

Effects of companion plant diversity on the productivity of fruits, berries and other ecosystem services in a food forest experiment

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Introduction

A widespread assumption about food forests is that they create a beneficial environment for fruit producing species to thrive and produce. Food forests are expected to increase biomass production, nutrient cycling, and the diversity of the associated fauna & flora, both above and belowground. These characteristics would also result in better drought and flood resilience, pest control, improved auto-fertility and redistribution of micronutrients as compared to traditional fruit producing systems.

These forest ecosystem services are based on rational and relative recently understood complex, scientific principles but so far the integrated effect on crop yields has not been well documented.

In this experiment, the yield and ecosystem services of a young food forest system are compared with that of a traditional fruit plantation over a period of 10 years.

Trial description

This trial aims to document the productivity of fruit trees and berry-producing shrubs in a food forest with varying companion plant diversity. The productivity in terms of bulk weight and quality will be monitored over a time period of at least 10 years. Financial returns will be assessed by monitoring all costs (labour, netting, weeding,...) and revenues.

The effects of companion plant identity and diversity on other ecosystem services, including soil carbon storage, nutrient cycling, and the diversity of soil biota will be monitored too.

The experiment has been established in Nov–Dec 2020.



Basic design

Two levels of companion plant diversity (B- & C-plots) and one control (A-plots) are present. Both levels as well as the control are replicated once.

The design of the plots aims to maximise production in monetary terms by:

- Selection of the right varieties for disease resistance, taste and production quantity;
- Optimisation of resource (light, water and nutrient) use;
- Improvement of the soil quality by optimisation of the leaf litter layer (In the two treatment levels B & C);
- Optimisation of harvest effort by also facilitating self-picking;
- Cost efficient bird protection;
- Efficient overall cost and time management.

Species Pool

Acquisitive plants

- A1 Salix alba
- A2 Tilia cordata
- A3 Viburnum tinis
- A4 Viburnum opulus
- A5 Philadelphus coronarius “Virginale”
- A6 Euonymus europaeus “Red Cascade”
- A7 Ligustrum ovalifolium “Aureum”
- A8 Cornus mas
- A9 Carpinus betulus
- A10 Lonicera pileata
- A11 Symphoricarpos chenaulti “Hancock”
- A12 Rosa rugosa

N2-fixing plants

- N1 Sophora japonica
- N2 Cercis canadensis ‘Forest Pansy’
- N3 Cystisus praecox “Allgold”
- N4 Hippophae rhamnoides “Leikora + Pollmix”
- N5 Elaeagnus ebinghii

Fruit and berries

- Pyrus communis 3 (Bon Chrétien Wiliam 1, Gieser Wildeman 1, Double Flup 1)
- Prunus domestica 3 (R. Claude d’ Althan 1, R. Claude Crottée 1, Prune de Prince 1)
- Lonicera dulcis Kamtschatka 3 (Balalaika 1, Bee Myberry 2)
- Rubus fruticosus 24 (Thornless Evergreen 6, Hull Thornless 18)

- Prunus persica 3 (Fertile de Septembre 1, Avalon Pride 2)
- Pyrus pyrifolia 3 (Hosui 1, Kosui 1, Nijiseki 1)
- Ribes nigrum × uva-crispa 3 josta
- Ficus carica 3 (Brown Turkey 3)
- Malus domestica 1 6 (Topaz 6)
- Malus domestica 2 6 (Pinova 6)
- Ribes rubrum 12 (Junifer 6, Rovada 6)
- Ribes uva-crispa 12 (Invicta 6, Hinnonmaki röd 6)
- Rubus idaeus 9 (Glen Ample 9)
- Rubus idaeus 9 (Autum Bliss 9)

Composition of the companion plant treatments:

All the plots contain the same production crops, planted in the same position in the respective plots according to the best practices for optimal water, light and nutrient use. The treatments focus on companion plant diversity.



- The A plots have no companion plants, except the spontaneously emerging graminoids and herbs.
- The B plots contain six companion plants per fruit producing trees. These plants have been selected from a pool of twelve candidate species that produce high quality litter for soil quality improvement.
- In the C plots, half of the companion plants consist of high quality litter species, whereas the other half consists of N2-fixing plants selected from a pool of six species.

More information on the trial at Eetbos Deinze? Piet.moerman@yahoo.com.

More information on Food Forest systems in Flanders? www.agroforestryvlaanderen.be