

## Transition Town Vincent (TTV) Community Food Forest Progress Report No. 1 – January 2024

### Using biochar and compost in the City of Vincent Community Food Forest

#### Introduction

The City of Vincent community food forest is an initiative of the Transition Town Vincent (TTV), a progressive, community based organisation fostering grass roots sustainability initiatives. The food forest is located on an elevated site, adjacent the Floreat Athena playing fields on the edge of Leederville. Because of the nature of the site and the types of trees planted, water management is a key issue which will increase in importance as the climate gets hotter and drier. This is being partly addressed by the use of mulch and cardboard placed around the plants but also by amending the soil with biochar and FOGO compost at the time of planting. This article aims to highlight the lessons learned with specific reference to biochar and FOGO compost. Guidelines for using biochar and compost in fruit tree plantings are provided in the appendix.



Figure 1 About 15 volunteers participated in the initial food forest planting

#### Background

The use of compost and biochar to improve soil water holding capacity for street trees is a relative recent practice in Australia but has been commonly used in the [City of Stockholm since the mid 2000's](#) which has reported numerous benefits including:

- Healthy trees and larger tree canopies.
- Increased drought tolerance and reduced irrigation demand.
- Reduced stormwater runoff.
- Improved stormwater quality and reduced eutrophication.

In Stockholm biochar is used in a range of applications from urban and suburban street trees through to landscaped areas to turf management of playing fields. Their approach is being adopted around the world including in Australia.

In Australia, the Dubbo Regional Council have used biochar and compost in street tree plantings with good results, reporting:

- Rapid tree growth, with trees being 8 metres in height within 42 months of planting.
- Tree watering being less than one third of what it had been traditionally.

See: [Improving Council Tree Planting with Biochar Case Study: Dubbo Regional Council](#).

### Using biochar and compost in the Food Forest

The City of Vincent is like many other urban local governments in the World which is dealing with a variety of issues such as the loss of tree canopy/vegetation cover, increases in impervious surfaces and loss of soil carbon leading to the urban heat island effect and associated hotter and drier conditions, increased water demand, reduced natural water availability and increased stormwater runoff and flooding. The author reported the results of the Stockholm and Dubbo approach to the City of Vincent Sustainability and Transport Advisory Group in early 2023 with a recommendation to trial the use of biochar and FOGO compost in the food forest being proposed by the TTV.

The City of Vincent had already provided a grant of \$2,000 to purchase plants for the food forest but agreed to budget up to \$1,000 for purchase of biochar. The only known commercial source of biochar was from the Green Life Soil Co in the Swan Valley. They had a number of biochar blends, however, it was decided to purchase 25L bags of their Waterwise award winning Charlie Charcoal product and blend this with the FOGO compost and worm wiz.

The aim was to get a ratio of biochar/compost/soil in the order of no more than 20% and no less than 10% as research indicates consistently that anything less than 10% is too little to have any impact while anything greater than 25% is unlikely to have any additional impact.

We had been advised that the biochar was fairly acidic which was beneficial for Perth sands as they were fairly alkaline.

In the first planting the biochar and compost were mixed in wheelbarrows next to the planting holes and applied to the hole and filled with sand and sprinkled with worm liquid. In the second planting it was decided to inoculate the biochar for two weeks before planting. This involved mixing bags of biochar and compost in large tubs (upside down compost bins) at a ratio of 1:1 and sprinkling with diluted worm liquid as they were mixed. The ratio of biochar/compost/soil in the planting holes was in the order of 1:1:3.

With both planting days, the enthusiasm of the volunteers was such that it was difficult to ensure consistency in things such as the size of the planting hole and the blending of biochar/FOGO with the soil and filling the hole with water. In hindsight, this could have been dealt with by having a briefing at the start and a demonstration.

In mid August the results of the planting days were communicated back to the City of Vincent Sustainability and Transport Advisory Group (STAG) with a written report outlining some of the factors to consider in a business case. It seemed that there were fairly obvious benefits to purchasing biochar and blending it with compost to apply to street trees plantings, which for the City of Vincent amounted to between 200-300 trees per year. Investigations are ongoing into other scenarios where biochar could be applied and associated benefits and costs.

## Outcomes

### Healthy plant growth

Measurements were taken on 18<sup>th</sup> November of the fruit trees planted 5 months prior on 18<sup>th</sup> June (Figure 1). On average, plants measured had grown 22.2%. Out of the total of 29 stems planted, 2 had died. These were both Macadamias. It is not known why they had died but it is surmised that the Macadamias require cooler soil temperatures which was not possible at the exposed site..

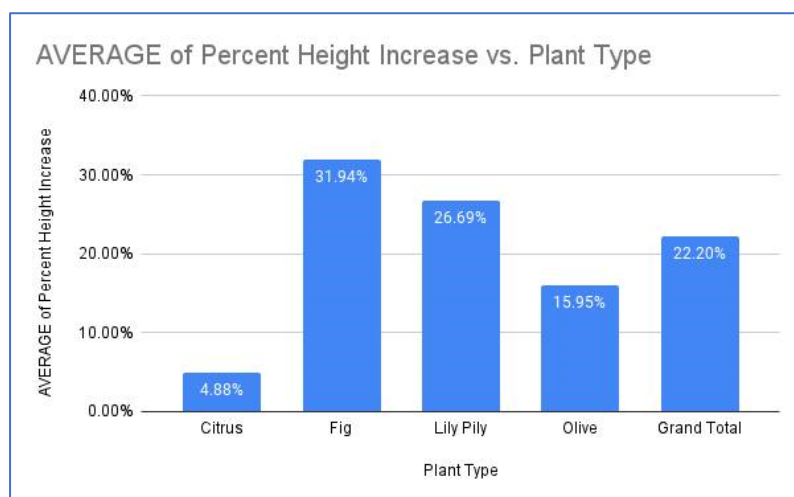


Figure 2 Plant growth 18th June to 18th November 2023

The healthy plant growth is likely to be due to a range of chemical, physical and biological effects of biochar and compost which are outlined in this paper by [Joseph et al \(2021\) 'How biochar works, and when it doesn't: A review of mechanisms controlling soil and plant responses to biochar'](#).

### Water use efficiency

Water use efficiency is a critical issue as all the plants are watered by hand. Although not there is little to benchmark against, it is noted that when the plants are watered the water soaks into the surrounding like a sponge. This is likely due to the effect of the biochar and compost which reduce the otherwise high bulk density of the sand and increase the soil structure and porosity, allowing water to soak down into the profile. It is also expected that the biochar with its micropores absorbs and retains water. Research papers indicate that biochar can absorb 4 times its weight in water.

Early on in their lives the plants were subjected to a heat wave where they were exposed to temperatures of over 35 degrees in 5 out of 6 days in late November 2023. The site was/is elevated and subjected to regular hot, dry easterly winds. At this point an additional weekly watering day was added to the existing 2 days. The plants did not seem to be too affected however, many of the taller plants have been staked to prevent additional stress and a couple have been surrounded by shade cloth.

### Awareness raising

The food forest and the associated use of biochar/FOGO compost was featured in a press release by the Council as well as on social media and radio interviews with Chris Cuttress. There is significant interest in the use of biochar and compost in street tree plantings in particular because of the issues around tree canopy cover and water use. There is also considerable interest in other applications e.g. turf because of its relationship to creating a more climate resilient urban area.

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Volunteers and City of Vincent representatives at the planting day. Credit: Steve Worner

## Forest of food starts to emerge in inner city

Michael Palmer | PerthNow - Central  
June 29, 2023 2:00AM

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Examples of the press received include:

City of Vincent website <https://www.vincent.wa.gov.au/news/planting-begins-at-community-food-forest/11977>

TTV Facebook Page

<https://www.facebook.com/groups/561901026006714/permalink/623516166511866/>

Perth Now article <https://www.perthnow.com.au/local-news/forest-of-food-starts-to-emerge-in-inner-city-c-11045764>

Permaculture West <https://permaculturewest.org.au/food-forest-for-vincent/>

Community development

The food forest has been successful in bringing together people in the local and broader community. The initial planting day on 18<sup>th</sup> June 2023 had about 15 participants from a range of age groups.

The second planting day on 23<sup>rd</sup> July 2023 had about 14 participants, also from a range of age groups.

There are 4 people involved with the 3x weekly watering of the plants. A busy bee attracted about 5 participants to undertake weeding and mulching around the plants.

Possible next steps

The food forest is an ongoing project and there are many spare spaces where biochar and compost could be applied in a way which aligns to the Council's objectives including:

- New tree plantings
- Around existing trees (i.e. Eucalypt and Olives trees)
- Garden beds e.g. for shrubs/bushes (especially bush tucker plants) etc.
- Drainage and erosion management.

Discussions with Con Poulios from Floreat Athena also indicated potential interest and support for using biochar/compost for:

- Turf renovation and management.
- Existing olive trees.
- Management of surface erosion and bank erosion.

There is considerable interest in the R&D space around the use of biochar/compost to help urban areas adapt to climate change. Preliminary discussions have been conducted with held with researchers and research organisations including:

- UWA, Professor Megan Ryan.
- Water Research Australia, Sandra Henville A/State Manager.
- Water Corporation, Anthony Bodycoat Manager R&D.
- Water Corporation, Antonietta Torre Principal Water Wise Cities.

Discussions are planned with the City of Vincent to progress this.

## Appendix

<b>Plant name</b>	<b>Quantity</b>	<b>Date planted</b>
Lemon - Meyer	2	18/6/2023
Olive - Manzanillo	2	18/6/2023
Fig – Black Genoa	1	18/6/2023
Grapefruit - Thompson	2	18/6/2023
Lilly Pilly – Bush Cherry	5	18/6/2023
Blue Lilly Pilly	5	18/6/2023
Custard Apple	1	23/7/2023
Black Mulberry	2	23/7/2023
Pomegranate – Wonderful	2	23/7/2023
Longan	1	23/7/2023
KP Mango	1	23/7/2023
Macadamia	2	23/7/2023
Burdekin Plum	1	23/7/2023
Peanut Tree	1	23/7/2023

## Appendix 1 - Growing fruit trees with biochar and compost – A growers guide

This guide aims to provide people who are using biochar and compost in growing trees with some basic instructions and information in relation to the type of biochar and compost to use, quantities, methodology and watering. It is based on the experience of the author with a community food forest project in Leederville near Perth, Western Australia.

### Type of biochar

The type of biochar is important because in our case, water holding capacity is the most important quality that we were seeking. Thus a biochar made from wood or straw or similar lignocellulosic biomass is best. Notwithstanding this, in the Perth region the only biochar we could source was the [Charlie Charcoal](#) product by Greenlife Soil Co in the Swan Valley. This is a biochar obtained from a stockpile of charcoal from the old [Wundowie foundry and wood distillation plant](#) which operated in the Perth hills between 1948 and 1981. Consequently the biochar is derived from Jarrah and slightly acidic, which is good for the alkaline sands we have in Perth.

### Nutrients

Compared to biochar derived from manures and wastewater solids, biochar derived from lignocellulosic material has fewer nutrients. However, nutrients can be provided by compost and by mixing with a biological agent such as worm liquid. The nutrients will adsorb to the biochar and will also provide a home for biological agents such as bacteria and fungus which also produce beneficial nutrients for the plant over time.

### Cost

A summary of costs per plant are as follows:

- 25L bag of Charlie Charcoal - \$28 (excludes trade discount)
- FOGO compost – Free
- 500mL Wormwiz - \$2.90 (excludes trade discount)

The cost per stem therefore is about \$30 excluding trade discount.

### Volumes

Approximately 1x 25L bag of Charlie Charcoal and 1x 25L bag of FOGO compost and 200ml of Worm Wiz was mixed into the soil/sand for each planting hole. The planting hole was about 0.5m x 0.5m x 0.5m (125L). This equated to a ratio about 1:1:3 of biochar, compost and soil or 20%:20%:60%. Rates of less than 10% for biochar are unlikely to have any impact.

The weight of one bag of Charlie Charcoal is about 10kg which is less than half the volume i.e. Weight of biochar can vary significantly depending on factors such as the size of the biochar e.g. powder, chunks, the pyrolysis temperature and the substrate used.

### Activation

Mixing the biochar with the compost and Worm Wiz was recommended to activate the biological processes which aid the soils fertility. In the first plantings, this was done in the wheelbarrow at the time of planting. For the second planting, the biochar, compost and worm liquid were mixed together in large vats (upside down compost bins) two weeks before the planting day.

### Quality control

Due to the enthusiasm of the volunteers there was a lack of quality control when it came to applying the biochar/compost mix to the planting holes so there was likely to be a significant variation in quantities applied. This does not appear to be detrimental to the plants however, which are showing significantly very good growth rates.

In the future it would be best to provide an introduction to the planting process and the benefits of biochar/compost/worm liquid along with a demonstration.

### Watering

After the initial planting, the plants were watered about once a week with 9L of water per plant. The water source is a small tank which is kept full with bore water. Watering is undertaken manually with watering cans. Fortunately there were some good rain during winter.

Waterings increased to about 2 per week in the beginning of October with one watering of 9L and a second watering of 18L, totalling 27L per week. In late November, when we experienced a heat wave, waterings increased to 3 times per week with the addition of another 9L per stem resulting in 36L per stem.

### Maintenance

In the six (6) months after plantings there was one community maintenance day In November which involved weeding, reapplying cardboard and newspaper and fertiliser (Seasol). The volunteers providing the watering also weed etc. opportunistically.

Guide prepared by Ian Kininmonth

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Attachment

## Attachment: Guidelines – Planting trees with biochar and compost

Prior to planting, provide planters with a demonstration of the method and explanation of the benefits of biochar and compost.

**Step 1** – Mix biochar and compost at a rate of 1:1 and sprinkle with worm liquid. Allow 2 weeks to activate.



**Step 2** – Dig planting hole approx. 50cm x 50cm x 50cm (or slightly deeper than the pot depth). Mix the biochar/compost/ soil a ratio of 1:1:3.



**Step 3** – Fill planting hole with water. Mix soil in the planting hole. Water thoroughly.



**Step 4** – Surround planting hole with cardboard and mulch to suppress weeds and help prevent evaporation.

