Sonoma Biochar Initiative
Building Healthy Soils
Redirecting Carbon

SONOMA ECOLOGY CENTER

Citizen Science: Biochar

A Step-By-Step Guide to Project Design and Evaluation

<u>Primary goal</u>: To investigate the impact of Biochar on crop success. Your participation in experimental plot data collection is essential!

<u>How you can help</u>: Set up comparative plots, tend your plants, and collect data to contribute to the study results.

<u>How to get started</u>: Read this sheet for instructions on how to use and evaluate the impact of Biochar during this growing season.

Step One: Create Your Plots

The purpose of this experiment is to assess the comparative health of plants grown with and without Biochar. To do so, you will set up identical growing plots, side by side. Everything about the plots must be the same, except one plot will have Biochar added and one will not. It is best to locate the test plots as close to each other as possible, so they'll receive similar amounts of sunlight and rain.

The standard garden plot in this study is 3 feet wide by 3 feet long. Establish two plots, one marked **Control Plot** (without Biochar) and one marked **Treatment Plot** (with Biochar). If your plots are smaller or larger than the standard, you can still participate. You'll just vary the amount of Biochar you apply, as noted in Step Two.

Fill your plots with poor quality or unfertilized soil, the worst in your garden, if possible. Results will likely be more marked if you start with ordinary soil instead of soil that has already been improved. This study is not looking for which participants get the best results; rather, this study aims to know how results differ between your two plots. Any treatments and soil amendments, except the application of Biochar and amount of water applied after planting, must be identical for the two plots. Biochar may be applied to second- or third-year plots. Changes build in soil over time.

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Step Two: Add the Biochar and Plant Your Crops

Prepare your **Treatment Plot.** To do so, mix the contents of the **Compost/Biochar** bag into the soil to about 6 inches deep. (Note that one bag will cover a 3-foot by 3-foot plot to 6 inches deep, but if you are using smaller plots, you can scale back the amount of **Compost/Biochar** accordingly to achieve this same depth of application.)

Next, prepare your **Control Plot.** To do so, treat the plot with whatever material you normally use to amend your garden soil. If you generally use compost, spread it evenly across the surface and mix it into the soil about 3 inches deep. The amount you apply should be half the amount of **Compost/Biochar** applied to the **Treatment Plot.** A simple method of measurement is to fill the empty **Compost/Biochar** bag halfway with your own material. Instructions for Biochar application can also be found on the packet.

After preparing the soil, begin planting. Remember to maintain these same characteristics for both plots:

● Type of seeds planted ● Pattern and spacing of the seeds within the plots ● Date of planting ● If applying Biochar to already-established plants, it must be applied to the root zone of identical species of similarly aged plants in each plot.

Step Three: Collect Data and Photos

Once you have set up your plots and planted, please fill in Page 1 of the **Datasheet**. You'll need only one 2-page **Datasheet** for both plots for the entire season, which will include instructions on data collection and plot management. Carefully record any application of fertilizer or compost made to the plots before or during planting. The **Datasheet** will prompt you for this information.

Once planting is complete, take a photo of the two plots and note the information called for on the datasheet. Always photograph from the same compass point for each plot. Include an unmovable object in the photo (e.g., pole in the background, wooden railings in the foreground) to help relocate your photopoint for the "After" photographs you'll take later in the season. Complete all sections of Page 1 of your datasheets. Keep your **datasheet** in a safe place so it will be available throughout the study.

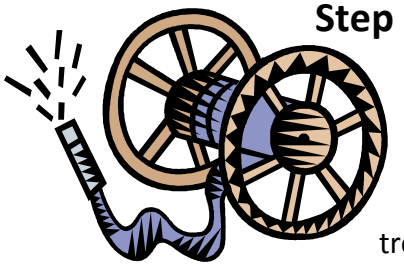
Maintain a photomonitoring schedule as close to the following as possible:

- May 1st: Planting and PhotoSet0
- June 1st: First month observations and PhotoSet1
- July 1st: Second month observations and PhotoSet2
- September 1: Fourth month observations and PhotoSet3.

Save your first photos as jpegs named for the plots they represent: YearMonthDay_YourName_ControlPhoto0 (e.g., 20130401_JoeBloe_ControlPhoto0 and 20130401_JoeBloe_TreatmentPhoto0). Email two photos only per email to research@sonomaecologycenter.org with "Citizen Science" in the subject line.

After 1 month, 2 months, and 4 months, you will email identically framed photos of your plots to the same e-address.

Follow-up photo files must be jpegs named YearMonthDay_YourName_ControlPlot1 (or TreatmentPlot1), YearMonthDay_YourName_ControlPlot2 (or Treatment Plot 2), and YearMonthDay_YourName_ControlPlot4 (or TreatmentPlot4). You will email only eight photographs in the course of the monitoring. Instructions for mailing hard copy rather than emailing are in Step Seven, below.



Step Four: Water Your Crops as Needed

Up until now, you have treated each plot the same, other than your application of Biochar to the treatment plot. Continue these identical treatments, with one important exception: when you are watering your plants, you must treat your plots differently. Please respond to them according to their water needs and moisture in the soil rather than watering both plots exactly the same amount every time. You should also record the different amounts of water you apply to each plot to maintain proper soil moisture. Fill in Page 2 of your datasheet with your observations about watering. It will prompt you for the correct information.

Step Five: Harvest Your Crops

When your plants reach full growth in each plot, harvest them. This may mean that you harvest on different days for each plot depending on crop readiness. However, you will need to harvest all your plants from one species at the same time within each plot (e.g.,

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all your carrots from the control plot will be harvested simultaneously). Make sure to make a note of your harvest date on Page 2 of your datasheet. Harvest time is also the time to take your final photos of the plots before plant removal. Read the datasheet for instructions on how to complete data collection.

Step Six: (Optional) Measure Your Harvest

(Step Six is intended for those citizen scientists who want to go to the next level of data collection and analysis!)

Each time you harvest one or more plants from one of your plots, please enter the following data on Page 2 of your datasheet.

- Date of harvest
- Plant species
- Aboveground and belowground weights – divide your harvested plants into the mass visible above the soil surface and that below. Weigh the aboveground and belowground portions separately using a standard kitchen scale and record the results in ounces or grams, whichever your scale records
- Area harvested – List this information whether you are fully clearing out your plot or harvesting a portion of the area
- Note any observations you make during the growth and harvesting process. You may include comparisons between plots, conditions that are different compared to other years, or anything else you observe about the results of your experiment. The datasheet will guide you in recording your observations.

Step Seven: Send in Your Results!

Once your plants have been harvested and all data is collected, please complete your datasheet and email to **research@sonomaecologycenter.org.** Or if you prefer to mail in printed results, print your photos and datasheets, gather in one envelope, and return to the following address. Keep copies for your own files! **Research Director,** Sonoma Ecology Center, P.O. Box 1486, Eldridge, CA 95431. Please write "Citizen Science Project" on the outside of the envelope and include your email address with your materials if you'd like us to send study results!