

Private landowners' engagement with woodfuel production: a scoping study in Fife

**A report to the Social & Economic Research Group
Forest Research, Forestry Commission**

by

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Beechwood fires burn bright and clear
If the logs are kept a year
Store your beech for Christmas tide
With new holly laid beside
Chestnut's only good they say
If for years 'tis stored away
Birch and fir wood burn too fast
Blaze too bright and do not last
Flames from larch will shoot up high
Dangerously the sparks will fly
But Ashwood green and Ashwood brown
Are fit for a Queen with a golden crown

Oaken logs, if dry and old
Keep away the winters cold
Poplar gives a bitter smoke
Fills your eyes and makes you choke
Elmwood burns like churchyard mould
E'en the very flames burn cold
Hawthorn bakes the sweetest bread
So it is in Ireland said
Applewood will scent the room
Pearwood smells like a flower in bloom
But Ashwood wet and Ashwood dry
A King may warm his slippers by.

Summary

1. In response to growing calls for social research to support national forest policy, Forest Research commissioned a scoping study in October 2008 to focus on woodfuel production and use. This report covers the main part of this study, a survey of private landowners in Fife.

2. The objective of the survey was to discover the attitudes and actions of private landowners in relation to options for woodfuel production and use.

3. Nine owners and one manager of private land in Fife completed a questionnaire and a semi-structured interview. Five were not currently engaged in commercial fuelwood production or sale. Three were growing short rotation coppice (SRC) for woodfuel and three sold firewood from forests (one did both). Other stakeholders interviewed included forest managers, other private landowners, firewood merchants, a timber contractor, wood-stove retailers and owners, and some involved in a community woodfuel project in Falkland.

4. Most surveyed made land management decisions either with a joint owner and/or with input from consultants or grant-giving bodies. Some decisions were also influenced by others living locally. Carbon emissions were not a major influence on owners' land management decisions.

5. All woodland owners surveyed used firewood from their woods in open fires and most also gave it to others. One had a log boiler; two had rejected installing wood boilers as being too labour intensive to run, one was looking at installing a community boiler to burn cereals and well-chipped wood to heat several estate houses.

6. All with woods recognised firewood as a forest benefit and chose at least three other benefits from a list: mostly conservation, landscape, shelter, and shooting/stalking. Some benefits were actively managed for and some provided other benefits in kind. When asked: why keep the woods?, the most frequent reply was: the woods have always been there; others included: not cost effective to remove, shelter, wildlife and landscape.

7. Commercial firewood sales from forests by those surveyed were as large logs to timber contractors - a by-product of timber operations which often do not cover costs. This firewood supply does not respond easily to changes in demand, because operations follow the timber market.

8. Winter 2008/09 saw a big rise in firewood log sales in Fife, compared to the past 10-15 years. Firewood merchants interviewed had not raised prices, as customers can switch to alternative fuels. Most landowners and a timber contractor gave economic reasons for not selling (more) firewood: high cost of extraction and low value product.

9. Firewood extraction costs depend on woodland type and location. In some circumstances, it may be economic to extract more firewood to meet the new local demand. Three estates (two in the survey) have begun collaborating on a firewood production project.

10. In all four cases where short rotation coppice (SRC) had been planted for woodfuel, the landowner believed that SRC could produce a better financial return than the previous land use. All had planted 10 or 15 ha of willow on marginal land with formerly low returns.

11. Problems with SRC included lack of information on SRC management, especially weed control and poor crop management by the woodfuel company. One had taken SRC willow out after 2 ½ years mainly due to poor growth and better wheat prices. None surveyed had yet had a woodfuel harvest. Good points cited were the grant to cover initial costs, low levels of maintenance needed, good habitat for birds, and opportunity to diversify the business.

12. The two most common reasons for not planting SRC were 1. the perception of poor financial returns relative to agriculture, particularly in the long term and 2. expected field drain damage by well-established willow roots and the prohibitive cost of returning land to agriculture. Concerns over food security were among reasons given by landowners for not planting trees on good arable land.

13. Recommendations: 1) case studies of individuals to identify specific factors that would enable more fuelwood production from existing woods; 2) a study to collate information required for landowners to make informed decisions about producing woodfuel for on-site use; 3) a wider survey assessing SRC growers' experience and information requirements, and setting up local growers' groups to share information where appropriate; 4) on-farm trials of SRC growth and harvesting on marginal land types; 5) an assessment of the extent of the need for planting woodfuel on drained land, taking account of land required for national food security and biomass fuel production potential from un-drained land.

1. Introduction

Trees are among the highest yielding crops in terms of stored energy per hectare (ha). Willow¹ plantations yield roughly 167 Gigajoules (GJ)/ha/yr²; wheat straw³ only 62 [1]. Trees are also among the most efficient sources of biomass in terms of harvested crop energy per total energy input (the energy ratio). Though grass produces similar yields to trees (up to 15 dry tonnes (t) /ha/yr), the energy ratio for conventional forestry has been calculated at 10 – 20 and 5-15 for short-rotation forestry, but only 2.4 -5.6 for grass and 3.4 for wheat [2].

When the UK Government signed up to the Kyoto Protocol in 1997, it agreed to take measures to reduce the UK's carbon emissions between 2008 and 2012. Burning and re-growing wood can reduce carbon emissions by replacing fossil fuel use. In 2002, the UK Government introduced Renewable Obligations Certificates (ROCs) which have lead electricity suppliers to install a small number of wood-fired and co-fired power stations: Steven's Croft, a 44 megawatt (MW) power station near Lockerbie, opened 27 March 2008 and is predicted to save 140,000 tonnes greenhouse gas emissions each year [3].

To meet the predicted increase in demand for woodfuel, a key aim for the Scottish Forestry Strategy is expansion of Scotland's woodfuel resource [4]. Private landowners own an estimated 66% of Scotland's forests [4] and it is believed that large areas of privately owned woodland (an estimated 350,000 ha in Great Britain as a whole [5]) could be managed so as to produce more woodfuel without compromising timber crops or other woodland benefits.

In October 2008, Forest Research commissioned a short scoping study to assess the extent of private fuelwood production and sale in Fife, and to explore how private landowners in the area might be encouraged to produce more fuelwood. This study was intended to complement larger studies commissioned in England, to explore whether separate issues needed to be researched in the Scottish context.

2. Background

a) Woodfuel markets

Woodfuel can be logs, woodchip or pellets. For central heating boilers, each fuel has its own boiler: only logs can be burnt in log boilers and so on. Logs have to be fed manually into log boilers, daily for domestic-sized boilers. Woodchip and wood pellets can feed automatically through a hopper.

In Fife, a 25 MW biomass plant, reportedly be able to burn woodchip as well as dried waste, is scheduled to be operational at Longannet by 2010 [6, 7]. Last August (2008) Tullis Russell (paper makers) announced plans to install a 45 MW biomass combined

¹ Willow at 30% moisture content grown in short rotation coppice plantations

² 1 Gigajoule is equivalent to 0.278 kilowatt hours

³ Wheat straw at 20% moisture content

heat and power (CHP) plant at Markinch, to be fully operational by 2011 [8]. Government grants have encouraged further woodfuelled heat systems in Fife, both domestic and medium scale: Dunfermline Business Centre, for example, buys woodchip from Balmoral Estate to fuel its 110kW boiler [9].

Wood pellets are a more energy-dense fuel than logs or woodchip, and are thus more convenient for urban households, where storage space is limited. Wood pellets produce 17 – 18 GJ/t compared to 14.7 GJ/t for air-dried logs⁴ or 12.6 GJ/t for woodchips⁵ [1]. Wood pellets are made from compressed sawdust. Waste sawdust can be used, or wood can be ground to sawdust in a hammermill. The energy requirement for the pelletising process is around 2.3% of the chemical energy of the pellets [10], making them potentially more energy efficient than wood chip or logs (depending on other forms of embedded energy, such as transport). Pellets are the most expensive of the three woodfuels, but they are the lightest to transport, and (unlike logs) do not have to be manually fed into the boiler. Chips boilers can become blocked by sub-standard woodchips: pellets are a more uniform, reliable product [11]. Biomass pellets are already an established method of heating in several countries including USA, Sweden and Austria.

b) Short Rotation Coppice

To produce wood for fuel commercially, short rotation coppice (SRC) has been developed. Many broadleaved species if cut back to ground level will 'coppice' i.e. produce several shoots in place of the original one. The new coppice shoots grow more quickly than the original stem, because the more extensive roots can more fully exploit the soil and also contain carbohydrate reserves.

Mean biomass yields for temperate coppice plantations of 6-8 dry t/ha/year were quoted in the 1980s; similar to yields of conventional forestry on comparable sites [12]. A commercial breeding programme of willows was started in Sweden by Svalöf Weibull AB in 1987, and optimal experimental yields of 14 – 20 oven dry t/ha/yr are now reported [13, 14]. Forest Research is running a UK-wide network of experiments on SRC willow and poplar yields, planted in 1995 and 1996 [15a & b].

Over the trees' lifespan, coppicing may not produce significantly more biomass each year from a tree, but it produces it at a convenient height and size for harvesting. Furthermore, coppice stems air dry more quickly and can be processed more easily than full-grown trees owing to small stem diameters. For woodchip, stems only 1-2 inches in diameter are needed, so harvests can be frequent - every 3-5 years for a fast-growing species like willow. This 'short rotation coppice' (SRC) can be harvested and shredded to chips by machine.

The Steven's Croft power station, near Lockerbie, uses 480,000 tonnes wood each year, of which 20% (96,000 tonnes) was intended to come from SRC willow [3]. Woodfuel companies were set up to encourage SRC planting by private landowners, but by 2007 only about 200ha of SRC and short rotation forestry was estimated to have been planted [7]. Steven's Croft burns other fuel: wood waste, sawmill

⁴ Stacked air-dried logs at 20% moisture content.

⁵ Woodchips at 30% moisture content.

byproducts, and small roundwood. Scotland's available woodfuel resource was an estimated 700,000 oven dry tonnes (odt)/yr in 2005, which could support, at most, about 11% of Scotland's domestic space and water heat requirement [16].

c) Types of Landowner

Over the past 15 years, a number of studies have sought to identify 'types' of private rural landowner in an area, with a view to guiding policy so as to effectively motivate landowners. Studies in the UK have assessed farmers' attitudes to wildlife conservation, aiming to increase farm uptake of environmental schemes. More recent studies have concentrated on types of rural woodland owner in terms of their willingness to provide public benefits [17, 18, 19]. There is now interest in assessing farmers' attitudes to woodfuel production with a view to increasing uptake of schemes aimed at increasing woodfuel supply.

3. Aims

The scoping study set out to address the question set by Forest Research: "what is the level of engagement of private landowners in commercial woodfuel production in Fife, and why?"

As more information emerged, the aims became more specific, i.e. to discover

- a) background information on land ownership and use,
- b) landowner membership of groups that might influence management decisions,
- c) landowners' engagement with firewood production and use and their attitudes to their woods, and to firewood production from their woods,
- d) landowners' engagement with, and attitudes to, woodfuel production from short rotation coppice, and
- e) landowners' attitudes and values regarding land management; particularly factors that could affect woodfuel production.

4. Methods

Ten owners or managers of land in Fife were interviewed; five who sold fuelwood commercially and five who did not. Six were farmers, three estate owners and one an estate manager. Semi-structured interviews, about half an hour in length, were conducted. A questionnaire was used, partly to guide the semi-structured interviews, and partly to obtain further information (see Appendix 12).

Seven factors were identified that might influence a decision to produce fuelwood commercially: 1) income, 2) business issues, including grants and litigation, particularly relating to trees and fuelwood, 3) energy independence, 4) climate change, 5) wildlife conservation, 6) landscape, 7) perception of the public in relation to farmland. A Likert scale attitudinal survey was then developed to explore the relative importance of these factors amongst the respondents. 33 statements were devised and discussed with SERG (Forest Research's, Social and Economic Research

Group). These were modified and reduced to 30 after three interviews, and reduced to 11 after a further four interviews. (Statements are shown in Appendices 9 - 12)

Five private landowners, producing woodfuel commercially, were identified with help from Forestry Commission staff, informal discussions with landowners, internet searches of forested estates, and from one of the woodfuel companies. Three landowners interviewed grew willow in SRC, and three sold commercial firewood from their woods (one did both).

As each commercial fuelwood producer completed a questionnaire and interview, a non-fuelwood producer was sought with roughly matching farm characteristics, in an approximate attempt to 'pair' fuelwood and non fuelwood producers. Four out of the five fuelwood producers owned over 200ha (500 acres), and one owned 81 ha (194 acres), so the survey concentrated on larger land-holdings.

Owners of large land-holdings account for most of Fife's area, so the scoping study is reasonably representative of the county as regards land-holding size. 92% of Fife is in landholdings of 50 ha or more (among 36% of owners) and nearly half (45%) the rural land in Fife is in landholdings of 200ha or more [20]. Furthermore, as a group, these owners are in a position to have a greater impact on commercial fuelwood production.

Further information was obtained from i) interviews with two other Fife landowners producing no commercial fuelwood, ii) a landowner near Fife who had attended a meeting on SRC in Fife, but had decided not to grow it, iii) four people involved in a community woodfuel project in Falkland including the forest manager, iv) two other forest managers, v) two firewood merchants, vi) four stove retailers and vii) two wood-stove owners.

5. Results of the Survey

a) Land ownership and use

Figure 1 summarises land use and ownership information.

b) Land management decisions and group membership

During the first interviews, it became clear that the owners reached land management decisions with input from at least one other individual: a consultant or a family member. Later interviewees were asked whether others were involved in their land management decisions, and if so, who.

One owner said he made all management decisions without input from others, but nine interviewees mentioned at least one other person, including agro-chemical consultants, agricultural or forestry consultants, and a grant giving body (the Scottish Government Rural Payments and Inspection Directorate). In several cases, decisions were made jointly with a joint owner. The estate manager was employed for the whole estate (5000+ ha), though the same estate also had a farm manager and two forest managers.

Figure 1. Farm and Woodland Characteristics

C O D E 1	Ho me use FW 2	Fire -wd sold 2	SR C will -ow	Main “crop” 3	Other “crops” ³	Area owned⁴ [rented]⁵ (acres)	Area of woods (acres)	Yrs own⁶ land
OOO1	O	O	O (No long er)	Barley	Broccoli	86 [358]	0	11 to 25
DOO2	√	O	O	Soft fruit	Arable: winter wheat	500 to 1000 [500 to 1000]	25 to 50	More than 50
DOO3	√	O	O	Grain last 2 yrs. (Single frm payment)	Sheep, cattle.	1000+	10	More than 40
DOO4	√	O	O	House letting	Barley, oilseed rape, wheat (and SFP)	396	15 – 20 + 300 Xmas trees.	More than 50
DOO5	√	O	O	Winter wheat	Barley, oilseed rape, beef, cottages, land rents.	1000+	272	More than 50
DFO1	√	√	O	Housing letting	Beef, sheep, arable	1000+	288	More than 50
DFO2	√	√	O	Tourism	Snowdrops, holiday lets, golf course, timber, Garden	1000+	51-100	26 to 50
DFC1	√	√	√	Bed & Break- fast	Barley, seasonal lets, cottage rent, countryside premium scheme	571	180 (+ 25 SRC)	11 to 25
DOO1	√	O	√	Digger & plant hire.	Potatoes usually main cash crop. Wheat, barley, oats. Suckling cows	600 [200]	30m field & river edges (+25 SRC)	26 to 50
DOC2	√		√	Mast rent, Single farm payment	Letting grazing; broccoli	194	54 (+37 SRC)	26 to 50
<i>Below: landowner near Fife who attended a meeting in Fife about SRC</i>								
DOO1	√			Sheep.	1. short lets 2. weddings, corp- orate entertainment 3. grain.	500 to 1000 [1000+]	100 to 250	More than 50

1. Landowner code. See tables of results in appendices for details;

2. Firewood from landowners' own woods/forests for home use or commercial sale;

3. “Crop” = income earner from the land; 4. Area of land owned and/or farmed as hereditary tenant;

5. [Any additional area rented is given in square brackets];

6. How long have you owned the land. (Range of years given).

DOO5. Interview with estate manager who tries to fit in with owner's long-term policy.

In some cases, at a weaker level, the needs of neighbouring farmers or the local community (as in the case of the Falkland community woodfuel project, see p12) affected management decisions. In one case a less financially advantageous option had been unofficially chosen to accommodate a neighbour's needs.

The respondents belonged to one or more of the following groups: Scottish Agricultural College (SAC), National Farmer's Union (NFU), Scottish Rural Property and Business Association (SRPBA), Farm Woodland Advisory Group (FWAG), British Association of Shooting and Conservation (BASC), the Game Conservancy, Tayforth Machinery Ring, Scottish Quality Cereals, East of Scotland Growers (a vegetable-growers group), and Linking Environment and Farming (LEAF). One mentioned that they used to belong to the NFU, and another to FWAG, but no longer.

c) Attitudes to woods, and to production & use of firewood

Why keep the woods?

Nine of the 10 landholdings had some woods and eight owners/managers of these were asked why they kept the woods as a semi-structured question. None gave firewood as a major reason to keep woods, though all use it. Financial reasons are given by some, as well as a desire to maintain the status quo, see Figure 2. Appendix 2 has more details of replies.

Figure 2. Why keep the woods?

- "The woods have always been there" (status quo) (3/8)
- Shelterbelt for animals (2/8)
- Wildlife habitat (2/8) (SRC monoculture – less biodiversity (1/8))
- Not cost effective to convert to cereals (2/8)
- Landscape rather too barren already (1/8)
- Had hoped for income from timber: stocking too low for economic harvest (1/8)

Benefits of woods

Suggested benefits were listed in the questionnaire and some respondents added other benefits in the space provided.. Nine of the ten owners had woods and all saw at least four benefits from them. Some were actively managing for non-wood benefits such as recreation, landscape and shelter for animals. See Figure 3 below. More details in Appendices 2 & 12.

Firewood use by landowners and others

All nine landowners with woods used the woods to supply part of their own domestic heating. All used logs in open fires, but one respondent also had a log boiler. It was one of seven boilers used on an estate, and was not in use at the time of the interview owing to a short-term lack of a covered wood store. All had other (non-wood) forms

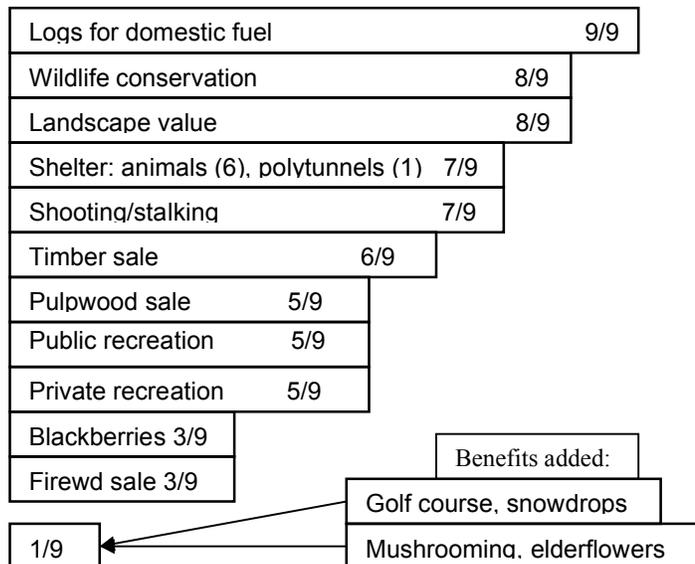
of heating, (one had a grain-fuelled boiler). One respondent was investigating installing a community biomass boiler which would run off both woodfuel and grain to heat several estate houses. Two had recently considered installing a woodfuel boiler (one logs and one pellets) but had decided they would be too labour-intensive to run. Balcas, based in N. Ireland, now provide pellets blown into hoppers throughout Scotland, which replaces the need for manual pellet feeding. Balcas are building a pellet plant in Invergordon, N Scotland due to open April 2009.

The wood boiler owner said he did not use wood for heating because it was cheaper than alternatives: he used it on principal. It was a good use of the woods. He had been chairman of the Organic Growers Alliance and involved with the Soil Association for many years. He believed in sustainability. He had chosen a log rather than a chip boiler because producing chips involved a large initial expense, and small impurities in the chip could cause problems in a chip boiler, and the estate staff could feed the boiler.

Greater use of their own woodfuel could encourage landowners to engage more with woodfuel production. A pellet producing machine, that could promote greater on-site use of woodfuel, is currently being developed by PelHeat in Staffordshire [27a, 27b]. The domestic-scale mobile 'pelletiser' will be able to produce pellets from most biomass, including wheat straw and wood, and is expected to retail for around £20,000. Biomass used must have a moisture content less than 15%.

Two wood-stove owners in Fife were asked about their motives for using woodfuel. One said he burnt wood because of a "romantic feeling" –he liked collecting his own wood; also he thought wood was cheaper. This winter, for the first time, he was having trouble getting supplies. Another described the attraction as a "mainly attavistic, caveman thing" of going out and collecting firewood.

Figure 3. Benefits of wood to landowners



e) Woodfuel production from existing woods

Seven landowners were asked how they produced firewood from their woods for domestic use. All did so by 'tidying up' dead and fallen trees. Two gave the right to cut firewood to farm or estate workers and others at times.

Two firewood merchants were interviewed and both reported a sudden rise in firewood demand and sales in Fife in winter 2008/09 after 10-15 years of low sales. They had sold firewood in Fife for 15 and 20 years respectively; the former was a full-time firewood merchant, the latter a timber contractor who sold firewood (accounting for, at most, about 5% of his income). One said many new wood stoves had been installed after the Autumn 2008 oil price rise and the 2008 grants for woodfuel heating systems. Both said more landowners were choosing to keep the firewood from felling operations for their own use and this exacerbated the shortage. The full-time merchant reported difficulty in finding firewood (wood now coming as far as 80 miles to his yard), having to work longer hours to keep up with the increased demand, and selling firewood green rather than dry.

This full-time merchant said he had not put his firewood prices up much because people might revert to fossil fuel use. A forest manager who sold firewood at times confirmed the high demand for firewood this winter 08/09, and said he had not put his prices up as he would rather keep his customers.

Three companies who sell stoves to Fife were telephoned. All had noticed an increase in demand for wood-burning stoves in winter 2008/09, - all logs burning stoves - none had sold any pellet stoves. A fourth company, advertising pellet stoves on its website, was phoned. They reported a steady sale of log stoves (over the past 18 months) to Central Scotland, but almost no pellet stoves over the same period.

None of the landowners mentioned a firewood shortage. Three landowners were asked about it and, of these, only one was aware of it – he had seen an advertisement in a local paper: a firewood merchant seeking standing firewood that could be felled in farm woodlands.

Commercial production of fuelwood from forests.

All three landowners who sold firewood commercially had over 50 acres of woods, and all sold firewood only as a by-product of timber harvesting or thinning operations, involving a third party (such as a forest-management company or contractor). The forest manager said the basis for management decisions by his company on behalf of his clients is financial: fuelwood is only ever harvested as a by-product of a timber harvest as the [current] price for timber is so much higher than for fuelwood. If timber prices fall, the timber harvest will be held off until prices rise again.

The timber contractor reported that most firewood he harvested came not from private land (because forestry operations cost money overall), but from amenity and wildlife operations for groups, like the Woodland Trust, who receive grants to cover the costs.

Why not produce [more] firewood from forests?

Six, of the seven who were asked this semi-structured question, answered that it was not economic to extract firewood alone. Three gave only economic reasons. One reported that there was little point in selling more firewood than the by-product of timber operations as the price was so low⁶. More details in Figure 4 and Appendix 3.

One forest manager said his company has two brush-baling machines that collect up the brush (small branches, twigs, attached leaves) and compress it into cigar shaped 'logs' that can be used as firewood. These machines cannot be used on steep or very wet land, and are only economic to use on large areas. Two of the forest owners expressed dislike of the "mess" left by timber harvesting companies (soil damage, brush left behind). The firewood merchant said conifer brush can sell for kindling, but it is too small and burns too quickly to interest most of his buyers of fire wood.

The firewood merchant/timber contractor said he did not harvest firewood as a primary product from woods as it "could not possibly pay" the labour costs of extraction, though "even stands of birch" might be profitable for some to cut for firewood. Extraction costs clearly depend on the type and location of the woods.

It may be economic to extract firewood as a primary product from certain woods to meet the new local demand. Towards the end of this study, two of the estates involved in the survey were collaborating with a third to form a firewood producers group and putting the woodland management for firewood out to tender to local forest managers.

Figure 4. Why not sell [more] firewood?

<i>Financial reasons given:</i>	
Not enough money in it to employ someone	2/7
Price of fuelwood too low	2/7
Not economic to cut to small logs	1/7
Need large long term amount to supply commercial market regularly	1/7
Most of the wood is more valuable left to grow on for timber:	
we will use all non-timber firewood ourselves	1/7
<i>Other reasons given:</i>	
Better to grow crops than fuel on good land in Fife. Food shortage fears (as well as price of firewood too low)	1/7
No one has asked to buy it – we would want to do harvesting ourselves, not now, maybe in future.	1/7

Fuelwood for local community use

A local community group, the Falkland Transition Group (FTG), has formed as part of the Transition Towns network of groups which aim to reduce their carbon footprints. Falkland Estate, on the western side of the village, is about 3000 acres in

⁶ In July 2008, price per tonne standing quoted to this owner was: firewood: £2, mixed conifer logs: £6.50, spruce green logs: £12.50, pallet wood, spruce pulpwood, chipwood: £0

size, of which over 1000 acres is forestry. The Estate does not currently have a commercial firewood business, though it does sell firewood to estate workers and neighbours when trees fall or need tidying up.

Late in 2008, FTG obtained Climate Challenge Fund⁷ funding to investigate the possibility of using wood from Falkland Estate to houses in Falkland village. The Estate owner (the Steward), the Estate management Chief Executive and the forest manager are supportive of the FTG idea. The forest manager believes that the wood should be converted to pellets before using. A member of FTG is leading the investigation, which has called for volunteers to conduct a house-to-house survey in Falkland to identify households interested in being involved.

f) Attitudes to Short Rotation Coppice (SRC) for woodfuel

All landowners interviewed knew about SRC. The SAC, Smith-Gore (advisors and managers to property owners), the farming press, other newspapers, friends or other farmers were given as places SRC was first heard about. (Details in Appendix 5).

An SRC woodfuel contract gave considerably higher prices than the £2/tonne for standing forest firewood in one landowner's contract with the timber contractor. The SRC grower quoted a guaranteed price of £14.35 per tonne dry weight for SRC willow in his original contract with a woodfuel company. This figure had later gone up to £23.18 per tonne. (The woodfuel company cuts the coppice, roughly every three to five years. The landowner stores it until dry). Even considering weight reduction during drying, this compares well with standing forest firewood price. The difference is likely to be explained by the relatively labour-intensive cost of harvesting firewood from forests.

Reasons for Growing SRC

All four landowners who had planted SRC thought it might do better financially than the previous land use. One farmer was selected because he had taken the willow out after 2 ½ years. He could see that the trees were not growing well (possibly due to salt winds), cropping levels would be well below the woodfuel companies projections, he feared losing field drains and the price of wheat had risen. Two owners were offered contract work with the woodfuel company; one said this was the main reason he had planted SRC.

All had planted SRC willow, on low-yielding (marginal) land. One wrote "on the woodfuel company's projections, SRC would make more than the grazing rents which the ground would otherwise produce", another grew SRC on very high land where cereals don't grow well, the fourth used un-drained land that often floods destroying about half the wheat crop. All had planted either 10 or 15 ha. More details in Appendix 7.

⁷ The Climate Challenge Fund is Scottish Government funding for communities in Scotland to implement actions that measurably reduce their carbon emissions.

Farmers' experience of growing SRC willow for woodfuel.

None of the SRC growers had had a harvest. The three who were still growing it, all indicated that this meant they could not make a final judgement. The trees' ages were about 18 months, 21 months, and 2 years regrowth (after the first year the willow field was mowed to reduce weeds). Further details of farmers' reasons for growing SRC, and the benefits and problems they had found so far are given in Appendices 7 and 8.

Figure 5. SRC good points noted by landowners

1. Grant covered full planting costs	4/4
2. Contract with minimum sale price	3/4
3. Possible work from SRC company	2/4
4. Good bird habitat	1/4
5. Low maintenance costs	1/4

Figure 6. Problems with SRC reported by landowners

1. Lack of management advice	4/4
2. Bad crop management by woodfuel company	3/4
3. Poor contact with company	2/4
4. Weeds	2/4
5. Company contract needed re-writing	1/4
6. Rabbit/deer damage	1/4

2/4 noted a neighbour complaint about SRC planting when first informed of it.

Reasons for not growing SRC

Figure 7. Reasons for not growing SRC

- Will not produce as much income as alternatives in long term 6/7
- Willow roots destroy field drains -> no return to crops 5/7
1 would not grow SRC due to drains, even if best option financially

Additional reasons:

- Trees don't grow well on arable land 2/7
- No marginal land 1/7
- SRC is a monoculture: lower conservation value than woods 1/7
- Not sure SRC is best option for producing energy 1/7
- Not enough land (dairy farmer with about 30 acres (12.5ha))

The reasons most frequently given for not growing SRC were poor financial profile and inability to return to agriculture due to loss of field drains. See Figure 7 above. Appendix 6 has more details.

During the interviews, several farmers expressed disappointment with tree-planting schemes started on their land in the past (15, 20 years ago or more). Disappointments included inappropriate planting practices (species/spacing) and changing grants schemes relating to trees. In some cases this experience appeared to partly inform their reactions to SRC schemes.

Poor financial profile of SRC

Six out of seven respondents said they did not think SRC would not produce as much income as alternatives. Three out of them also said there was no assurance of a market for woodfuel in the long-term. Specific responses included:

- (a) If woodfuel was index-linked to an agricultural product, farmers would be more ready to grow it, as they would know they weren't losing out financially by changing from agriculture.
- b) There is plenty of coal locally available. Coal is cheaper and easier to extract for the amount of heat it produces.
- c) You need to have a regular annual payment to get people to grow it

A landowner near Fife mentioned hearing stories of woodfuel companies going bankrupt and not honouring their contracts with farmers. (These stories may be based on reports of the failed Arbre power station, where farmers were seen to lose out. A 2006 study of SRC in Fife, Nottinghamshire and Oxfordshire, also concluded that decisions to grow SRC or not, as well as where to grow it (low-yielding land preferred) were primarily financial – in the short and long term [21, 22]. This study included some farmers growing SRC miscanthus which has energy yields of 225 GJ/ha/yr⁸ - even higher than willow [1].

Loss of field drains

Five of the seven respondents said willow roots destroy field drains, so return to agriculture would not be possible once SRC was well-established. One of these gave this as his only reason for not planting SRC and said would not grow SRC even if it provided a better financial return than other possible uses of the same land. He said would rather grow wheat for biofuel than SRC. One farmer said that the roots of any vegetation, even grass, would choke field drains if left growing for long enough.

Field drains are pipes, buried under the soil, perforated on top, and lying so that soil water drains into them and flows along them. Field drains were believed to be buried about 30 inches (76.2 cm) under one farmer's fields in this survey, and about 36 inches (91.4 cm) under another's. Trial plots in Sweden found willow fine root hairs only 45cm (mean depth 40cm) below ground, but this was only five years after cuttings were planted [23]. The vertical depth of SRC willow roots can be several metres [24]. The UK Government Department for Environment, Food and Rural

⁸ Miscanthus at 25% moisture content

Affairs (DEFRA) states in 2002: "Willow roots, which are fibrous in nature, will penetrate down to field drains and it is recommended that SRC is planted at least 30 metres from any drains that are considered important." [25]. Most field drainage systems put in since 1940 had Government grants to help pay for them [26].

A woodfuel company's recommendation, that willow roots could be treated with Round-Up and the field then ploughed to it to agriculture, was treated with scepticism by one landowner, who wanted to know whether this had been tried in practice. Fears about field drains were also important to many farmers who took part in the 2006 study, though less so to those growing SRC than to those considering it [21, 22].

g) Landowner attitudes and values about land management

Appendices 9 and 10 show details of results for statements with high levels of agreement. Statements with different answers from different people are presented in Appendix 11. Appendix 1 explains respondents' codes.

All landowners broadly agreed with each other about the following eight statements (SA=Strongly Agree; A=Agree; NV=No View; D=Disagree; DS=Strongly Disagree):

- ◆ I manage my land in a way that I believe the next generation will thank me for (1SA,5A)
- ◆ I want to manage my land in a way that enhances wildlife conservation (4SA, 7A)
- ◆ I want to manage my land in a way that enhances landscape beauty (3SA, 5A, 1NV as beauty is in the eye of the beholder)
- ◆ Government grants are a good way to get a new enterprise started. (3SA, 4A)
- ◆ I am put off by health & safety litigation when I consider harvesting woodfuel (5D, 2SD)
- ◆ I manage for woodfuel because it provides a financial return. /I would manage for woodfuel if it provided a financial return (1 SA, 5A, 1NV because said it would depend on the other returns or benefits possible from that wood)
- ◆ A good use of woods is as places where people can go to relax (5A, 1 NV – did not mind)
- ◆ Woodland management takes up a lot of my time (1SD, 5D, 1A because of time re-writing the woodfuel company's contract for SRC, which was initially unsatisfactory.

All those asked agreed with the statement: 'I manage for woodfuel because it provides a financial return' (or 'I would manage for woodfuel if it provided a financial return'). But four out of 10 disagreed with the statement that they would [or did] manage for woodfuel because/if it provided a *better* financial return than other possible uses of the same land. Of these, one disagreed because he did not yet know whether SRC would make a better financial return than other possible uses of the same land, and it was not his primary reason for planting, and one disagreed with respect to harvesting from forests but not with respect to SRC. The other two disagreed strongly.

Where many respondents gave No View (NV) responses, the interviews usually showed that reaction to these statements depended on many circumstances, so it was not possible to give a view without knowing the circumstances. All statements with many NV responses were later removed from the questionnaire.

There was some indication from the interviews that landowners' opinions would not necessarily reflect their actions in practice.

Climate change fears did not appear to drive any of the landowners' land-management decisions, and many were sceptical of the value of reducing carbon emissions as a way to deal with climate change. All were prepared to 'do their bit' for climate change though, and were quite happy to be involved in reducing CO₂ levels. Falkland Transition Group, by contrast, formed with the principal aim of reducing their carbon footprint.

h) Information requested by landowners

Due to the semi-structured nature of the interviews, the respondents themselves asked some questions. These have been summarised and included below.

Figure 8. Information requested by landowners

- ◆ The cheapest way to produce a joule of energy from an area of land (to heat estate houses).
- ◆ Evidence of effects of SRC on field drains on farmland.
- ◆ Willow site preferences and other SRC species site matching information.
- ◆ Methods of good SRC management, especially weeding methods.
- ◆ Experience of other SRC growers with a view to forming a growers group.
- ◆ Advice on a good SRC woodfuel company.

6. Discussion and conclusions

The factors limiting further fuelwood production, either from existing forests or SRC, are seen by most private landowners in this study as financial. In existing woods, the cost of harvesting firewood is too high, and the sale price too low. Firewood sale price is limited by the price of alternative fuels. SRC seen in this study was grown on agricultural (rather than wooded) sites and uptake was limited to marginal land. Relatively high returns on alternative crops on better sites and the perceived uncertain nature of the woodfuel market in the long term as well as the possible effects of tree roots on field drains.

A possible solution in existing woods could be to modify silviculture to reduce harvesting costs. Coppicing trees within existing forests, in small stands designed to facilitate harvesting, possibly combined with modifications to existing felling machinery, might reduce harvesting costs enough to promote firewood production in woods, and still allow many other woodland benefits to continue.

Short rotation coppice harvesting and shredding machinery could also be adapted: to drive beside (rather than through) the crop. This would allow woodfuel to be harvested from strips of SRC grown on field edges (many of which now commonly grow hedges or wild trees), thus maintaining or increasing shelter benefits from the trees.

Hedge trimming machinery could be adapted to pollard⁹ tree stems (in short rotations) beside fields of grazing animals.

Technological and silvicultural innovations, however, are of limited use to private landowners if they are not interested in adopting them. What, then, might encourage landowners to *change* their current management?

Woodfuel from existing forests

Questions that introduced the idea of change in woodland management (i.e. 'why keep the woods?' 'why not replace woods with another use?' 'why not produce more fuelwood?') elicited a desire to maintain the status quo where woods were concerned, as well as the importance of some of the non (directly) financial woodland benefits. A number of financial reasons were also given, which are of interest as they imply that the owner might change management under the right circumstances. Financial reasons were also given by most owners for not planting SRC, and by all owners as a reason for planting it (in two cases the only reasons for planting SRC were financial). As one landowner explained (with reference to SRC): for a farmer to adopt something new there has to be a clear financial advantage, even though to continue with something already in progress does not require the same level of financial scrutiny.

Whether a clear financial advantage is possible for fuelwood production from existing woods will depend on many factors specific to that woodland. These include the quantity and accessibility of fuelwood in the woodland, owner's current use of the woods, type of woodfuel required by local users, and availability of trusted harvesters locally. Some landowners, particularly if they do not employ a forest manager, may not be aware of coppicing as a way to reduce firewood harvesting costs

Some landowners and managers, in this study, were at times influenced by the needs of neighbours and other local people in their land management decisions. Given the current shortage of firewood logs in Fife, further fuelwood production might be stimulated by identifying firewood log users and putting nearby woodland owners in touch with them directly, and then seeking ways of producing a financially advantageous outcome for both landowner and buyer. This appears to be already happening. By the end of this scoping study, three estates (two in the survey) had discussed collaborating to produce more firewood commercially.

Case studies of individual woodland owners could identify all factors that could enable them to produce more woodfuel. A group of case studies could build a picture of key enabling factors that apply to landowners more generally.

Woodfuel from SRC

SRC was seen, by landowners in the survey, as appropriate to marginal land and low input management, yet available yield information appears to be mainly from optimum sites and management regimes. One farmer took SRC willow out largely because growth was poor compared with that predicted. Some in the survey, who

⁹ Cut as for coppice but above the height where grazing animals can reach the new shoots.

decided not to grow SRC, mentioned being influenced by stories of other farmers' experience of it. Growers who suffer losses, or even disappointment and wasted effort based on falsely high expectations, will contribute to reducing the reputation of SRC as a worthwhile crop.

On-farm SRC trials on a range of marginal land types could provide landowners with more accurate expectations of SRC returns. It could also be worth trialling different species in SRC on sites less suited to willow. Improving knowledge on the potential for SRC on marginal land, set against concerns for food security is part of Recommendation 8 of the Wood Fuel Task Force Report [15].

Lack of information on SRC was a concern of all SRC growers in this study.

A wider survey could identify the experience, concerns and information requirements of a larger group of SRC growers'. Possible information requirements might include identification and location of high yielding, site-appropriate planting material and weed control methods. As part of this study, contact information could be used to set up local growers' groups where growers wished to be involved. Growers' groups could form an additional channel for effective communication of new research information (others include SAC, machinery rings, and the farming press).

Food security is a concern of Government (as well as being expressed by one of the landowners in this study). A desk study of land requirements for national food security, as well as an estimation of potential biomass production from the un-drained rural land area (currently without trees), could indicate whether it is necessary or desirable to encourage woodfuel plantations on drained land.

If, following such a study, further woodfuel planting on drained land was recommended, the effects of SRC willow on field drains could be studied. If no on-farm information is available, a number of on-farm plots in well-established SRC willow, grown on land with field drains, could be set up, and the drains assessed for root damage. The trial should cover effects on drains over the whole coppice lifespan. If field drains were found to be choked by willow, trials could be set up to assess alternative species with different rooting patterns for their yields when grown in SRC.

Encouraging greater woodfuel use by landowners

Greater use of woodfuel by rural landowners is likely to encourage more interest in harvesting and growing it. None of those surveyed in Fife used wood as their major source of heating, or to supply power, but four either had recently investigated or were investigating using their own wood to provide more of their heating requirements, to a single houses or a group of estate houses.

A desk study to uncover information on energy values and energy costs of production from grower to user for different types of biomass fuel could provide the information necessary for landowners to make informed decisions about producing biomass for on-site fuel use. A study of this kind should collaborate with the Falkland Transition Group woodfuel study.

7. Future Research Needs

Analysis of this preliminary survey suggests that the following research would enhance scope for the implementation of several recommendations of the Wood Fuel Task Force Report (WFTFR).

1. Case studies could identify key factors that enable specific landowners to produce more fuelwood through increased forest harvesting and, where appropriate, improved silviculture. Methods for forecasting fuelwood volumes in existing woods, currently being developed by Forest Research, would be a valuable tool in these studies.

These case studies could contribute to building a picture of key factors that lead to greater fuelwood production under different circumstances. Where woodfuel production was increased, case studies could become best practice examples to promote woodfuel as an additional farm product to other landowners locally.

WFTFR Recommendation 1: "Demonstration sites and best practice examples need to be developed, to promote bioenergy as an additional opportunity to add to the many other benefits valued by owners and other stakeholders. Priority: High".

2. A desk study could uncover the information required for landowners to make informed decisions about producing woodfuel for domestic use, including on for estate houses. The study could collate information on energy values and costs of production from grower to user for different types of biomass and biomass heating system, and present them in the form of options in a flow chart for users to follow. A study of this kind should collaborate with the Falkland Transition Group woodfuel study as much of the information will be relevant to both studies.

3. A wider survey could assess the experience and information requirements of a larger group of SRC growers'. Possible information requirements include identification and location of high yielding, site-appropriate planting material and weed control methods. Contact information could be used to set up local growers' groups to share experience where appropriate. SRC Growers' groups could form an additional channel for effective communication of new research information.

WFTFR Recommendation 4: "A series of research projects to address specific needs in short rotation forestry.... the information has to be effectively communicated.... Priority: High".

4. On-farm SRC trials on a range of marginal land types could provide landowners with realistic expectations of returns. Variables could include crop yields and harvesting costs. Marginal land could include steep sites, those with salt winds, very wet sites and field edges. It could also be worth trialling different species in SRC on sites less suited to willow.

WFTFR Recommendation 19: "There is a need to increase the rate of new woodland creation for future biomass supplies. Priority: High".

WFTFR Recommendation 8: "Improving knowledge on the potential for short rotation coppice on more marginal ground to set against growing concerns about food security". Priority: Medium".

5. A desk study of total area of un-drained rural land in Scotland, combined with yield data from marginal sites, could produce an estimation of the overall potential for new biomass production from un-drained land. Along with a parallel study of land requirements for national food security, these studies could indicate whether it is necessary or desirable to encourage woodfuel plantations on drained land. See WFTFR Recommendations 8 & 19, above.

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<p>Logs to Burn, Logs to burn, Logs to burn, Logs to save the coal a turn, Here's a word to make you wise, When you hear the woodman's cries.</p> <p>Never heed his usual tale, That he has good logs for sale, But read these lines and really learn, The proper kind of logs to burn.</p> <p>Oak logs will warm you well, If they're old and dry. Larch logs of pine will smell, But the sparks will fly.</p> <p>Beech logs for Christmas time, Yew logs heat well. "Scotch" logs it is a crime, For anyone to sell.</p>	<p>Birch logs will burn too fast, Chestnut scarce at all. Hawthorn logs are good to last, If you cut them in the fall.</p> <p>Holly logs will burn like wax, You should burn them green, Elm logs like smoldering flax, No flame to be seen.</p> <p>Pear logs and apple logs, They will scent your room, Cherry logs across the dogs, Smell like flowers in bloom</p> <p>But ash logs, all smooth and gray, Burn them green or old; Buy up all that come your way, They're worth their weight in gold.</p>
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