

Hedges for fuel

The Organic Research Centre

Rob Wolton March 2014

robertwolton@yahoo.co.uk

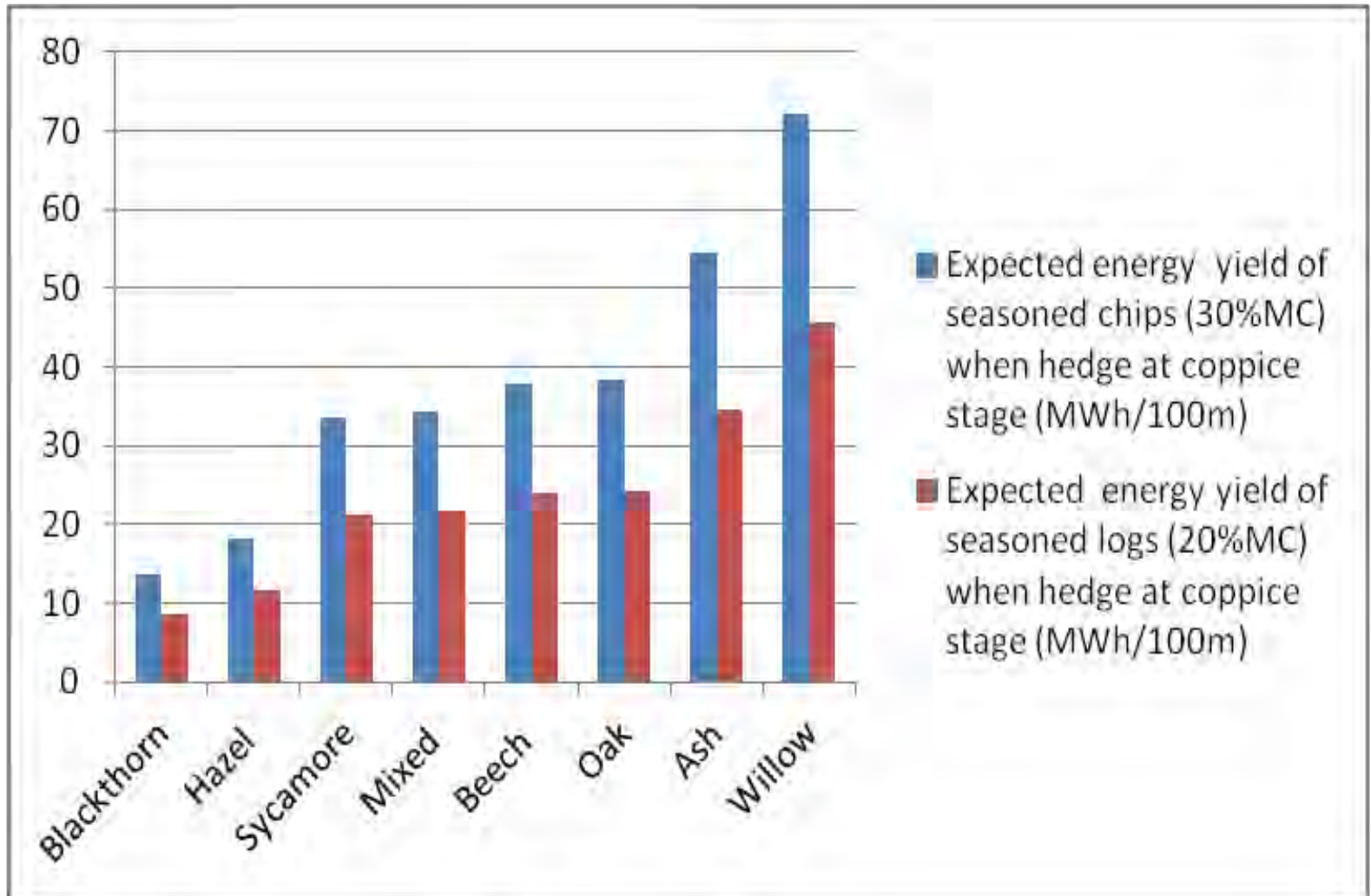


*“Many farms have no other woodland,
nor supply of fuel,
than what their hedges furnish;
yet are amply supplied with this....
Hedge-wood is looked up to as a crop.”*

Marshall (1796)

What hedges types are suitable for fuel production?

- Most hedges! But need to be management appropriately.
- Mixed hedges and beech, ash and willow ones all good.
- Blackthorn hedges, and those in exposed sites or growing on infertile soils, likely to produce poor crops.
- Pure hazel hedges marginal, data lacking on hawthorn hedges.
- The more tree species, the greater the potential.



What woods burn best?

- All wood has same energy content by weight, at the same moisture content.
- Only in open fires are the different burning properties of species likely to be of any importance.
- Far more important to ensure wood is properly seasoned.

Optimal management of hedges for fuel

- ❖ Avoid top cutting - side trimming OK
- ❖ Harvest at coppice stage (6-7m high, larger stems 15-20cm diameter)
- ❖ Don't let hedges develop into lines of trees (although these can be harvested)



NB. Coppicing may require a Felling Licence

What to do about flailed hedges

- ❑ Hedges flailed short for many years will have lost vigour
- ❑ Rejuvenate by coppicing (and discard cut stems)



Planting new hedges for fuel

- ✓ Use species that accumulate biomass rapidly - willow, poplar, alder
- ✓ Ensure fertile soils and good access
- ✓ Consider alley-cropping systems, managing hedge as short-rotation coppice
- ✓ Hedges may also provide useful supplementary fodder



Managing for fuel crop - the options

1. Lay + Log
2. Coppice + Log
3. Coppice + Chip



Logs or chips?

Logs are:

- Flexible - open fires, stove, log boilers or ranges
- Small branches wasted
- Take much muscle and 8x the man hours to produce - but keep you fit!

Chips are:

- Used in woodchip boilers which are highly automated but expensive
- Can use 100% biomass
- More cost effective

Lay + Log system

- Firewood seen as by-product
- Inefficient way to harvest fuel
- Very labour intensive



Step 1. Hedge laid

20 - 50% wood
retained in
hedge as
steepers



Step 2. Brash burnt

70% of
extracted
biomass
wasted in
bonfires



Step 3.

Cordwood extracted
and air dried

Step 4.

Cut and split - by
chainsaw and axe
or firewood
processor



Firewood processor can greatly speed up processing



Step 5. Logs burnt in stove or boiler



Coppice + Chip system

- Fuel is a primary purpose
- Cropping highly mechanised
- Highly efficient



Step 1. Chainsaw coppicing

- On wet soils this will often be only option
- Greatly speeded up if stems lifted clear by tractor grab



Or excavator-mounted feller-buncher used to coppice hedges



Pincer attachment

- Pincers preferred because no risk from wire, stones, etc.
- But damage stools
- Cut high and finish with chain saw?



Step 2. Coppiced material chipped



Step 3. Chips self dry

Simple!

- ✓ No green leaves
- ✓ Heaped under cover
- ✓ Self-dry in 3-4 months
- ✓ Works at farm scale in our climate



Step 4. Chips burnt in boilers

- Boilers completely automated
- Highly efficient
- 1 hour a month to fill hopper and empty ash



35 KW boiler, Lewmoor Farm

Working together

On the continent, there are many examples of joint ventures between farmers and their local communities. They involve:

- ✓ Sharing equipment hire or purchase
- ✓ Shared woodchip drying and storage facilities
- ✓ Commercial partnerships between woodchip producers and end users
- ✓ Heating public buildings like schools, offices, retirement homes, swimming pools

Shared
woodchip
drying and
storage
shed,
Normandy





Mayor's office in Athis, Normandy,
heated by woodchips from local hedges



Community housing woodchip boiler at Samson-de-Bonfosse

| Cropping systems compared | % of material cropped | Time for 100m of hedge (hours) (Will vary greatly between hedges) | | | |
|---------------------------|-----------------------|--|---------------------------------|-----------|------------|
| | | Laying/ coppicing | Processing | Transport | Total Time |
| Lay + Logs | 20 | 56 with chainsaw | 28 with chainsaw + axe | 3 | 87 |
| Coppice + Logs | 60 | 8 with chainsaw + grab | 16 with wood processor | 3 | 27 |
| Coppice + Chip | 100 | 8 with chainsaw + grab | 2 with whole tree chipper | 1 | 11 |

| Comparison of fuel costs (Dec 2013) | Pence per KWh | Comments |
|---|---------------------|--|
| <i>Coppice + Chip system</i> | 2-3 | Chips sourced and processed from farm hedges |
| <i>Coppice + Log system</i> | 4-8 | Logs sourced and processed from farm hedges |
| <i>Lay + Log system</i> | 15-30 | Logs sourced and processed from farm hedges |
| Bought in wood chips (30% MC) | 3.1 | Based on bulk order of 10 tonnes. If chips have to be blown into store will be more expensive. |
| Wood pellets | 4.4 | Based on bulk order of 5 tonnes. If pellets purchased in bags, more expensive. |
| Natural gas | 4.9 | |
| Heating oil | 5.8 | |
| LPG | 6.5 | |
| Electricity | 15.0 | |

Savings and support payments

On-farm hedge woodchip and log costs shown in previous slide do not take account of:

1. Savings from not cutting hedges every year - these may be substantial
2. Any funding through agri-environment schemes (for hedge laying or coppicing)
3. Any funding received through Renewable Heat Incentive - these allow capital costs of boiler installations to be recovered in 6-7 years

Other cropping systems possible

For example,
cordwood or
whole trees can
be seasoned
outside before
being chipped.

Greater wear on
chipping machines
and trees must be
transported....



Whole 20 yr old trees, including
roots, drying for chipping,
Whitemoor Farm

But advantages of this system are:

- ✓ No need to have shed to dry chips in
- ✓ Chips have lower moisture content (20 % vs 30%)
- ✓ No need to double handle chips
- ✓ No loss of 15% of biomass through fermentation



200KW woodchip boiler for 9 houses, Whitemoor Farm

Chip quality

- Must be matched to boiler requirements
- Good boilers not fussy!



Branch loggers - transitional between Logs and Chip systems?



How much hedge does a farm need?

- ❖ 100 - 200m of hedge need to be cropped each year to heat a typical four bedroom leaky farmhouse (35MWh), using the Coppice + Chip system.
- ❖ Five times this amount will be necessary under the Lay + Log system - unlikely to be feasible if hedges only source of firewood.
- ❖ Taking 150m as the average length needed each year, on 17-18 year coppice cycle, about 3km of hedge need to be managed for fuel to heat the farmhouse.
- ❖ For environmental reasons, usually a farm will need to have at least 6 km of hedge in total.

But there are disadvantages to Coppice + chip system

- Risks to biodiversity, landscape and social amenity
- Cultural change
- Woodchip boilers expensive - £30,000 for a typical farmhouse (£12,000 for log boiler)



Biodiversity

- X Untrimmed hedges provide poor cover
- X Coppicing reduces habitat continuity
- ✓ More flowers on shrubs
- ✓ Greater herb, invert, bird and mammal diversity over full cycle



Impact on landscape

- Lines of trees already common
- Greater structural diversity



Impacts on social amenity

Untrimmed hedges can:

- Obstruct views
- Impede access along paths
- Reduce visibility along roads



Impact on culture

- Laying is traditional, not coppicing - but plenty of scope for both!
- Uncut hedges seen as untidy



Proposed environmental safeguards

- Max 50% hedges on farm managed on Coppice + Chip system
- Max 25 year coppice rotation, normally 10 - 20 years
- Max 5% of hedges on farm coppiced in any one year



Some conclusions

- ❖ Coppice + Chip method more cost-effective, but Lay + Log method may be better for small scale and community initiatives. Coppice + Log is intermediate.
- ❖ Fuel can be produced from hedges at less than half the price of buying heating oil, and sustainably
- ❖ Substantial capital investment needed for boilers, but machinery can be hired
- ❖ Cultural resistance may be expected - involve local community
- ❖ Environmental safeguards needed

Resources

- Technical guide in preparation - Devon Hedge Group & Cordiale
- Tools to assess the yield of hedges are in development - <http://www.cordialeproject.eu>
- Wood fuel from hedges toolkit for community groups, Dartmoor Circle. <http://www.dartmoorcircle.org.uk>
- Five reports on woodfuel from SW hedges www.hedgelinek.org.uk/wood-fuel
- Biomass Energy Centre. www.biomassenergycentre.org.uk.

Managing hedges for fuel will help to save them. Thank you.

