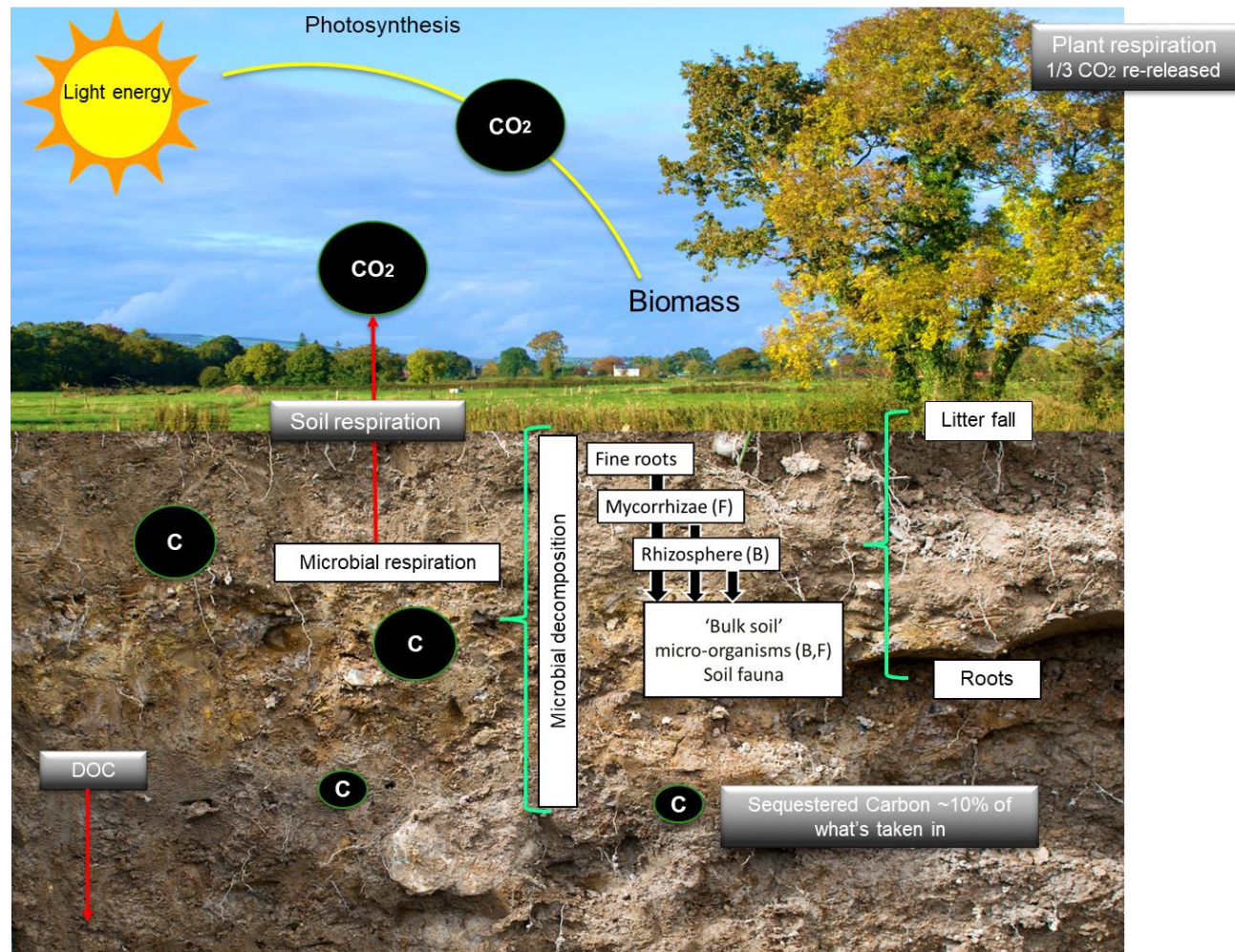# Carbon research - hedgerows

Presented by: Lilian O'Sullivan
Signpost farms
15/12/2021

Carbon sequestration

- Ecosystems that can sequester more CO_2 than they emit = carbon sinks
- Those that emit more than they sequester = carbon sources– LULUCF 4.8 Mt CO_2 eq (2018)
- Carbon sequestration can help balance GHG emissions - MACC

Hedgerow research

Since 2010 Teagasc has been researching the role of hedgerows in land use carbon budgets in order to be able to give:

- the amount of carbon stored in hedgerows nationally

- an annual sequestration figure (the amount of new carbon that is stored by the growing hedgerow every year)

To be able to answer the questions above- we need to know

- the extent of hedgerows,

- the size of hedgerows (the width and height)

- and the type (is it managed or unmanaged, does it contain trees, is it new or old).

- the typical amount of carbon stored in a hedgerow.

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Hedgerow research

2011 – Teagasc Hedgerow Map – image processing techniques of 2005 aerial photography database - 6% country covered in hedgerow and scrub (non-forest trees and woody plants).

2012 - Teagasc/FERS Ltd - Lidar hedgerow scanning (EPA Funding) used laser scanning techniques (LIDAR) to successfully estimate biomass in hedgerows. Using published models:

- Estimated that hedgerows sequester between .66 – 3.3 $tCO_2\ ha^{-1}\ yr^{-1}$
- Estimated total national sequestration of hedgerow and non-forest woodland patches at 0.3 to 1.1 $Mt\ CO_2\ yr^{-1}$.

Hedgerow research

2017 – Teagasc/FERS Ltd – BRIAR (Biomass Retrieval in Ireland using Active Remote sensing) project to explore less expensive alternatives to LiDAR.
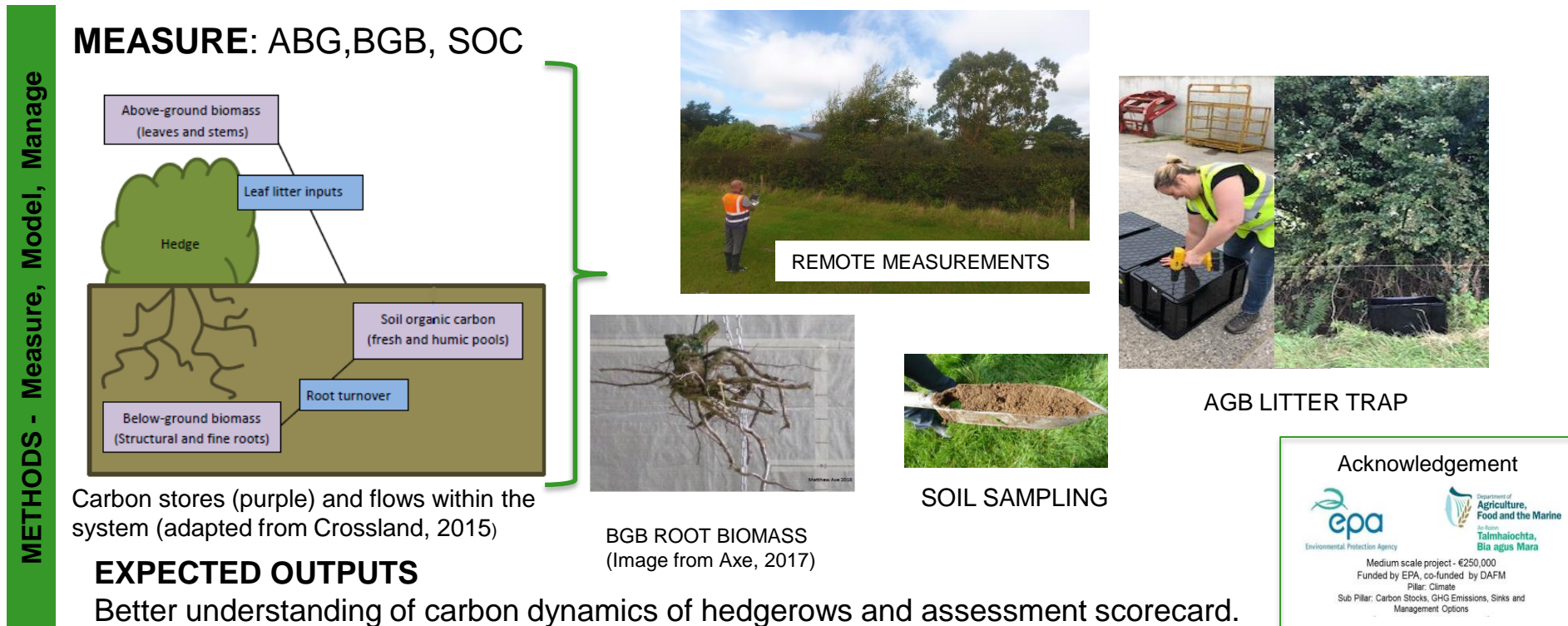
- LiDar or photogrammetry from aircraft or drone required to accurately measure biomass and then estimate carbon
- RADAR could detect hedgerow removal
- Extent ~680,000 km.
- Net removals 1995-2015 of between 0.16% and 0.3% per annum (based on aerial photographic records and county surveys) but rate of decline is much slower in latter half of period.
- Direct measurements of hedgerow biomass are required to quantify carbon stock changes for National greenhouse gas reporting for the Land Use Land Use Change and Forestry sector.

New hedgerow research

OBJECTIVES

Calculate carbon stock of measured biomass from selected hedgerows & relate to volume measurements captured using remote technologies: Δ biomass volume = Δ C stock
Develop an integrated scorecard BMP for carbon and other ecosystem services.

METHODS - Measure, Model, Manage

MEASURE: ABG, BGB, SOC

Above-ground biomass (leaves and stems)

Leaf litter inputs

Hedge

Soil organic carbon (fresh and humic pools)

Root turnover

Below-ground biomass (Structural and fine roots)

Carbon stores (purple) and flows within the system (adapted from Crossland, 2015)

REMOTE MEASUREMENTS

AGB LITTER TRAP

BGB ROOT BIOMASS
(Image from Axe, 2017)

SOIL SAMPLING

EXPECTED OUTPUTS
Better understanding of carbon dynamics of hedgerows and assessment scorecard.

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How to increase C-sequestration?

- Biomass accumulation – aboveground biomass accumulation depends on growth response over time but this is affected by management!
- Biomass density – over-trimming limits accumulation & induces gappiness.
- Extending hedge width has greatest capacity to sequester C in aboveground biomass (Axe, 2017)
- Field boundaries with trees have greater carbon sequestration due to aboveground C storage (Falloon et al., 2004)
- Establishing hedgerow on cropland increases SOC stock by 32% (Drexler et al.2020)

Photos: Julie Larkin, PhD

Summary

Land sector represents an emissions source BUT management can enhance sink potential – e.g. soil and biomass management.

Options to quantify the extent of hedgerows have been trialled – estimates of c-sequestration exist

Current work will refine and develop a hedgerow specific model.

Options to enhance carbon sequestration stocks exist.

Hedgerows have multiple benefits!

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Thank you – Questions?

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References

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