EFAO 2023: Working Research Protocol

Using leaves as mulch for preparation of new ground

Farmer-researcher(s): Alberto Suarez Esteban, Nature's Apprentice Farm - EAST

Project type: Research trial

Research priorities: Soil health

EFAO Contact: Sarah Larsen, sarah@efao.ca

Farm Info

Nature's Apprentice Farm is a Diversified 6.5 acre farm with a vegetable garden, with a patch of cut flowers, a patch of berries, a developing agroforestry patch, and also developing food forests. We use regenerative agriculture techniques such as no-till, no-chemicals, cover cropping, animal integration, diverse and dense plantings, hedgerows, ponds, etc. We use only hand tools. 2022 was our third year of operation.

Objective

We believe that leaves have a huge potential for enabling ecological farmers to prepare new ground without the burden of weeding or spreading large amounts of heavy organic matter. We have observed that, after only one season, a deep leaf layer can smother weeds and improve soil properties and life. However, this is just anecdotal. Our main question is: can a deep layer of leaves smother weeds and create the soil conditions for the establishment of a thriving agroforestry system?

Background

Preparing new ground for agricultural production without disturbing the soil or using chemicals, represents a significant challenge for any ecological farmer. The need to suppress weeds and spread compost to restore fertility can be very time consuming and back-breaking. This is particularly acute in agroforestry systems. These are often planted in previously cropped soils lacking the fungal life that trees need to prosper. Because of this, trees often require watering, fertilizing and weed control for a minimum of 2-3 years.

Experimental Design

To answer our question, we will compare 3 treatments:

1. Leaf+bag treatment: apply a 30 cm (12”) uniform layer of deciduous tree leaves on top of an underlay of used, flattened yard waste bags
2. Leaf only treatment: same as the one above but without the yard waste bag underlay.
3. Control: no bags or leaves applied

Each treatment would be applied to 5 x 5’x4’ plots for each treatment for a total of 15 plots, placed as shown in the field layout below in fall 2023.

Field Layout

Rectangles with blue outline represent blocks (5), to capture variations in parent soil (sandier to the SW). Orange circles represent plots (1 of each treatment in each block; 15 overall). The exact location of the plots within the blocks may vary.

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Statistical model

We will use an analysis of variance (ANOVA) with a (randomized complete block design?) to analyze differences among treatments for the measurements listed below.

Measurements

Soil health

Organic matter

- Baseline measurements: 3 composite samples of total carbon (including inorganic and organic carbon) from UofG soil lab; combine soil from the replicate plots in each treatment
- Follow-up measurements: After three years (fall 2026), follow-up measurements of total carbon from the 15 plots (pending funding availability)

Compaction

- Baseline measurements: Using EFAO's penetrometer, measure the strength of the soil under each plot location before the plots are established - 3 times/plot
- Fall 2024, 2025, 2026: Measure the strength of the soil under each treatment in - 3 times/plot

Weed pressure

Aerial ground cover

- Take a baseline photos of the site
- Fall 2024, 2025, 2026: Take photos of the plots with the bags on to see what is growing through and around.
- Estimate % weed cover

Photos

- Original area (hay field)
- Different plots with different treatments, spring and fall every year
- Trees already planted to show the ultimate goal
- Me using the penetrometer
- Me taking soil samples

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Research Plan

Please note that if data is submitted after the submission deadline, EFAO staff cannot guarantee that your data will be analyzed and written up before the Research Symposium and/or the next growing season.

Time	Task	Methods & Measurements or Action Item
September 2023	Experiment layout	Stake plots and assign treatments randomly within each blocks
September/October 2023	Compaction	Take and submit penetrometer data
September/October 2023	Soil test	Take soil samples and send to UofG lab
November 2023	Treatments	Lay down leaves and bags in treatment plots
December 31, 2022	Farmer-fee and research expense invoice with receipts for expenses	Submit invoices at this site: https://efao.ca/data/
January/February 2023	Finalize and publish research report	Work with EFAO staff to review polished research report for publication.
November 2024	Data collection	Estimate weed cover and take penetrometer data. Take photos. Submit measurements and photos.
November 2025	Data collection	Estimate weed cover and take penetrometer data. Take photos. Submit measurements and photos.
September 2026	Soil test	Take soil samples and send to UofG lab
November 2026	Data collection	Estimate weed cover and take penetrometer data. Take photos. Submit measurements and photos.
December 2026	Final report	

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Staff check-ins

Fall 2023 - when EFAO staff send the penetrometer and soil sampling kit
Spring 2024 - general check-in
Fall 2024 - check in about data collection
Spring 2025 - general check-in
Fall 2025 - check in about data collection
Spring 2026 - general check-in
Fall 2026 - check in about data collection

Memorandum of Understanding

Please fill out the MOU at https://airtable.com/shrc1mcIYcx5Aq6Ex