

ASSESSING THE EFFECT OF CM AND GM ON BIOMASS CARBON STOCKS IN THE UK

CEH, SRUC, AFBI

APPROACH

- Identify main CL and GL types in the UK
- Assign carbon stock factors of each CL and GL type
- Assess the area of each CL and GL type
- Calculate biomass carbon stocks for each inventory year
- Calculate annual stock change
- Develop projections

CROPLAND TYPES

- Annual Crops
- Orchards
- Set Aside and Fallow
- “Shrubby perennial crops”
- Short rotation coppice
- Perennial Grass Crops



GRASSLAND TYPES

- Pasture and semi-natural Grassland (non-shrubby GL)
- Shrubby Grassland
- Hedges





GRASSLAND BIOMASS STOCK FACTORS

Crop Type	Total biomass Carbon Stock t C/ha	Uncertainty t C/ha	Source(s)	Root: Shoot ratio
Annual	5	1.2	AFOLU guidelines default; Olsen et al (1983). Uncertainty is the standard deviation of AFOLU default values and T2 values for Germany and Denmark	Assume no Below Ground Biomass.
Orchards	10	6.75	UK Specific value. Milne and Brown (1997) Uncertainty is the standard deviation of the values in Table 3c.	0.24
Shrubby perennial crops	3.7	2.0	Stock is mean of values for blackcurrant biomass from Finland and Denmark and vines from Australia, Canada, Denmark, Germany, Portugal Uncertainty is the standard deviation of these values.	Assume no Below Ground Biomass.
Perennial grass energy crops.	9.97	2.48	Half of the median annual yield of miscanthus from measurements at twelve UK sites (Rebecca Rowe, CEH pers. comm.) Uncertainty is calculated using the standard deviation of these measurements.	2.8
Short rotation coppice	4.36	2.9	Half of the median annual yield from measurements at nine UK sites (Rebecca Rowe, CEH pers. comm.) Uncertainty is calculated using the standard deviation of these measurements.	0.46
Set Aside and Fallow.	5	1	Olsen, et al (1983). Assumed to be similar to non-woody grassland. Ireland adopts a similar approach. Uncertainty mean of Tier 2 Non-Woody Grassland values for Denmark and Germany	4.0

GRASSLAND BIOMASS STOCK FACTORS

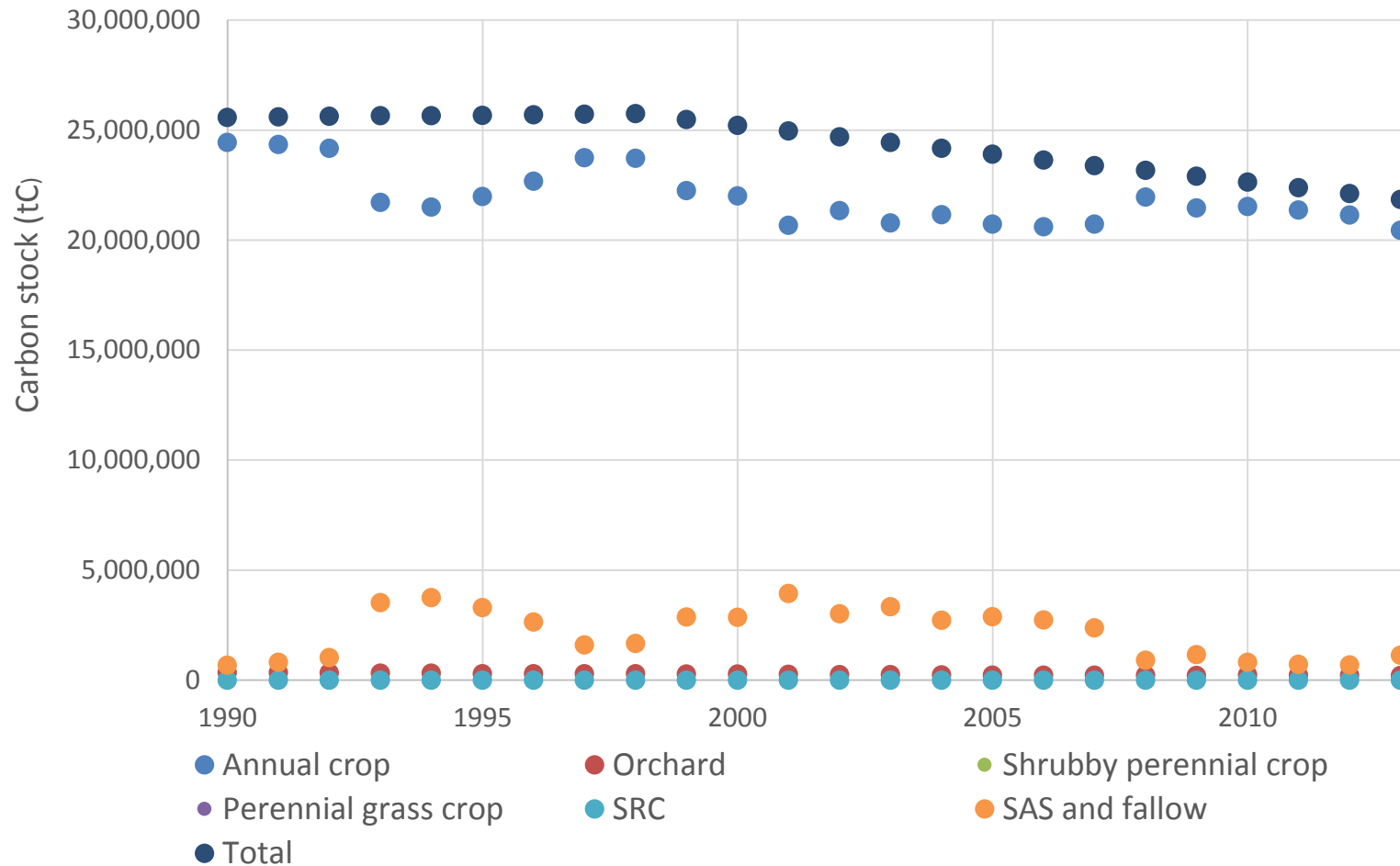
Crop Type	Total biomass Carbon Stock t C/ha	Uncertainty t C/ha	Source(s)	Root: Shoot ratio
Pasture and Semi-natural Grassland	2.8	1.5	Average of UK applicable data. Uncertainty is the combined uncertainty for Above and Below Ground Biomass carbon stocks from that data.	4.0
Shrubby Grassland.	10	3.6	Calculated using Average of values of Above and Below Ground Biomass carbon stocks for heather moorland (including all species) from Kayll (1966), Forrest and Smith (1975), Forrest (1979). Uncertainty is the standard deviation of these data.	0.53
Hedges	546	148	Mean of Above Ground Biomass carbon stocks from Wolton (2012); Robert Wolton, Hedgelink (pers. comm.) and Alfie Gathorne-Hardy, Oxford University (pers. comm.) Below Ground Biomass estimated using the AFOLU guideline default value for Shrubland. Uncertainty is the standard deviation of these data.	2.8

ACTIVITY DATA SOURCES

		
Countryside Survey	Available since 1978. Consistent methodology	No information on crop type. Compiled approximately decadally Not spatially referenced
Annual Agricultural census data	Long, consistent time series. Compiled annually. Includes main crop types for all UK administrations. Good fit with Countryside Survey areas	Not spatially referenced
IACS LPIS	Spatially referenced. Detailed classification. Compiled annually	Only available since 2004 Data very messy. Inconsistent classification across the UK. Poor fit with Countryside Survey areas.
UK Land Cover Map	Available since 1990 Spatially referenced	No detailed information on crop type Inconsistent time series (pixels vs polygons). Compiled approximately decadally
CORINE	Available since 1990	No detailed information on crop type. Compiled approximately decadally.

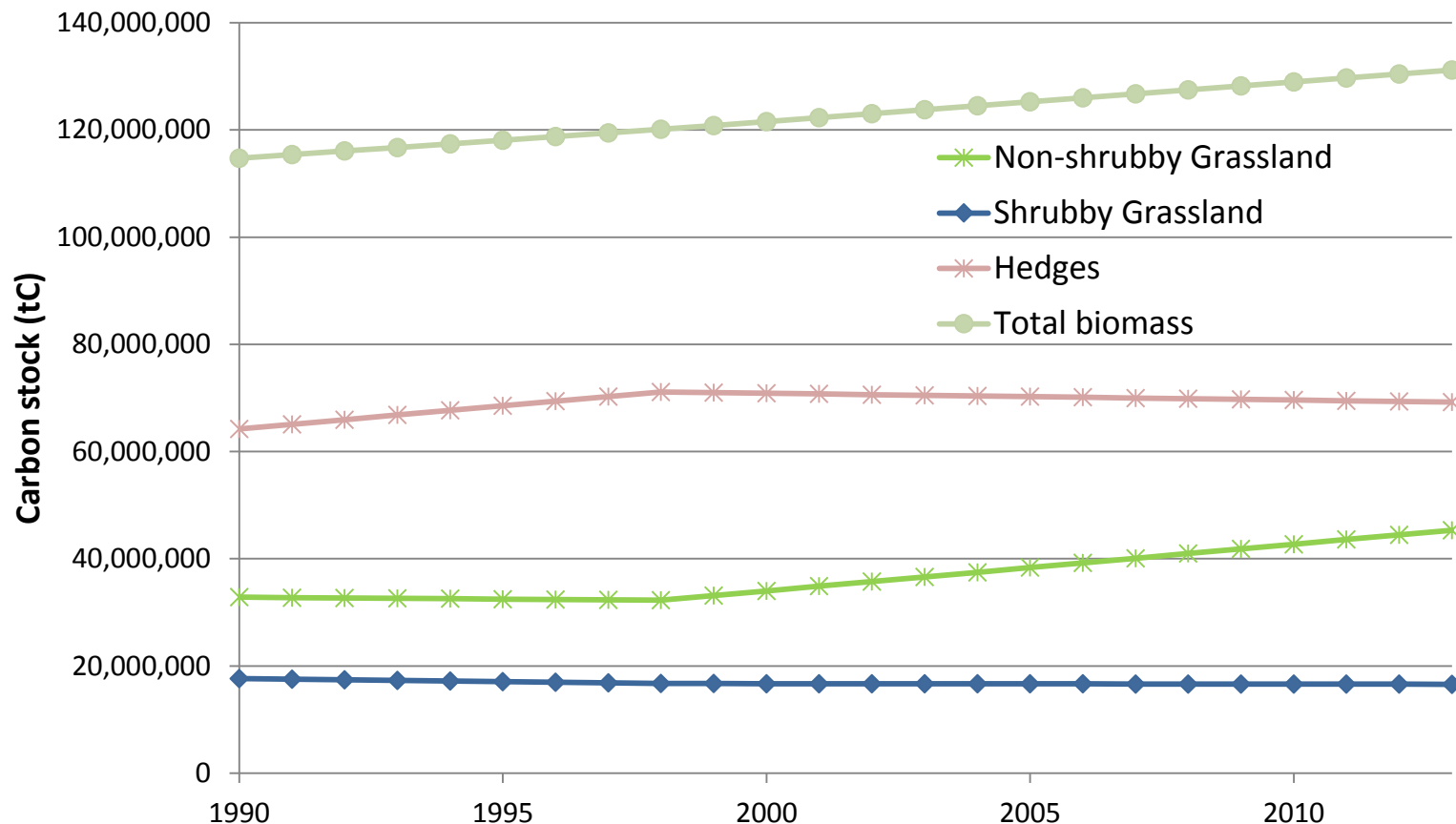
CROPLAND BIOMASS CARBON STOCKS

Cropland biomass carbon stocks - UK



GRASSLAND BIOMASS CARBON STOCKS

Grassland biomass carbon stocks - UK



PROJECTIONS – UK CROPLAND MANAGEMENT

	Low emissions	Medium emissions	High emissions.
England	<p>Increase in Cropland area from Deforestation to Cropland following 1990 – 2013 inventory low emissions scenario (Buys et al, 2014).</p> <p>Deforested land assumed to be under annual crops.</p> <p>Other crop type areas as in 2013.</p>	<p>Increase in Cropland area from Deforestation to Cropland following 1990 – 2013 inventory mid emissions scenario (Buys et al, 2014).</p> <p>Deforested land assumed to be under annual crops.</p> <p>Other crop type areas as in 2013.</p>	<p>Increase in Cropland area from Deforestation to Cropland following 1990 – 2013 inventory high emissions scenario (Buys et al, 2014).</p> <p>Deforested land assumed to be under annual crops.</p> <p>Other crop type areas as in 2013.</p>
Wales	<p>Conversion of 2.5 kha per year from Grassland to Cropland.</p> <p>Converted land assumed to be under annual crops.</p> <p>Other crop type areas as in 2013.</p>	<p>Conversion of 5.5 kha per year from Grassland to Cropland.</p> <p>Converted land assumed to be under annual crops.</p> <p>Other crop type areas as in 2013.</p>	<p>Conversion of 10 kha per year from Grassland to Cropland.</p> <p>Converted land assumed to be under annual crops.</p> <p>Other crop type areas as in 2013.</p>
Scotland	<p>No change in Cropland area. Crop type proportions as in 2013.</p>	<p>No change in Cropland area. Crop type proportions as in 2013.</p>	<p>No change in Cropland area. Crop type proportions as in 2013.</p>
NI	<p>No change in Cropland area. Crop type proportions as in 2013.</p>	<p>No change in Cropland area. Crop type proportions as in 2013.</p>	<p>No change in Cropland area. Crop type proportions as in 2013.</p>

PROJECTIONS – UK GRASSLAND MANAGEMENT

Low emissions	Medium emissions	High emissions.
Change in Grassland area from Deforestation to Cropland and conversion of Grassland to Forest and Settlements following 1990 – 2013 inventory low emissions scenario (Buys et al, 2014).	Change in Grassland area from Deforestation to Cropland and conversion of Grassland to Forest and Settlements following 1990 – 2013 inventory mid emissions scenario (Buys et al, 2014).	Change in Grassland area from Deforestation to Cropland and conversion of Grassland to Forest and Settlements following 1990 – 2013 inventory high emissions scenario (Buys et al, 2014).
All land use change assumed to be to or from non-shrubby Grassland.	All land use change assumed to be to or from non-shrubby Grassland.	All land use change assumed to be to or from non-shrubby Grassland.
Hedge area is 2004 – 2013 average, except Wales where hedge area increases 10% between 2013 and 2030.	Hedge area is 2004 – 2013 average, except Wales where hedge area increases 10% between 2013 and 2030.	Hedge area is 2004 – 2013 average, except Wales where hedge area increases 10% between 2013 and 2030.
Shrubby Grassland area is 2004 – 2013 average.	Shrubby Grassland area is 2004 – 2013 average.	Shrubby Grassland area is 2004 – 2013 average.

THANK YOU FOR LISTENING

