# Best practices for soil regeneration:

# forests

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PEFC/01-00-01

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**Programme for Endorsement of Forest Certification schemes**
**Italy**

***EU DG Clima Expert group***

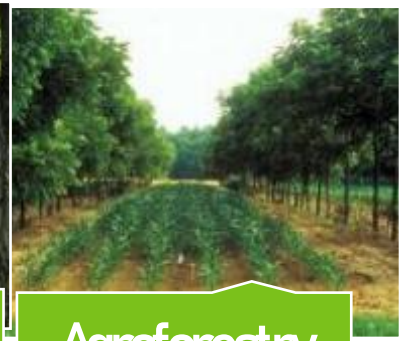
***“Carbon removals – FORESTS”***

# Pefc Italy and its certification standards

Forests

Plantations

Urban Green areas



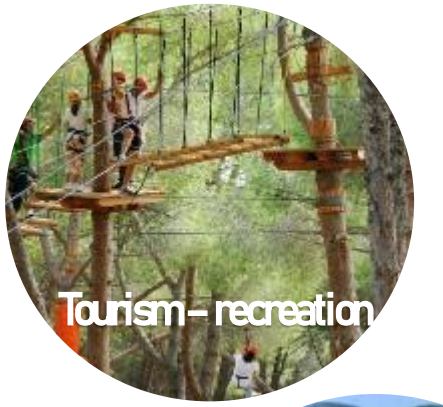
Agroforestry

Ecosystem Services

CoC and Logo

# Certifying the sustainability of management and ecosystem services







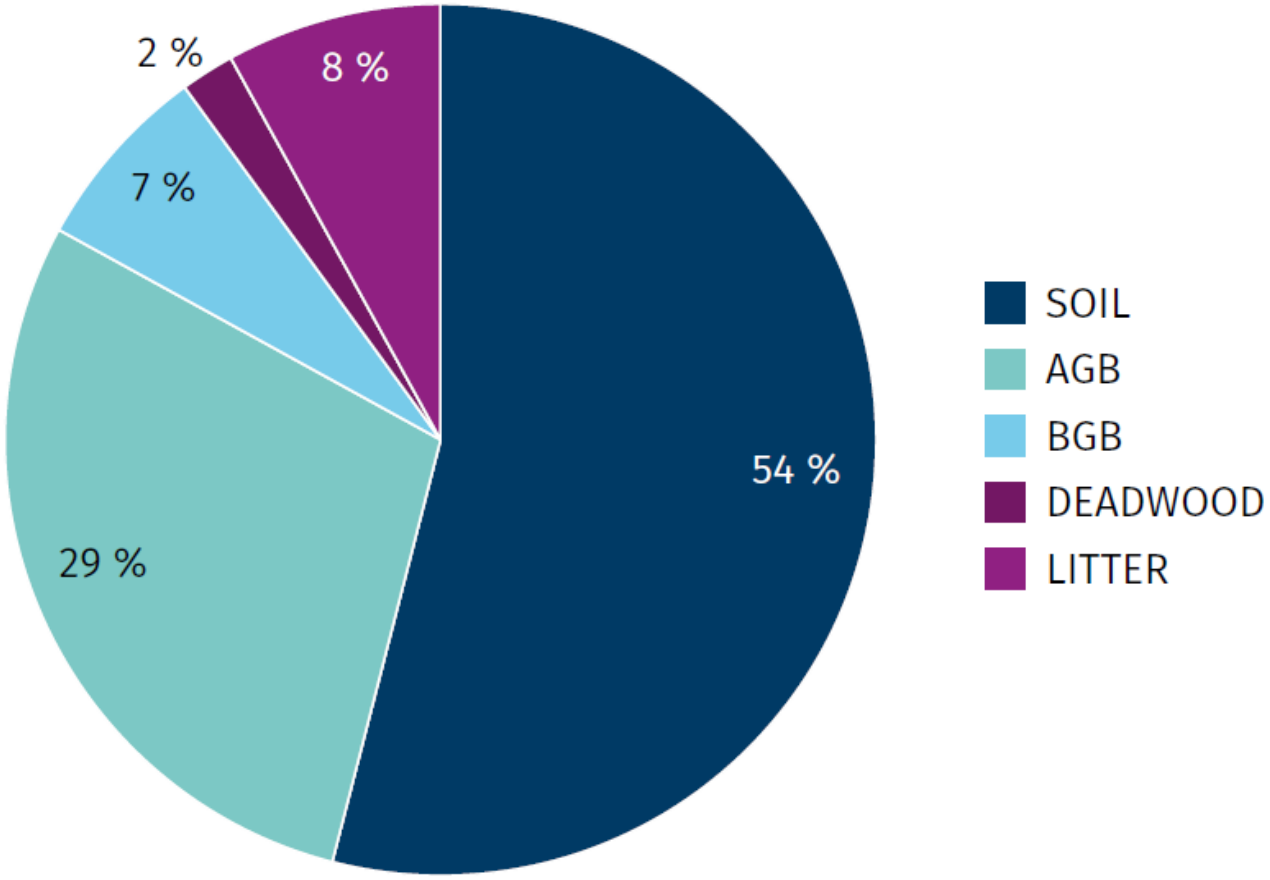
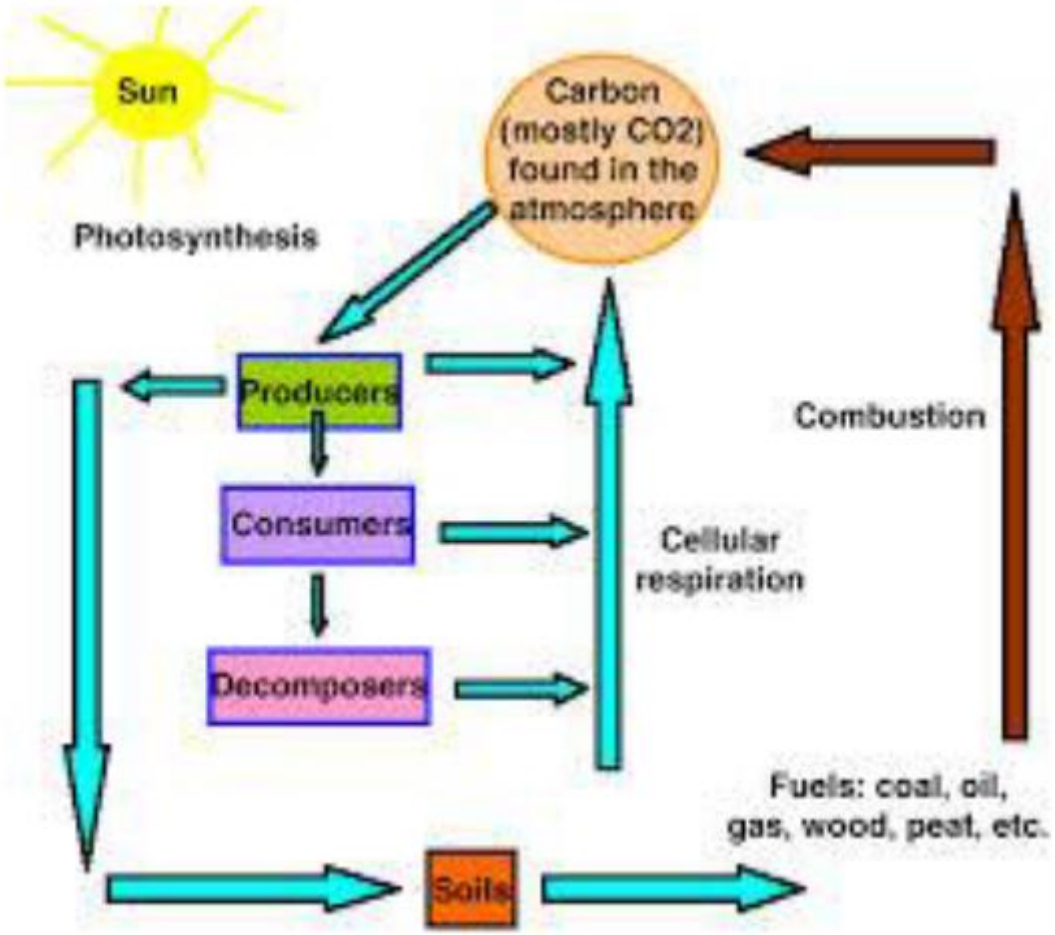


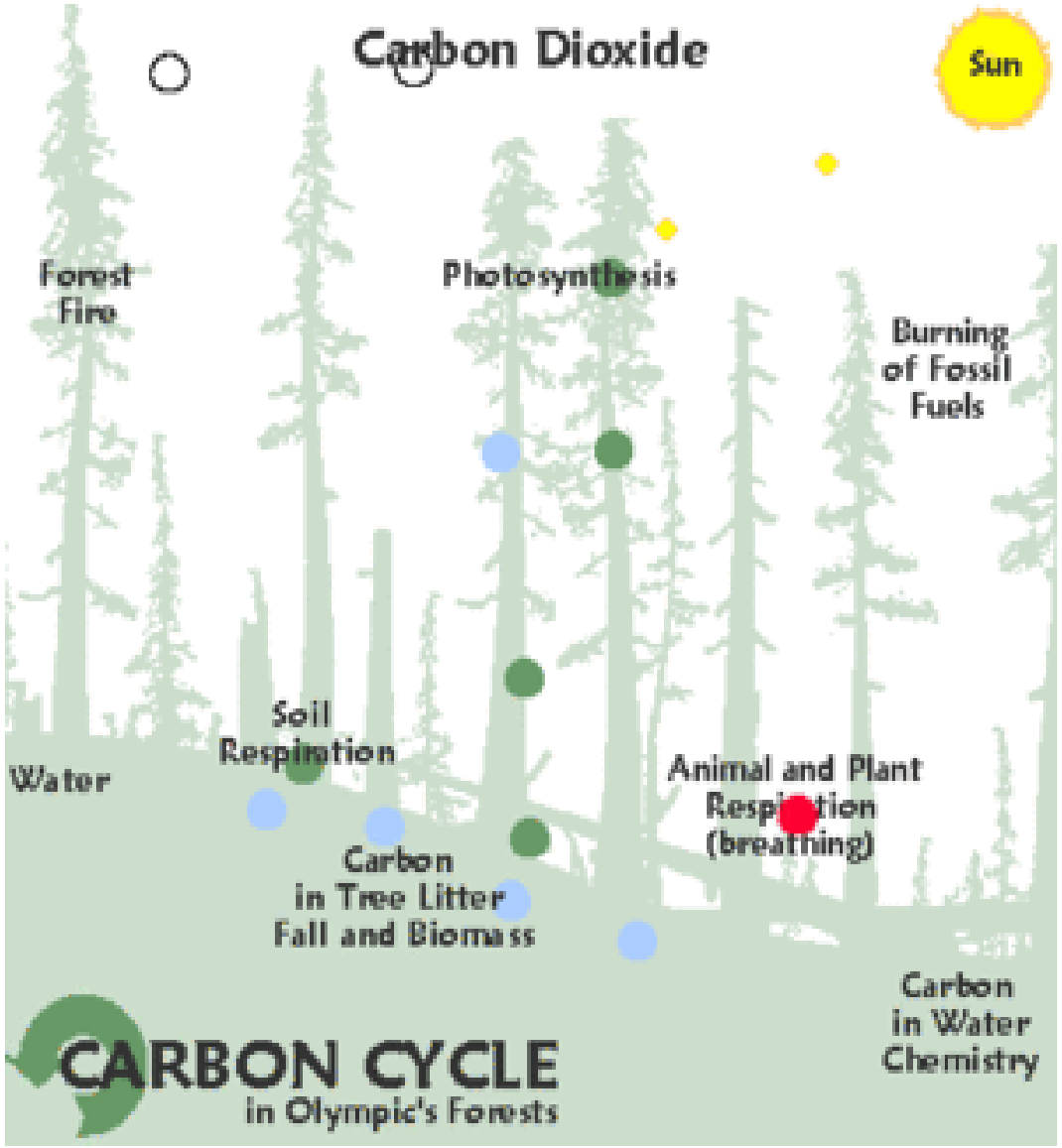

**Figure 4.** Proportion of forest carbon pools in Europe 2020: ABG, above-ground biomass; BGB, below-ground tree biomass. Data source: Forest Europe 2020.

**Soils are the largest terrestrial carbon reservoir** (IPCC 2021), with European soils hosting more than half of the forest carbon pools. However, in Europe more than 60–70% of soils are degraded as a direct result of unsustainable management practices (EC 2020), and are a net emitter of CO2 (EEA 2022a).

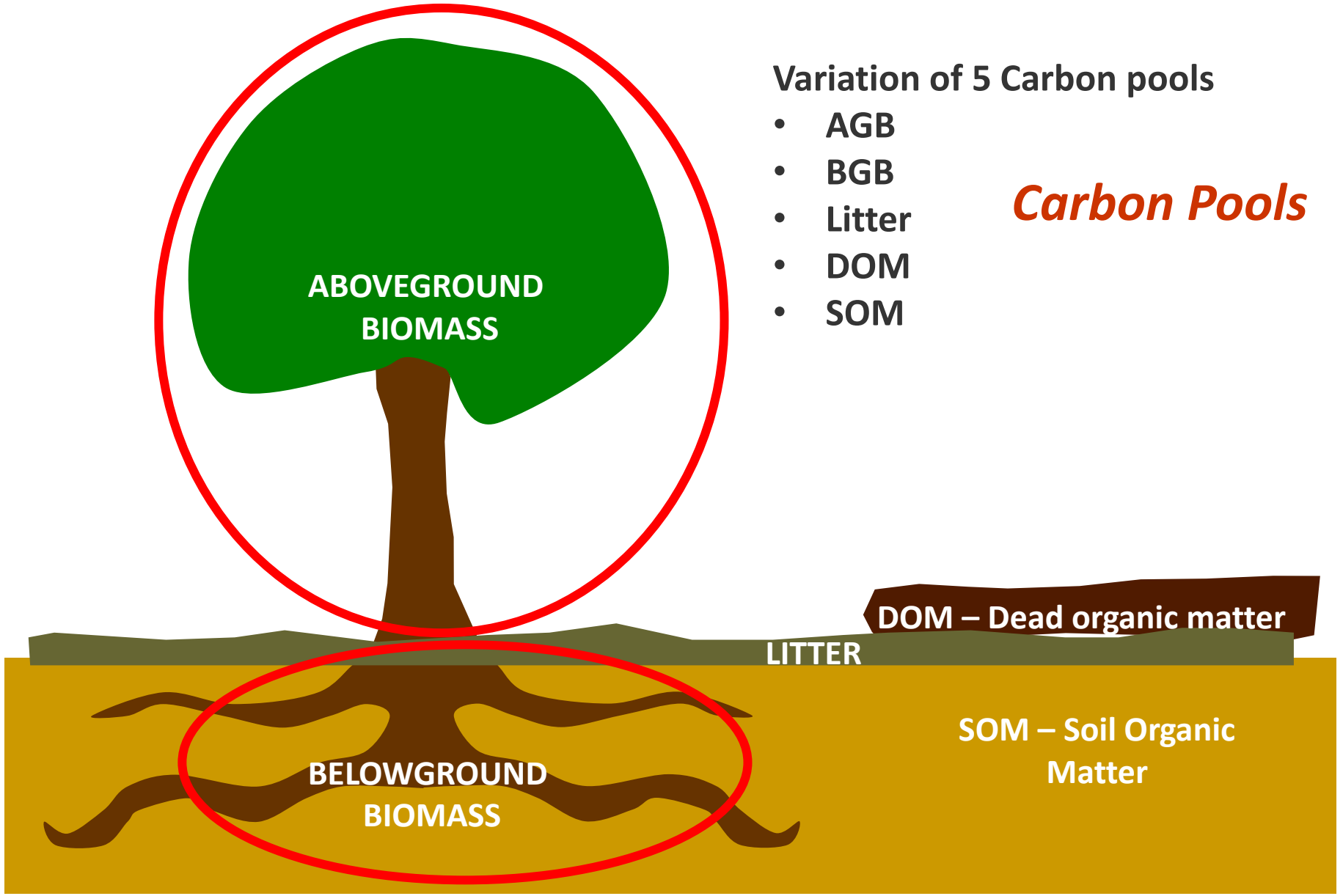
**Improved soil management for carbon sequestration is therefore particularly relevant for any carbon farming practices.**

# Carbon cycle



$$\Delta C_{ij} = (\Delta C_{LB,ij} + \Delta C_{SOM,ij} + \Delta C_{DOM,ij}) \cdot 44/12$$




Variation of 5 Carbon pools

- AGB
- BGB
- Litter
- DOM
- SOM

***Carbon Pools***

# How to calculate the tree biomass and its C content

V (m3) x D density (t dm/m3) = T dm Trunk

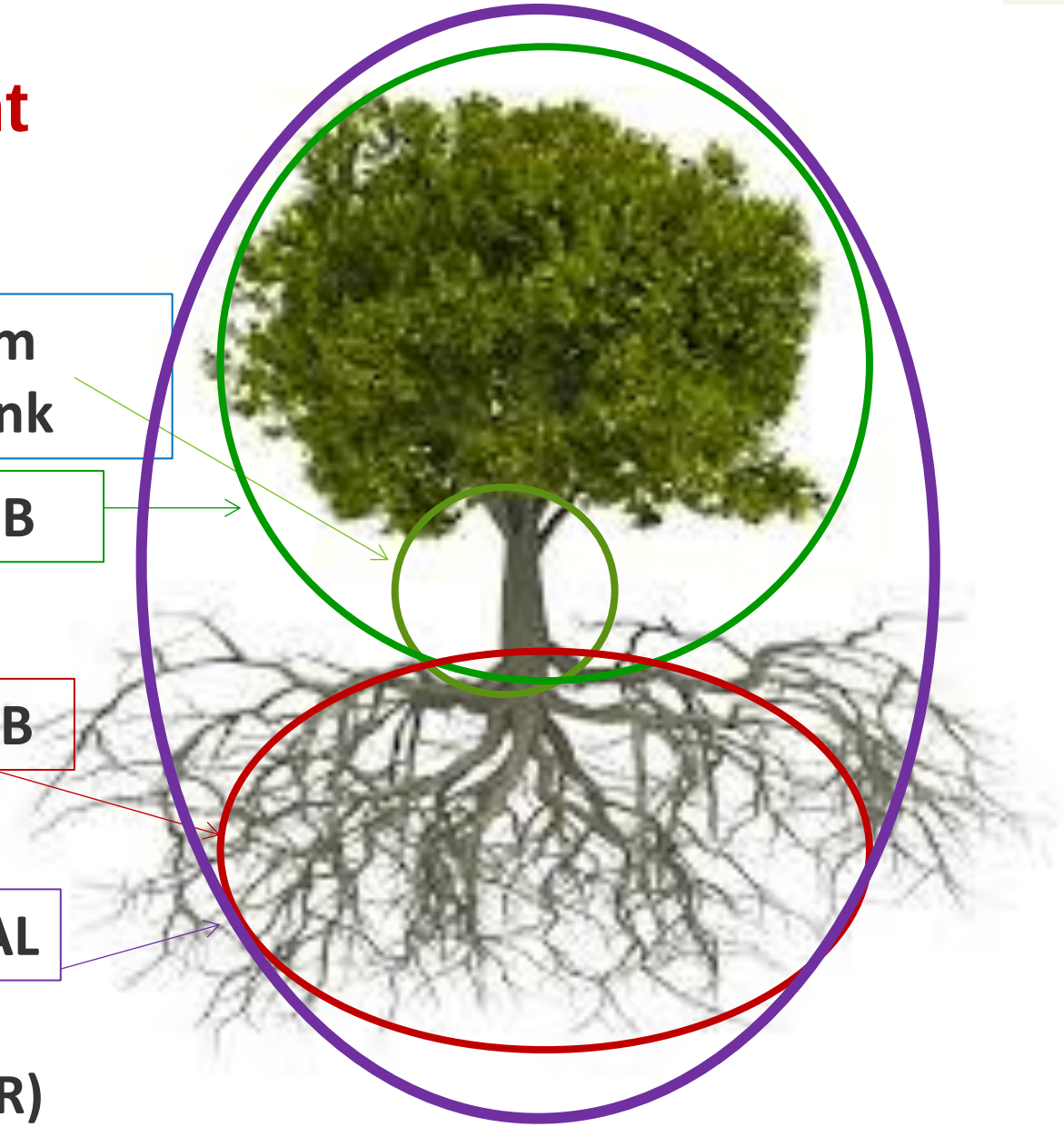
T dm trunk x BEF = T dm AGB

+

T dm AGB x R = T dm BGB

=

T dm TOTAL



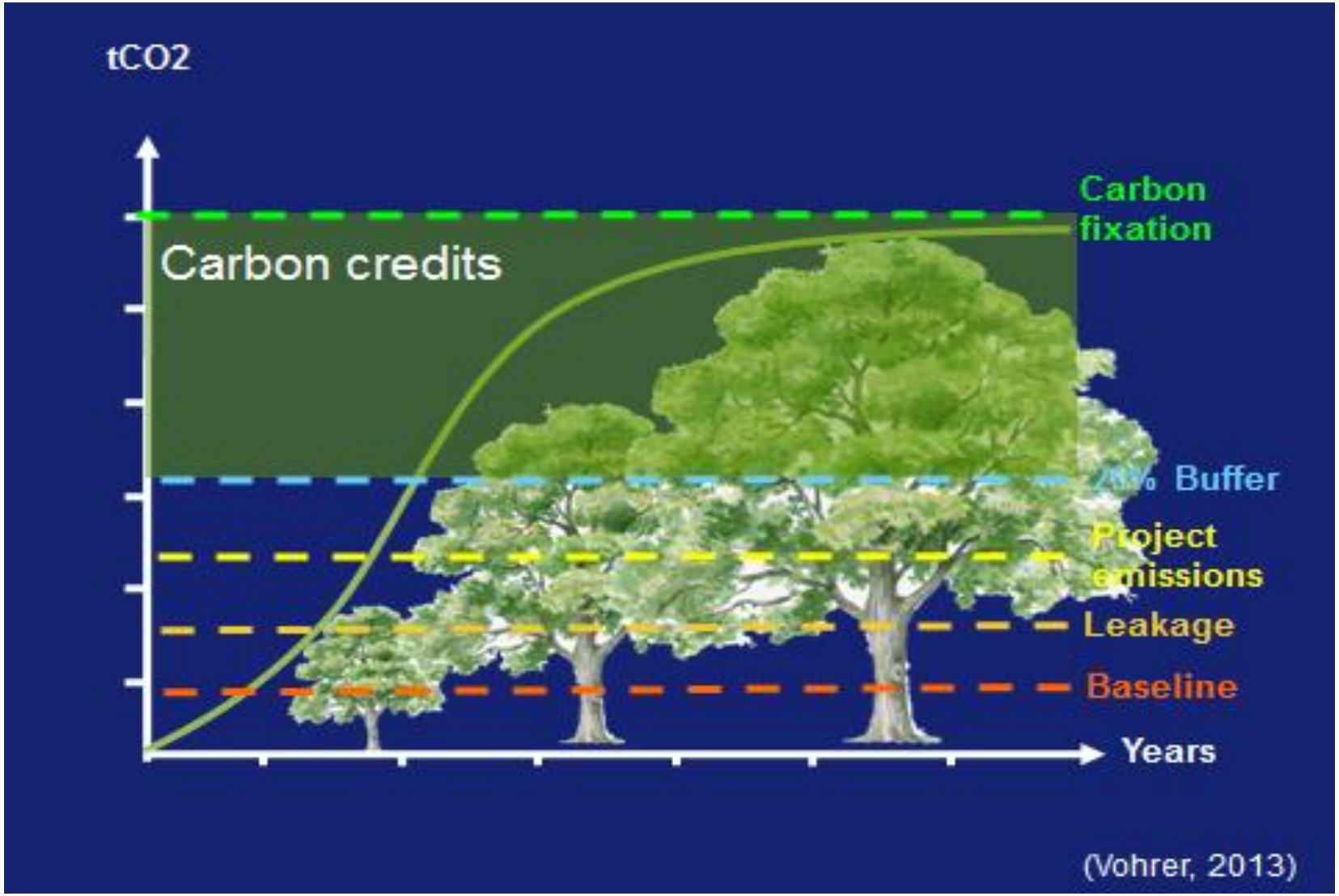
Total Dry Matter= $(V*D*BEF_s)*(1+R)$

?

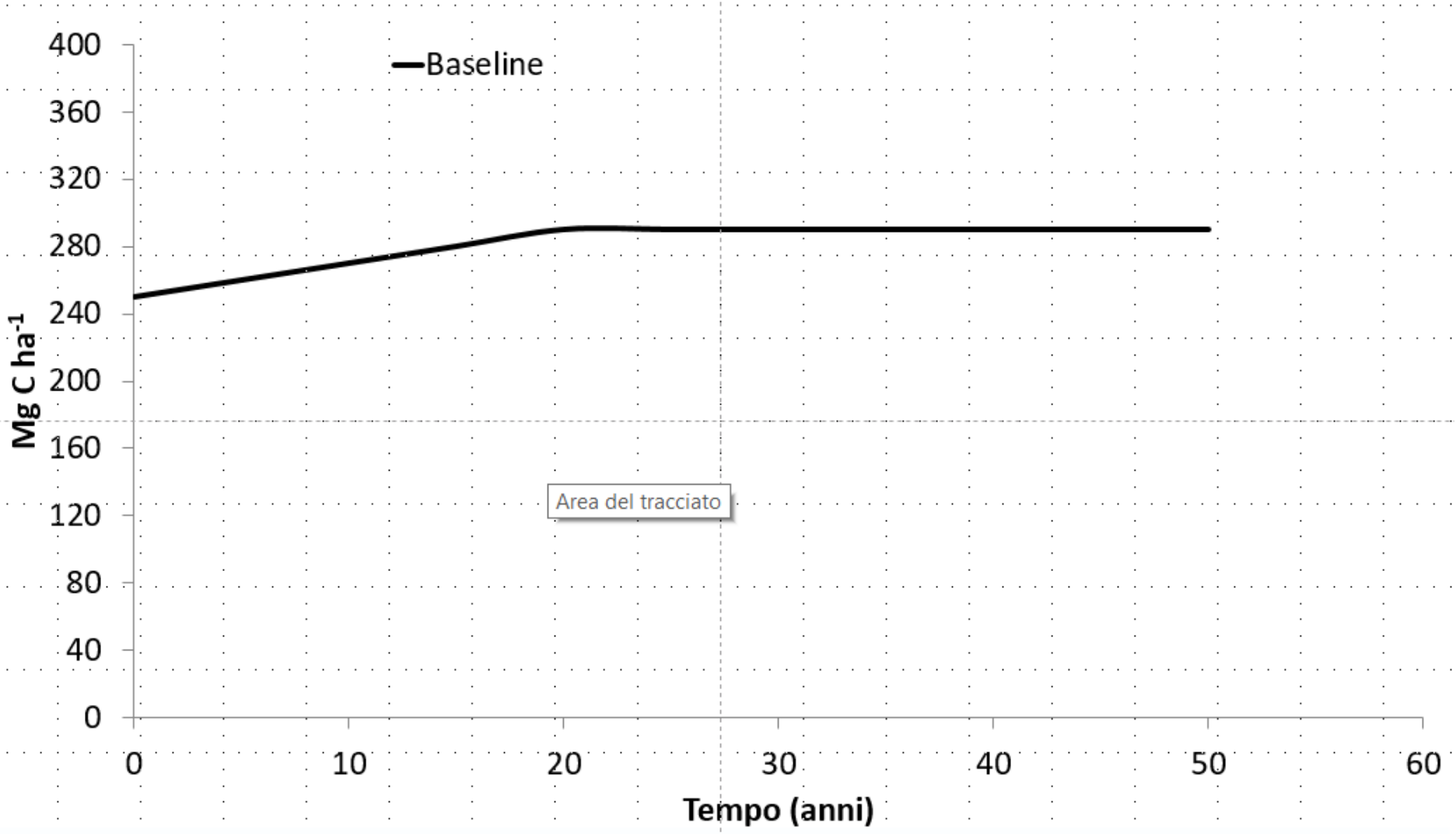

| | | | |
|---|---|---|---|
| T dm TOTAL | X | CF (0,48) = | C total |
| C total | X | $CO_2/C$ (44/12) = | t $CO_2$ |

Besides carbon sequestration, forest ecosystems harbour biodiversity and provide many other important ecosystem services that are vital to society and human wellbeing. These include provision of timber and non-wood forest products, soil formation and protection against erosion, water purification and retention, local climate regulation, and provision of recreational use (Thompson et al. 2014). **The concept of carbon farming accounts for these services and includes provisions to avoid any harm to these "*natural values*".**

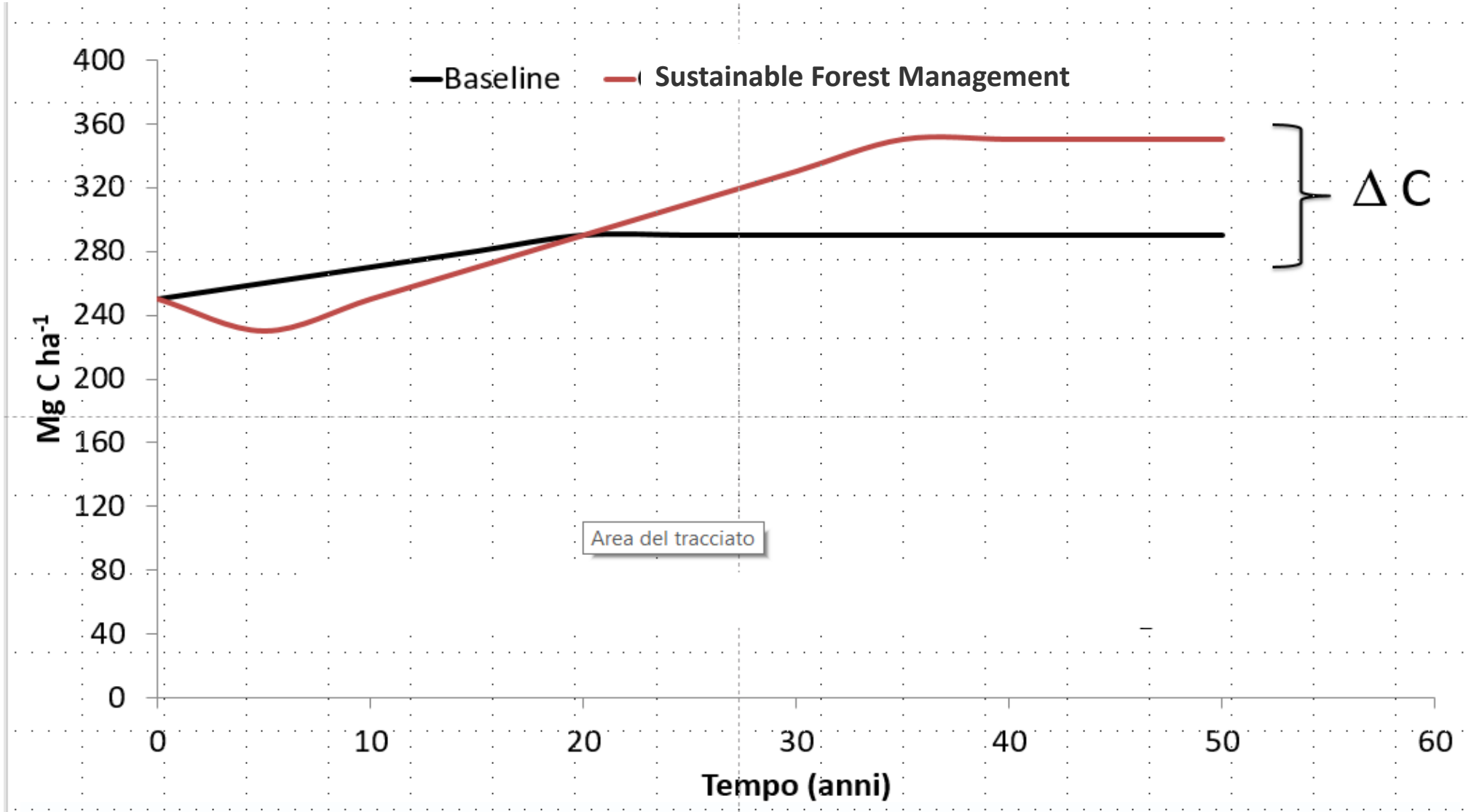
# How to create credible Carbon credit?



# Additionality in forestry



# Additionality in forestry



# PEFC Ecosystem Services Certification Standard.

## PEFC ITA - SE:2021

***ANNEX 1***

***FOREST CARBON: STORAGE, UPTAKE AND NON-EMISSION***

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LIFE CO2 PES & PEF
LE FORESTE CHE RIGENERANO L'ECONOMIA
LIFE19 CCM/IT/001201

NATURA 2000

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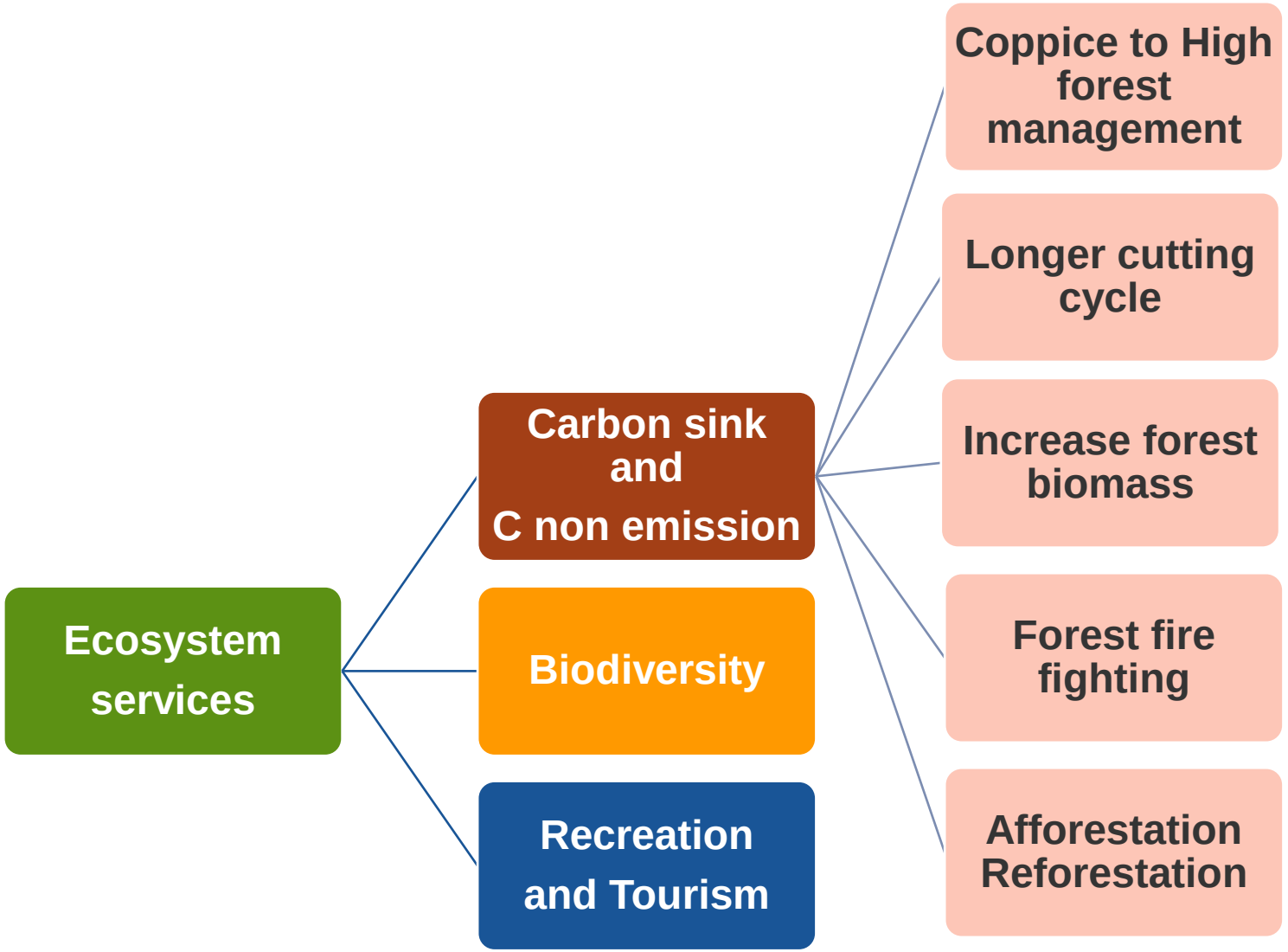
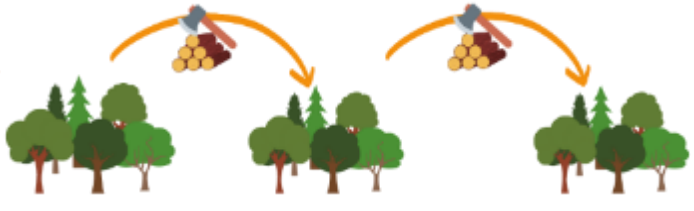
# ES and certified «additional activities»



# Forest Carbon:
## storage and uptake

- ...GOOD PRACTICES

### COPPICE TO HIGH FOREST




### LONGER CUTTING INTERVAL


### INCREASE IN BIOMASS IN THE FOREST


- IPCC equation 2.5: stock difference method, volume 4 (IPCC 2006)
- $CO_{2FY} = (V*D*BEF_s)* (1+R)*CF * 3,67$
- $CO_{2CX} = (V*D*BEF_s)* (1+R)*CF * 3,67$
- $CO_{2/anno} = (CO_{2FY}-CO_{2CX})/(Y-X)$

**Tabella 1**

La seguente tabella riporta i valori di Incremento corrente (INFC, 2005), densità basale, Root/shoot ratio, BEF (Federici et al, 2008) e BEFs (IPCC 2006) per le principali specie presenti in Italia, suggeriti dal PEFC pe l'applicazione delle metodologie di calcolo precedentemente riportate

| **Specie** | **Incr. corrente m³/ha/anno** | |
|---|---|---|
| | **fustaia** | **ceduo** |
| Abete rosso | 8,2 | |
| Abete bianco | 8,3 | |
| Larice | 3,9 | |
| Pino silvestre | 3,7 | |
| Pino nero | 6,7 | |
| Pini mediterranei | 3,9 | |
| Altre conifere | 6,8 | |
| Faggete | 6,6 | 5,4 |
| Rovere, roverella, farnia | 2,9 | 2,1 |
| Cerrete | 4,3 | 3,1 |
| Castagneti | 7,2 | 6,8 |
| Ostrieti, carpineti | 3,7 | 3,3 |
| Boschi igrofili | 5,8 | 5,8 |
| Altri boschi caducifogli | 5,2 | 5,2 |
| Leccete | 2,8 | 2,9 |
| Sugherete | 1,2 | 1,0 |
| **Fonti** | INFC, 2005. Inventario Nazionale delle Foreste e dei Serbatoi Forestali di Carbonio. Ministero delle Politiche Agricole Alimentari e Forestali, Ispettorato Generale – Corpo Forestale dello Stato (CRA) – Unità di ricerca per il Monitoraggio e la Pianificazione forestale | |

| **Specie** | **Densità basale (t/m³)** | **R (rapporto radici/fusto)** | **BEF1** Fattori di espansione delle biomassa (dall'incremento al ad AGB) | **BEFs** Fattori di espansione delle biomassa (dalla provvigione al AGB) |
|---|---|---|---|---|
| **Boschi gestiti ad alto fusto** | | | | |
| Abete rosso | 0,38 | 0,29 | 1.29 | 1.3 |
| Abete bianco | 0,38 | 0,28 | 1.34 | 1.3 |
| Larice | 0,56 | 0,29 | 1.22 | 1.3 |
| Pini montani | 0,47 | 0,36 | 1.33 | 1.3 |
| Pini mediterranei | 0,53 | 0,33 | 1.53 | 1.3 |
| Altre conifere | 0,43 | 0,29 | 1.37 | 1.3 |
| Faggio | 0,61 | 0,20 | 1.36 | 1.4 |
| Cerro | 0,69 | 0,24 | 1.45 | 1.4 |
| Altre querce | 0,67 | 0,20 | 1.42 | 1.4 |
| Altre latifoglie | 0,53 | 0,24 | 1.47 | 1.4 |
| **Boschi gestiti a ceduo** | | | | |
| Faggio | 0,61 | 0,20 | 1.36 | 1.4 |
| Castagno | 0.49 | 0.28 | 1.33 | 1.4 |
| Carpino | 0,66 | 0,26 | 1.28 | 1.4 |
| Altre querce | 0,65 | 0,20 | 1.39 | 1.4 |
| Cerro | 0.69 | 0.24 | 1.23 | 1.4 |
| Leccio | 0.72 | 1.00 | 1.45 | 1.4 |
| Altre latifoglie | 0.53 | 0.24 | 1.53 | 1.4 |
| Conifere | 0.43 | 0.29 | 1.38 | 1.3 |
| **Fonti** | • 2006 IPCC Good Practice Guidance for LULUCF: **BEFs** Tabella 3A.1.10<br>• Federici S, Vitullo M, Tulipano S, De Lauretis R, Seufert G, (2008). An approach to estimate carbon stocks change in forest carbon pools under the UNFCCC: the Italian case. iForest 1: 86-95 [online: 2008-05-19]: **Densità basale D** e **Root/shoot Ratio R e BEF1** | | | |

# Forest Carbon:
## storage, uptake

- ...GOOD PRACTICES

PROTECTION FROM BIOTIC DAMAGE

....REFORESTATION/AFFORESTATION

- IPCC, 2006 – Vol. 4 chapter 2 – Eq. 2.10 biomass).
- **$CO_2$ year= Iv *BEF1*D*(1+R)*CF*3,67**

# Forest Carbon:
## non-emission

FOREST FIRE FIGHTING

INPUT USE REDUCTION

ENERGY

LIFE 20 PRE IT/017

C·FARMs
CARBON FARMING CERTIFICATION SYSTEM

# D6 REPORT: FEASIBILITY ANALYSIS OF THE SAMPLING FRAMEWORK

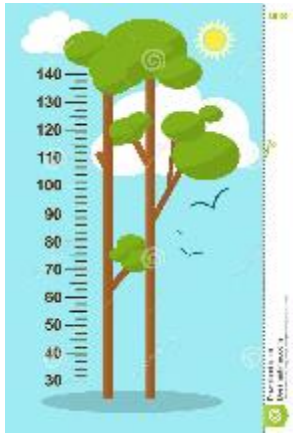
## ACTION A.5

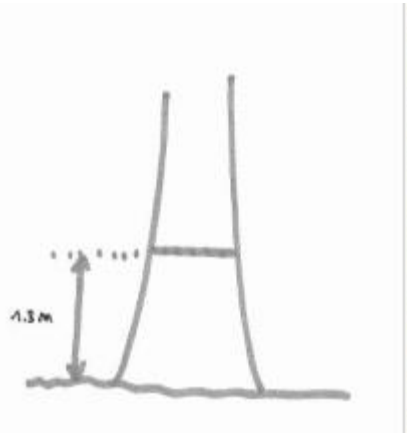
UNITUS, CREA FL E PEFC ITALIA

$CO_2$ S.Fo. Ma
Marche

***«$CO_2$ Stored in Forest Management Marche» Project***
***Calculation and certification of carbon sequestration in managed forests***

*«$CO_2$ Stored in Forest Management Marche» Project*
*Calculation and certification of carbon sequestration in managed forests*




# Pilot areas samplings

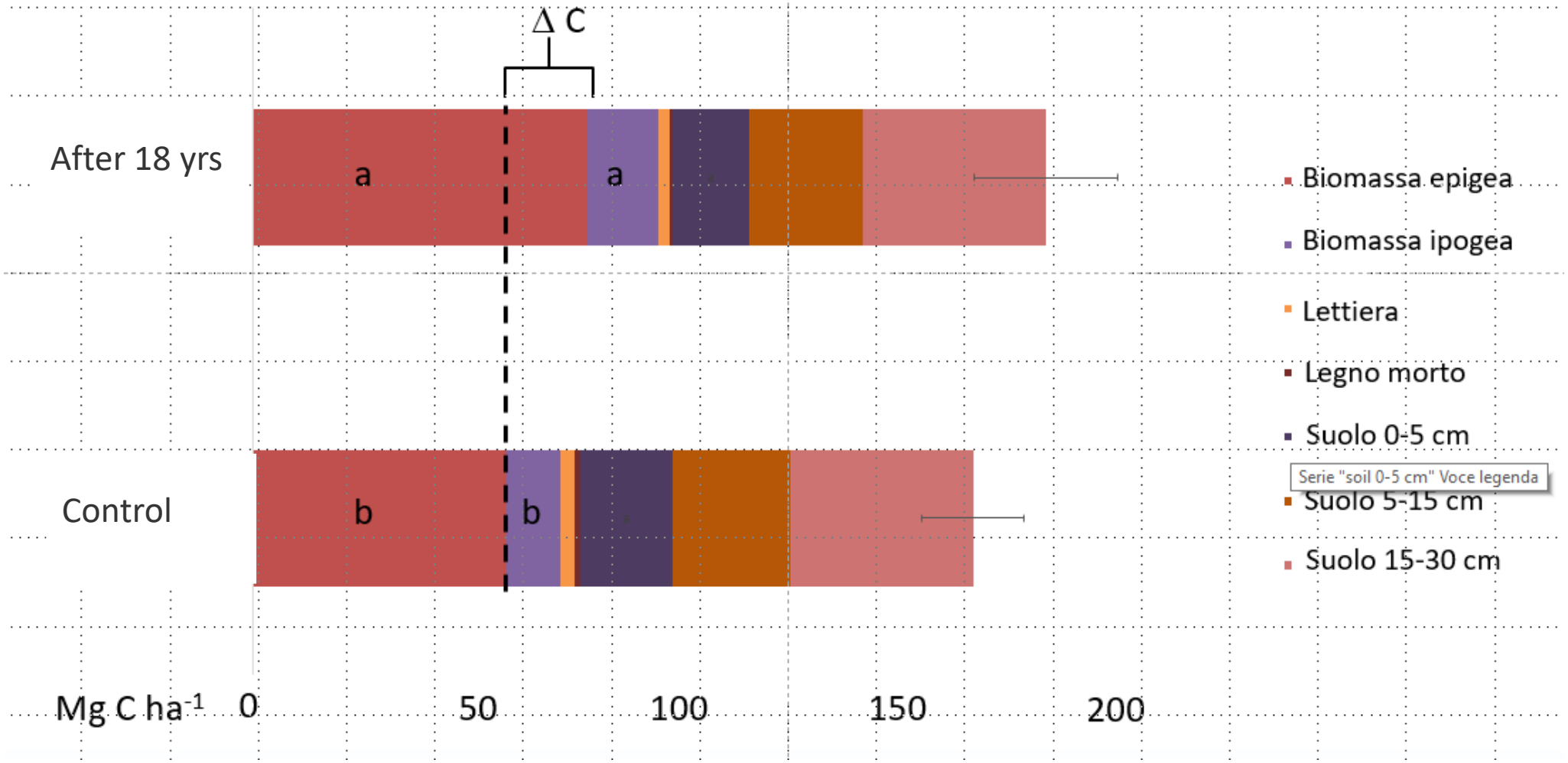
**Carbon POOLS**

- **Aboveground biomass** (Protocol INFC)
- **Soil** (Protocol JRC)
- **Dead wood** (Alberti et al 2008)
- **Litter** (Protocol JRC)
- **Belowground Biomass** (root/shoot)

CO$_2$ S.Fo. Ma
Marche

# *«CO$_2$ Stored in Forest Management Marche» Project Calculation and certification of carbon sequestration in managed forests*

# Monte Maggio - Faggio



# Forest soils can increase climate change mitigation with targeted management

Latest news
Published on02.05.2023

Sebastiaan Luyssaert [l]...Aleksi Lehtonen [a]

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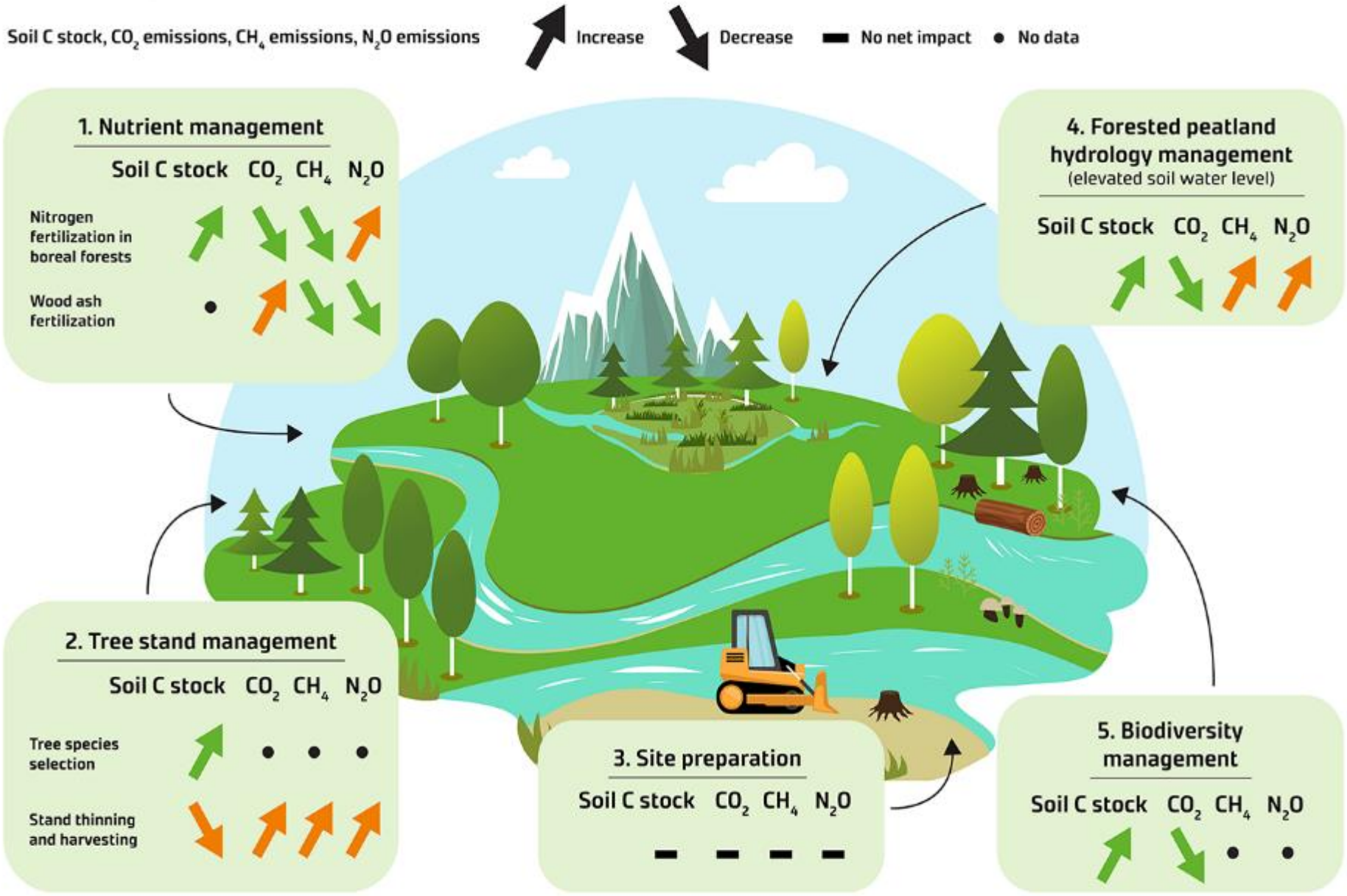


- Management practices affect soil C stock, CO2, CH4, N2O emissions in temperate and boreal forests.
- (Green arrow indicates positive impacts for climate change mitigation and orange arrow negative impacts for climate change mitigation).


| PRACTICE | | Quantification | Additionality | Permanence | Leakage Prevention |
|---|---|---|---|---|---|
| **Afforestation** | | High | High | High | High |
| **Silvi-cultural practices** | *Species selection* | Medium | Medium | High | Medium |
| | *Reduced harvest/ Lengthened rotation* | Low | Medium-High | Medium | Low |
| | *Reduced thinning intensity* | Medium | Medium | Medium | Medium |
| | *Diversification of forest structure* | Medium | Medium | High | High |
| | *No harvesting* | Medium | Medium-High | Medium | Low |
| | *Site fertilisation* | na | Low-Medium | Medium | High |
| **Fire management** | | High | High | Medium | High |
| **Agroforestry** | | Low | High | Medium-high | High |
| **Peatland manage-ment** | *Peatland restoration* | Medium | High | High | Medium |
| | *Continuous cover forestry on drained peatlands* | Medium | Medium | High | Medium-high |

Despite much research over the last decades (Keenan et al. 2013; Kutsch and Kolari 2015; Hyyrynen et al. 2023), the role of forest management on long-term carbon sequestration potential remains uncertain. Consequently, predictions are contradictory among existing models, which disagree on whether the carbon balance of global forests will be positive or negative in 2100.
It is, therefore, generally challenging to derive robust conclusions about the potential of carbon farming practices in the long term.

# Multifunctional management and forest C credit market ... but with respect!


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