CarboCatch

Bringing Agroforestry Home

SPACE4GOOD

Louis Bolk Instituut

Rijksdienst voor Ondernemend Nederland

Netherlands Space Office

Who are we

SPACE4GOOD

Earth Observation for Social & Environmental Impact

Space4Good provides geospatial solutions to unlock, accelerate and scale social and environmental impact for good using:

- Remote sensing
- Geoinformation
- Artificial Intelligence

Rabobank ECOSIA ARSARI GROUP esa WORLD BANK GROUP

Louis Bolk Instituut

The Louis Bolk Institute is the knowledge institute for sustainable agriculture, nutrition and health.

Purpose CarboCatch

Problems

Climate agreement 25,000 ha agroforestry must be achieved before 2030, we are now at 1000 ha

- **Farmers** must become more sustainable
- **Industry** would like to purchase carbon credits
- The **public sector** wants to be able to predict and model for the development and stimulation of agroforestry

Solution

Platform CarboCatch

Challenges

In-field measurement

- Expensive
- Manual
- Inconsistent
- Unable to scale

Carbon Credit Market

- Lack of trust
- Lack of transparency
- Unknown quality
- Unmet growing demand

Projects

- Lacking expertise
- Inadequate tools
- High certification expenses
- No viable business model

CarboCatch

Farmers & Project Developers adopting agroforestry need knowledge & financial support.

CarboCatch provides support at farm & national levels by providing insights & business opportunities using remote sensing & AI.

Governments & agroforestry networks want to increase & monitor agroforestry

Biomass verification

Carbon forecasting

Suitability analysis

Added Value

BETTER MONITORING

Remote Sensing

CHEAPER

Carbon Verification

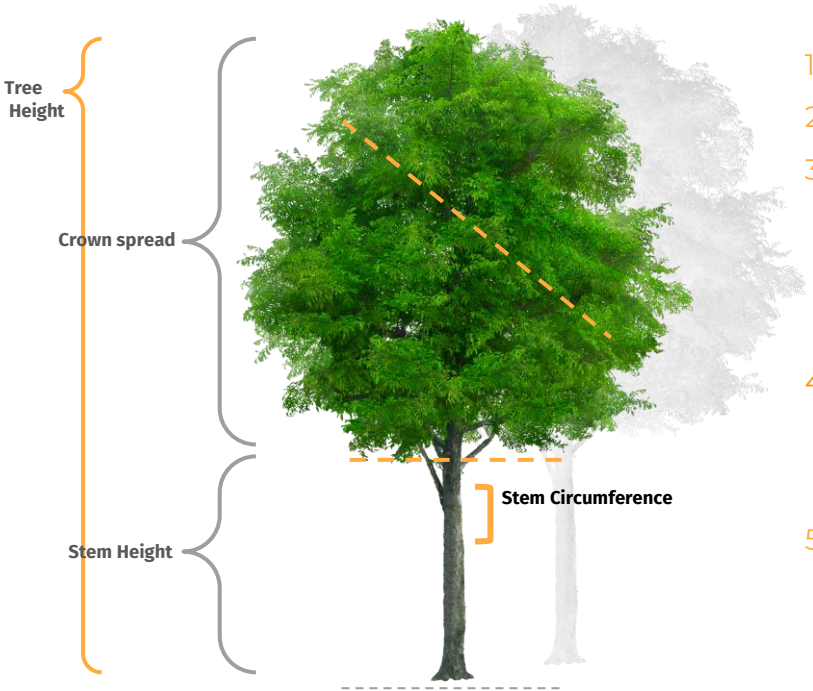
EASIER

Biomass Assessments

UNLOCKING POTENTIAL

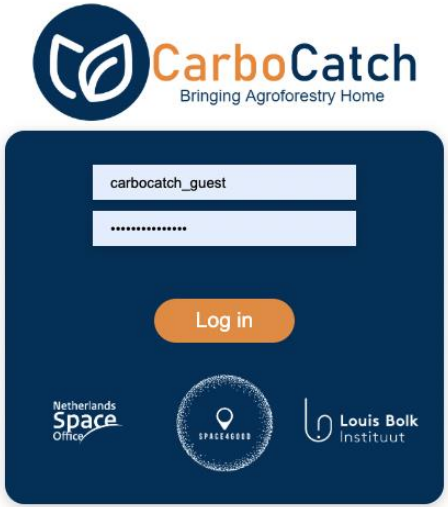
Business Cases

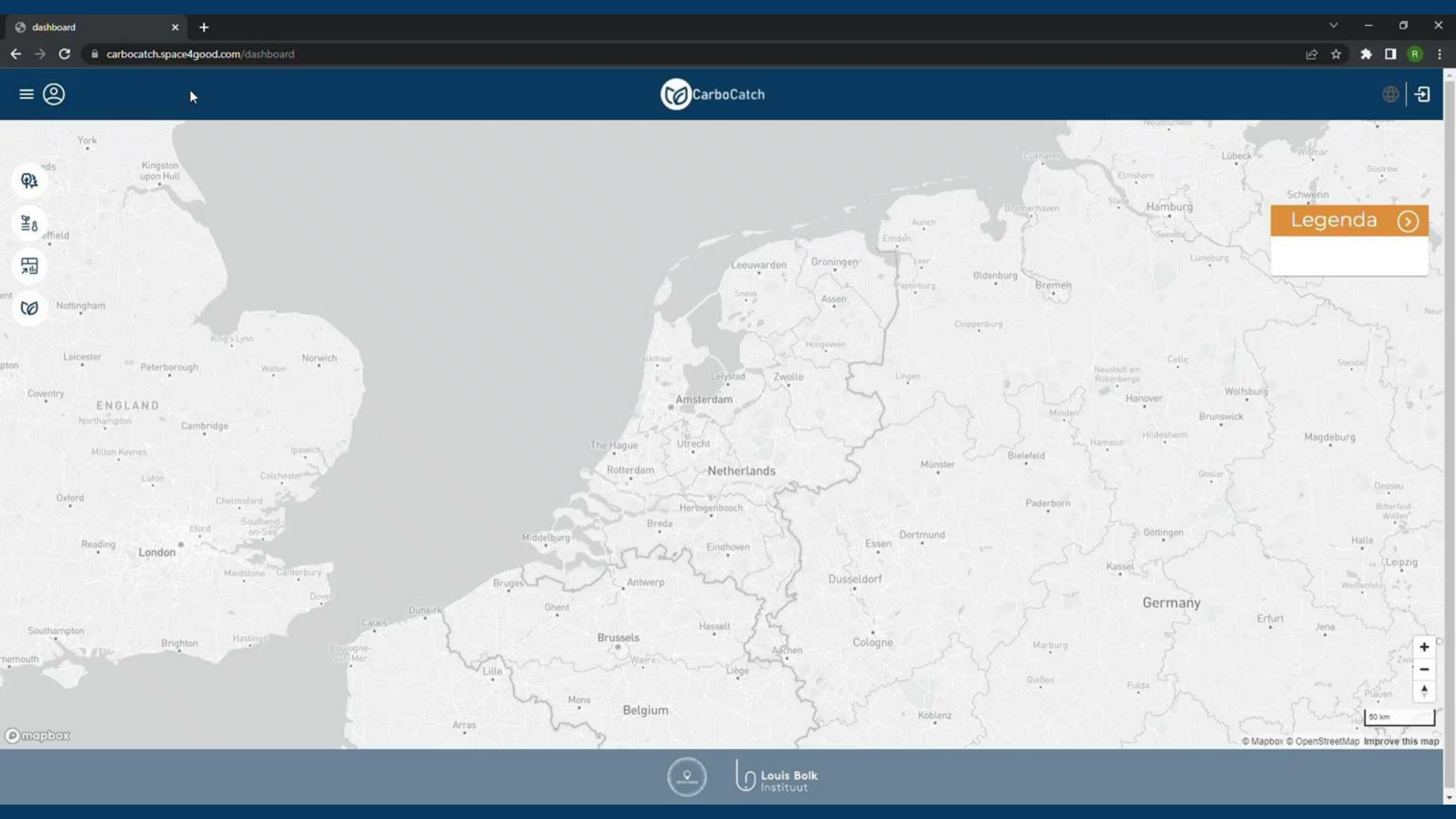
CarboCatch in Action



1. Functional platform
2. User friendly data management
3. Data visualization
    a. **Current biomass**/carbon stock
    b. **Suitability** maps per tree species
    c. Indication of **potential** carbon per plot
4. Data analytics using machine learning algorithms
    a. Superview Satellite Data, 0.5 meter resolution
    b. Cutting edge AI models for trees detection and measurement
5. Scalable & adaptable
    a. Current infrastructure can handle thousands of farms
    b. Highly adjustable to different contexts

Platform Demonstration




dashboard
carbocatch.space4good.com/dashboard
CarboCatch
Legenda
Amsterdam
Netherlands
Germany
Belgium
London
ENGLAND
Brussels
Hamburg
Bremen
Dusseldorf
Cologne
Dortmund
Rotterdam
The Hague
Utrecht
Antwerp
Eindhoven
Hannover
Leeuwarden
Groningen
Zwolle
Lelystad
Nottingham
Leicester
Peterborough
Norwich
Cambridge
Coventry
Northampton
Milton Keynes
Oxford
Reading
Brighton
Southampton
Canterbury
Dover
Calais
Dunkirk
Bruges
Ghent
Lille
Arras
Mons
Liège
Aachen
Hasselt
Breda
Middelburg
Hertogenbosch
Münster
Bielefeld
Paderborn
Essen
Koblenz
Marburg
Kassel
Göttingen
Magdeburg
Wolfsburg
Brunswick
Oldenburg
Emden
Assen
Lübeck
Schwerin
Erfurt
Jena
Leipzig
Halle
50 km
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CarboCatch

Biomass verification

Carbon forecasting

Suitability analysis

BETTER MONITORING
Remote Sensing

EASIER
Biomass Assessments

CHEAPER
Carbon Verification

UNLOCKING POTENTIAL
Business Cases

CarboCatch

Bringing Agroforestry Home

Questions?

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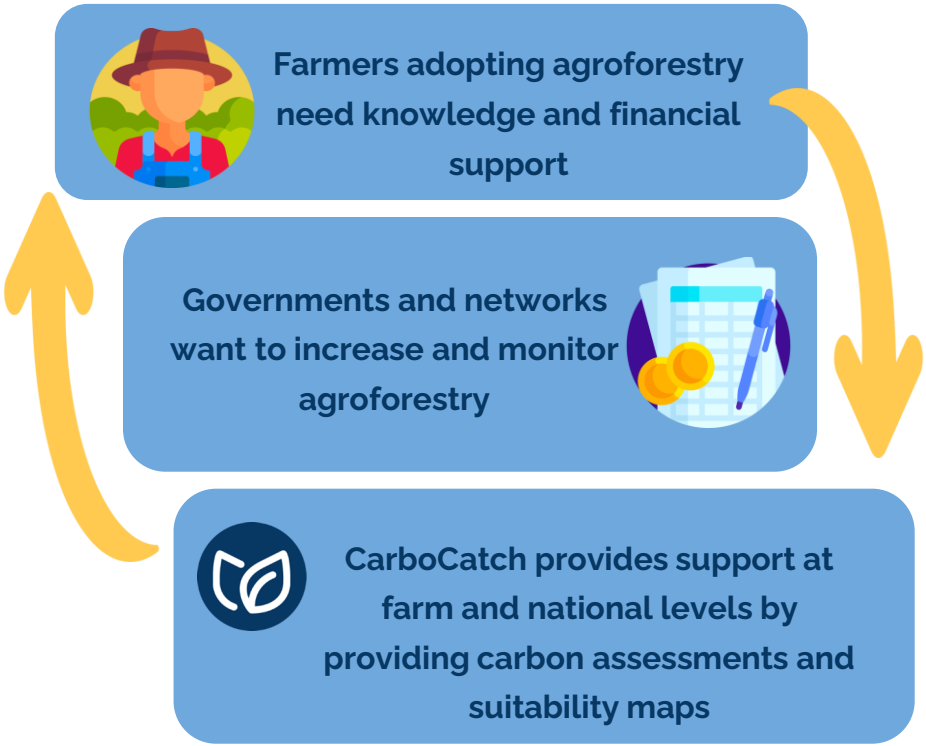
CarboCatch

Better - Cheaper - Easier - Unlocking Potential



Vervolgstappen

Fase 3:

- Pilot project
- Commercialisatie
- Onderzoek naar uitbreiding buitenland
- Verbeteren van voorspellingen obv jaarlijkse monitoring
- Verbeteren van geschiktheidsanalyse
- Iteratieve optimalisatie gebaseerd op feedback gebruikers

Agroforestry network / Companies supporting transition / Provinces

Definition: Working directly with farmers

Value proposition - Farmer Networks:

- Easier
- Unlocking potential - business case
- Cheaper

Notes:

- Province Gelderland is looking to use carbon credits generated on their farms for compensation - would need to reach out directly to the province

Problems:

1. Lack of technical capacity
2. Difficult to contact and keep track of all Agroforestry farmers
3. Monitoring is done in the field which is costly and time consuming
4. Lack of access to costly high-resolution satellite imagery and unreliable statistical reporting methods.

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LNV

- Current: 1k ha agroforestry, Target: 20k ha
    - Monitoring only possible with Remote sensing

Value proposition Government:

- Better
- New: Unlocking business cases: Facilitating transitions
- Scalable
- Easier uptake (removing barriers for transition to agro)

Problems:

1. Need more hard data (proof left & right)
2. The ability to make data tangible & quantitative
3. Requirements for agroforestry (targets)
4. Broader support and a shared vision
5. Monitoring and reducing nitrogen emission

Project Developers

NatureCredits
https://naturecredits.com//
Landowner link to carbon market,

GreenDutch
https://greendutch.nl/
GreenDutch develops innovative CO 2 construction projects in collaboration with landowners & land users in the Netherlands

Value proposition Project Developer:

- Cheaper
- Faster
- Better - Access to premium assessments for premium credits

Problems:

1. Money: Scaling their projects - uptake
2. Money: Reducing cost - expensive manual assessments
3. Money: Pre Financing their project - no money from start - usually comes later (upfront investment)
4. Management: Monitor progress and determine potentials (oversight)

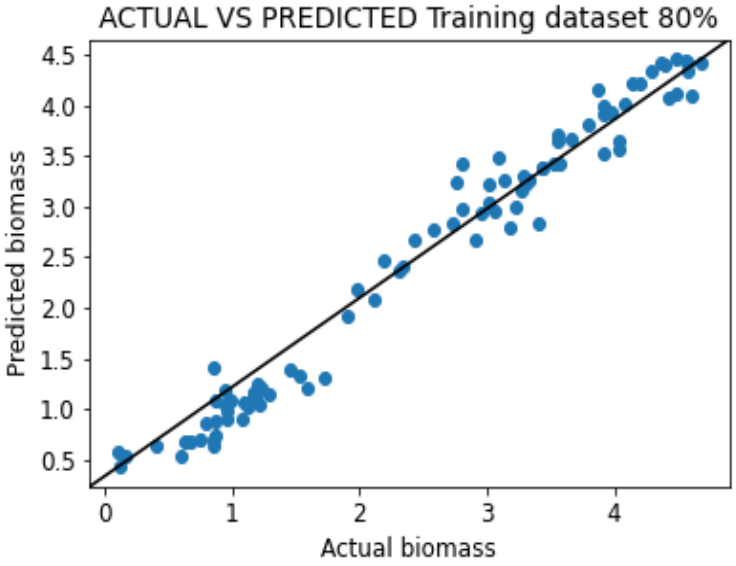
Problems & Opportunities

Problems with current situation	Opportunities with agroforestry
• Farming sector stressed • Soil degradation • Increased emissions limits • Monoculture systems • Lack of experience and knowledge of agroforestry in this climate • Lack of financing and subsidy schemes to support transitions	• Short term investment, long term returns • Build farmer's climate resilience • Greater quality and higher yields • Additional revenue from carbon credits • Increased biodiversity • Transition agriculture towards net zero goals • Become experts and leaders in this space for EU

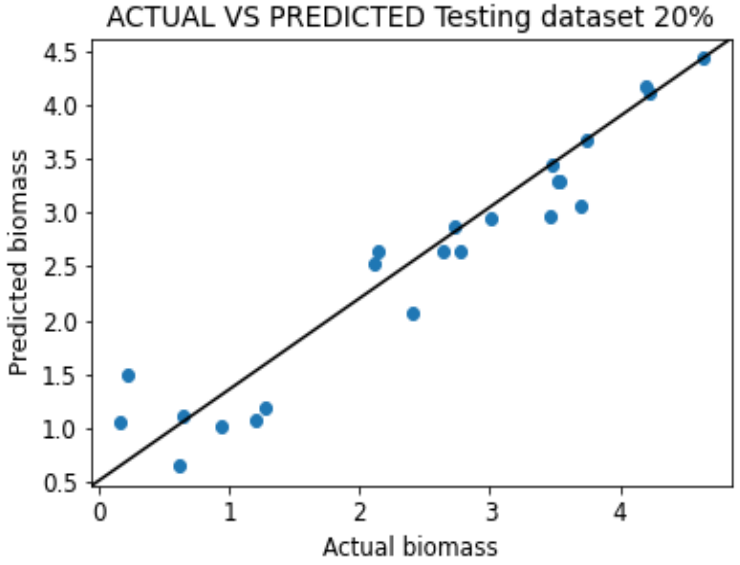
In short:

The Netherlands needs more agroforestry!

Biomass model performance



R2 80% Train: 0.93
R2 20% Test: 0.96
MAPE 80% Train: 17.0
MAPE 20% Test: 36.1



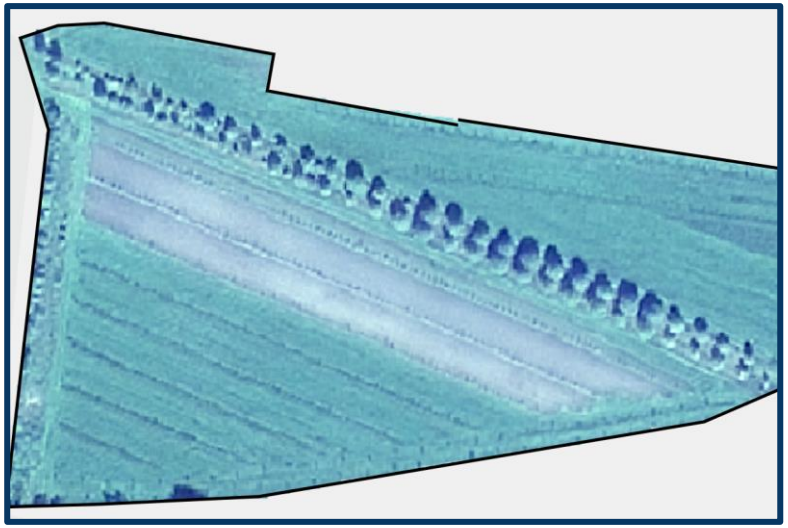
Satellite Data

Superview data

- Rood, groen, blauw, NIR en NDVI
- Extractie van data rondom de boom - 3 x 3 pixels (1.5 x 1.5 m)
  - Alle bomen vergelijkbaar in grootte
  - Variatie valt binnen resolutie

AHN data onderzocht, maar te weinig scans voor deze maat bomen

- Wordt relevant in vervolg, met volwassen bomen



Interviews stakeholders

provincie Gelderland

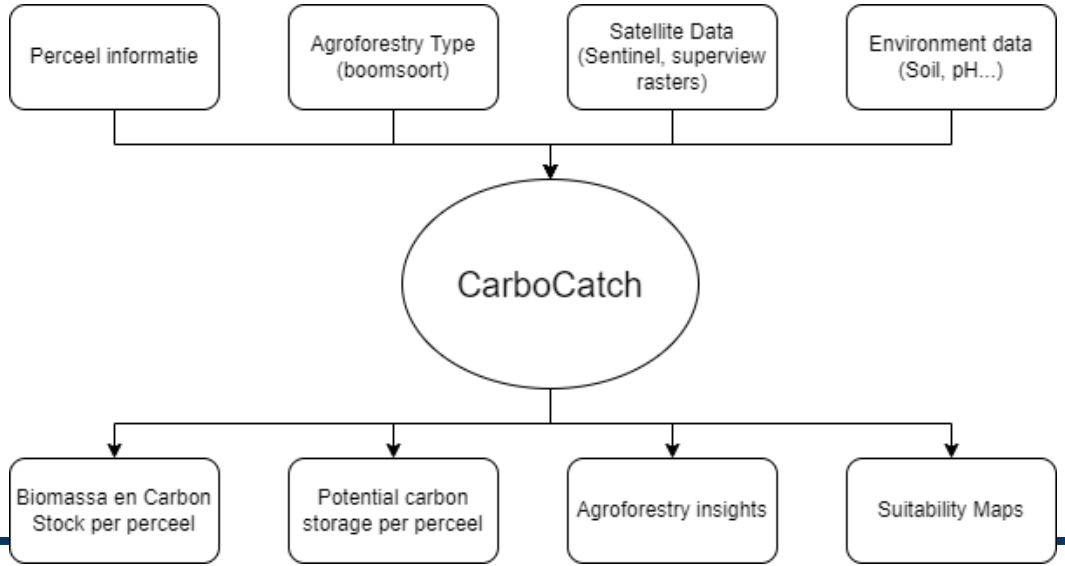
Provincie Noord-Brabant

Ministerie van Landbouw, Natuur en Voedselkwaliteit

CarboCatch Design

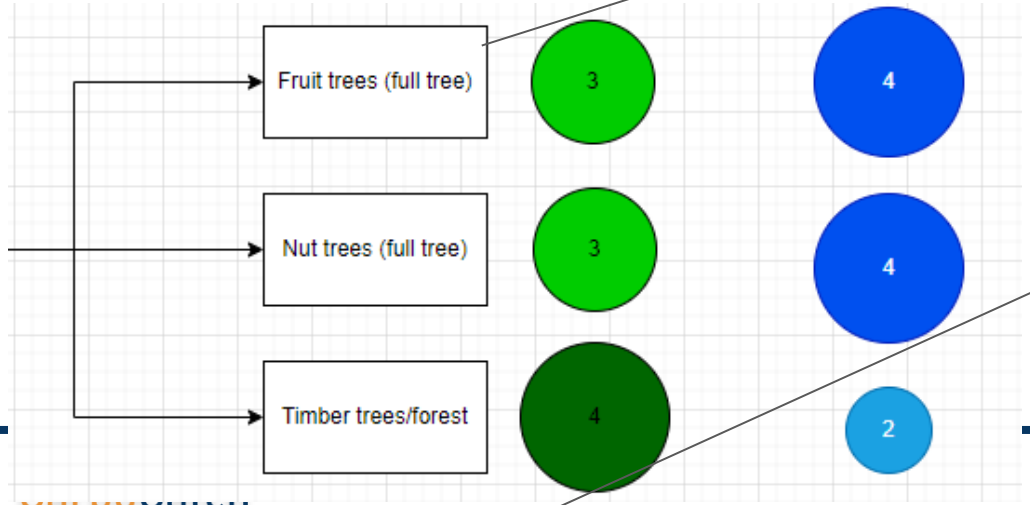
CarboCatch:

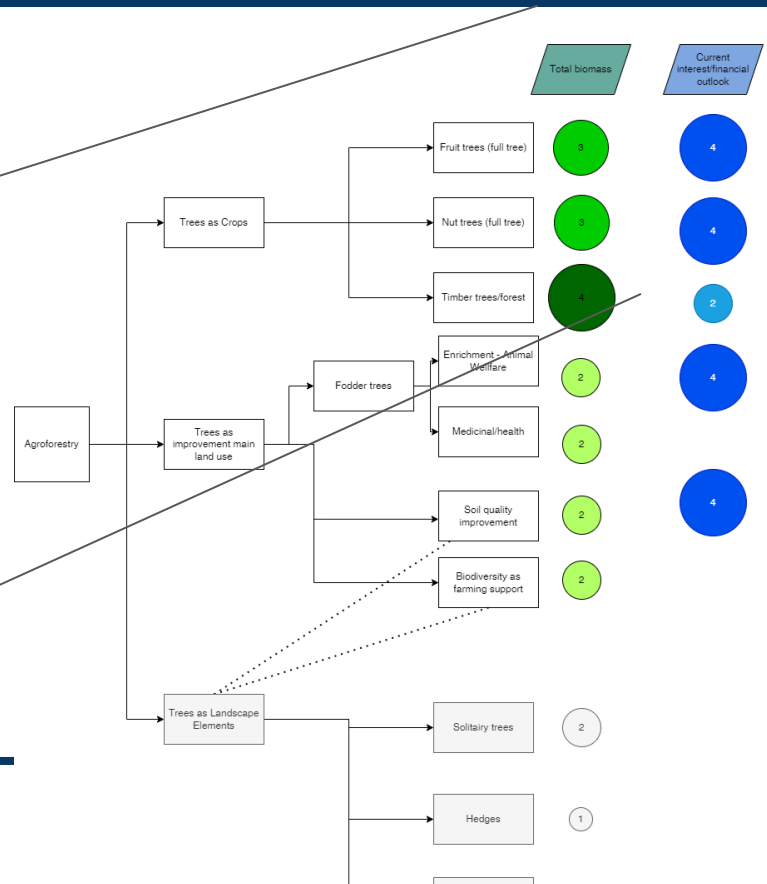
Monitoren koolstofopslag + voorspellen ontwikkeling van biomassa in agroforestry projecten a.d.h.v. satellietdata



Agroforestry classificatie

- 7 hoofdtypen species + landschapselementen (buiten beschouwing)
- Grootste bijdrage biomassa bij ‘bomen als een gewas’

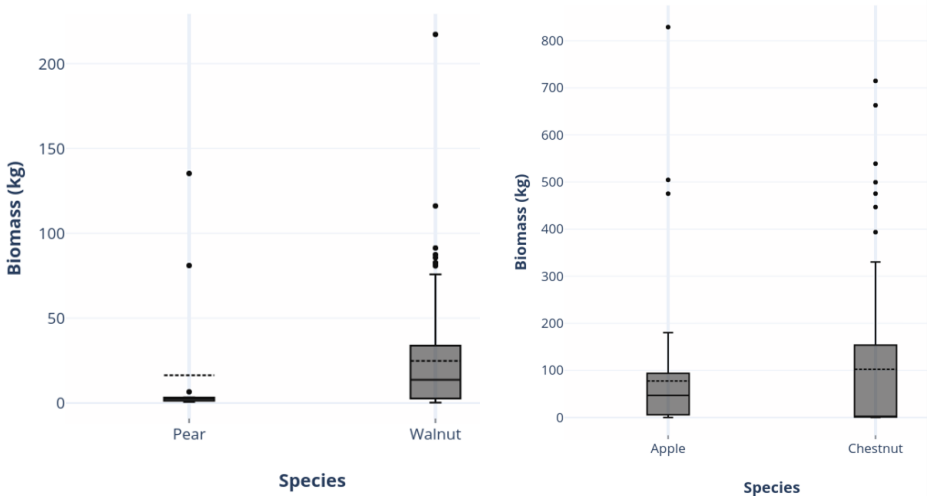




Veldwerk

- Veldwerk data
  - Soort
  - Hoogte
  - Diameter

- De veldgegevensdistributie voor verschillende soorten was als volgt:
  - Appel (73)
  - Castanea sativa of Kastanje (60),
  - Juglans regia of walnoot (115) en
  - Peer (15).
  - Daarnaast hebben we 51 locaties zonder biomassa geotagging om het model over kale grondlocaties te trainen.
  - Dit resulteerde in een totaal van 314 datapunten.



Boxplot met de verdeling van grondgegevens voor verschillende soorten. De stippellijn geeft het gemiddelde weer.

Satellietdata

- Satellietdataportaal
- Superview-1 4-bands gegevens (Rood, groen, blauw, NIR)

Doel

- Modeltraining om biomassa te voorspellen
- Voorspel biomassa op nieuwe percelen

Veld in Alphen

Resultaten

- In totaal zijn 34 scenario's getest met verschillende combinaties van boomsoorten/kale bodemcategorieën.
- In elk scenario werd het random forest-model getraind op de grondwaarheid
- Top 3 modellen werden geselecteerd