CARAT
CARbon Agroforestry Tool

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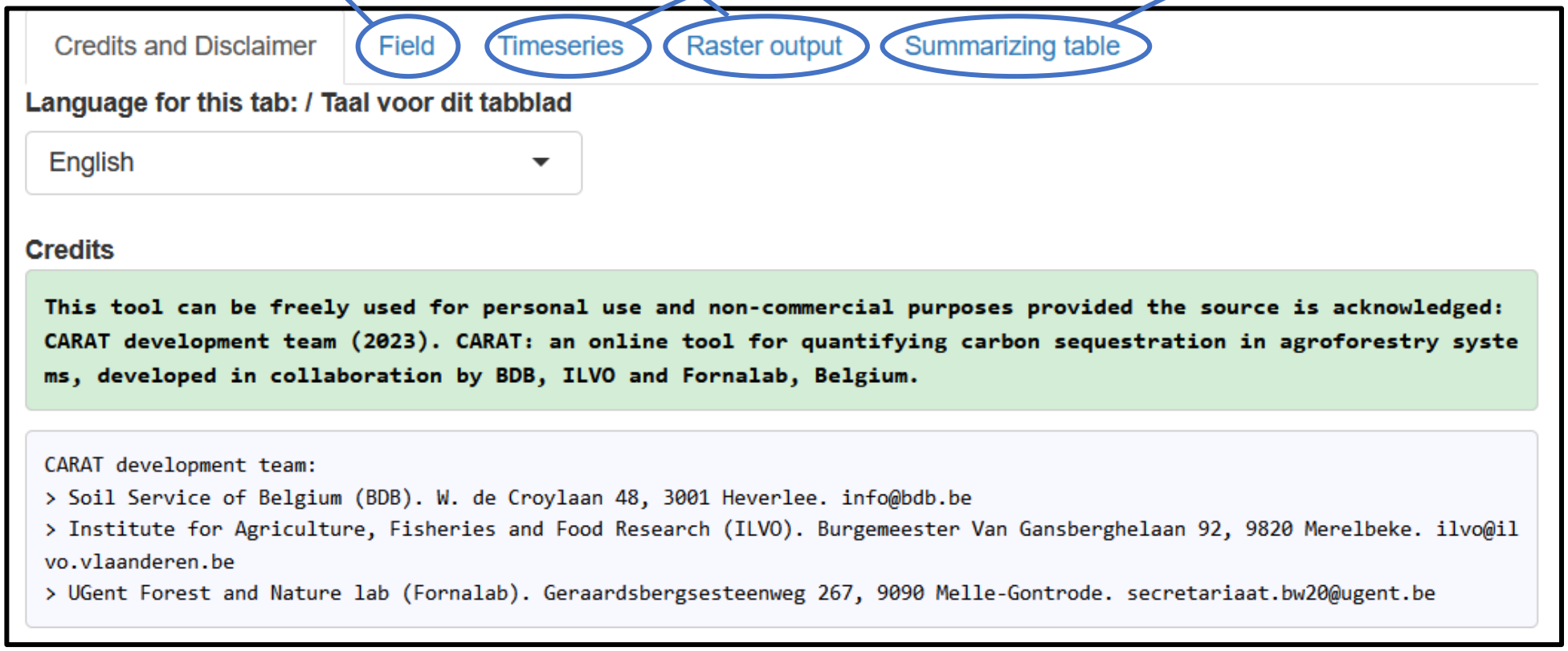
CARAT development team (2023). CARAT: an online tool for quantifying carbon sequestration in agroforestry systems, developed in collaboration by BDB, ILVO and Fornalab, Belgium

ILVO

CARAT: a tool for quantifying above and belowground carbon sequestration in AFS

Field-specific Spatially explicit Evolution f(time) Simulation & optimisation



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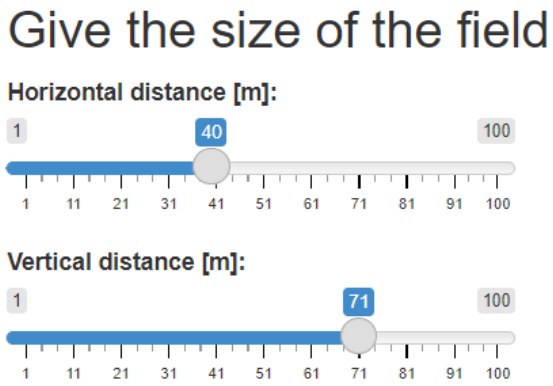
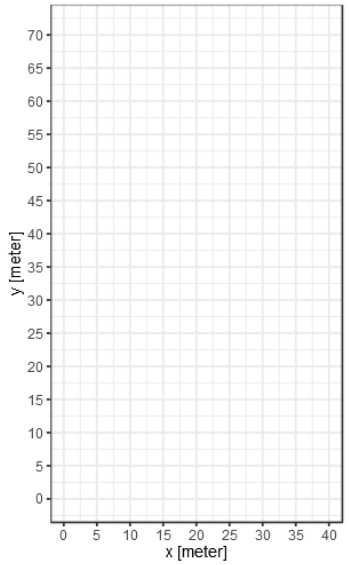
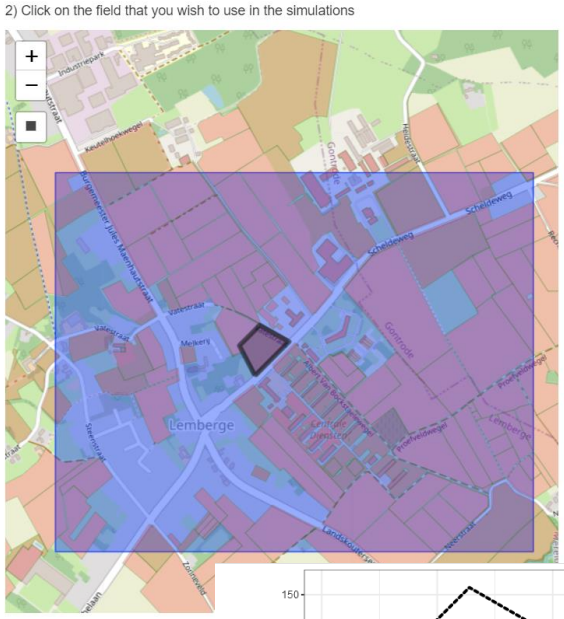
Step 1: field selection

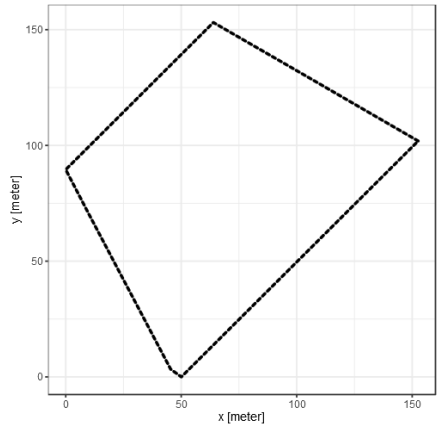
Define rectangular field



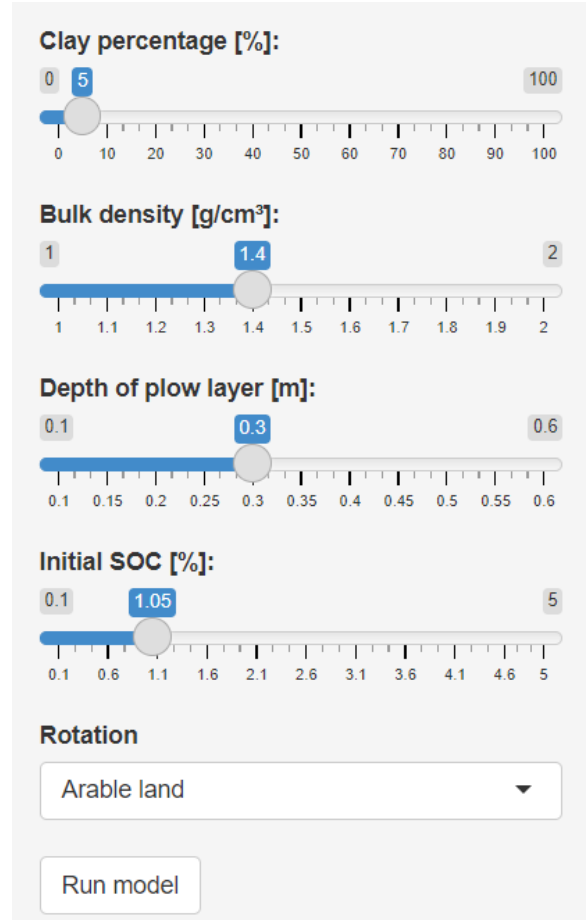


Select existing field

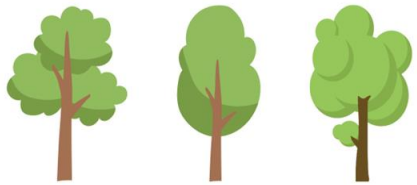




Field characteristics



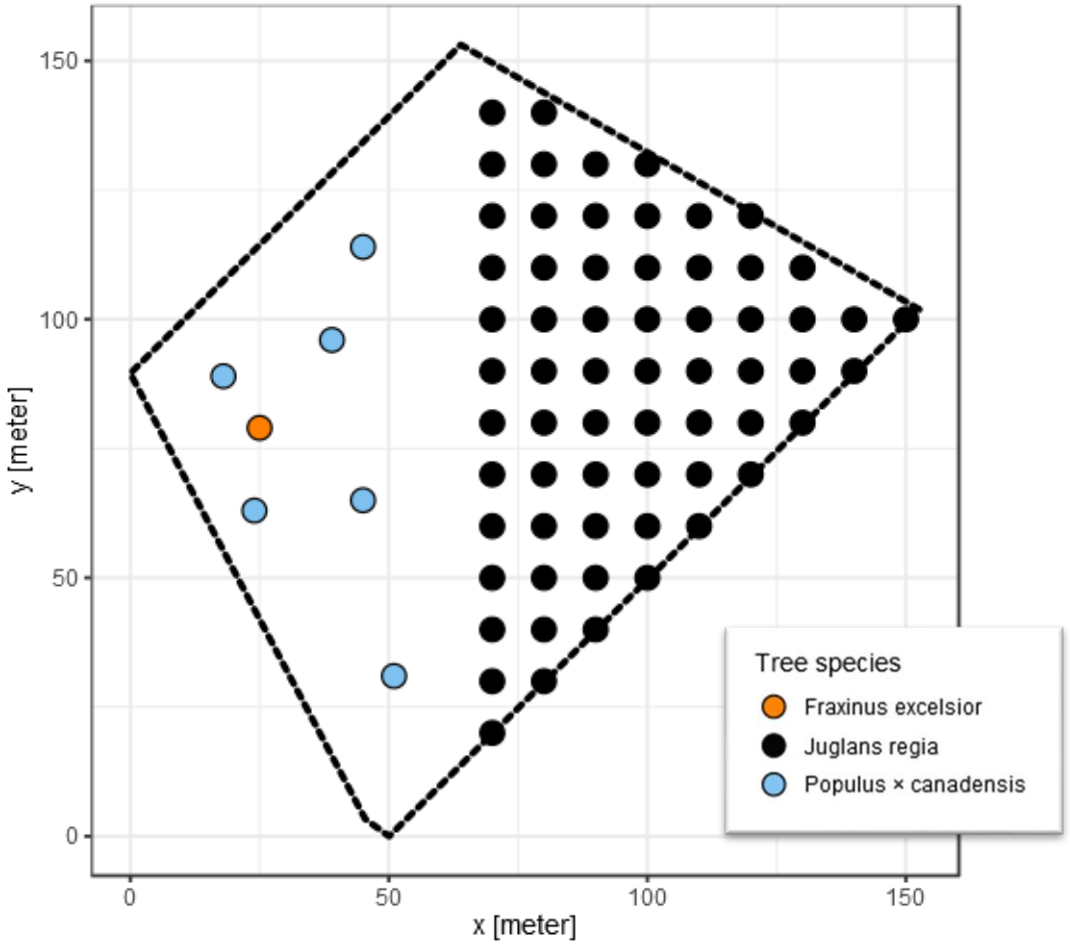
Step 2: agroforestry design



2) Select tree species

Acer pseudoplatanus

- Acer pseudoplatanus
- Alnus glutinosa
- Aesculus hippocastanum
- Corylus avellana
- Fraxinus excelsior
- Juglans regia
- Malus domestica
- Populus × canadensis



3) Place trees by clicking or creating a grid

Click in the plot area to place trees of this species, or specify spacing between the trees when planted in a grid

Vertical distance between trees [m]:

5

Horizontal distance between trees [m]:

10

Confirm

4) If necessary, remove trees

Clicking will:

- (•) Add trees
- ( ) Remove individual trees
- ( ) Remove trees per species

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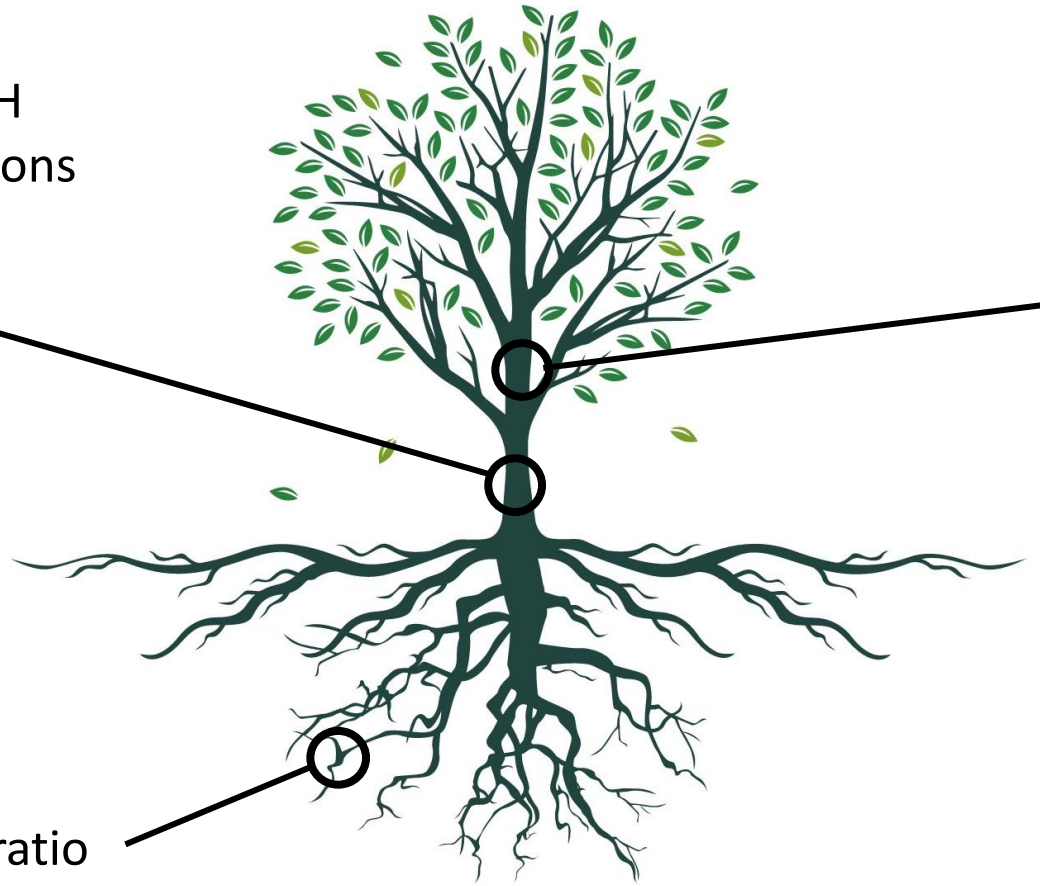
Step 3: simulation of tree growth & biomass

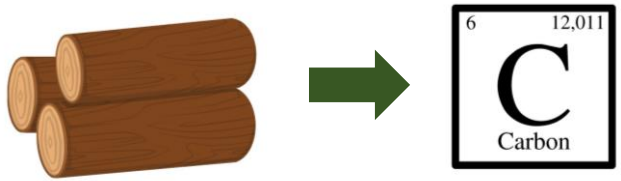
AF & tree species specific DBH evolution & allometric equations

$$DBH = \frac{a}{e^{b-c\,t}}$$



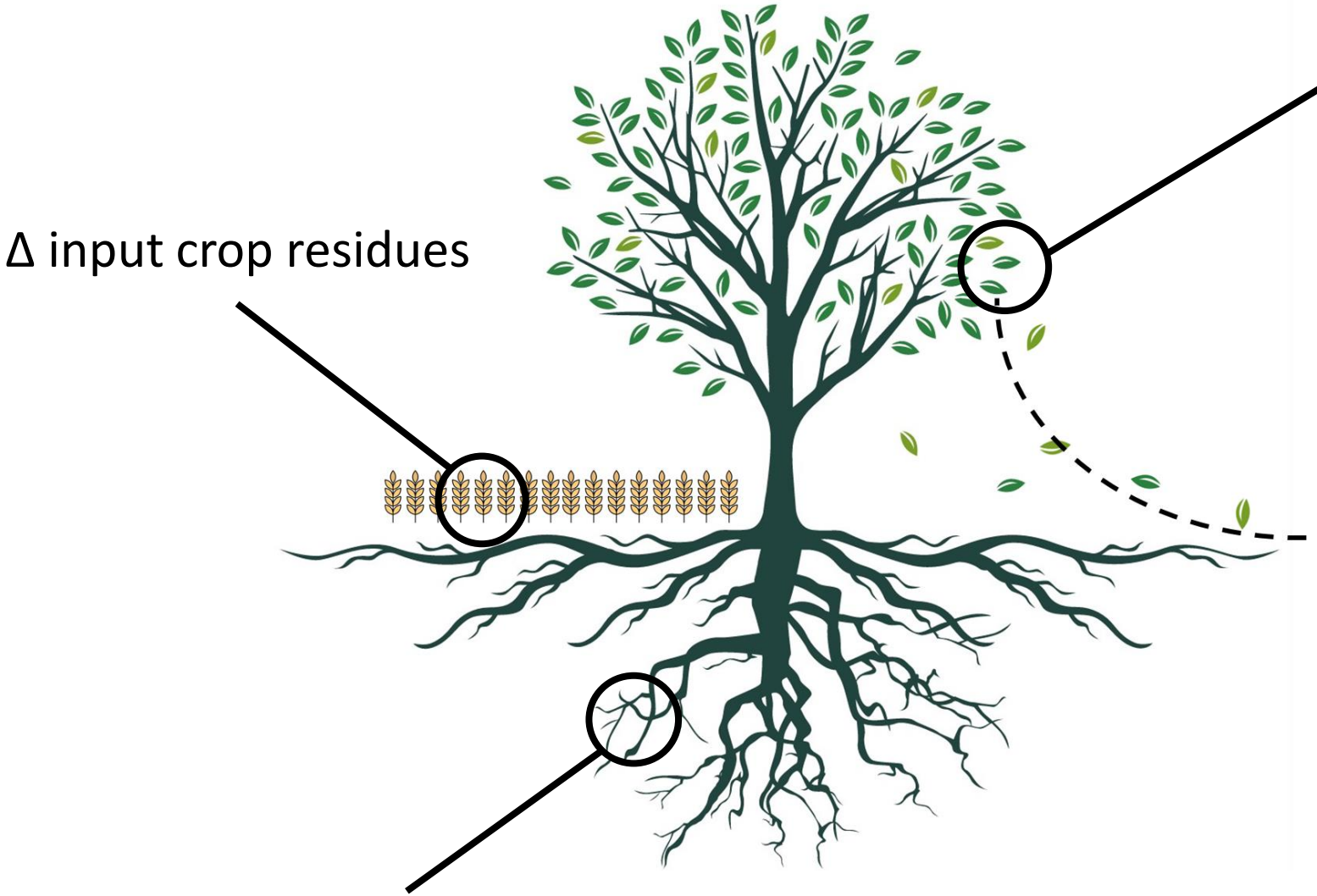
Tree species specific wood density

Root-to-shoot ratio assumed 0.26



conversion factor 47%

Step 4: simulation of soil organic carbon



Tree leaf litter:

- Exp. decreasing

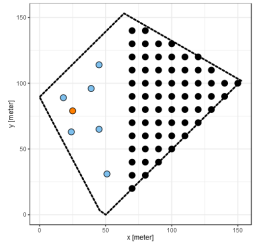
$$LF_{ij} = \frac{\alpha_j \gamma_j^2}{2\pi} \sum_k DBH_{jk}^{\beta_j} \exp(-\gamma_j d_{ijk})$$

Ferrari and Sugita (1996)

- Tree species specific

  α, β and γ determined for each tree species based on Ishihara & Hiura (2011)

  Species specific DBH curve



- Calculated for each tree
- RothC

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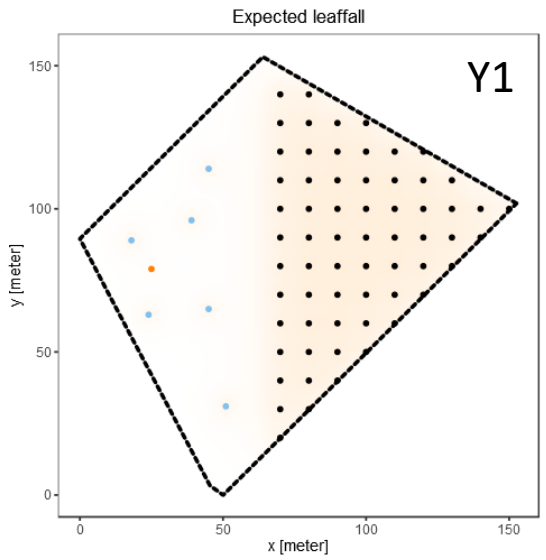
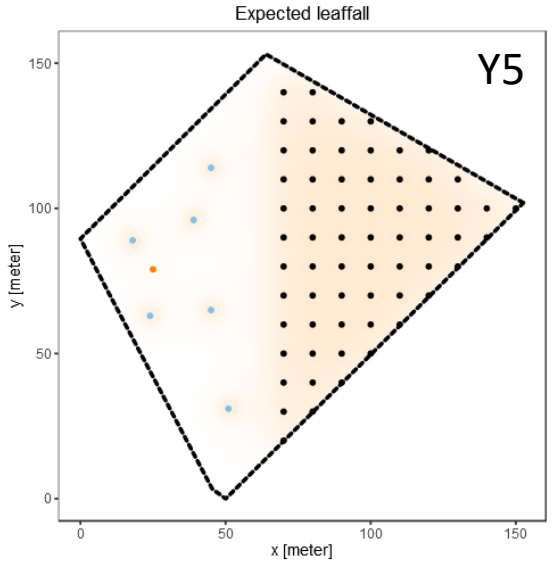
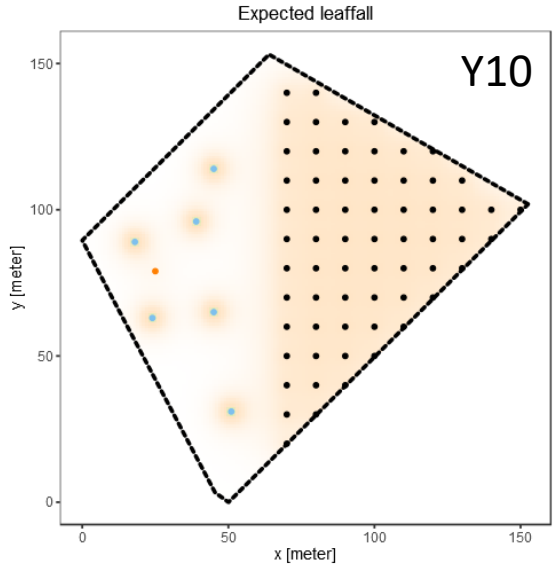
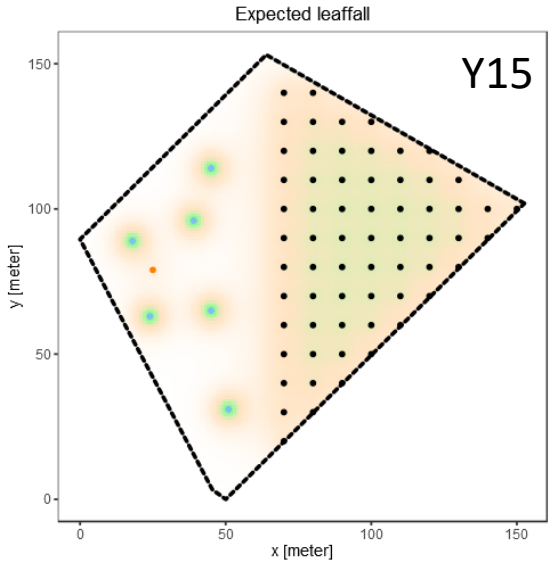
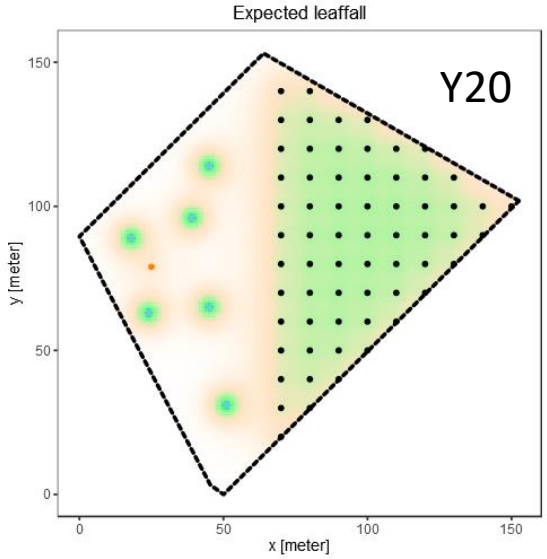
Output: Leaf litterfall distribution

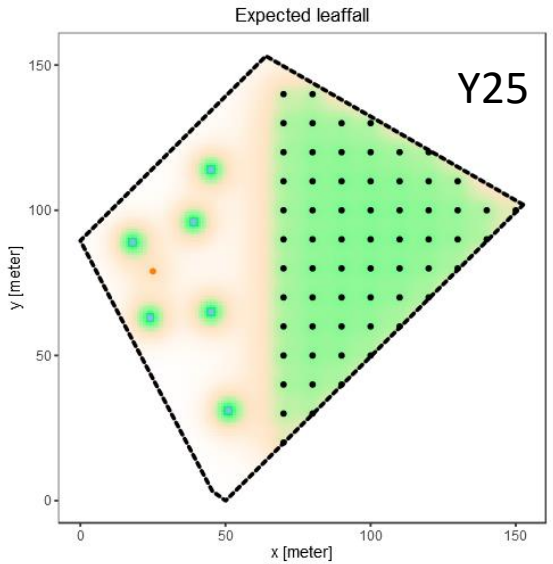


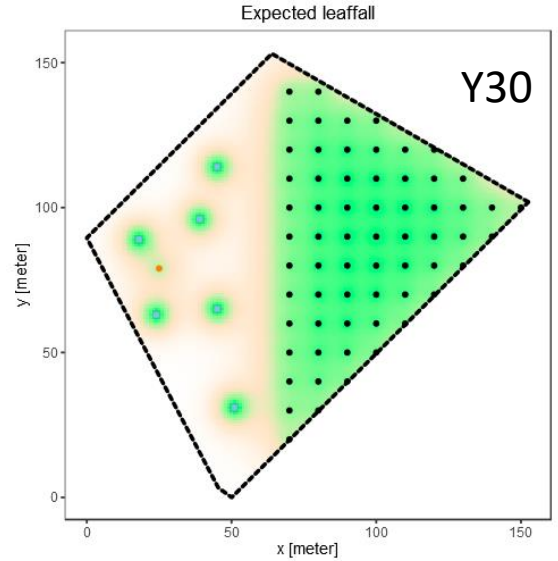


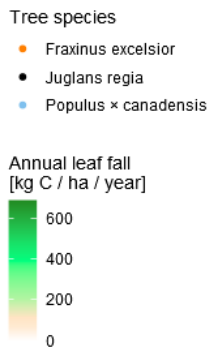












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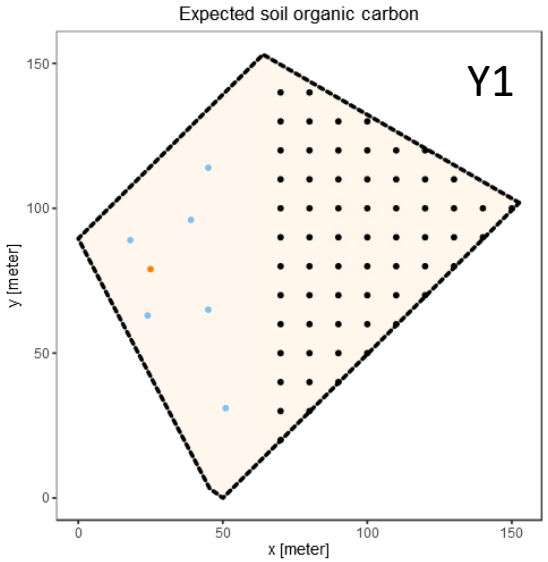
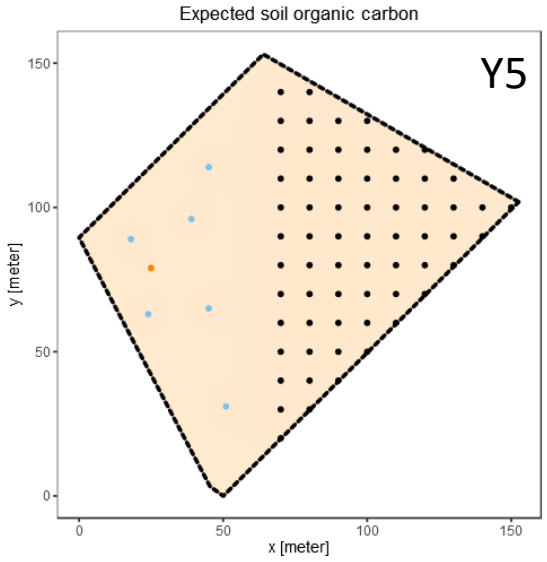
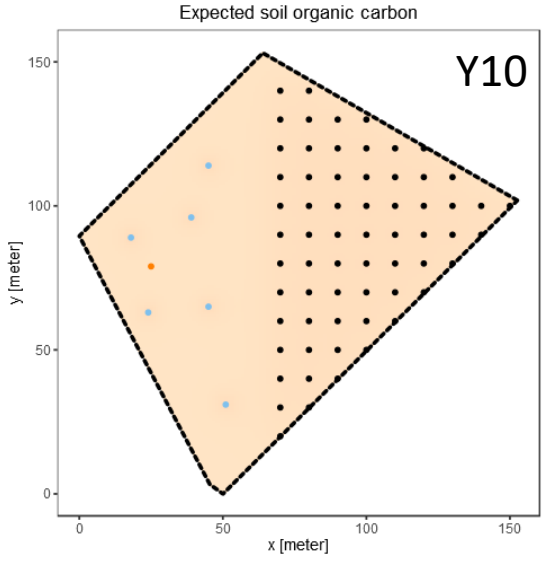
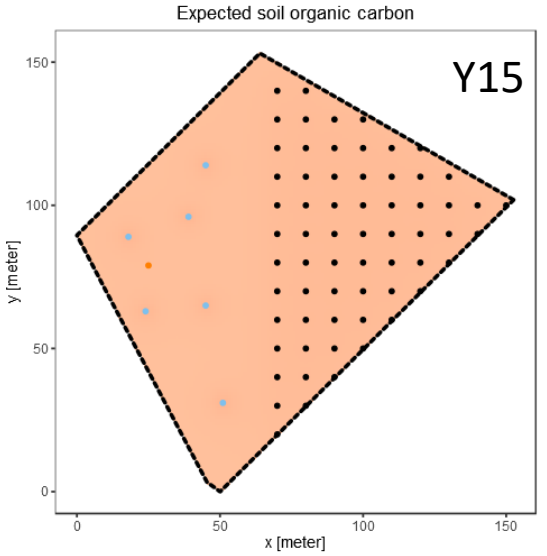
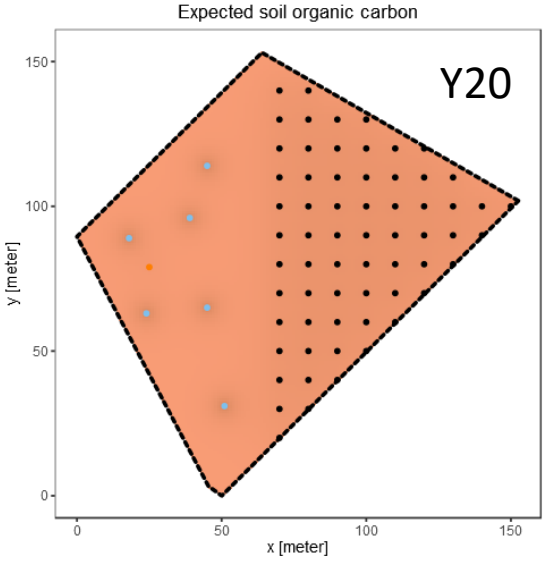
Output: SOC

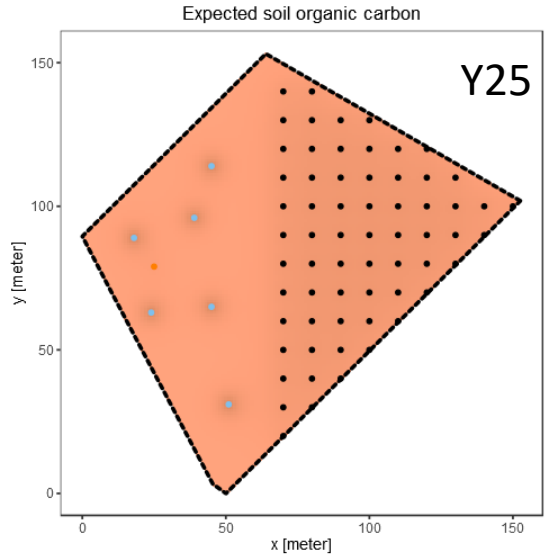


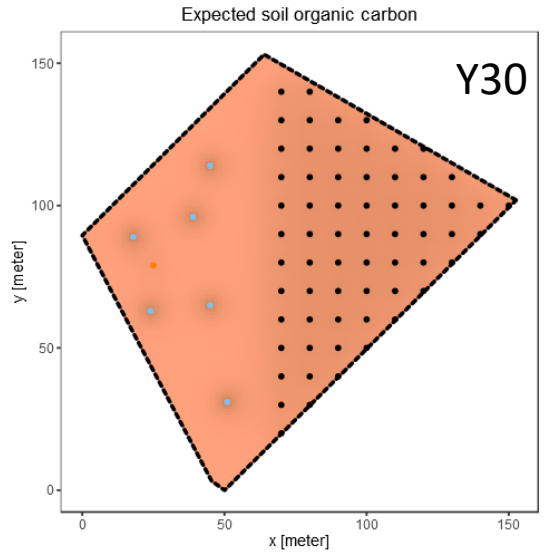


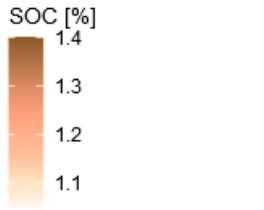












Tree species

- Fraxinus excelsior
- Juglans regia
- Populus × canadensis

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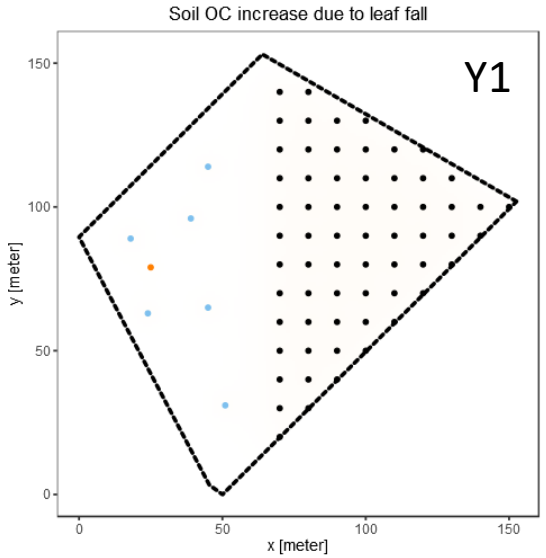
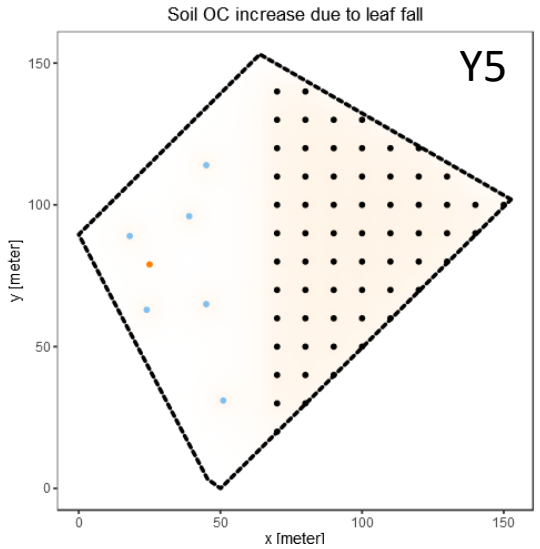
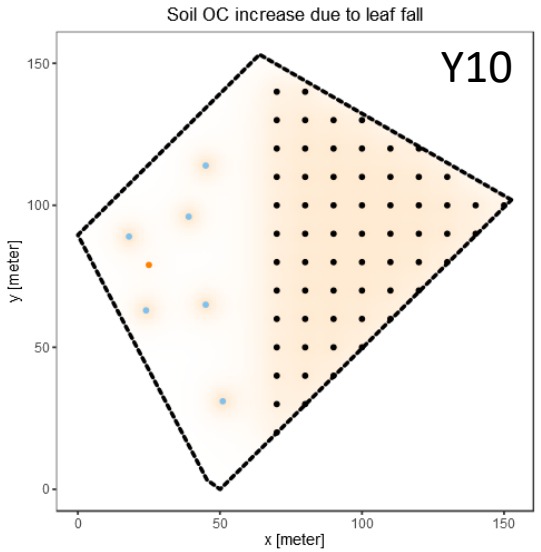
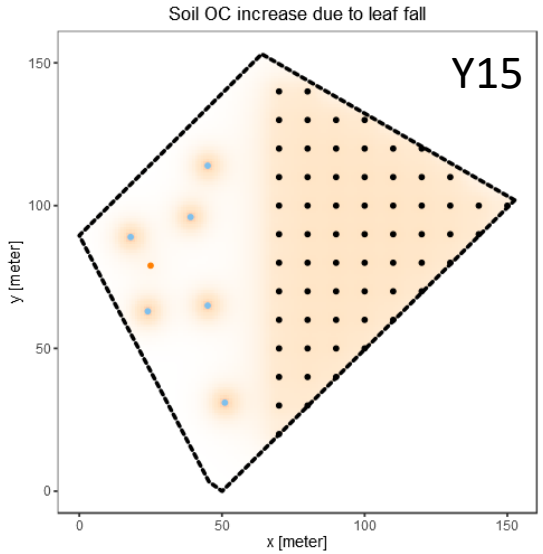
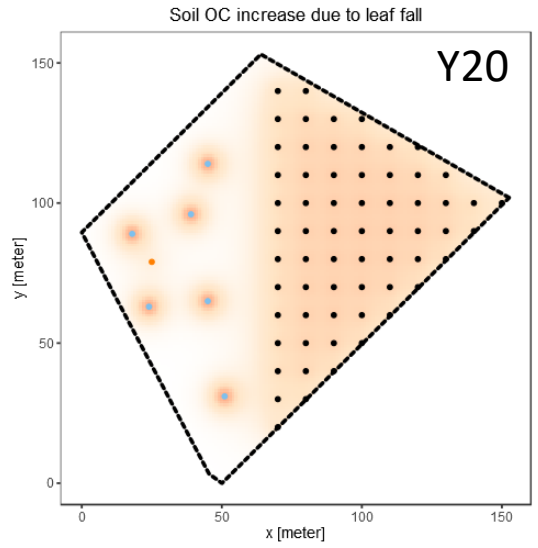
Output SOC: increase due to leaf litterfall

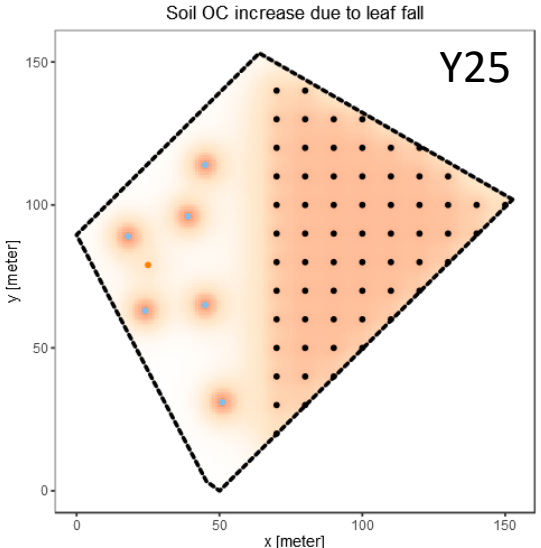


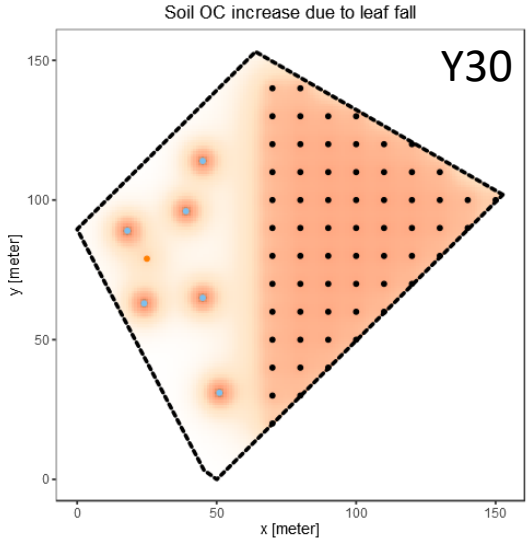


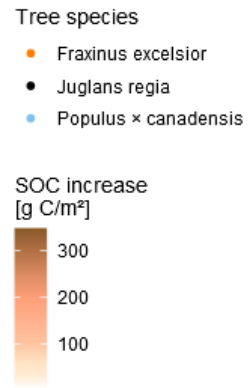








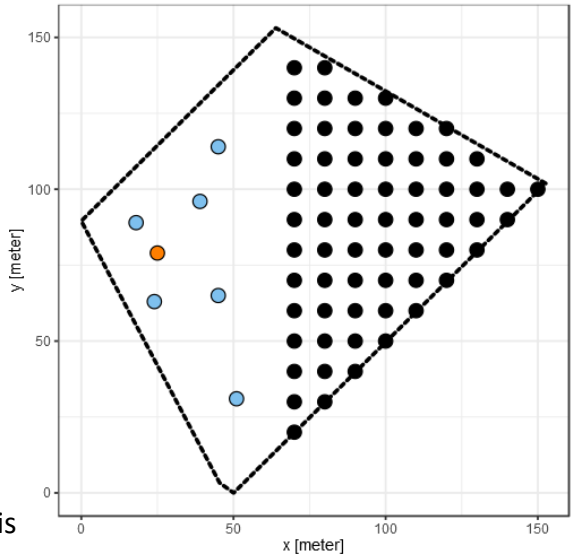




ILVO

Output: field-level estimation

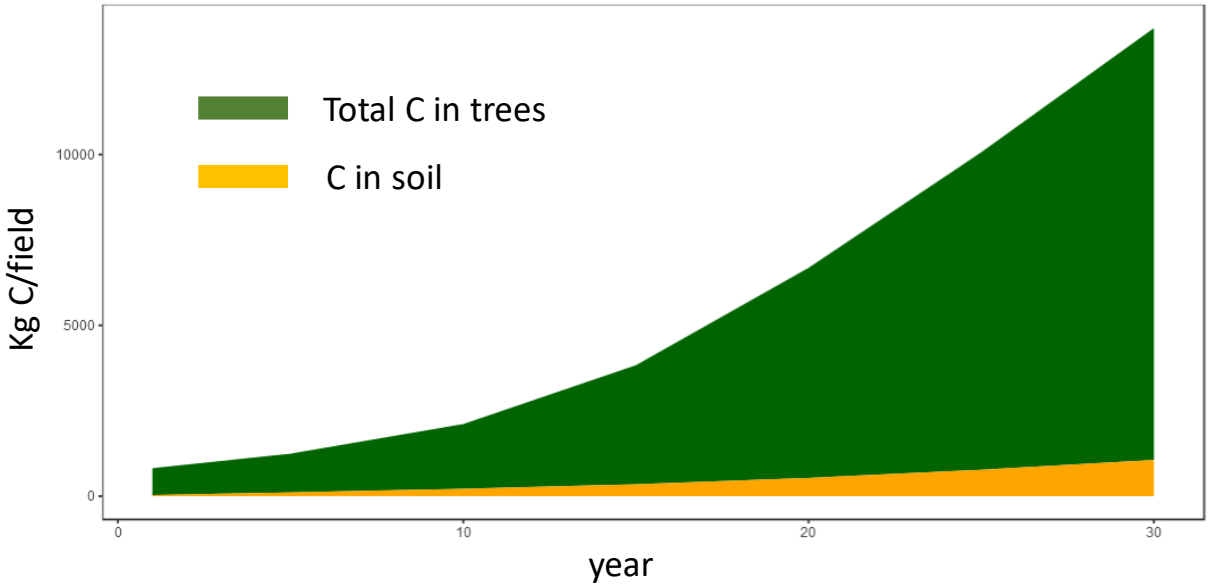
Years	Increase in SOC due to AF [kg C / field]	Increase in SOC due to AF [kg C / ha]	Total C in trees [kg C / field]	Total C in trees [kg C / ha]	Total C increase due to AF [kg C / field]	Total C increase due to AF [kg C / ha]
1	30.50	26.00	787.00	669.90	817.50	695.90
5	108.30	92.20	1134.90	966.03	1243.20	1058.23
10	214.90	182.90	1893.49	1611.76	2108.39	1794.66
15	346.30	294.70	3484.36	2965.92	3830.66	3260.62
20	534.10	454.70	6148.13	5233.35	6682.23	5688.05
25	773.60	658.50	9291.87	7909.32	10065.47	8567.82
30	1060.20	902.50	12640.79	10759.95	13700.99	11662.45



Fraxinus excelsior

Juglans regia

Populus x canadensis



92%

8%

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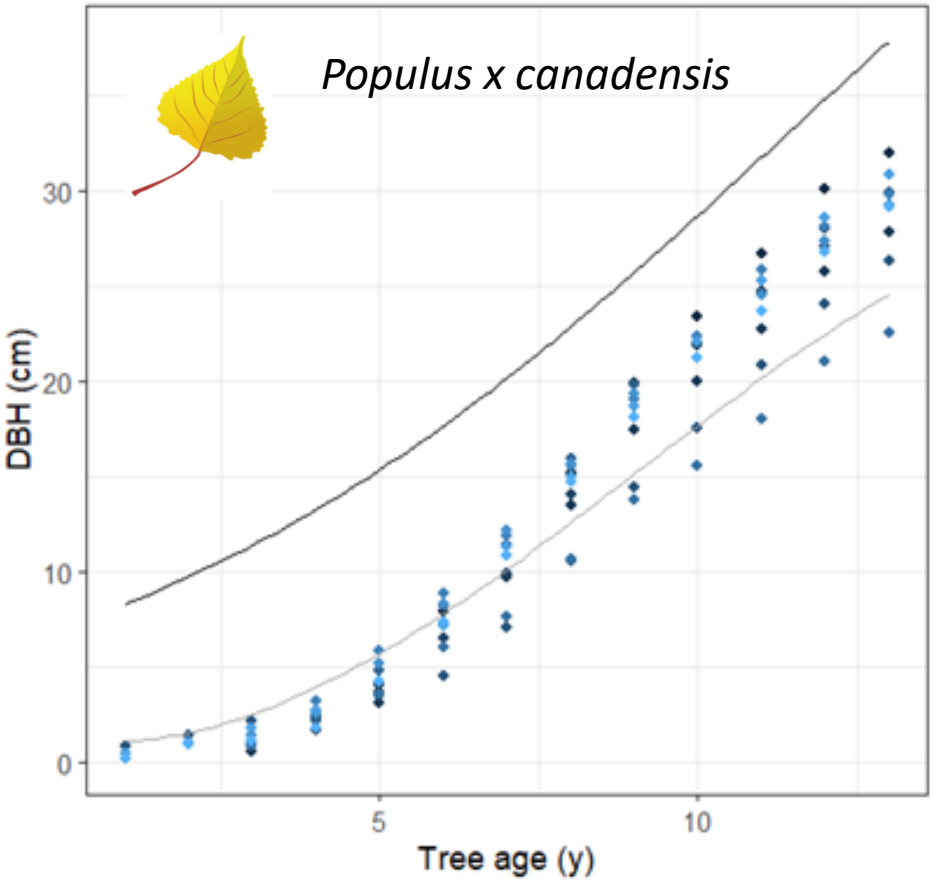
Comparison with existing fields



CARAT

Yield-SAFE

Comparison with existing fields

Populus x canadensis

Juglans regia

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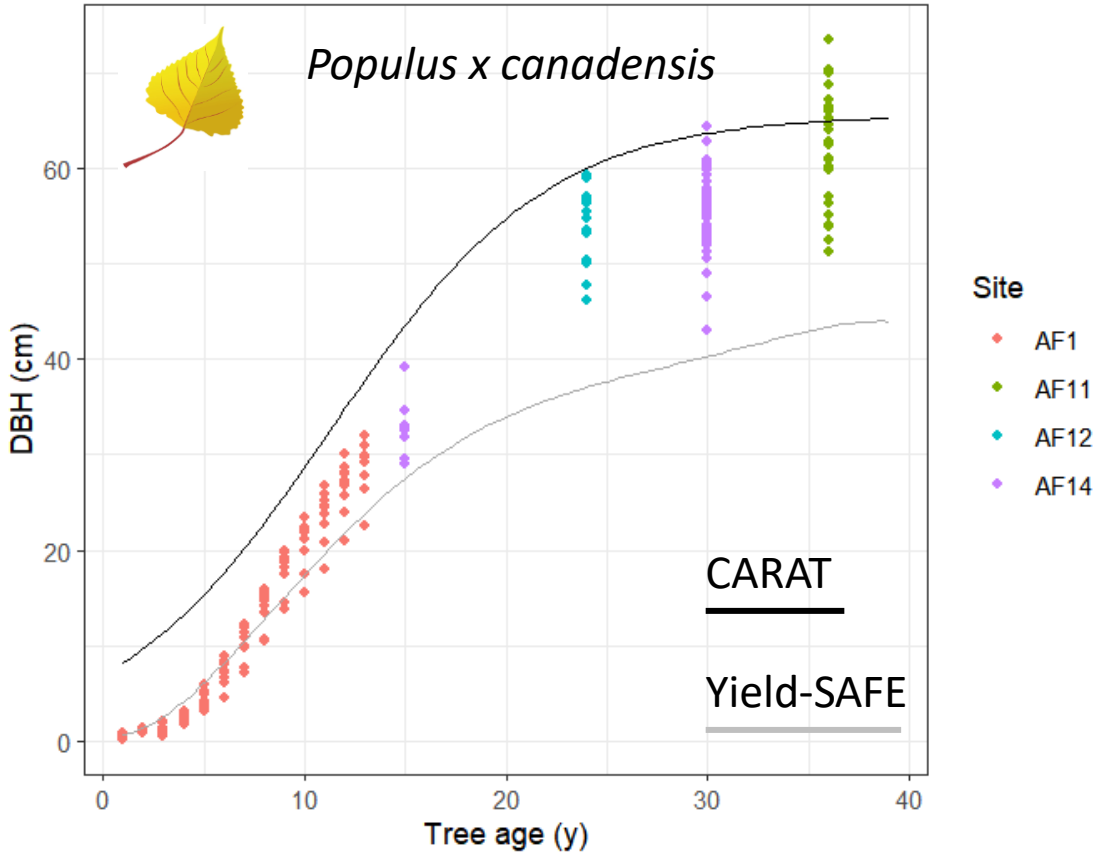
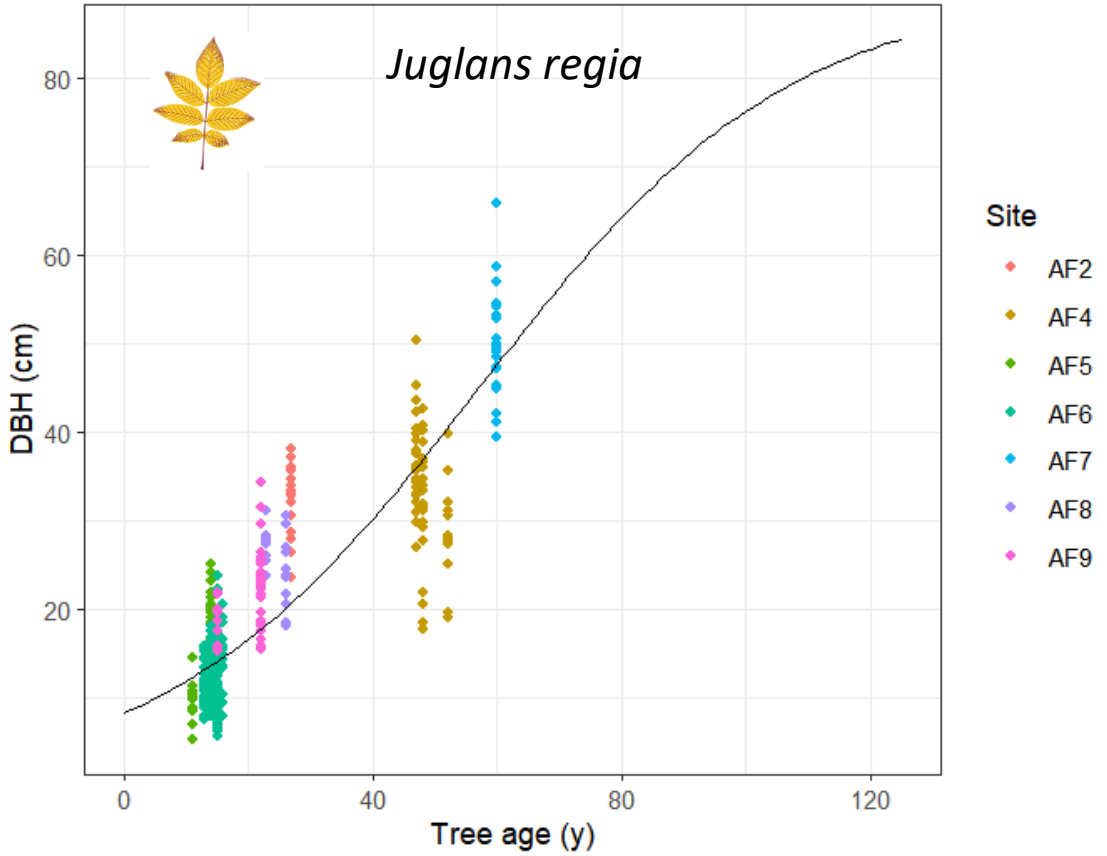
Comparison with existing fields





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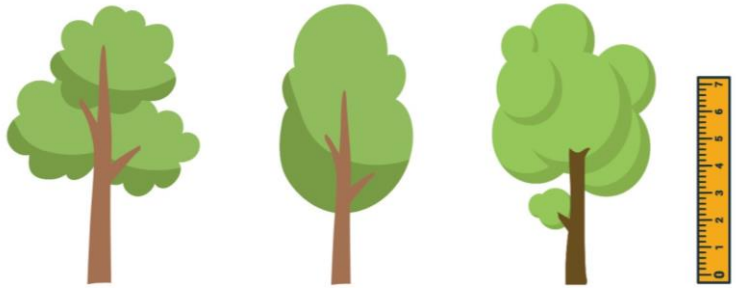
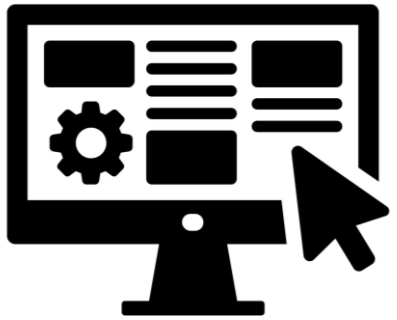
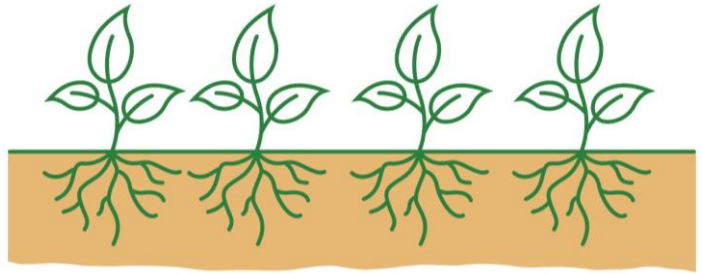


Future steps





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AGROFORESTRY VLAANDEREN

https://www.agroforestryvlaanderen.be/nl/nieuws/koolstofopslag-in-agrofo 90%

Nieuws | Onderzoek & Projectwerking | Kennisloket | Agroforestry Planner | Menu

DEEL DIT ARTIKEL

ALGEMEEN

Koolstofopslag in agroforestry systemen simuleren met de CARAT tool

19/09/2023

Simuleer het koolstofgehalte op je agroforestry-perceel met de CARbon Agroforestry Tool "CARAT"

WELKOM BIJ DE AGROFORESTRY PLANNER!

Op deze Agroforestry Planner vind je een verzameling van kennis en interactieve tools die zorgvuldig is samengesteld door het Consortium Agroforestry Vlaanderen. Klik op de tegeltjes om meer te weten te komen over agroforestry via het Kennisloket, de E-academy en de vijf interactieve tools!

VERBREED JE KENNIS VIA HET KENNISLOKET EN DE E-ACADEMY

KENNISLOKET

Ik ben op zoek naar kennis over verschillende agroforestry gerelateerde thema's.

E-Academy

Ik wil graag (basis)kennis opdoen over agroforestry in de vorm van een (gratis) online lessenreeks.

GA ZELF AAN DE SLAG MET 5 INTERACTIEVE TOOLS

DENTRO

Welke bomen zijn geschikt voor mijn agroforestry perceel? Kies uit een volledige boomsoortenlijst of selecteer geschikte variëteiten voor populier of fruitbomen.

BETULA
ontwerptool

Hoe ontwikkel ik stap per stap een plan voor een nieuw agroforestry project? Met welke aspecten dien ik rekening te houden?

INTACT
kosten-batentool

Welke kosten en welke baten kan ik verwachten bij het uitvoeren van mijn agroforestry plan? Op welke termijn?

CARAT
koolstof tool

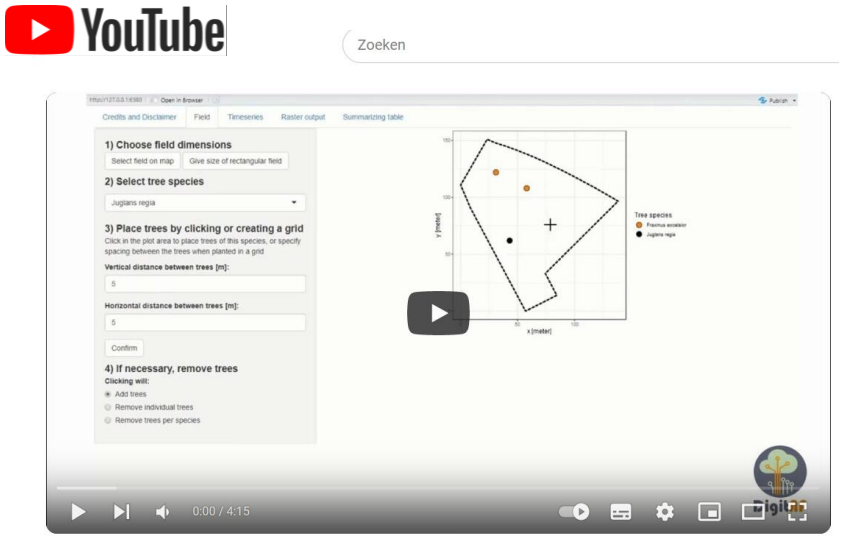
Hoeveel koolstofopslag zal mijn agroforestry project realiseren, in de biomassa en in de bodem? Op welke termijn?

MIMOSA
notenoogst keuzetool

Welke werktuigen bestaan er voor het oogsten van noten en welke keuze is daarbij geschikt voor mijn situatie?

www.agroforestryvlaanderen.be/nl/agroforestryplanner

https://shiny.ilvo.be/PLANT/CARAT_v3/



ILVO

Thank you

contact: paul.pardon@ilvo.vlaanderen.be

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