduced the need for erosion repairs? (Y/N) \_\_\_\_\_\_\_\_
     2. If yes, please provide:
        1. An estimate of the **total annual DECREASE in mechanical erosion repair cost** due to Mulching within the Study Area: - \_\_\_\_\_\_\_\_ **$/year**
        2. A **description** of the mechanical erosion repair activities within the Study Area that used to be carried out on an annual basis, and how/why the activities changed:
* **Record any descriptions about this change in erosion:**

If grower previously received or is currently receiving **financial assistance** for Mulching, please complete table below (*see example in first gray row for guidance*). ***Note:*** *Any financial assistance payments listed are not included in the partial budget analysis because cost-share is temporary and not received by all but can be noted in the footnote of PBA table in the case study.*

Table M.5: Financial Assistance History for Adopting Mulching

|  |  |  |  |
| --- | --- | --- | --- |
| **Start Year and Ending Year** | **Source of Funding** | **Payment per Acre** | **Acres Enrolled** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Describe in table below any **other benefits, costs, or changes in activities** that were not needed or added due to adopting Mulching *(e.g., improved water holding capacity or soil nutrient retention*):

Table M.6: Other Benefits, Costs, or Changes in Activities due to Adopting Mulching

|  |  |  |
| --- | --- | --- |
| **Description of Other Benefit(s)** | **$/acre** | **# Acres Affected** |
|  |  |  |
|  |  |  |
| **Description of Other Cost(s)** | **$/acre** | **# Acres Affected** |
|  |  |  |
|  |  |  |

# **COMPOST APPLICATION**

**TIP:** *If a particular effect cannot be attributed solely to compost application, the user can enter it on the Combined Practice Effects section.*

**CA. 1. Please answer the following questions about grower’s history of Compost Application within the Study Area:**

a. **First Year Adopted:** \_\_\_\_\_\_\_\_\_\_\_ b. **First Year Acreage:** \_\_\_\_\_\_\_\_\_\_\_ c. **Current Acres:** \_\_\_\_\_\_\_\_\_\_\_

**CA.2. What type of compost is grower applying (*e.g., composted animal manure or green waste compost) and describe when and how they apply?***

**CA.3. What is grower’s compost costs?** Complete table below as appropriate. **User must also enter Frequency,** which means the number of years between applications. For example, enter 2 if compost is applied every other year, 1 for every year, and 0.5 for twice a year, etc. **% of Study Area Acreage that Compost Cost Applies** is important to adjust for the making and purchasing of compost material. This column allows you to adjust grower’s cost based on how you calculate them. For example, 100% would mean you think about per acre costs spread across the Study Area, whereas 50% means that your per acre costs are only applied to 50% of the Study Area acreage that needs compost. ***Note:*** *The spreading of compost cost applies to 100% of Study Area because the cost is the same no matter if compost is only applied to tree rows, alleys, or both.*

Table CA.1: Costs of Compost Material and Application

|  |  |  |  |
| --- | --- | --- | --- |
| **Compost Material and Application** | **$/acre/application** | **Frequency** | **% of Study Area Acreage that Compost Cost Applies:** |
| Cost of making compost on-farm |  |  |  |
| Cost of purchasing compost |  |  |  |
| Cost of spreading compost |  |  | 100% |
| Other: |  |  |  |
| Other: |  |  |  |

**CA. 4. What was the C:N ratio of the compost grower uses?** \_\_\_\_\_\_\_ **C:N**

**CA.5. What rate does grower apply compost?** \_\_\_\_\_\_\_\_ **tons/ac**

**CA.6. Complete table below if grower observed a yield decrease or increase due to Compost Application in the Study Area.** We suggest only entering changes in yield below if compost application is the only soil health practice analyzed, otherwise enter yield impacts in the Combined Practice Effects tab. (S*ee example in first gray row for guidance.*)

Table C.2.: Observed Change in Average Yield due to Applying Compost

|  |  |
| --- | --- |
| **Benchmark Average Yield (lbs/ac)**  **Before Applying Compost** | **Change in Yield due to Applying Compost**  **(+/- lbs/acre or % increase)** |
|  |  |
|  |  |

* 1. **Is this estimated or reported yield?** \_\_\_\_\_\_ Estimated \_\_\_\_\_\_ Report from Processor
  2. **Add any comments about weather impacts (drought year or wet spring) on yield:**

**CA.7.**  Identify in table below any **reductions or increases** **in nutrient inputs (N, P, K, Micronutrients)** due to Compost Application. *(The example illustrates a reduction of 30 lbs/ac of both N and K due to applying compost.)*

Table CA.3: Reductions or Increases in Primary Nutrients due to Applying Compost

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **N Reduction or Increase (lb/ac)** | **P Reduction or Increase (lb/ac)** | **K Reduction or Increase (lb/ac)** | **Micronutrient Cocktail Reduction or Increase (lb/ac) and price/lb** | **Additional Notes** |
|  |  |  |  |  |
|  |  |  |  |  |

* **Record any descriptions about this change:**

**CA.8. Identify in table below any reductions or increases in other pesticide inputs due to Compost Application.** Provide the benchmark cost/acre (include chemical and application costs) for each pesticide category *before* Compost Application and the observed/estimated percent increase or decrease in cost per acre *due to* adopting Compost Application. (*The example illustrates a 15% reduction in insecticide use due to Compost Application.)*

Table CA.4: Reductions or Increases in Pesticide Costs due to Applying Compost

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Herbicides** | | **Insecticides** | | **Fungicides**  **Fungicides** | |
| **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* **Record any descriptions about this change:**

**CA.9. If grower observed a reduction in soil erosion due to Compost Application, please answer the following questions, or if grower cannot associate a reduction in soil erosion with mulching solely, use the Combined Practices Effect section:**

* 1. **Please describe any changes grower may have visually observed in erosion on their orchard:**
  2. **Please estimate the Number of Acres that saw a reduction in the rate of sheet and rill erosion**: \_\_\_\_\_\_

***Note:*** *This could be the entire area where grower has been applying compost in cases where slopes are relatively uniform throughout or, if the area is comprised of a combination of relatively flat areas and steeper ground, the acreage could be the portion encompassed by the steeper ground.*

* 1. **Please provide grower’s observed/estimated reduction in sheet and rill erosion**: \_\_\_\_\_\_ **Tons/Acre/Year**

***Note:*** *Enter tons of reduced erosion results modeled using any sediment reduction tool, such as the Nutrient Tracking Tool; enter the erosion reduction value from RUSLE-2 analysis if undertaken by your advisor; or any value that seems reasonable based on soil including zero.*

* 1. **Is mechanical erosion repair a typical part of the Study Area operation?** (Y/N) \_\_\_\_\_\_\_\_
     1. If yes, has Compost Application reduced the need for erosion repairs? (Y/N) \_\_\_\_\_\_\_\_
     2. If yes, please provide:
        1. An estimate of the **total annual DECREASE in mechanical erosion repair cost** due to Compost Application within the Study Area: - \_\_\_\_\_\_\_\_ **$/year**
        2. A **description** of the mechanical erosion repair activities within the Study Area that used to be carried out on an annual basis, and how/why the activities changed:

**CA.10. If grower previously or is currently receiving financial assistance for Compost Application, complete table below:**

***Note:*** *Any financial assistance payments listed are not included in the partial budget analysis because cost-share is temporary and not received by all but can be noted in the footnote of PBA table in the case study.*

Table CA.5: Financial Assistance History for Compost Application

|  |  |  |  |
| --- | --- | --- | --- |
| **Start Year and Ending Year** | **Source of Funding** | **Payment per Acre** | **Acres Enrolled** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**CA.11. Describe in table below any other benefits, costs, or changes in activities that were not needed or added when grower began Compost Application** *(e.g., reduced water stress leading to more flexible irrigation scheduling*):

Table CA.6: Other Benefits, Costs, or Changes in Activities due to Compost Application

|  |  |  |
| --- | --- | --- |
| **Description of Other Benefit(s)** | **$/acre** | **Acres Affected** |
|  |  |  |
|  |  |  |
| **Description of Other Cost(s)** | **$/acre** | **Acres Affected** |
|  |  |  |
|  |  |  |

# **COMBINED PRACTICE EFFECTS**

This section is for economic effects that cannot be attributed to individual practices. **Benefits or costs reported here are not reported in any other section.**

**CP.1. Complete table below if grower experienced a yield decrease or increase due to adopting the combination of soil health practices** (*see example in first gray row for guidance.*) **Try to avoid outlier low or high yield years due to weather impacts.**

Table CP.1: Observed Change in Average Yield due to Combined Soil Health Practices

|  |  |
| --- | --- |
| **Benchmark Average Yield (lbs/ac)**  **before Adopting Soil Health Practices** | **Change in Yield due to Soil Health Practices**  **(+/- lbs/acre or % increase)** |
|  |  |
|  |  |

* 1. **Is this an estimated or reported yield change?** \_\_\_\_\_\_ Estimated \_\_\_\_\_\_ Report from Processor
  2. **Add any comments about weather impacts (drought year or wet spring) on yield:**

**CP.2. Identify in table below reductions or increases in nutrient inputs (N, P, K) due to the combination of soil health practices adopted.**

Table CP.2: Reductions or Increases in Nutrients due to Combined Soil Health Practices

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **N Reduction or Increase (lb/ac)** | **P Reduction or Increase (lb/ac)** | **K Reduction or Increase (lb/ac)** | **Micronutrients Reduction or Increase (lb/ac) & Price ($/lb)** | **Notes** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

* **Record any descriptions about this change:**

**CP.3. Identify in table below any reductions or increases in pesticide costs due to the combined soil health practices.** Provide the benchmark cost/acre (include chemical and application costs) for each pesticide category *before* adopting soil health practices and the observed/estimated percent increase or decrease in cost per acre *due to* adopting the soil health practices. (*The example illustrates a 20% reduction in insecticide use due to decreased mite infestations over time due to adopting combination of soil health practices.)*

Table CP.4: Reductions or Increases in Pesticides due to Combined Soil Health Practices

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Herbicides** | | **Insecticides** | | **Fungicides** | |
| **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** | **Benchmark Cost ($/ac)** | **% Change (+/-)** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

* **Record any descriptions about this change:**

**CP.4. If grower observed a reduction in soil erosion due to adopting a combination of soil health practices, please answer the following questions:**

* 1. **Please describe any changes grower may have visually observed in erosion on their orchard:**
  2. **Please estimate the Number of Acres that saw a reduction in the rate of sheet and rill erosion**: \_\_\_\_\_\_ ***Note:*** *This could be the entire area where grower has adopted soil health practices in cases where slopes are relatively uniform throughout or, if the area is comprised of a combination of relatively flat areas and steeper ground, the acreage could be the portion encompassed by the steeper ground.*
  3. **Please provide grower’s observed/estimated reduction in sheet and rill erosion**: \_\_\_\_\_\_\_\_ **Tons/Acre/Year**

***Note:*** *Enter tons of reduced erosion results modeled using any sediment reduction tool, such as the Nutrient Tracking Tool; enter the erosion reduction value from RUSLE-2 analysis if undertaken by grower’s advisor; or any value that seems reasonable based on soil including zero.*

* 1. **Is mechanical erosion repair a typical part of the Study Area operation?** (Y/N) \_\_\_\_\_\_\_\_
     1. If yes, have soil health practices reduced the need for erosion repairs? (Y/N) \_\_\_\_\_\_\_\_
     2. If yes, please provide:
        1. An estimate of the **total annual DECREASE in mechanical erosion repair cost** due to combination of soil health practices within the Study Area: - \_\_\_\_\_\_\_\_ **$/year**
        2. A **description** of the mechanical erosion repair activities within the Study Area that used to be carried out on an annual basis, and how/why the activities changed:

**CP.5. Describe in table below any other benefits, costs, or changes in activities due to the combination of the soil health practices adopted.**  Enter cost/value per acre and the number of acres affected based on location (i.e., tree rows, alleys, or both). Description should include the soil health practices responsible for the change. *(For example, a savings in irrigation due to increased soil available water holding capacity, or an additional cost could be the management costs associated with timing of various new soil health practices being implemented.)*

Table CP.5: Other Benefits, Costs, or Changes in Activities due to Combined Soil Health Practices

|  |  |  |
| --- | --- | --- |
| **Description of Other Benefit(s)** | **$/acre** | **Acres Affected** |
|  |  |  |
|  |  |  |
| **Description of Other Cost(s)** | **$/acre** | **Acres Affected** |
|  |  |  |
|  |  |  |

# **Changes in the Soil**

This part of the interview records information about how the soil has changed following adoption of soil health practices. As in parts of Section I, information collected here will be used in writing the case study itself and is not used by the R-SHEC Tool for determining the change in net income.

**S.1. Please list the predominate soil types on the orchard:**

**S.2. Has grower observed changes in their soil quality (or orchard conditions) that they attribute to the soil health practice(s) they have adopted? If yes, please describe the changes.**

**S.3. Does grower have soil organic matter test records from fields in the Study Area? If yes, please fill out table below.**

Table S.1: Study Area Soil Organic Mater Test Records

|  |  |  |  |
| --- | --- | --- | --- |
| **Year of Soil Test** | **Soil Organic Matter Value (%)** | **Year of Soil Test** | **Soil Organic Matter Value (%)** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

* 1. **Average SOM value for the years before grower started using their first soil health practice:** \_\_\_\_\_\_\_\_
     1. **In the Study Area, during harvest, has grower seen an impact on dust with soil health practice adoption? If yes, please describe.**
     2. **Have the soil health practices made grower’s crop more resilient to extreme weather or pest pressure? If yes, please fill out table below.**

Table S.2: Extreme Weather or Pest Pressure

|  |  |  |  |
| --- | --- | --- | --- |
| **Type of Weather** | **Year Experienced** | **Effect on Yield** | **Did Soil Health Practices Help?** |
| Excessive Precipitation |  |  |  |
| Drought |  |  |  |
| Excessive Temperature |  |  |  |
| Pest Pressure |  |  |  |

# **Additional Questions**

**These questions are optional but encouraged to include if including the results of the R-SHEC analysis in a full case study write-up.**

**What is the tree and row spacing for this Study Area?**

\_\_\_\_\_\_\_\_ ft tree spacing x \_\_\_\_\_\_\_ ft row spacing

**How many years has grower been involved with agriculture?**

**How many people are involved in the operation? What is grower’s role?**

**Who does grower generally talk to about soil health practices?** Where do they get information (e.g., NRCS, RCDs, Extension, YouTube, consultants, etc.)?

**Please describe what motivated grower’s adoption of soil health practices and when?**

**What challenges has grower experienced during the adoption of soil health practices?**

**What else does grower like about the soil health practices they have adopted that you have not mentioned above?**

**OPTIONAL: Complete following tables to describe the Study Area’s current irrigation system and practices for the story aspect if writing a full case study:**

**What is the water source for this Study Area?** \_\_\_\_\_Groundwater \_\_\_\_\_District surface water \_\_\_\_\_Both

Table 1: Study Area Irrigation System

|  |  |  |
| --- | --- | --- |
| **Irrigation System** | **Yes/No** | **Additional Notes/Description** |
| Double/Single line drip |  |  |
| Micro-sprinklers |  |  |
| Solid-set sprinklers |  |  |
| Furrow |  |  |
| Flood |  |  |
| Other: |  |  |

Table 2: Study Area Irrigation Practices

|  |  |  |
| --- | --- | --- |
| **Irrigation Practices** | **Year Adopted** | **Additional Notes/Description** |
| Evapotranspiration monitoring |  |  |
| Use of a pressure chamber |  |  |
| Soil moisture monitoring |  |  |
| Measure distribution uniformity |  |  |
| Leaf sampling |  |  |
| Other: |  |  |