IBI Technical Bulletin #102

Practical aspects of biochar application to tree crops

By Julie Major, PhD, IBI Agricultural Extension Director

Biochar should always be tested for safety before applying to soil (see IBI Technical Bulletin #101: *Quick tests to determine whether a biochar material contains compounds that are potentially harmful to plants*). Biochar is not a single material and can vary in its composition according to how it was made and what it was made from. While IBI is aware of several tree planting projects using biochar, to our knowledge there have not been any research results published in the scientific literature in English on applying biochar to trees when establishing them. For this reason we are providing guidelines for experimenters to consider.

When using a biochar material for the first time, trying a new way of applying biochar and/ or a new rate of application, you should always start on a small scale (for example with two or three trees) and never try a new technique on a large area, before you have observed positive results. Also, while no recommended application rates for biochar can be given at this time, biochar should be applied in moderate amounts to soil. Rates around 1% by weight or less have been used successfully so far in field crops.

Illustration of a tree's drip line. Image from www.vtfpr.org

Biochar should ideally be applied to an area of soil that tree roots will eventually utilize to take up nutrients, i.e. the "drip line". The drip line refers to the area you would get, once the tree has reached its mature size, if you drew a circle on the soil corresponding to the size of the tree's crown. To apply biochar to the entire drip line it is necessary to work it into the soil beyond the tree's planting hole, and this is not always possible. Here we describe different ways of applying biochar when establishing trees.

1.0 Surface application

For tree establishment, it may be possible to broadcast and incorporate or band apply biochar over the entire planting area or within each tree's drip line, and add more biochar in planting holes. Broadcasting can be done by hand on small scales, or on larger scales by using lime/solid manure spreaders or broadcast seeders. Incorporation can be achieved using any plowing method at any scale, including hand hoes, animal draft plows, disc harrows, chisels, rotary hoes, etc. Moldboard plowing is not recommended as it is unlikely to mix the biochar into the soil and may result in deep biochar layers. When working with fine, dry biochar, wind losses during application and incorporation can be significant and

precautions must be taken to minimize this. Moistening the biochar after weighing it is an easy way of controlling dust.

2.0 Localized applications

Applying biochar to planting holes can improve the growth of trees early on, but keep in mind that roots will eventually grow outside the biochar amended area. There are techniques which can be used to apply biochar to trees after they have been established. For example, biochar can be applied in trenches radiating out from the base of established trees ("radial trenching") or in holes dug at some distance from the base of the tree ("vertical mulching"). When applying biochar to planting holes, mix the biochar with soil you will use to back fill the hole, and do not apply very large amounts of biochar. Work has also been done to use biochar as an ingredient in the medium used to grow tree seedlings or cuttings.

Biochar applied at transplanting oil palms in Costa Rica. Pictures by T. Benjamin.

Ponderosa Pine seedlings grown in 25% (by volume) charcoal as a substitute for vermiculite.

http:// terrapreta.bioenergylists.org/ biocharmediappine

Biochar applied in trenches to established trees in Japan. Photo by Sugiura