

Managing traditional hedges for biofuel

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- **Hedges are everywhere - 700,000 km in UK**
- **Historically important**
- **Multifunctional**



Photo: HedgeLink, 2013

Hedge fuel - making better use of existing resources



Photo: Hedgelink, 2013

Experiences from Organic Research Centre Trials

Elm Farm and Wakelyns



More information can be found at www.twecom.eu or <http://tinyurl.com/TWECOM>

Hedge Surveys and Planning

- Survey carried out prior to management for woodfuel
- Predominantly under-managed, 75% in favourable condition (as defined by Hedgerow HAP)
- Hedgerow management plans



Harvesting Trials

Hedges



Hedge Harvesting Trials

Small scale



Medium scale



Large scale

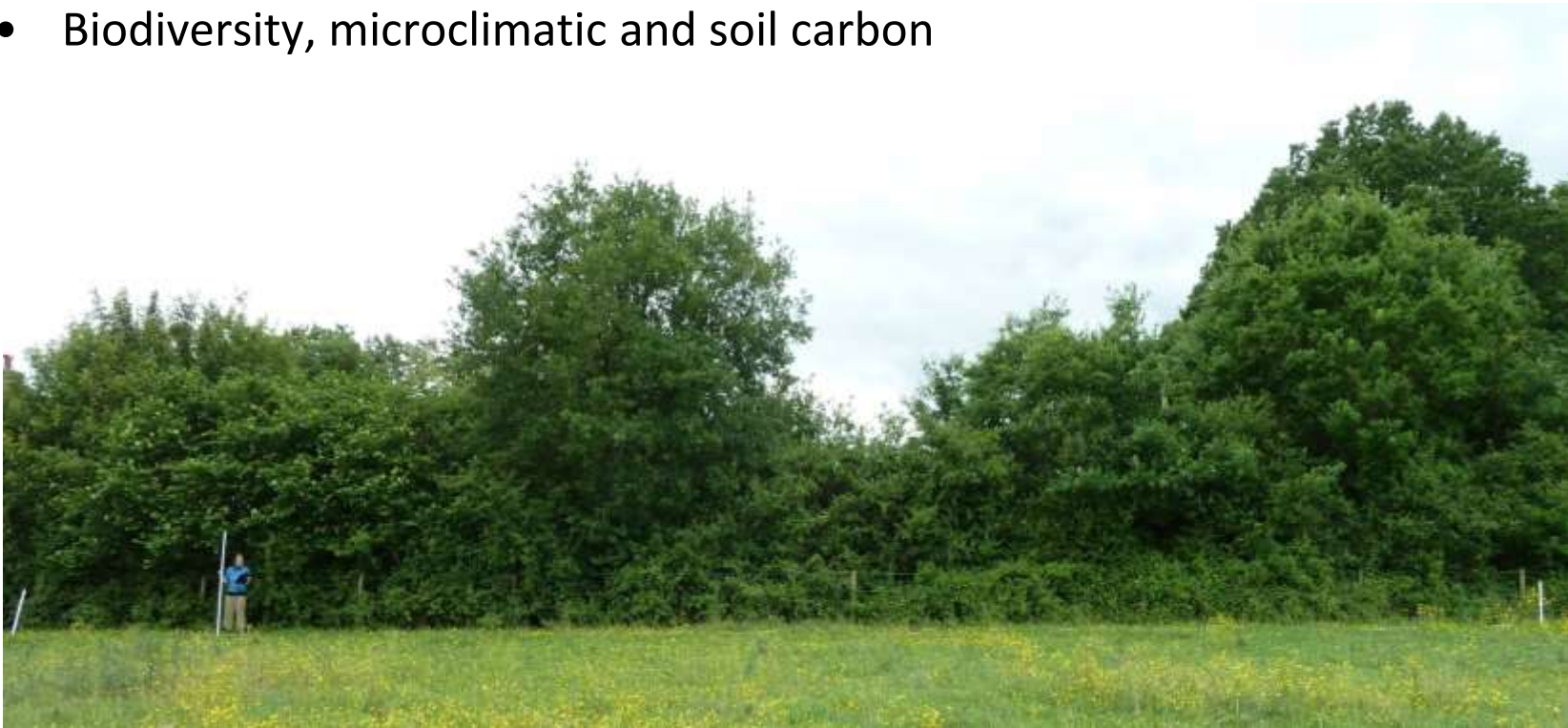


**Harvesting
Methods**

**Processing
Methods**

Assessments:






- Costs associated with each machinery option
- Time to coppice or chip a length of hedge
- Chip quality (M.C., ash, C.V., particle size)
- Biomass productivity
- Coppice regrowth rates and stool survival
- Biodiversity, microclimatic and soil carbon



Some results.....

Overview of performance

Score	Machine availability	Purchase cost	Haulage requirements	Length of hedge /day
1	Regionally	Over £10,000	Low loader required	Less than 50m
2	Within county	£5,000-£10,000	Can use own trailer	50m – 100m
3	Locally	£1,000-£5,000	Self-drive within 10 miles	100m – 200m
4	On-farm or nearby	Under £1,000	Self-drive	More than 250m

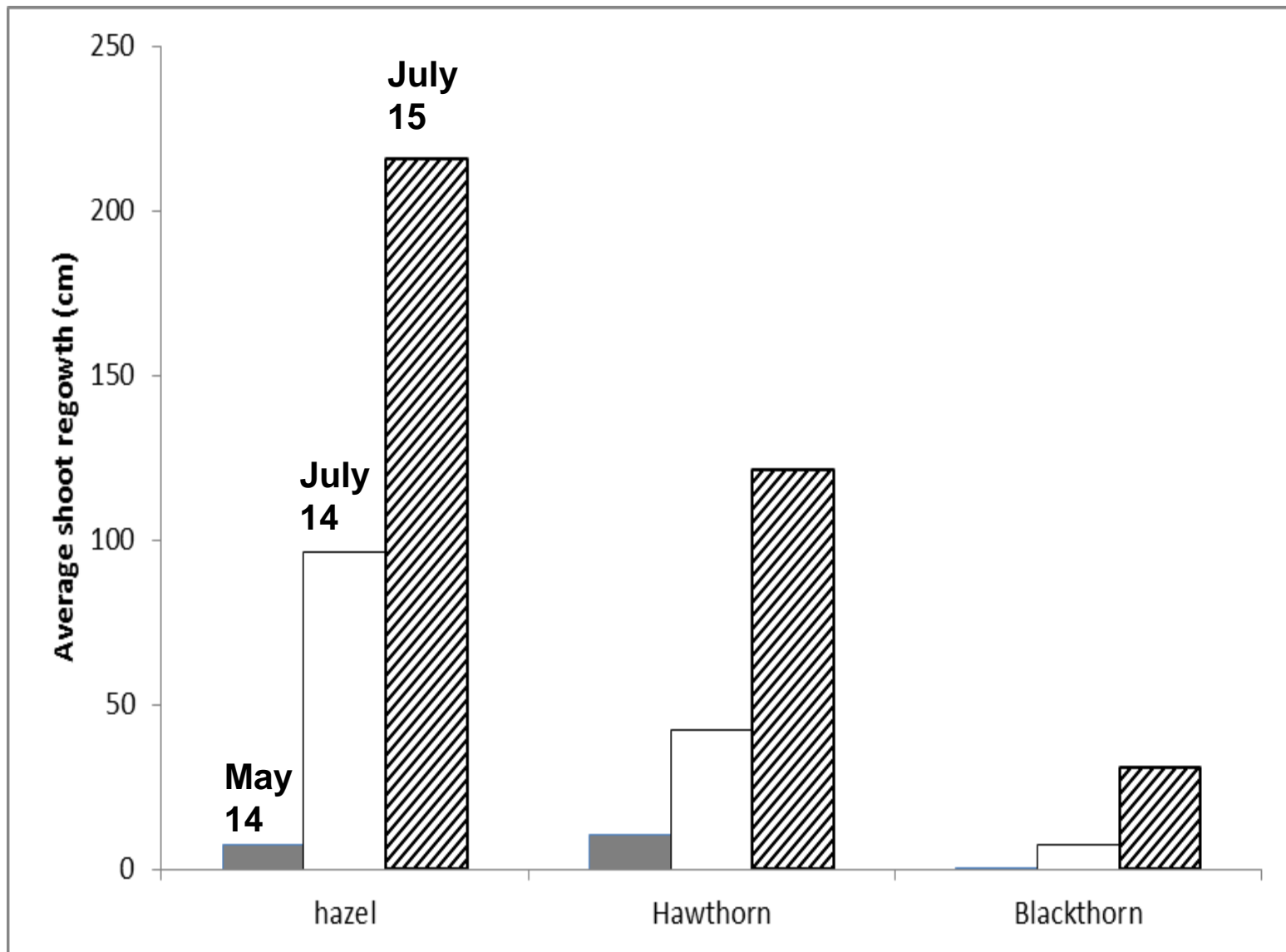
Hire cost 	Machine availability 1 Felling grapple with chainsaw bar	Purchase cost 1	Haulage requirements 1	Length of hedge/day 3
Hire cost 	Machine availability 1 Hydraulic tree shears	Purchase cost 2	Haulage requirements 1	Length of hedge/day 3
Hire cost 	Machine availability 3 Tractor mounted single circular saw	Purchase cost 3	Haulage requirements 3	Length of hedge/day 2
Hire cost 	Machine availability 3 Assisted fell technique	Purchase cost 3	Haulage requirements 2	Length of hedge/day 4
Hire cost 	Machine availability 4 Manual fell with chainsaw	Purchase cost 4	Haulage requirements 4	Length of hedge/day 1

Regrowth

Average regrowth (\pm SE) of different treatments, diagonal shading measured in June 15, solid shading Nov 15



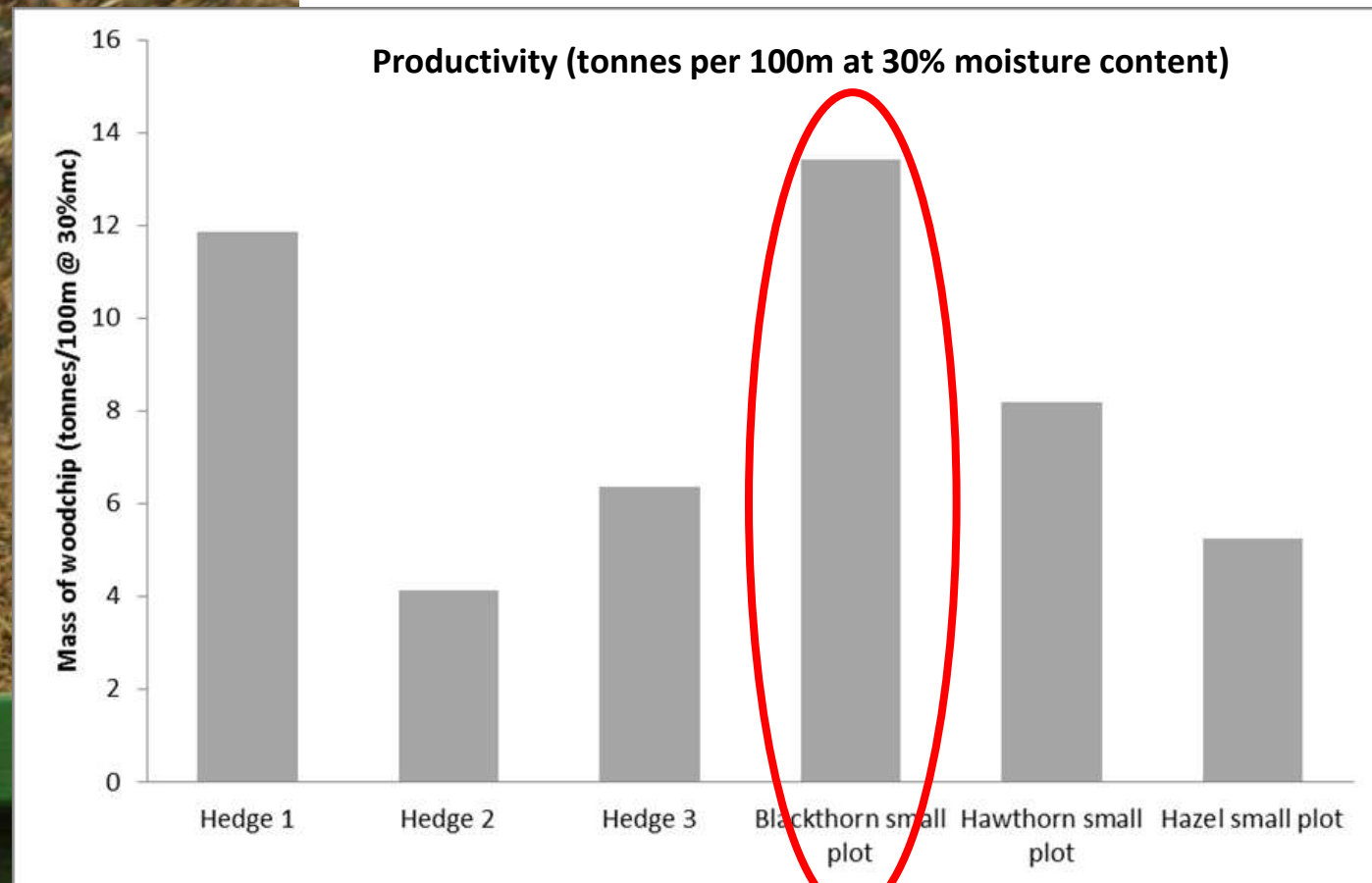
Average shoot regrowth of single species plots at Elm Farm



Woodchip Production

8.2 tonnes average biomass production per
100m hedge (30% MC)

(range 4-13 tonnes)





Fuel quality?

Trials demonstrated that hedgerow woodchip can meet **BS EN** standards and **ÖNORM G30** standards for particle size distribution.

Saleable on the open woodchip market

Comparative Energy Costs to a Customer

Fuel + Method	Pence per Kwh
Hedgerow woodchip (large scale chipper)	1.6 – 3.1**
Hedgerow woodchip (small scale chipper)	2.8 – 4.2**
Bought in wood chips (30% MC)	3.4*
Seasoned wood	5.6*
Wood pellets	6.7*
Mains gas	5.4*
Heating oil	2.8*
LPG (bulk)	6.0*
Electricity	16.6*

* Figures taken from Nottingham Energy Partnership, 2016

** Depends on which harvesting method (does not include transport, cost as self supplying)

Impacts of Coppicing

Management for woodfuel - positive and negative impacts on the wildlife of individual hedges and on biodiversity at a landscape scale

If hedgerows are to be promoted as a source of woodfuel any potential biodiversity impacts need to be assessed



Photos: Hedgelink, 2013

Biodiversity Protocol

This protocol has been developed for farmers interested in harvesting woodfuel from thier hedges to monitor the biodiversity impacts and and aid decision making in the design of a coppice rotation/ hedge management plan.

User Guide

Please refer to the hand book for surveying methods and how to use the tool. The survey handbook is available from www.twecom.com



Photos: Rob Wolton 2014



HEDE DATA ENTRY

Farm landscape

Date	19/08/15
Name of farm	Catherines Farm
Size of farm (ha)	101.00
Length of hedgerow on farm (km)	9.50
Length of hedgerow surveyed (km)	1200.00
Number of individual hedges on farm	5
Number of individual hedges surveyed	5

Key

Enter data

NOTE: Enter the data from your hedge survey in the main data entry form below for each individual hedge surveyed. Some data entry boxes provide you with a drop down list to select from.

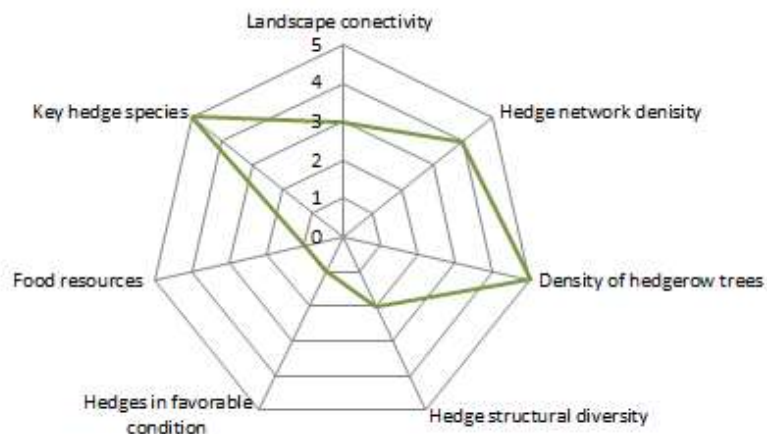
Individual Hedges

Hedge Reference Number	1	2	3	4	5	6	7
1 Length of the individual hedge (m)	600.0	400.0	200.0	200.0			
2 Hedge side surveyed	E		N	S			
3 Hedge growth stage	A		B	A			
4 Average height of hedge shrub (m)	20.00		5.00	10.00			
5 Average width (m)	2.00		4.00	1.00			
6 Average height of base of canopy <0.5m?	Y	N	N	N			
7 % gaps (to nearest 5%)	50	10	0	0	0		
8 Any gaps >5m	Y	N	N	N	N		
9 Number of hedgerow trees	12	2	2	4	4		
10 Number of hedgerow trees with veteran features	12	2	2	0	0		
11 Number of woody species	3	4	4	4	5		
12 Three most dominant woody species:							
13 1	Oak, sessile	Ash	Willow, goat	Hazel	Aspen		
14 2	Maple, field	Hawthorn	Hazel	Blackthorn	Blackthorn		
15 3	Dogwood	Birch, silver	Birch, silver	Maple, field	Pine, Scots		
16 4	Number of non-native woody species?	Y	Y	Y	Y		
17 Bank type	C	B	A	A	A		
18 Bank height (m)	0.50	0.50	0.50	0.50	0.50		
19 Ditch type	A	D	A	D	C		
20 Adjacent land use	A	G	B	B	B		
21 Margin width (m)	3.0	3.0	3.0	3.0	3.0		
22 Cover of nettles, cleavers and docks under 20%?	N	Y	Y	Y	Y		
23 Current management	D	E	A	C	C		
24 Evidence of wildlife	Y	Y	Y	Y	Y		

Results

Indicator	Measurement	Result	Score
Landscape connectivity	average number of nodes per ha	0.095	3
Hedge network density	average km of hedge per ha	0.045	4
Density of hedgerow trees	average number of trees per km of hedge	11	5
Hedge structural diversity	number of hedge growth stages present on the	6	2
Hedges in favorable condition	% of total hedge length in favorable condition	70	1
Food resources	% of total hedge length providing a good food resource	60	1
Key hedge species	number of key hedge species present on farm	6	5

Description	Hedge numbers
Hedges suitable for coppicing	3,4,5,33,55
Hedges in unfavorable condition	2,1,6,8,9,10
Hedges in favorable condition	8,7,4,3



Protocol available from www.twecom.eu

Conclusions:



- Every hedge is different and has to be assessed and managed on its own merits.
- Woodchip of reasonable quality which meets industry standards can be produced from hedgerows.
- The unit energy cost of hedgerow woodchip relatively favourable when compared to the cost of other fuels
- Important to consider the impacts of changes in management on biodiversity and other ecosystem services



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....making better use of on-farm resources including woody features, waste and co-products



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Questions?

