Meeting the Needs of the People and the Forest: Woodfuel and Woodland Management across the United Kingdom's Midlands.

Thesis presented for the degree of

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Abstract

Building on work in the field of rural geography, this thesis considers the changes which have taken place to the ways in which woods are managed and how the market for woodfuel has evolved following the considerable growth in demand for firewood and woodchip over the past decade. Through the use of in-depth interviews and field visits to woods and woodfuel businesses across the Midlands, it is demonstrated that the growth of the market has encouraged private woodland owners to carry out more management. This is a significant change from the latter half of the 20th Century when falling timber prices, and the lack of a market for wood products generally, resulted in many woodlands being neglected. In particular, the woodfuel markets have stimulated the removal and restoration of 'Plantation on Ancient Woodland Sites' (PAWS) by creating a market for the products of first and second thinning operations. Woodland owners are now able to make small, but significant, profits from their woods which is a marked change from a decade ago. A principal driver of the woodfuel market is the 'Renewable Heat Incentive' (RHI), whereby the Government is subsidising the use of woodchip-fed biomass boiler systems as part of the transition towards a greater use of renewable energy sources. Whilst the Forestry Commission's principal objective remains the production of high quality timber, this thesis demonstrates it is reviewing how it may contribute to the woodfuel market's growing share of the UK's energy sector. In the thousands of small, privately-owned woods across England, the majority of which are owned for amenity and wildlife purposes, the thesis explores how the growing demand for firewood and woodchip is encouraging greater management. The many ways in which woodfuel management is complementary to other management objectives like timber production, wildlife and shooting are highlighted.

The changes which have taken place to the UK's forestry sector with the growing use of woodfuel is contextualised by exploring the extent to which they typify a 'post-productivist' shift. In many ways, the UK's forestry sector appears to have entered a post-productivist era, with less emphasis placed on timber production since the 1980s and more policies to promote wildlife. The doctrine has been widely critiqued by examining the changes to agriculture but the forestry sector has been largely neglected, barring the work of Mather *et al*. (2006) who claim it has undergone a post-productivist shift. This view is contested by exploring how the growth of the woodfuel markets is promoting greater timber harvesting, as well as affecting how public and private woodland owners view their woods as money-making assets.

The market from the perspective of the woodfuel merchants is also explored. Their histories and backgrounds are presented, revealing a diverse community of people with different business aims. Following an analysis of the ways in which merchants operate, from the

types of machinery used to the methods of delivery, a typology of merchants is proposed. Whilst a ‘professionalisation’ of the sector has taken place over the past decade, with more standardised units of sale and improved customer service, an informal firewood market exists whereby some customers are unwillingly sold unseasoned firewood. With wood burning becoming a more popular activity in the UK following a surge in the use of dedicated wood burners, people are becoming more knowledgeable about the burning properties of different species of wood. However, the growth in demand for wood has led merchants to question whether the UK’s woods and forests can continue supplying the market at the current rate. Many merchants struggle to source timber for woodfuel and this had led them to supplement their stocks by purchasing from European suppliers. A contrasting view, however, is that the UK has a surplus of timber across its many unmanaged woods, as demonstrated by the Forestry Commission’s most recent national survey. The thesis therefore highlights a perception amongst merchants that the country’s timber supplies are at risk from the growing demand for woodfuel.

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I would like to thank The Economic and Social Research Council for appreciating the relevance of the project and providing funding for the research. Woodlands are a national asset and the public outcry which followed the Government's announcement in 2010 that it wished to sell 150,000 hectares of publicly-owned woodland highlight how important woods are for many people.

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Chapter 1
Introduction

"We want to see a new woodland culture in which woodlands and wood as a material and fuel are highly valued and sought after. To achieve this requires people to think and behave differently, such that woodlands and wood products are used and appreciated in everyday life."

[Independent Panel on Forestry, Final Report, 2012:7]

The UK's woodfuel markets have expanded rapidly in recent years. Whilst the reasons for this are complex, there appear to be two primary factors responsible. Firstly, despite the recent drop in wholesale energy prices, the period from 2000 to 2008 involved a sharp increase in the cost of domestic energy, the cost of which has been rising generally since the 1970s (Figure 1.1). When supplies of energy fall, the global use of firewood has often risen, as was the case during the Oil Crises of the 1970s (Manzone and Spinelli, 2014). The increasing cost of domestic energy in the UK during the past decade encouraged the uptake of wood burning appliances, as people sought to reduce their energy bills. Secondly, the transition towards low carbon energy systems, with greater use of renewable sources to produce both heat and electricity, has led to the development of a wide-ranging set of subsidies to promote the use of biomass at the national and European levels. In the UK, the Renewable Heat Incentive (RHI) was introduced in 2011 and pays owners of biomass boilers for every kWh of energy they produce. The large number of such biomass boilers in domestic and commercial settings has greatly increased the demand for wood in the UK. A key question is how a country with limited woodland cover and a forestry sector which contracted considerably during the latter half of the 20th Century might respond to such a growth in its demand for wood.

In an attempt to stimulate the development of local woodfuel supply chains, in 2007 the Forestry Commission (FC) launched its *Woodfuel Strategy for England*. In this, the FC outlined its intention to encourage the harvesting of an additional two million tonnes of wood per year from England's woodlands by 2020. This represents 50% of the current annual increment, which is the amount of woodland biomass grown each year. The FC believe the strategy will deliver multiple benefits for society, one of these being helping to meet the growing demand for wood. Also important, however, the FC hopes a more established woodfuel sector will promote the greater management of the country's woods, which it is

claimed are generally neglected by their owners, owing to a lack of markets for wood products. Bringing more woods into management is believed to be of benefit to wildlife and the diversity of woodland plants (FC, 2007). Finally, the FC hopes a more developed woodfuel sector will support the growth of rural economies, with greater numbers of businesses involved across the supply chain, employing people to harvest, process and transport wood, and installing burning appliances in rural properties. Whilst many biomass boilers have been installed in buildings in urban areas, it is believed a mature woodfuel market will be of most benefit to rural areas, particularly where property owners are not connected to mains gas and therefore reliant on more expensive heating oil, liquid petroleum gas and electricity (DECC, 2013[a]).

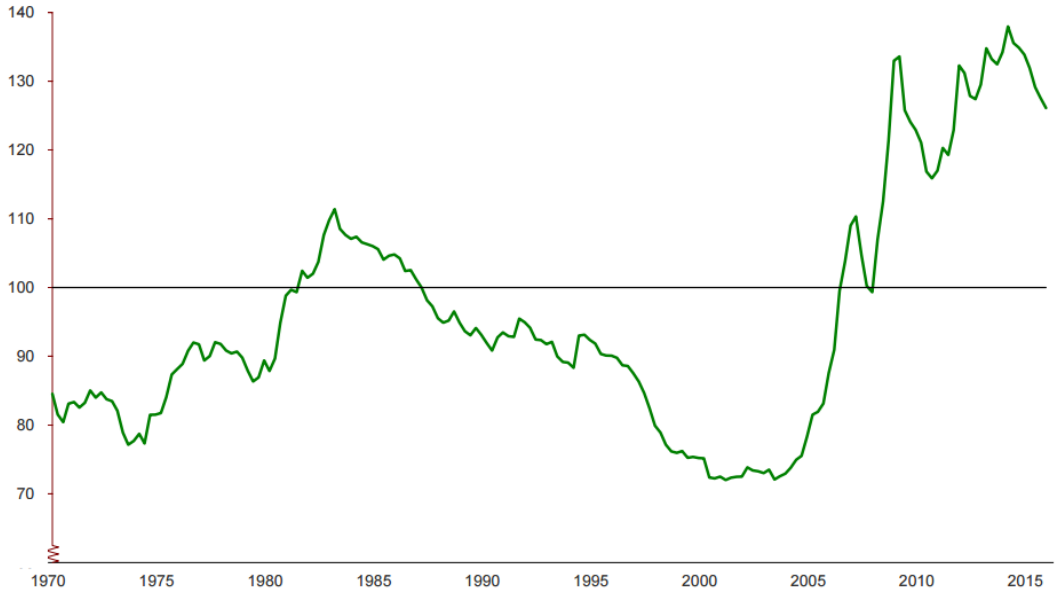


Figure 1.1 An Index of real domestic fuel and light prices since the 1970s (Q1 1987=100). Though there have been some cuts in energy prices over the past few years, these have been smaller than the previous rises. Source: Dempsey *et al*. (2016).

There are a number of challenges associated with harvesting an extra two million tonnes of wood from English woodlands. As the FC (2007) appreciate, many of the country's woods have been neglected since the market for small diameter wood, like coppice, collapsed in the early 20th Century. With little need for management, many woods have become overgrown and difficult to access, with many lacking woodland tracks on which specialist harvesting equipment can travel. This problem is compounded in woods with steep terrain.

To incentivise owners to reinstate management for the production of woodfuel in under-managed, difficult-to-access woods, the FC set-aside £10 million of grant-aid to contribute towards the cost of woodland management work. This grant was called the 'Woodfuel

Woodland Improvement Grant' and operated from 2011 to 2014 under the 'English Wood land Grant Scheme (EWGS) (see FC, 2014). Under the scheme, up to 60% of the costs associated with increasing the harvesting of woodfuel were covered by the FC. These costs may have been for civil engineering projects to improve a wood's accessibility (e.g. tracks and drainage) as well as the compilation of woodland inventories to assess the trees for woodfuel harvesting, preparing tenders and sales contracts. This grant funding was set aside specifically for projects aimed at increasing the production of woodfuel. Today, woodland owners must apply for grants from the Countryside Stewardship Programme which is part of the wider, £900 million Rural Development Programme for England (RDPE) grant scheme. As such, owners are competing for funding amongst a wider group of people involved with all aspects of agricultural and rural management.

There are, therefore, challenging market conditions for a greater programme of harvesting. Not only are woodland owners a diverse group of people, whose management objectives may not match the FC's drive for increased woodfuel production, but many of the country's woods are small and fragmented (Yeomans and Hemery, 2010). With some woods potentially being too small to manage economically (Quine *et al*., 2012). The difficulty is, therefore, how to unite such a diverse group of people whose woods may be some distance to markets. The costs of harvesting and dragging heavy timber through overgrown woods also presents a challenge for woodland owners who do wish to engage with the woodfuel market. The FC (2007) and Quine *et al*. (2012) have highlighted skills shortages in the sector, with the country as a whole still learning about the woodfuel supply chain, from harvesting techniques in small, difficult-to-work-in woods, to the installation and maintenance of biomass boiler systems. The development of the woodfuel energy market has been described by Tubby (2013) as having the potential to transform the country's forestry sector. However, when energy production does not fit within the traditional forester's role as 'timber supplier', another question arises as to which group of people are prepared to work in small, less economically manageable woods to meet the growing demand for woodfuel. As explored in this thesis, a variety of types of 'woodfuel merchant' have emerged in recent years to fulfil the demand for harvesting greater volumes of wood for use as firewood and woodchip.

A considerable, but often over-looked challenge, to a more established woodfuel supply chain is the need for a change in attitudes and culture about woodlands and their management. As alluded to in the opening quote of this Chapter, the UK lacks a 'wood culture', with wood-products and the benefits of woodlands generally being under-valued by society (Independent Panel on Forestry, 2012). There is a general lack of knowledge about woodland management from the public, with many people believing the felling of any tree is

bad for the environment (Agbenyega *et al*., 2009). The UK has an under-developed woodfuel supply chain relative to many other European countries, which make greater use of woodfuel-fed Combined Heat and Power (CHP) units in district heating networks (Kelly and Pollit, 2010). Denmark, for example, is the second most energy efficient country in the world, producing 50% of its electricity from CHP units (Zumbrun, 2008). McKay (2006) attributes the lack of woodfuel supply chains powering district heating schemes to the Government's failure to state where energy producers should source their renewable energy from, to allow market forces to work freely around the most cost-effective renewable energy technologies. The result is that companies have had little incentive to invest in biomass technologies which require additional cost to acquire the raw material, like woodfuel. Whilst the European CHP market underwent rapid growth during the 1990s, with much government backing (Madlener, 2007), the UK's energy producers have overlooked sourcing woody biomass from Britain's many unmanaged woodlands, the result being an under-developed woodfuel supply chain, lacking in technology and expertise (McKay, 2006).

Firewood has also been an established component of many European countries' modern energy mixes for longer than it has in the UK. As one interviewee involved with this study said, until recently using firewood was considered an "eccentric minority interest". As DECC (2013[a]) notes, data about the volumes of firewood used in the UK is difficult to find. This is not the case for many European countries. In Sweden, Finland and Norway, firewood comprises 20-25% of the energy provision in detached households according to Manzone and Spinelli (2014). Firewood usage increases through Southern Europe with France using 22 million tonnes per year (Elyakime, 2013) and Italy using 19 million tonnes (Caserini *et al*., 2007). In the small Portuguese city of Bragança, firewood is burnt in 42% of peoples' homes, contributing 43% to the city's total energy needs (Azevedo *et al*., 2016).

Whilst the UK only has 0.05 hectares of woodland per person, compared with the European average of 1.4 hectares (FAO, 2003), Austria and Denmark also have a relatively low density of woodland cover with 0.5 ha and 0.1 hectares respectively, yet still have well developed woodfuel supply chains (McKay, 2006). This highlights that having a large amount of woodland is not necessarily a requirement for the widespread use of woodfuel. Instead, the culture of using firewood has been part of the European psyche for longer than it has in the UK. Mytting (2015) provides a thorough overview of the culture surrounding wood burning across Scandinavia, highlighting how firewood has become ingrained into its culture.

"Scandinavia has become an especially interesting region in which to study the history and culture of heating with wood – bearing in mind that the use of firewood here has *increased*

hugely over the last thirty years – the principal reasons are these: We have a wealth of forestland; our tradition of woodburning has never been broken by the adoption of coal burning or any other means of obtaining heat."

[Mytting, 2015:18]

Whilst not claiming that the 'new woodland culture' called for by the Independent Panel on Forestry (2012) is intended to resemble Scandinavia's wood burning culture, it calls for a greater respect for the potential contribution that woodlands make to society. This is particularly in relation to harvesting greater amounts of wood for use as fuel as part of a more extensive programme of woodland management. If the FC's *Woodfuel Strategy for England* is successful and a more pronounced 'woodland culture' develops, the hope is that local economies will be re-connected to under-managed woods, resulting in greater woodfuel and timber production which in turn reduces people's reliance on fossil fuels and provides a more diverse range of woodland habitats for wildlife.

Despite the rapid growth of the UK's woodfuel sector over the past decade, few geographers have analysed the changes to woodland management and patterns of land ownership. This is surprising given the history of human geographers interested in understanding the drivers of land management and land use change. During the latter half of the 20th Century, a number of geographers regarded rural areas in the UK and western Europe as having entered a 'post-productivist' era, encapsulated with a greater focus on sustainable farming methods, less intensive food production and a more diverse rural economy (see Halfacree, 1997; Evans *et al*., 2002; and Wilson and Rigg, 2003)

Post-productivism is an interesting theoretical framework with which to view the UK's forestry sector, in response to the burgeoning woodfuel markets. The Government has encouraged owners to harvest more by providing grants, an inherently *productivist* standpoint. However, this has occurred at the same time that an increasing number of people with non-farming backgrounds are buying woods, primarily for environmental and amenity purposes (see Lawrence *et al*., 2010), suggesting an era of *post-productivism*. Geographers have largely not examined the UK's woodlands with a post-productivist framework, focusing instead on farming. Mather *et al*. (2006) provide some analysis of the UK's forestry sector, suggesting that it is a good example of a post-productivist sector. However, this was before the woodfuel markets underwent considerable expansion. Post-productivism as a doctrine is contentious amongst geographers with some arguing that it over-simplifies a complex situation. The failure of geographers to use an actor-orientated approach to explore the

post-productivist doctrine is criticised by Wilson (2001). This research contributes to the debate, with a focus on the actors involved with the woodfuel markets.

Few studies have explored the development of the woodfuel supply chain and the interests and decision-making of the actors present. In particular, there have been no studies about how woodfuel merchants operate, as they purchase timber from woodland owners and process it into various types of woodfuel (firewood, woodchip and wood pellets). Indeed, the woodfuel sector and its impacts on woodlands have largely been ignored by geographers. Of the non-geographical research, Kinash *et al*. (2013) note that the majority of researchers have treated woodfuel as a single commodity and have focussed primarily on the large-scale, national and international supply issues associated with wood pellets and woodchips. These being the main types of woodfuel used in power stations producing electricity and in smaller-scale CHP units and domestic biomass boilers. How the growing demand for firewood from the widespread installation of domestic wood burners has influenced the harvesting and processing of wood has received little attention from researchers. Of the research into the large-scale use of woodchips and wood pellets, the majority comprise quantitative analyses of the potential volumes available in the UK's woodlands, with little focus on understanding the actors' interactions and perceptions of the market or their concerns. This thesis addresses the lack of research into these aspects of the woodfuel markets and woodland management in the UK with the following aim and set of objectives.

Research aim: to understand the impact of the firewood and woodchip markets on the management of woods across the English Midlands and the role and interactions of merchants with woodland owners and timber suppliers.

Research objectives:

- *Explore the management objectives of woodland owners and the extent to which the production of firewood and woodchip is taken into account*. Whilst some of the larger woodfuel merchant companies involved with the research produce pellets, the majority focus on either firewood and/or woodchip. This is especially the case for the many self-employed merchants who operate across smaller areas, sourcing timber from local woods and supplying firewood to domestic users. On the many estates which have installed biomass boilers involved with the study, all of them use woodchip as a feedstock. As such, the thesis focusses on the production and supply of firewood and woodchip in particular. One important area of research is the extent to which owners wish to make a profit from their wood. Previous research reveals management decisions are not guided by the desire to make money, but given the growth of the firewood market, owners may be increasingly tempted to do so.

- *Explore how firewood and woodchip production can complement the management of a wood for wildlife, biodiversity, timber production and amenity.* Having discussed with owners their management objectives and the extent to which they meet these, an assessment can be made of how firewood and woodchip production may be a complementary objective. Given one of the underlying drivers of the FC's *Woodfuel Strategy for England* (2007) is to promote wildlife, it is important to consider the extent to which owners' believe they can meet their own management objectives whilst also harvesting greater amounts of woodfuel. The thesis therefore explores the extent to which woodland owners are using the woodfuel markets to help meet other management objectives, such as the restoration of Plantation on Ancient Woodland Sites (PAWS).

- *Explore the changing role of woodfuel merchants and the way they operate across the larger firewood and woodchip markets*. Given the need to process more timber, more quickly, by cutting and splitting into firewood, or chipping into woodchip, the merchants have needed to adapt their modes of operating and their relationships with timber suppliers. The thesis explores the histories and backgrounds of merchants and how their businesses have adapted to the growing market before presenting a 'typology' of the variety of merchants, including 'opportunistic' merchants who operate within a more informal market and the 'entrepreneurial' merchants who provide an increasingly professional service. The merchants' perceptions concerning the supplies of timber to meet the growing woodfuel demand are also explored.

- *Explore the extent to which a 'wood culture' is present in the UK and the conflicting philosophies within forestry regarding its role as a 'timber' supplier, but increasingly as an 'energy' supplier*. The thesis critiques peoples' knowledge (and in some cases 'mis-knowledge') about firewood burning and the way in which woodfuel merchants regard themselves as educators of the public. Comments from interviewees and discussions on internet forums about wood burning are analysed, highlighting the diversity of opinions about the qualities of different species of wood.

- *Consider the extent to which the UK's forestry sector has entered a post-productivist era in light of previous work by geographers*. Like other geographers who advocate that there are post-productivist areas of agriculture in the UK (see Ilbery and Bowler, 1998; Halfacree, 1999), Mather *et al*. (2006) argue that forestry demonstrates many characteristics of post-productivism. This research critiques post-productivism by focusing on the actors present, as called for by Wilson (2001).

Chapter summaries

Chapter 2

Chapter two reviews the context of the research, providing an overview of the relevant literature. A brief history of woodland management, the economics of forestry and woodland management, and the reasons for woodland ownership are presented. This is followed by an analysis of the scale and drivers of the UK's woodfuel markets and the global trade of woodfuel.

Chapter 3

Chapter three covers the methods used to conduct the research, including the use of interviews, an online survey, field visits, photography, textual analysis of internet discussions, the use of a field diary and participant observation.

Chapter 4

Chapter four explores the types of woodland owner and management objectives encountered in the research. Management for wildlife, personal pleasure and the desire to make a profit from woodland ownership are the principal themes addressed.

Chapter 5

Chapter five examines the growth of the firewood and woodchip markets and the role of the woodfuel merchants. The relationships between woodland owners and merchants are explored as well as the degree of competition between merchants for timber. A typology of woodfuel merchants is presented.

Chapter 6

Chapter six follows on from the themes addressed in Chapters four and five with a review of the role of foresters following the growth of the woodfuel markets, with a focus on how they perceive themselves as 'energy providers'. The FC's greater involvement with woodfuel production is highlighted. The chapter concludes with an analysis of the learning, and in some cases, 're-learning' about using wood for energy and the cultural aspects of woodland and woodfuel management.

Chapter 7

Chapter seven draws together the principal conclusions of the research in relation to the original aim and objectives. Where relevant, recommendations for policy-makers are made. The research method is briefly critiqued, which is followed by some suggestions of areas of further research.

Chapter 2

Woodfuel in Society

The reasons for owning and managing woodland are varied. For millennia, woods and trees have been crucial for human societies. They have provided people with timber to build homes and with space to graze and hunt animals and they have provided people with firewood for heating and comfort. Woodlands have been appreciated for the range of resources and recreational opportunities they provide for humans as well as for their beauty. As such, woods have continually appeared in folklore, art and literature. This chapter explores previous research about the management of woods and forests, highlighting how management objectives are a product of personal preferences, interests in wildlife, economics and tradition. After examining how and why woods are managed, the Chapter reviews the growth of the woodfuel markets in the context of the energy sector's shift towards greater use of renewables.

2.1 Woodland Management and Economics in the UK

Depending on the objectives of the owner and the needs of society, trees and woodlands are managed in a great variety of ways. They can be shaped to produce timber for specific purposes such as shipbuilding and they can be cut in different ways to produce wood products, animal fodder and to protect them from grazing animals. Throughout history, woods have been used by their owners for both commercial gain and for their amenity value (Williams, 2006). During the Middle Ages, 'forest law' was applied to many wooded landscapes, principally to protect the animals which the monarch and aristocracy wished to hunt (Watkins, 2014). Trees within Royal Forests were also subject to protected status to provide shelter for game. Sherwood Forest is one of the most well-known of the remaining ancient forested landscapes (having been continuously wooded since at least 1600). During the 13th Century, Sherwood Forest was composed of a changing pattern of oak and birch woodland, interspersed with heaths (*Ibid*., 2014). The forest has been used as a source of timber for shipbuilding, a popular tourist destination and, more recently, as a site of conservation, involving the reintroduction of grazing and the removal of coniferous plantations which were established after the Second World War (*Ibid*., 2014). Wood pastures were a common feature of Medieval wooded landscapes where livestock were reared and grazed on shrubs and saplings (Jörgensen, 2013). Trees in wood pastures were often pollarded to prevent the livestock from eating new shoots. Such wooded landscapes

which involve a mixture of natural processes and human management have been termed 'cultural landscapes' by Kirby *et al*., (1995) and Quelch (2005). In such cases, local economies and livelihoods may become dependent on woodlands, the management of which produce distinctive habitats.

Today, the UK has 3.1 million hectares of woodland, corresponding to a 13% cover of the total land surface. 10% of England is wooded, with 74% being broadleaved (Table 2.1). The great majority of English woodlands are in private ownership, with the FC owning just 16%.

	England	Wales	Scotland	Northern Ireland	UK
State Owned					
Conifers	151	98	431	56	735
Broadleaves	64	19	40	7	129
Total	**215**	**117**	**471**	**62**	**864**
Private sector					
Conifers	189	53	628	11	880
Broadleaves	903	136	337	39	1,416
Total	**1,091**	**189**	**965**	**50**	**2,296**
Total Woodland					
Conifers	340	150	1,059	66	1,615
Broadleaves	966	156	377	46	1,545
Total	**1,306**	**306**	**1,436**	**112**	**3,160**

Table 2.1 Area (in thousands of hectares) of woodland across the UK in 2016. Source: FC (2016[a]).

Although the UK's area of forested land has doubled since the Second World War, a coverage of 13% is well below the European average of 33% (FAO, 2015). In 2013, the UK was the third largest net importer of forest products, behind China and Japan (FC, 2015[c]). Over the past three decades, the rate of creation of new woodlands has been falling in England and the UK as a whole (Table 2.2).

Decade	Average area of planting per year in England	Average area of planting per year in UK
1970s	2,300	23,900
1980s	1,700	25,200
1990s	4,800	18,600
2000s	4,500	12,300
2010s	2,600	10,200

Table 2.2 Average areas of new woodland planting in England and UK as a whole, per year between 1970-2015. Planting in England shows fluctuation. The vast majority of new planting takes place in Scotland. Source: FC (2016[a]).

Silviculture is the practice of establishing and managing woods and forests. One of the oldest silvicultural techniques is coppicing. This makes use of the majority of broadleaf trees' ability to produce new shoots from their stumps after being cut. It is believed to be a natural response to the damage caused by fire, wind, and from large herbivores like elephants, beavers, wild ox and forest bison which once roamed the UK (Koop, 1987; and Monbiot, 2013). However, humans learnt to harness trees' regenerating ability to produce small diameter poles for firewood and charcoal production. Coppicing mimics the natural disturbance in woods caused by large herbivores and wind damage, which opens up the canopy, allowing a shrub layer to develop with more sunlight reaching the ground.

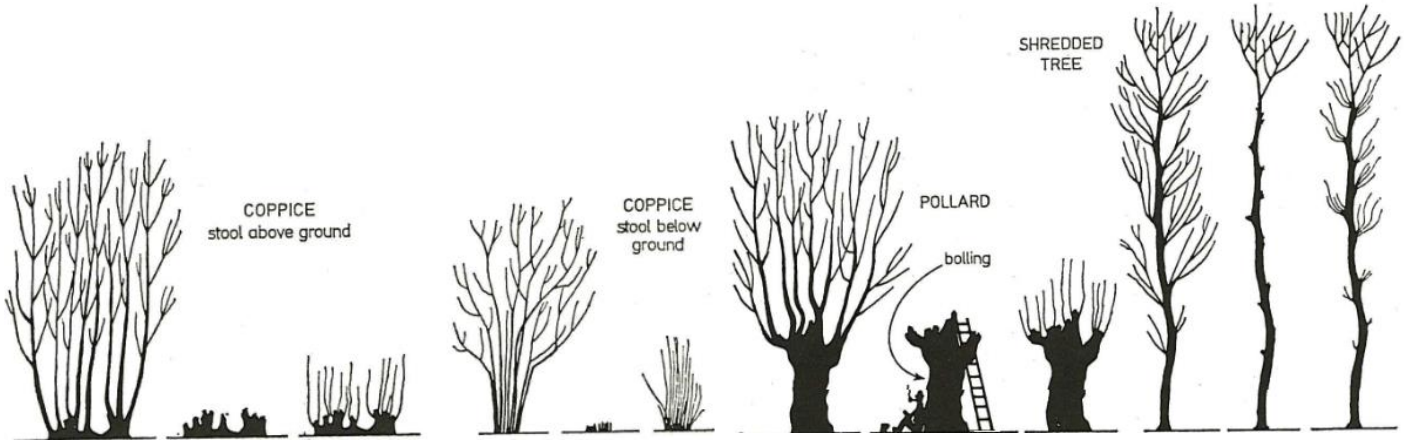


Figure 2.1 The shapes of trees following coppicing and pollarding. From left to right, trees are shown before cutting, just after cutting, and one year after cutting. Source: Rackham (1976).

The usefulness of coppice products has meant it has been used as a management technique for millennia, with archaeological evidence of its occurrence dating back to the Mesolithic, Neolithic, Roman and Anglo-Saxon periods (Buckley and Mills, 2015). The Romans made great use of coppicing to produce charcoal which they used to fuel their furnaces for smelting iron ore. Rackham (2003) estimates that an area of over 90km^2 of coppice woodland was needed to supply six Roman ironworks in Sussex between 120 and 240AD. Large-scale demand for firewood from coppice management continued to come from the glass making and tan bark industries up until the 17th and 19th centuries respectively (Buckley and Mills, 2015).

As Rackham (1976) notes, one useful attribute of coppicing is that it is a reliable method of rapidly producing large, predictable volumes of biomass, with oak coppice able to grow 7 feet in one year. It is generally carried out in cycles, known as rotations, ranging from 5 to 20 years across woodland compartments (known as coupes) of 2 hectares or less (Rackham, 1980). 'Simple coppice' involves cutting all trees in a given area whereas 'coppice-with-standards' involves leaving some larger trees to continue growing, normally

trees which are considered to have potential for producing high quality timber (Buckley, 1992; Peterken, 1996).

Across Europe during 17th and 18th centuries, the fear of timber shortages to supply its growing industries led to the development of 'scientific forestry' where the best tree species for timber production were planted and nurtured, rather than relying on natural regeneration (Kirby and Watkins, 2015). The concept of sustainable forestry was introduced following the publication of Hannss Carl von Carlowitz's *Sylvicultura Oecconomica* in 1713 which promoted the practice of cutting different parts of a woodland on a rotation, ensuring a continuous supply of timber (Watkins, 2014). Whilst the UK was late in accepting the principles of 'scientific forestry' until the onset of the First World War (*Ibid*., 2014), they have remained broadly in use across most commercial timber plantations since. Today, commercial timber growers carry out a series of thinnings across timber stands to maximise the quality and value of the final crop, ensuring they are harvesting sustainable volumes of timber (Hart, 1991).

By the end of the First World War, the UK's timber stocks had been severely depleted, as part of the war effort, in part to help construct trenches across Western Europe (Watkins, 2014). The need to rapidly replenish the country's timber stocks was recognised as a necessity, which led to the creation of the Forestry Commission in 1919. The FC subsequently purchased hundreds of thousands of hectares of low-grade, marginal land and on it planted fast-growing conifers (*Ibid*., 2014). It was during the first half of the 20th Century that many ancient woodlands were planted over with even-aged, homogenous conifer plantations, creating the so-called 'Plantation on Ancient Woodland Sites' (PAWS). With these conifer plantations, the forestry sector switched its focus towards the production of softwood. In the 1920s, the harvested volume of hardwood timber was twice that of softwood (Evans, 1997). By 2000, however, softwood harvesting volumes were 17 times greater than hardwood (FC, 2005). PAWS have been much criticised by conservationists given the particular ecological value of ancient woodland, which are believed to provide the best indicators of what species and structures were present in the UK's *Wildwood*, this being the natural woodland existing before any human interference. As Peterken (1996) notes, ancient woods typically have greater biodiversity and contain rarer species than more recent woods. Unfortunately, the value of the country's ancient woodlands only became widely appreciated in the 1980s following the publication of Oliver Rackham's *Ancient Woodland: Its History, Vegetation and Uses in England* in 1980. By the end of the 20th Century, it was estimated that half of the UK's ancient woodlands had been lost to PAWS (Green, 1996).

As the demand for charcoal fell and coal, oil and gas became the dominant fuels in the UK from 1850 onwards, the need for traditional coppice management systems in broadleaved woodlands declined, with no economic imperative to manage them (Buckley and Mills, 2015) and by 1900, the market for coppice products had essentially collapsed (Watkins, 1990). The growing use of synthetic materials, like plastics and steel, rendered the market for woodland products increasingly redundant (Aldhous, 1997) and the country's woods became progressively more neglected (Collins, 1985; Rackham 1980). This was compounded by the migration of people from rural to urban areas, leaving fewer people to manage woods serving fewer, if any, economic functions (Rackham, 1980).

During the latter half of the 20th Century, the many owners of larger, private estates across lowland England struggled to make profits from their woods, particularly with falling timber prices from the 1980s onwards (Figure 2.2).

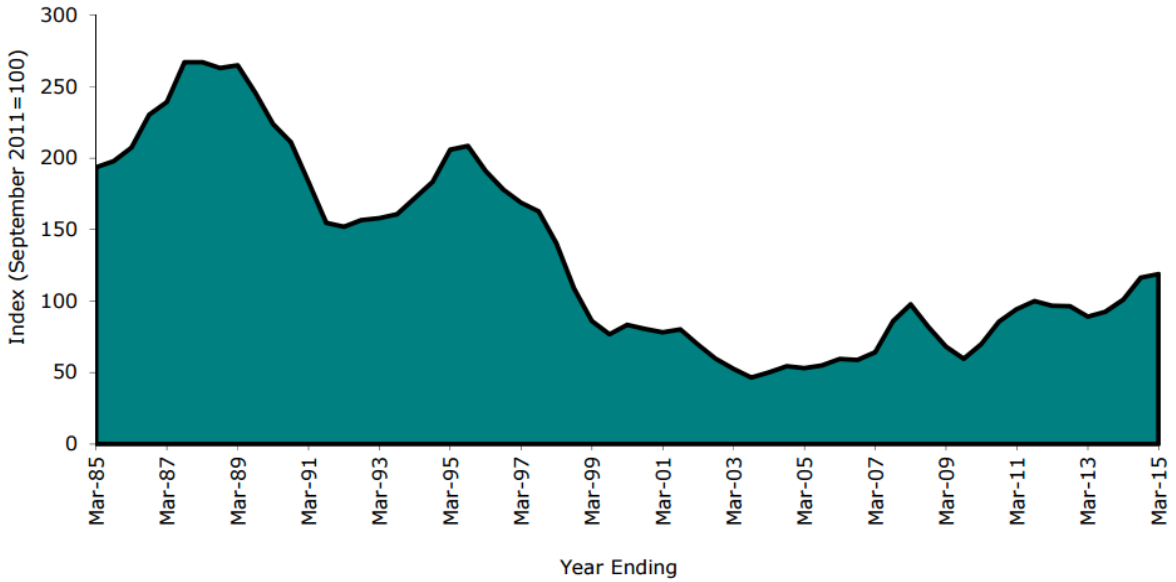


Figure 2.2 Coniferous standing sales price index for Great Britain 1985-2015 in real terms. Source: FC (2015[a]).

Nicholls and Young (2005) explore the economics of woodland ownership on rural estates from the 1960s to 2000s by analysing the finances of 66 estates representing the 'best practice' of lowland forestry. Over the 40 years, there was a marked deterioration of woodland income; in 1963, 47% of estates made a profit from their woods, but in 2005, this had fallen to 9%. In 1963, 27% of estates were making a loss from their woods, which had risen to 57% by 2005.

As Figure 2.2 highlights, from 1988 to 2004, there was a significant drop in the price of standing timber, and both the real and nominal prices of many woodland products were

lower than they were in 1963 (*Ibid.,* 2005). One difficulty facing woodland owners and managers during the 1990s to early 2000s was the growing use of recycled fibre, which significantly lowered the demand for small diameter thinnings, which were traditionally used in bulk markets like pulpwood (Mason, 2007). With owners unlikely to continue spending money on a loss-making enterprise, and with fewer markets to cover the costs of first and second thinnings, less woodland management was taking place. With declining timber prices, many estates closed their sawmills and cut the number of workers in their forestry departments. Between 1963-2005, the average number of people working in forestry departments reduced from 11 to 4 (Nicholls and Young, 2005). One question arising from the study was that if these figures represent estates demonstrating 'best practice', how were other, smaller estates coping? As Nicholls and Young (2005: 16) write: "For good reasons, lowland forestry has seldom been regarded as a profitable activity".

With less income for owners through their woodland assets, increasingly less management took place on estates in the latter half of the 20th Century. In many cases, no, or minimal woodland management was taking place, with over a quarter of owners managing their estates to minimise outgoings, rather than producing wood products (Nicholls and Young, 2005). With a decline in woodland profitability, the use of traditional management practices, like coppicing, became rarer throughout the majority of the 20th Century. One effect of this, is so-called 'cultural severance', which according to Rotherham (2008), is the cessation of 'traditional' management practices because they are no longer economic to continue. Like coppicing, such practices also include the cutting of peat and turf, charcoal production and wood cutting. The management practices often become synonymous with distinctive habitat types and can become ingrained into a community's culture. Therefore, their discontinuation and the resulting impact on the landscape is described as a 'cultural severance', with potential negative impacts on both local economies and wildlife which depend on the distinctive habitats they create.

The abandonment of traditional heathland management during the 18th and 19th Centuries, caused principally by parliamentary enclosure, and then by FC plantations in the 20th Century (Webb, 1986; Gimingham, 1972; and Rackham 1986), is another example of cultural severance. Whilst the site, whether it be heathland or coppice woodland, remains physically intact, the lack of long-term management, including harvesting gorse and bramble as fodder and cutting turf and wood for fuel, carried out by local people, causes a change in the structure of the site, and often, its ecology (Rotherham, 2011). The diversity of ground vegetation reduces as it is shaded out by tall, homogenous species, often conifers or successful pioneer species like birch (Figure 2.3).



Figure 2.3 The cutting of birch trees on a cycle across traditionally managed heathlands has been suggested by Rotherham to reverse the trend of cultural severance. Such 'woodfuel lots' are used in America and across Europe (Rotherham, 2011). Source: Rotherham and Titterton (2013).

In the case of lowland heaths, Rotherham and Titterton (2013) suggest small-scale local businesses, or volunteer communities, could fell the trees which have replaced the traditional low-ground bracken and gorse vegetation. Such management could be financed through the sale of firewood harvested from the site, thus re-linking the land with the local economy. Rotherham (2015:3405) argues that the loss of various habitats from cultural severance "is the most serious threat for nature conservation in the 21st Century, at least in the medium-term, the impacts exceeding those of climate change".

Estimating the amount of woodland where little, or no management takes place is invariably difficult. Not only do problems arise regarding how to define whether a wood is being 'managed', but it is difficult identifying and contacting woodland owners to assess any management taking place (Church *et al*., 2005). For some owners, applying 'non-intervention management' might mean their woods are under one form of management, albeit little, if any, wood is harvested. For example, The Woodland Trust (2016:1) defines management as "the process by which the objectives of a woodland owner are achieved". Under this definition, any wood where an owner allows natural forces complete control through non-intervention, could be classed as managed. Yeomans *et al*. (2008) note that active woodland management has significantly declined over the past 50 years, with only 7% of English woodlands having approved management plans. However, the authors do not define 'active management', or note that the absence of an 'approved management plan' does not necessarily mean a wood is not managed. Quine *et al*. (2012) claim that 43% of woods in the UK – only 27% in England – were being "sustainably managed" in 2011. "Sustainable management" was defined as the application of 'multi-purpose forestry' to comply with the grant and felling licenses, as called for under the UK Forestry Standard (UKFS). The FC's definition of 'active management' is whether a felling license or grant has been issued over the past 15 years. Since 2007, the number of woods in 'active management' has risen steadily (Figure 2.4).

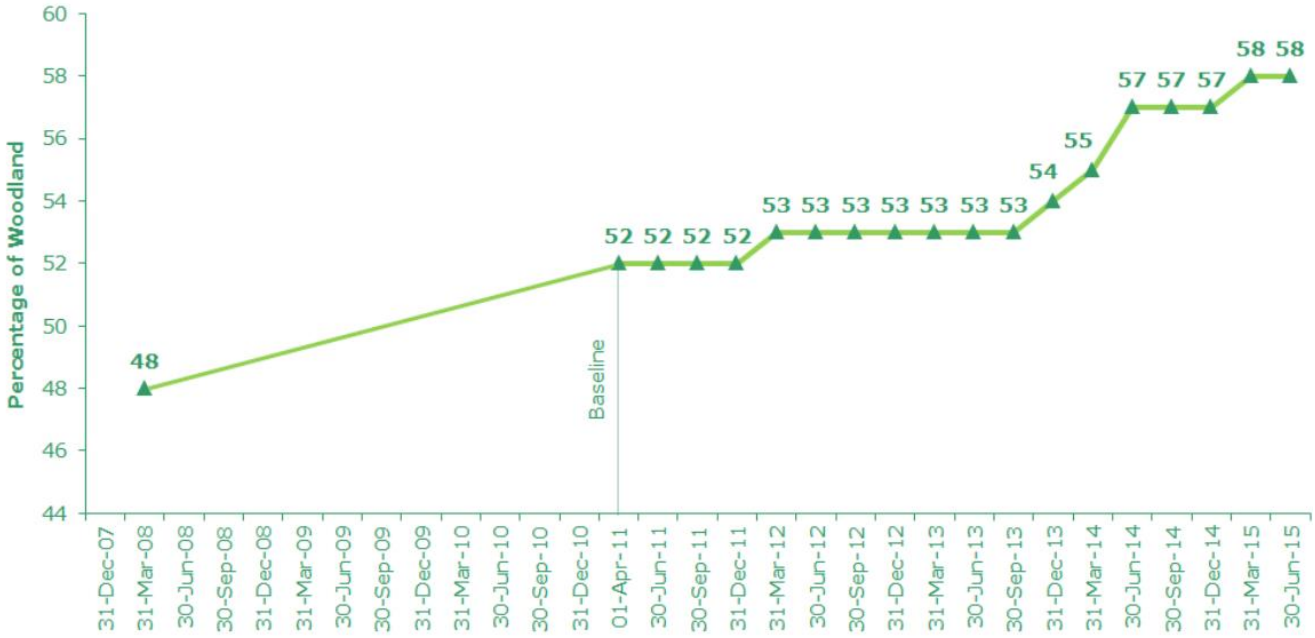


Figure 2.4 Percentage of English woodland in 'active management' (including the Public Forest Estate), based on the FC's definition (the use of a felling license or grant aid in the preceding 15 years). Source: FC (2015[b]).

Mckay *et al.* (2003) estimated the 'unutilised' or 'unharvested' wood resource across Great Britain by calculating the potential growing stock of woody biomass each year (the annual increment) and the amount harvested. As Table 2.3 shows, in England, there was a considerable difference between the annual increment and the amount being harvested, particularly in broadleaf woods. A similar conclusion was made by Mason (2007); that 70% of under-managed woodlands across Great Britain are broadleaf.

	Million green tonnes per year		
	Conifer	Broadleaf	Total
Annual increment	3.8	3.3	7.1
Annual harvest	2.3	0.6	2.9
Unutilised wood	1.5	2.7	4.2

Table 2.3 Estimates of increment and harvest in England in 2001. Source: McKay *et al*. (2003).

Whilst it is likely true that there are significant amounts of under-managed woodlands in England, most attempts to estimate this amount fail to capture the extensive 'un-registered' or 'non-recorded' management and harvesting taking place. McKay *et al's*. (2011) study for example, had no way of accurately estimating the amount of wood harvested from small woodlands, or any unaccounted sales of wood to sawmills, crafts people or woodfuel merchants. As noted previously, a lack of a management plan, or the use of a felling license or grant aid, are not indicative of a lack of management. In a study of 147 small woodland owners in South East England, Leach (2011) found that whilst 43% had a management plan, only 2% never managed their woods. Based on the FC's definition, of 'active management' only 16% of the owners surveyed would be classed as 'actively managing' their woods. This being the percentage of owners who had applied for grant aid or felling licenses. Whilst the FC's official statistics give the impression of a lack of management, the reality is that 98% of owners in South East England carry out some form of management, based on data collected by Leach (2011).

Regarding the management of woodlands across Europe, whilst the UK is by no means near the top of the list of countries with high levels of management, it does compare favourably. The Food and Agriculture Organisation of the United Nations produces a list of European countries, based on their amounts of woodland management. Again, this list is based on the premise that an official management plan is indicative of a woodland being managed. The UK is listed as having 43% of its woods under management in 2010 (FAO, 2015). To compare with some other European countries: Norway (22%), Italy (74%), Austria (100%), Switzerland (56%), Spain (19%), Sweden (97%) and Finland (100%). Whilst such attempts

to estimate the amount of management taking place are useful for large-scale studies, they are limited by their under-representation of the extensive 'unreported' management, as highlighted by Leach (2011). Without collecting information from owners, either through surveys or interviews, about the amount and type of management they carry out, owners who do not engage with the FC, or who make sales of timber which are not documented, are under-represented in 'official' estimates of woodland management.

2.2 Woodland Owners' Management Objectives

Whilst woods have always been managed for multiple objectives, it has only been within the past twenty years that 'multi-purpose forestry' has become ingrained in national and European policies. Multi-purpose forestry seeks to promote the delivery of environmental and socio-cultural outputs for wider society alongside timber production. The 1992 Rio Earth Summit focused policy on multi-purpose forestry, which prompted national and regional institutions to incorporate the concept into their criteria for sustainable forestry (FC, 2016[b]). In 1997, multifunctionality was defined as a principal characteristic of European agriculture by the European Council (Council of the European Union, 1997). Slee (2012) notes that whilst the economic output of rural areas has fallen across Western Europe over the past twenty years, their environmental and socio-cultural values have been increasingly recognised through the 'Ecosystem Services' approach. One difficulty for policy-makers is that environmental and socio-cultural forest services often lack an obvious market, and therefore raising income to maintain them is challenging. Furthermore, woodland owners may have particular management aims which do not fall within national policy aims. Writing about the use of the UK's woods for shooting, Slee (2012) notes that it partly represents a form of high status recreation for some owners who have little interest in timber or woodfuel production. Slee (2012) also describes conservation organisations as having little interest in supporting the economies of local communities.

Whilst Quine *et al*. (2012) claim that little is known about the demographics of private woodland owners in the UK and what motivates them, numerous studies consistently highlight that the most popular management objectives focus on wildlife, landscape conservation and amenity uses. Timber production and the use of woods as an investment opportunities, however, are rarely identified as principal management objectives. McMorran (2008) found that conservation and biodiversity were the primary management objectives in 89% of wooded areas. The majority of woodland owners feel responsible for the management of landscapes as a whole, with Lawrence *et al*. (2010) reporting that most

owners consider themselves ‘custodians’ of their woods and Leach (2011:26) finding that 88% agree with the statement: “I feel I am as much a guardian of the wood as its owner”.

Blackstock and Binggeli (2000) surveyed farmers across Northern Ireland with woods on their land, finding landscape and conservation were their primary management aims.

Aims	% of sample
Landscape	85
Conservation	84
Sporting	75
Shelter	74
Timber	64
Public recreation	24

Table 2.4 Northern Irish farmer’s aims for their woods. Source: Blackstock and Binggeli (2000).

Burgess *et al*. (1998) found similar results for woodland owners in Bedfordshire. One notable result was the low number of owners interested in producing coppice products.

Principal objective of woodland ownership	% of sample
Wildlife and conservation	35
Sporting and game	22
Shelterbelt	18
No specific use	13
Timber	6
Coppice production	3
Other	3

Table 2.5 Principal management objectives of woodland owners across Bedfordshire. Source: Burgess *et al*. (1998).

Most studies about owner’s management objectives are based on the *number* of woods where objectives are applied, rather than the *area* of woods. In the few studies completed which take the *size* of a woodland into account, timber production, investment opportunities and shooting become more important (Render, 2004; McMorran, 2008).

Perhaps the largest survey of woodland owners and their objectives was conducted by Nicholls *et al*. (2012). They surveyed 2,600 owners, 80% of whom cited more than one aim, highlighting the multifunctional use of woods. The top three management objectives were ‘personal pleasure’, followed by ‘landscape conservation’ and ‘biodiversity’. The great majority of owners believe their woods are ‘very important’ in contributing to the “aesthetic qualities of the local landscape”, reflecting the responsibility that owners feel for their woods.

Over two thirds of owners believe they take the provision for wildlife strongly into account when devising management strategies.

Despite the importance of wildlife and biodiversity to woodland owners, there have been few studies into how people believe their woods and management approaches actually promote them. Quine *et al*. (2012) note that few studies have focussed, more widely, on the relationships between woodland management and the provision of ecosystem services. With recent policies designed to increase the production of woodfuel, the argument that management *per se* supports wildlife has often been used. In *The Woodfuel Strategy for England* (FC: 2007:9), it is claimed that:

"Lack of management is contributing to a decline in the biodiversity of our woodlands. Increasing the level of ecologically sensitive management would help a range of flora and fauna including priority and declining species such as dormice, nightingales and woodland butterflies."

13 conservation organisations, including The Wildlife Trusts, Friends of the Earth, The Woodland Trust and the RSPB, support the Woodfuel Strategy for England, believing that an established woodfuel market will necessitate more management. These conservation organisations argue that a lack of management has contributed to falling biodiversity and numbers of woodland specialists because of the increase of 'high forest' (older, taller trees) during the second half of the 20th Century (Wildlife and Countryside Link, 2009). Hopkins and Kirby (2007) found that the area of high forest within broadleaved woods increased from 51% in 1947 to 97% in 2002. This, the conservation bodies claim, means that the UK's woodlands are less structurally complex which, reduces their variety of habitats. Evidence for a loss of woodland species include: a 19% fall in the species richness of woods between 1990-2007; a 74% drop in the population of specialist woodland butterflies since 1990; and a 32% drop in the population of specialist woodland birds since 1970 (DEFRA, 2009). Weir (2014) argues that the lack of management for timber, woodfuel, charcoal and crafts product, and the corresponding reduction in the use of coppicing, have formed dense canopies, with little structural diversity in their lower layers. This has been compounded by deer which graze on the ground vegetation which does grow (*Ibid*. 2014).

Since the collapse of the coppice market, coppicing has been used most widely by conservation bodies because of the structural complexity and wildlife benefits it is thought to produce (Buckley, 1992; and Feber *et al*., 2001). However, as Quine *et al*. (2012) note, some species may not require the lighter, warmer conditions that result following coppicing. Woodlarks (*Lullula arborea*) and nightjars (*Caprimulgus europaeus*), for example, require open ground, with small areas of clearfelling being of benefit (Symes and Currie, 2005).

Equally, some owners prefer to use ‘non-intervention’ or ‘minimal intervention’ approaches, choosing to let the natural death and growth of trees dictate their wood’s structure. Furthermore, reinstating coppicing in woods which have not been cut for many years is not always successful. Evidence suggests that as the diameter and age of a tree increases, there is an increasing risk of mortality, or at least, fewer stems appearing, after re-coppicing (Ŝplíchalová *et al*., 2012; Pyttel *et al*., 2013). It is for this reason that Buckley and Mills (2015) warn that reinstating coppicing in neglected areas is not always commercially viable. Nonetheless, coppicing is widely appreciated by owners as being aesthetically pleasing with Leach (2011) finding 76% of private owners use coppicing in their woods. Comments collected by Leach (2011) yield insights into how owners regard coppicing, and more widely, the difference in opinions between owners who manage their woods productively and those preferring minimum intervention:

“*We talked to an expert and they say coppice half an acre.” “…coppicing leads to diverse habitats.”*

“I want to reinstate the hazel coppices. I want it to be a working woodland.” “I am worried that woodland is being bought for recreation. Some people just use it as a place to stay in but do not look after it. It can get tangled and overgrown and it should be productive.”

“People do over manage their woods. If you leave them there is a natural cycle and coppicing is not natural. I am not saying “don’t coppice” but it should not be the essential thing across a large landscape.”

With a greater focus on wildlife following the adoption of multi-purpose practices into national and international policies, there has been growing interest in the UK for Continuous Cover Forestry (CCF) over the past twenty years (Mason, 2007). CCF is an umbrella term to describe management practices which avoid the use of clearfelling, and promote the use of natural regeneration (rather than planting) which lead to a greater variety of tree species of irregular heights (Pommerening and Murphy, 2004). Such practices include coppice and coppice-with-standards and generally involve managing forests on a *per tree* basis by thinning stands, whilst retaining a canopy and using the standard trees to provide seed for natural regeneration (Wilson, 2013).

Whilst CCF has been used most widely in conifer plantations, as part of efforts to restore native species to areas like PAWS (Thompson *et al*., 2003), CCF principles can also be applied to broadleaved woods (Hart, 1995). Harmer (1994) notes, however, that the use of natural regeneration in lowland broadleaved woods may be increasingly difficult due to rabbit and deer grazing and the cost of protecting saplings. Nonetheless, CCF may be attractive to

owners of broadleaved woods because it involves nurturing the best quality stems which will ultimately produce more valuable timber, encouraging them to carry out more management (Mason, 2007).

2.3 Woodland Management for Commercial Gain

A number of studies have shown that making a profit from their woods is not an important consideration for the majority of owners. Nicholls *et al*. (2012) found that the use of woods to make a return on investment, and produce income from wood products, are not considered as important as the amenity and wildlife aspects of woodland ownership (Table 2.6). Woodlands as 'investment' opportunities include their 'real estate value', their 'capital value' (through the sale of timber and wood products), and their tax-saving value. Furthermore, as Urquhart *et al*. (2009) note, other amenity uses of a woodland, like shooting, may be of greater importance than management for wood products.

Owner's aims for the woodland	Number selecting this aim (multiple choices)	Main aim (single choice)
Personal pleasure	1154	158
Landscape Conservation	1072	134
Biodiversity	1006	122
Timber Production	841	113
Long-term Family Ownership	824	111
Other Environmental Benefits	623	44
Sporting Benefits	536	55
Income	496	63
Capital Growth/Investment	446	52
Public Access	257	38
Securing Grants	98	12
Other	101	43

Table 2.6 Owners' aims for their woodlands. 2,600 owners were surveyed. Source: Nicholls *et al*. (2012).

It has been suggested that falling timber prices from the 1980s to the early 2000s (see Figure 2.2) have contributed to a negative perception of woods as profitable assets, discouraging owners from spending money to manage their woods (Selman and Powell, 2003). Lawrence *et al*. (2010:38) add that the lack of markets and the costs of management are contributory factors for some owners' failure to manage their woods: "Perhaps most significant here is the seemingly widespread perception that woodlands and forestry cannot offer substantial economic returns". Furthermore, the same authors report on a study by Sharpe *et al*. (2001) that the majority of owners (87%) would manage their woods if only to

break even. This is despite income not being regarded as an important management objective for most owners.

McCay *et al*. (2011) report on the view that it is difficult to manage small woodlands profitably, in part due to low timber prices since the 1980s and the costs of planning and carrying out management, particularly on steep or uneven ground where specialist harvesting equipment may be needed. Walne (2014) claims it costs at least £1,500 a year to pay a contractor to manage two hectares of trees for timber production, plus £150 for insurance against injuries. Furthermore, Quine *et al*. (2012) note that the majority of the UK's wood-using industries have developed around the harvesting and transport of the bulk availability of softwood. This means the costs of harvesting small volumes of timber from woods with poor access are considerably higher (*Ibid*., 2012).

Despite the perception of woodland management not being a profitable activity, over the past five to ten years, timber prices have risen markedly, by over 120% in real terms (Table 2.7). Whilst this is a positive trend for timber growers, the fact that prices are still lower than they were twenty years ago highlights how much prices had fallen since 1995.

Change from previous year	Percentage change in real terms
Year to March 2011	34.9
Year to March 2012	2.4
Year to March 2013	-7.9
Year to March 2014	13.2
Year to March 2015	17.8
Changes over longer periods to March 2015	
5 years	69.9
10 years	123.9
20 years	-42.3

Table 2.7 Percentage change in Coniferous Standing Sales Price Index for Great Britain. Source: FC (2015[a]).

Quine *et al*. (2012) attribute the growing value of standing timber to the developing woodfuel markets which they suggest is altering the economics in favour of management in some woods, where owners have access to local markets, either directly or through merchants. Equally, Lawrence *et al*. (2010) believe that attitudes towards making income through woodland ownership may be changing, in that owners appreciate that small, but useful incomes, are now possible and desirable. Indeed, Sharpe *et al*. (2001) found that whilst timber production is not a primary objective for most owners, 75% view timber as a potentially important source of income, revealing a willingness to sell timber if needed.

With timber rising in value, the price of woodlands has grown by 50% over the past five years, with the number of people purchasing small woods doubling (Walne, 2014). Ficenec (2015) notes that sales of woodland in 2015 were 50% greater than in 2014. Investors in the UK's forestry sector have seen returns of 19% over the past decade (*Ibid*., 2015). A two hectare wood in Derbyshire is currently on sale for £45,000 from Woodlands.co.uk which is a well-known vendor. A wood's price is affected by the age and stock of its trees, as well as its location and accessibility. Clegg and Fenning (2015:51) write: "If the last decade has seen a real appreciation of forestry's fundamentals, it has also been driven, in our view, primarily by private individuals and forestry investment funds… The situation over the last 18 months appears to have changed with the demand for timber now ahead of supply. Partly, this is a development of traditional processing industries but also the arrival of subsidy-led biomass demand."

Whilst it is likely that personal pleasure and wildlife remain the principal management objectives for new owners, one of the attractions of purchasing a wood are the tax breaks. Inheritance tax is not paid on woodland (provided it was owned for at least two years prior to death). Furthermore, owners do not pay income tax on the sale of wood products, provided their wood is managed for commercial purposes. Equally, owners do not pay capital gains tax on the increase in value of their wood.

According to Lawrence *et al*. (2010), note that it is difficult to track changes to the patterns of rural land ownership in the UK because half of all the land is unregistered. Nonetheless, one general trend of rural land ownership over the past 15-20 years has been an increasing number of owners coming from non-farming or, 'rural' backgrounds. Ward and Manley (2002) note that in 2000, 39% of farms sold across the UK were purchased by non-farmers. In 1993, over 66% of woodland owners surveyed by Sime *et al*. (1993) had farming backgrounds. By 2007, less than a third of woodland owners have farming backgrounds (Urquhart, 2009). Many new woodland owners coming from non-farming backgrounds are retirees, often looking for more rural lifestyles (Lawrence *et al*., 2010). Other than woods owned by the FC and private individuals, other notable woodland-owning organisations include charities which own approximately 3.5% of the UK's woods, private businesses with 11%, Local Authorities with 3% and private forestry businesses with 2% (Lawrence *et al*., 2010).

One area of productive woodland management which the majority of owners make use of is woodfuel. Despite the growth of the woodfuel market, few studies have explored how owners are considering firewood and woodchip production in the ways that they manage their woods. Firewood production is often classed as 'other' activities in surveys of owners, with little comment on the nature of production or on the number of owners potentially interested in using the growing market to supplement their income and reduce their domestic heating bills. Quine *et al*. (2012) note that the FC believes one reason for a recent growth in the number of felling licenses is because more owners are looking to harvest their own woodfuel. In a large-scale survey of owners, Nicholls *et al*. (2012) found firewood to be the most commonly produced wood product (Table 2.8). Fencing is the second most commonly produced wood product, followed by woodchip. The number of owners producing firewood and woodchip combined outstrip the number of owners producing all types of other wood products. In terms of the study area of the current research, the data reveal that, outside the South East, South West and East England, firewood and woodchip production in the East and West Midlands is greater than in other regions like Yorkshire and Northern England. The relatively high number of owners who produce coppice roundwood is also worthy of mention, considering the near collapse of the market during the 20th Century.

Region	Wood products							
	Firewood	Woodchip	Roundwood Veneer	Roundwood Joinery	Roundwood Beaming	Roundwood Fencing	Roundwood Coppice	No products
NE England	30	25	3	9	12	21	6	33
NW England	45	19	3	12	11	26	17	60
Yorkshire & Humberside	45	33	8	17	18	26	10	65
East Midlands	56	24	8	19	12	24	18	49
West Midlands	68	33	3	15	16	27	23	52
London	6	5	2	3	2	3	3	4
East England	91	36	6	22	19	31	37	69
SE England	162	60	6	31	38	69	90	156
SW England	135	42	7	33	35	58	34	145
Highlands	8	5	2	4	4	5	3	7
Grampian	6	4	2	3	3	3	2	2
Perth & Angus	6	3	0	2	2	2	3	0
Central Scotland	5	3	0	1	2	1	3	5
South Scotland	8	6	2	3	5	5	4	4
Wales	60	22	2	10	14	21	14	86
Northern Ireland	4	2	1	2	3	4	2	0
Other	1	0	0	0	0	0	1	0
Total	**736**	**322**	**55**	**186**	**196**	**326**	**270**	**737**

Table 2.8 Wood products and markets by region. The data is based on the survey responses of 2,600 woodland owners. The responses came from owners of all-sized woods, highlighting that woodfuel is the most popular wood product for all owners, regardless how much wood they own. Source: Nicholls and Young (2005:33).

In a survey of 149 small woodland owners, Leach (2011) found woodfuel to be amongst the top six reasons why people purchased a wood:

1) It is a place for recreation
2) Relaxation
3) They have always wanted to own a wood
4) They have a love of wildlife
5) An interest in conservation
6) It is a source of woodfuel

For 75% of owners involved with Leach's (2011) study, having access to a source of woodfuel which they could use themselves or sell to others was classed as either 'quite' or 'very important'. Whilst the average income generated from sales of wood products and other income sources (£345) was below the average annual expenditure on management (£397), Leach (2011) does not account for the savings from using less gas and oil at home for owners who burn their own wood. Secker Walker (2009) conducted a small survey of woodland owners and found all participants harvested their own firewood, however, in many cases harvesting was not planned or managed across the wood as a whole.

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2.4 Post-productivism

Post-productivism is a doctrine put forward by some rural geographers to describe the shift in focus on agricultural production towards a desire for greater protection of the environment and widening the range of economic activities in rural areas (Ilbery and Bowler, 1998; Wilson, 2001; and Almstedt, 2013). Given the rising value of timber and woodlands, as well as an increasing number of woodland owners coming from non-farming backgrounds (Lawrence *et al*., 2010), the post-productive transition is an interesting perspective to position the current research. This is especially so given the majority of new woodland owners are interested in managing their woods primarily for wildlife and amenity purposes – which are inherently post-productivist objectives – but concurrently, timber prices are rising as well as a rapid expansion of the UK's woodfuel sector taking place. As such, whilst there is evidence of post-productivism in the woodland management sector with a greater diversity of owners placing less emphasis on timber production, there is also evidence of productivism with buoyant timber prices and expanding woodfuel markets.

The concept of post-productivism became commonly used by rural geographers in the UK during the 1990s to describe the changes that had taken place to agriculture during the latter half of the 20th Century (see Halfacree, 1997; Ilbery and Bowler, 1998; Evans *et al*., 2002; and Wilson and Rigg, 2003). These changes encapsulate the transition away from 'productivism' which Woods (2011) describes as an agricultural system where maximising food and fibre production is the primary objective. According to Jack (2007), post-productivism involves a reduction in the area of rural land used for non-agricultural purposes with a greater proportion of farmers' incomes coming from sources other than food production. Post-productivism also involves a diversification of the rural economy with farmers looking for alternative sources of income and more people in non-agricultural employment (Evans *et al*., 2002; Macken-Walsh, 2009). According to Mather *et al*. (2006), post-productivism could be a powerful tool to explain land-use change and has reinvigorated British human geographer's interest in the topic which has been neglected in recent years.

The term post-productivism was rapidly, and uncritically, adopted by geographers in the 1990s who believed it succinctly conceptualised the socio-economic changes taking place in many rural areas (Evans *et al*., 2002). These changes were brought about in part following growing dissatisfaction with agricultural over-production by European farmers during the 1980s who received large amounts of public subsidies (Woods, 2011). Policy reforms were introduced to encourage farmers to focus less on food production and more on diversifying their activities and income streams, such as planting woodland (*Ibid*., 2011). A number of rural geographers studied the changes and concluded that a post-productivist shift had

occurred, driven by policy and social changes (see Halfacree, 1997; Ilbery and Bowler, 1998; and Woods, 2011). Halfacree (1997) studied the impact of counter-urbanisation on the creation of a more diverse rural population and concluded that it was a major driver of post-productivism. He believes that the urban-rural migrants were less interested in producing agricultural products and were responsible for creating new 'rural spaces' with more opportunities for amenity and recreation. In the woodland sector, it is increasingly common for owners not to have a farming background, often being retirees whose management objectives are principally focussed on amenity and enjoying the wildlife in their woods. (Lawrence *et al*., 2010) This supports Halfacree (1997) in his assertion that urban to rural migration has contributed to a restructuring of the countryside, with less focus on production. It is, therefore, relevant to question whether woodland owners are willing to produce more woodfuel at a time when the Forestry Commission is encouraging them to do so to help meet renewable energy targets.

Despite many studies about the causes and effects of post-productivism, there is no agreed definition of the term and it has become known as a 'fuzzy' theory which Evans *et al*. (2002) and Mather *et al*. (2006) note is one reason why geographers have reached different conclusions about its usefulness. Instead, post-productivism has been described using a set of characteristics (see Ilbery and Bowler, 1998; Wilson, 2001; and Evans *et al*., 2002) which represent what a 'post-productivist' landscape might look like (Table 2.9). These include a change in emphasis from maximising agricultural production towards amenities, preservation of cultural landscapes, and importantly, more environmental protections (Wilson and Rigg, 2003).

As well as there being no agreed definition of the term post-productivism, geographers have not reached an agreement over how the process takes place. However, Wilson (2001) suggests that the shift from productivism to post-productivism is a spectrum, with different regions in various stages of the transition. He classified some Mediterranean regions as not having even entered a productivist phase whilst other northern European regions, like the UK, had become post-productivist.

Ilbery and Bowler (1998)	'Known characterisitcs' • Reduction of farm output • Withdrawal of state subsidies • Production of food within an increasingly competitive international market • Growing environmental regulation of agriculture 'Three bipolar dimesnions of change': antithesis with productivism • From intensification to extensification • From concentration to dispersion • From specialisation to diversification
Wilson (2001)	'Seven dimensions': antithesis with productivism • Ideology • Actors • Food regimes • Agricultural production • Agricultural policies • Farming techniques • Environmental impacts
Evans *et al*. (2002)	'Five convenient categories' • Shift from quantity to quality in food production • Growth of on-farm food diversification and off-farm employment (pluriactivity) • Extensification and promotion of sustainable farming through agri-environmental policy • Dispersion of production patterns • Environmental regulation and restructuring of government support for agriculture.

Table 2.9 Debates about what constitutes post-productivism have invariably involved identifying 'dimensions' or 'characteristics'. One result of this is that it has become a broad term, encompassing changes to agricultural management, economic policy and culture. Taken from Mather *et al*. (2006:443). There appear to be three principal changes which take place in the transition from productivism to post-productivism. These include: less intensive farming methods; diversification of the rural economy; and national policies to encourage more environmentally-sensitive management.

Mather *et al*. (2006) suggest one characteristic of post-productivism is the transition from a focus on commodity to non-commodity outputs, presenting post-productivism as the antithesis of productivism. Under a 'productivist' system, farmers maximise food production using high inputs of nutrients. In the forestry sector, a productivist system involves maximising high quality timber using traditional forestry practices like clearfelling and re-planting. However, this system became uneconomical for many forestry departments in lowland areas during the latter half of the 20th Century, with many closing down as timber prices fell and the demand for small diameter thinnings reduced because of the growing use

of recycled fibre (Mason, 2007). By necessity, productive woodland management declined and income from shooting became more important sources of income (Nicholls and Young, 2005). For rural areas generally, Mather *et al*. (2006) attribute the passing of the 1986 Agriculture Act as a seminal moment in the transition towards post-productivism. This Act reversed the trend of maximising food production which had been the UK's focus since the Second World War when the fear of food shortages guided policy-making (Mather *et al*., 2006). Similarly, Halfacree (1997) claims that the UK's productivist phase lasted from the end of WW2 until the late 1970s with sufficient counter-urbanisation taking place to re-define the activities taking place in the countryside. These involved greater amounts of recreation and a desire to use more sensitive management practices, especially after the environmental damage caused by intensive farming methods (*Ibid*., 1997).

Since the 1986 Agriculture Act, there have been significant changes which Mather *et al*. (2006) suggest are indicative of a post-productive transition. Energy consumption and fertiliser use fell by 29% and 25% respectively between 1985 and 2003 (DEFRA, 2004), highlighting the adoption of more efficient farming practices. There were also falls in crop area and cereal production as well as the number of cattle (Figure 2.5). Mather *et al*. (2006) also comment on the rapid rise of the horse population (predominantly used for recreation) and a significant increase in people buying farms for 'lifestyle purposes' where income is not their primary objective. Support for agri-environmental schemes also rose from £4 million in 1985 to £277 million in 2003, reflecting the use of policy to encourage farmers to adopt more sensitive farming practices, including subsidies to plant woodland.

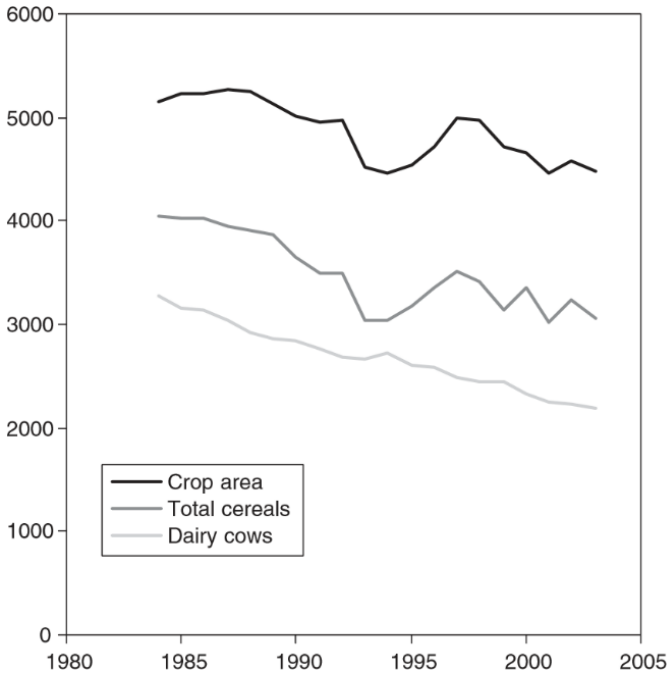


Figure 2.5 Falling crop area, cereal production and dairy cows in the UK since 1985. Mather *et al*. (2006) believe such trends are indicative of the shift in policy away from maximising food and fibre production, accompanied by a fall in national self-sufficiency. Taken from Mather *et al*. (2006:448).

Despite acceptance by some geographers who use the term freely (see Halfacree, 1997; Argent, 2002; and Woods, 2011), post-productivism has been much criticised for how it is conceptualised as well as there being a lack of empirical evidence that farmers have adopted it. Walford (2003) asserts, for example, that productivism remains the overriding objective for farmers who continue to intensify and specialise their activities. Similarly, Evans *et al*. (2002) claim there is little to suggest a reversal of productivism has occurred and suggest that diversification and 'pluriactivity' (off-farm employment) do not imply post-productivism. Wilson (2001) bemoans the lack of actor-orientated and behaviourally grounded research used by proponents of post-productivism to argue its case. The use of such research methods could, therefore, be useful in furthering the debate about post-productivism. In-depth interviews with farmers and woodland owners are used in the current study to address the lack of behaviourally grounded research to inform the post-productivist debate as suggested by Wilson (2001).

The majority of literature on post-productivism has focused on agriculture in the UK, with some work focused on Australia (Argent, 2002), Norway (Björkhaug and Richards, 2007), the US (Bergstrom, 2002) and South Africa (Hoogendoorn, 2010). Few studies have hitherto examined post-productivism in developing countries, though Wilson and Rigg (2003) believe that post-productivism in advanced economies and the phenomenon of 'deagraianisation' in developing countries could be combined to produce a globally applicable theory. Very few geographers have explored the changes to forestry in the UK using a post-productivist framework. This is despite Mather *et al*. (2006) believing that the changes in the forestry sector are better examples of post-productivism than in farming. They believe the radical changes in British forestry policy during the 20th Century towards more environmentally sensitive practices represent a shift towards post-productivism.

As Mather *et al*. (2006) note, the UK's area of forested land more than doubled during the 20th Century, driven primarily by policy in response to the fear of timber shortages. The planting of fast-growing coniferous trees took place predominantly in upland areas, by the public and private sectors. By the 1980s, however, with poor forest management decisions becoming symbolic of global environmental degradation, British forestry policy was over-hauled. The importance of wildlife and the amenity aspects of forests were elevated by adapting the grant system so it no longer focused primarily on timber production. Under the old Forestry Grant Scheme (FGS), timber production had to be owners' primary objective but under the new, more flexible, Woodland Grant Scheme (WGS), applicants could rank wildlife and conservation as their top priorities. Mather *et al*. (2006) analysed owners' objectives under the new WGS and found that timber production was not high on owners' agendas (Table 2.10). They also found a small increase in the number of objectives which owners

considered to be of ‘high priority’ from 2.8 in 1995 to 3.2 in 2002, which they took as evidence for an increase in multi-purpose forestry. Mather *et al*. (2006:447) write: “It is not contended that timber production was the sole objective throughout Britain’s forests until around 1990…It was not until 1990, however, that the primacy of timber production was seriously challenged, and that non-productive objectives began to feature prominently in private forestry policy”. Mather *et al*. (2006) also contend that the significant increase in the planting of broadleaf species since the mid-1980s represents a post-productive shift because it highlights a move away from traditional timer producing species like Sitka spruce and Scots pine (Figure 2.6).

	‘High' priority objective	Percentage of applications
1	Enhancing the landscape	72.7
2	Maintaining and creating new wildlife habitats	64.7
3	Providing alternative	30.5
4	Managing or regenerating forests or woodlands	29.4
5	Providing shelter	24.7
6	Producing wood and marketable timber	19.8
7	Providing public recreation	15.1
8	Providing sporting use	13.4
9	Providing employment	4.4
10	Restoring or improving industrial or derelict land	7.0
11	Conserving archaeological features	2.8
12	Other	5.2

Table 2.10 ‘High’ priority objectives in WGS applications 1995-2002. Mather *et al*. (2006) note that this list of management objectives applied to the whole country, even in areas that underwent rapid ‘productivist’ afforestation.

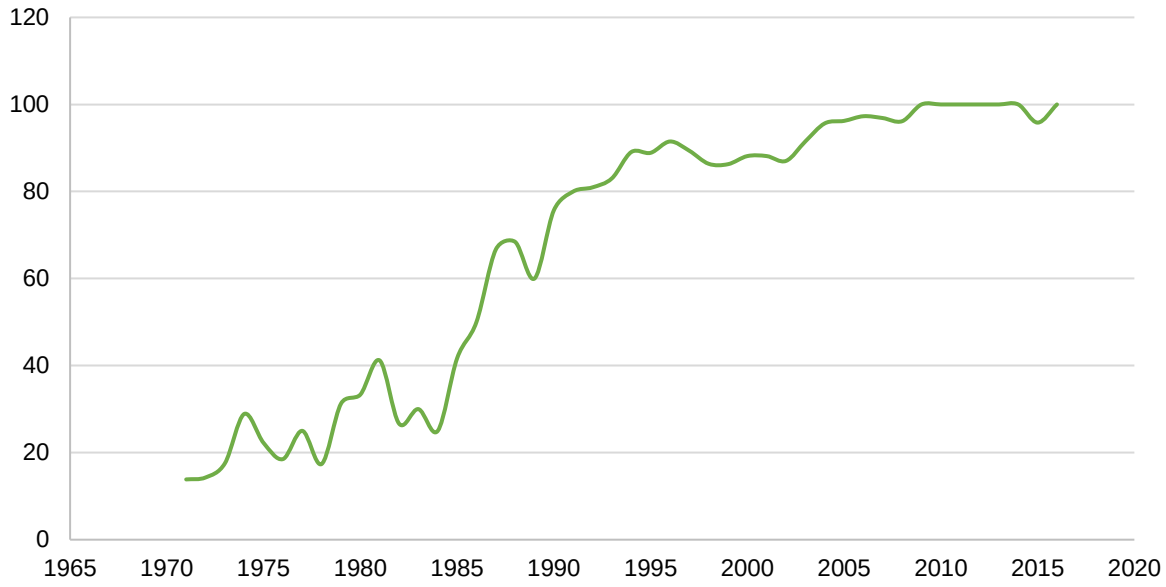


Figure 2.6 Total broadleaf planting as a percentage of all planting in England, 1971-2016. Since 2005, broadleaf planting has comprised virtually 100% of all new planting in England, indicative of what Mather *et al*. (2006) believe to be a post-productive shift. Source: (FC, 2017).

Post-productivism remains a contentious issue in geography with Evans *et al*. (2002) and Walford (2003) arguing that productivism is still the over-riding objective for farmers. Evans *et al*. (2002) go as far as questioning what the purpose of the doctrine is, even if it was widely accepted. They claim there would be few directions to undertake further research, other than merely describing changes to rural areas. This criticism is perhaps a little harsh given it is necessary to observe changes prior to explaining them and post-productivism could be a useful theoretical perspective to explain changes in land-use. As Mather *et al*. (2006) highlight, there are trends in the UK's forestry sector to suggest a post-productive shift has occurred. These include changes in policy which removed the primacy of timber production in the grant system, more subsidies for wildlife and conservation purposes and more non-traditional timber trees being planted. However, Mather *et al*. (2006) made their assertion that the forestry sector demonstrates post-productivism prior to the significant growth of the woodfuel markets and it should, therefore, be questioned whether this is the case now.

Wilson (2001) has criticised proponents of post-productivism for focusing too much on 'exogenous forces' (i.e. the 'dimensions' used to characterise it in Table 2.9) and failing to use behaviourally grounded research to understand why management practices change. This criticism can be levelled at Mather *et al*. (2006) who argue that British forestry is post-productivist without taking into consideration peoples' reasons for management. For example, it cannot be claimed with certainty that planting more broadleaf trees is indicative

of post-productivism without speaking with owners and managers. Evans *et al*. (2002) and Wilson (2001) have also criticised post-productivism because it encourages dualistic thinking, something which has been widely criticised by some human geographers during the 1990s (see Sayer, 1991 and Murdoch, 1997). Similarly, Ward *et al*. (2008:118) criticise the analysis of previous work on post-productivism for being "overly structuralist and deterministic" and put forward the case for taking a commodity-specific approach to further the debate. They analyse the European trade in sugar and how its material properties and policies has led to a post-productive shift in its modes of production. With greater consumption of woodfuel in the UK, this study explores whether the expanded firewood and woodchip markets mean the forestry and woodland management sectors are in a post-productivist stage. Labelling regions as productivist or post-productivist is overly-simplistic for Evans *et al*. (2002) and Murdoch (1997) and reduces the quality of debate about the economic, environmental and social drivers of rural activities. A behaviourally grounded approach, as called for by Wilson (2001) allows for a more nuanced understanding of changing forestry practices in the context of the woodfuel markets and accepts from the outset that there are many variables affecting peoples' motivations to manage and own woodland.

2.5 The Woodfuel Energy Market

The growth of the UK's woodfuel market forms part of the transition towards a low carbon, renewable energy system. Whilst wood has been used by humans for thousands of years as a source of heat, it is being increasingly used in more sophisticated burning appliances to produce both heat and electricity, at a variety of scales. Woodfuel comes in four main forms (Figure 2.7). The most traditional form being firewood, requiring the least processing before burning, usually in a domestic setting. Firewood may be burnt on open fires, which is an inefficient method of heating as large amounts of heat energy is lost through the chimney. Firewood is increasingly being used in more efficient wood burning stoves, sales of which have grown markedly in the UK in recent years with approximately 180,000 (Wallop, 2013) sold per year. It remains the most commonly used woodfuel across the world, with one estimate being over 1.5 billion m^3 per year (Parikka, 2004) which is probably an underestimate given its recent growing use across Europe in particular. The majority of firewood is consumed in developing countries where it forms 80% of the total primary energy supply (Keam and McCormick (2008). Nonetheless, firewood has remained in use in all industrialised countries, even as they transitioned to fossil-fuel based energy systems (Lillemo and Halvorsen, 2013). A second type of woofuel include woodchips. These are produced by passing logs through a chipping machine for burning in either a power station or biomass boiler.



Figure 2.7 The range of woodfuels available. From left to right: firewood logs (having been cut, split and stacked); woodchips for combustion in a biomass boiler; wood pellets; and a wood briquette.

Wood pellets and briquettes are produced by applying high pressure to saw dust which liquefies the lignin present, which acts like a glue, and binds the dust particles together (Brignall, 2015). Saw dust may be derived from forest management activities or from saw mills, in which case, pellets and briquettes have been described as 'recycled' wood (Magelli *et al*., 2009) or the dust could be produced directly from purposefully harvested timber. Like woodchips, pellets can be burnt in small-scale domestic biomass boilers (with outputs of 5-7kW) to provide space heating, or in medium to large-scale power stations, like the Drax power station in North Yorkshire (with an output of 27TW), to produce electricity and/or heat,

often being co-fired with coal. In a similar fashion to wood burners, the number of installations of woodchip and pellet-fed biomass boilers has risen greatly in the UK, with many being used in public buildings like schools and hospitals as well as in domestic settings.

The growing demand for woodfuel comes at a time when the global demand for wood is rapidly increasing, driven in part by the growing demand for sawn wood, pulp and paper from China and India (Söderberg and Eckerberg, 2013). The effect of this could be a switch from what is currently believed to be a surplus of European wood stocks to a deficit (*Ibid*., 2013). The impact of this could be a shift towards smaller diameter logs produced on shorter rotation lengths (the periods of time used to grow timber) used by the forestry sector (FAO, 2009). The EU has taken a highly positive view of biomass and the potential contribution it could make to the energy industry: “Biomass, for its part, could significantly reinforce sustainable security of supply. Biomass is a widespread and versatile resource that can be used just as easily for heating as for electricity...The enormous potential of forest and agricultural residues has so far not been exploited” (European Commission, 2001:43).

Wood pellets and woodchip in particular have become globally-traded commodities, with many European countries importing vast quantities of woodchips and pellets from the USA, Canada, and to some extent from Russia, Brazil, Australia and South Africa (Perry and Rosillo-Calle, 2008; Verhoest and Ryckmans, 2012). Equally, many European woodfuel businesses have invested heavily in those countries to build dedicated production plants and to provide more stable and efficient supply chains. Europe’s demand for woodfuel has come from fears surrounding energy security and a reliance on imports from insecure regions, the threat of global warming, and, notwithstanding the recent oil price crash, the overall trend of rising fossil fuel prices (Díaz-Yáñez *et al*., 2013). As such, governments across Europe provide subsidies for biomass energy, of which woodfuel is one kind. Biomass is all plant (and tree) material produced by the reaction between carbon dioxide, water and sunlight, known as photosynthesis, to produce the carbohydrates required for growth (McKendry, 2002). Moiseyev *et al*. (2014) note that despite co-firing coal with woodfuel being a relatively cheap option for power companies to reduce their carbon emissions, the process receives large subsidies from the UK government. With woodfuel widely recognised as a low carbon, renewable source of energy, The Economist (2013), claims it contributes to meeting 50% of Europe’s renewable energy demand. Without the large subsidies available for power companies to use woodfuel, Moiseyev *et al*. (2014) believe its share of the energy market would be greatly diminished because of a lack of supply of waste wood from other timber-using industries. There are many social and economic arguments as to why a mature biomass market is beneficial to society, including the support for rural economies and energy

diversity in both industrialised and developing countries (Söderberg, 2011). Tackling climate change, however, has been, and continues to be the principal impetus behind the growth of the woodfuel industry (CEBR, 2010). Whilst the woodfuel industry is promoted as supporting rural economies and combatting climate change, it is also criticised for stimulating too much demand for wood which could lead to the ecological degradation of forests as well as a reduction in spaces for recreation (Söderberg and Eckerberg, 2013).

Fear of climate change has been a strong element in the push for greater use of renewable energy generally, as well as growing sentiment towards viewing the Earth as a finite resource. As Zachmann *et al*. (2014) note, the two World Wars spurred initial interest in the use of renewable energy with security of supply being an important issue. During the oil crises in the 1970s, renewable energy received heightened support as politicians sought to reduce their country's reliance on Middle Eastern oil exporters. It was during the 1970s too that environmental groups such as the Club of Rome began warning the public about resource depletion (see Meadows *et al*., 1972) and the Gaia Hypothesis emerged which explored humans' relationship with nature (see Lovelock, 1972). Widespread concern about man's impact on the climate came to the fore at the United Nations Framework Convention of Climate Change in 1992 which led to the signing of the Kyoto Protocol in 1997. Since then, various financial mechanisms and carbon emissions trading schemes have been introduced by governments across the globe to stimulate the uncompetitive renewable energy market and de-carbonise their economies. One of the many financial mechanisms introduced include extensive public funding for woodfuel projects across Europe.

The European Renewable Energy Directive was published in 2009 and mandates that 20% of the energy consumed by the European Union is renewable by 2020 (see Directive 2009/28/EC). In 2011, the European Commission set a new target of cutting Greenhouse Gas (GHG) emissions to at least 80% of 1990 levels by 2050 in an attempt to keep global warming to within 2°C (EC, 2011). Different Members of the Union are required to contribute varying amounts to meet this objective with the UK required to produce 15% of its energy from renewable sources by 2020. To achieve this target, the UK has put in place a set of policies designed to increase the use of renewables, mainly through financial incentives. These include the Renewables Obligation, Feed-in Tariffs, the Renewable Transport Fuel Obligation and the Renewable Heat Incentive (RHI) (DECC^{a} 2015).

Figure 2.8 displays how the UK's consumption of different fuel types has changed from 1970-2014. A notable trend has been the decline of solid fuels, like coal, which had provided 47% of the total energy used in the UK in 1970. By 1980, gas became a major

contributor to the energy mix after North Sea gas came on line, becoming the dominant fuel by 2000. Since 1990, there has been a growing bioenergy and waste sector.

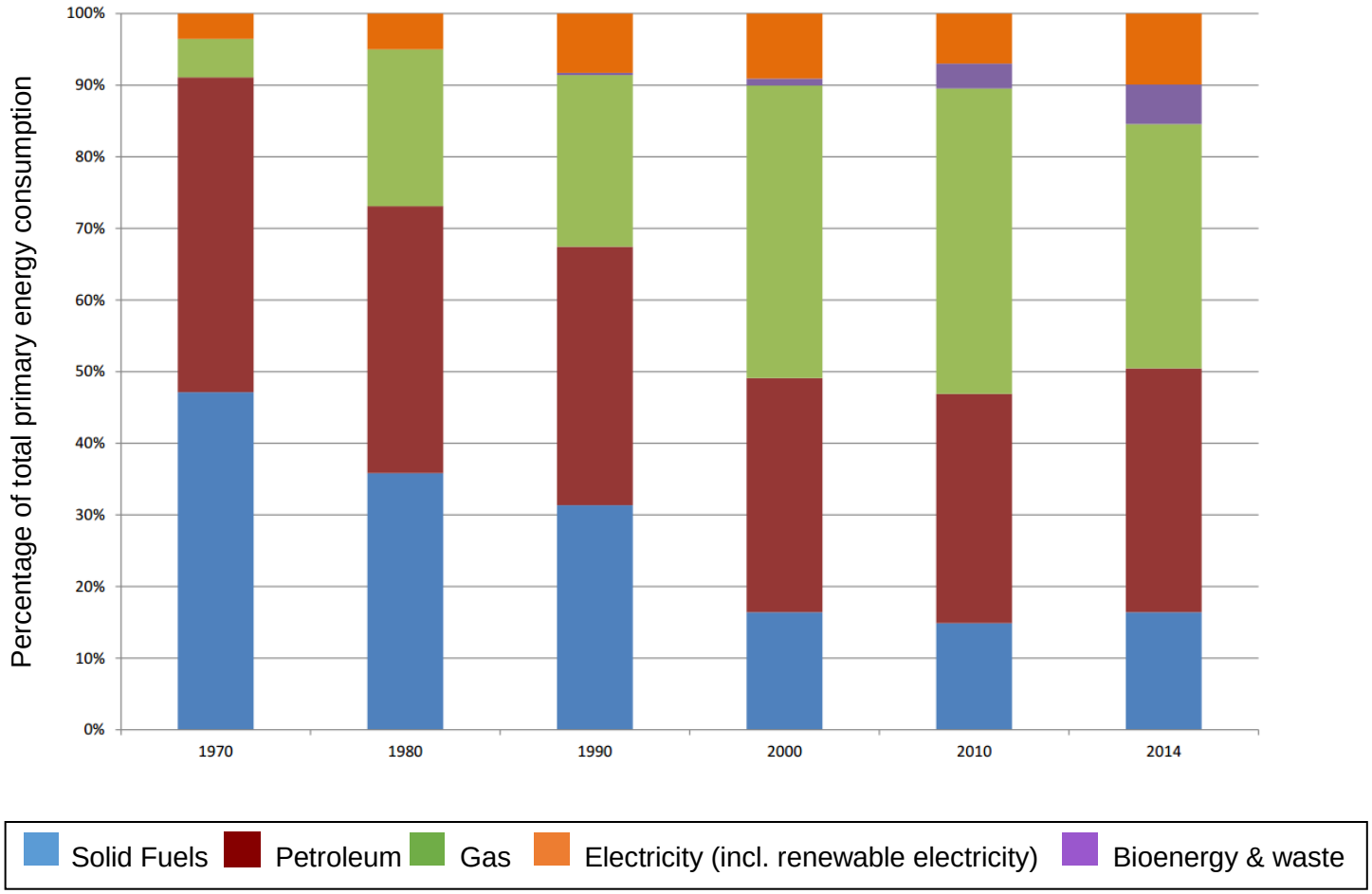


Figure 2.8: Total primary energy consumption (total amount of energy reaching all users excluding losses) by fuel type in the UK 1970-2014. Source: DECC (2015[b]), ECUK Table 1.02

Currently, the UK's transport and domestic sectors consume the most energy: 38% and 27% respectively (Figure 2.9). In 1970, industry consumed the most at 40%. Given the domestic sector currently uses almost a third of the total energy consumed in the UK, a considerable reduction could be made by changing the way electricity and heat is generated and used in British homes

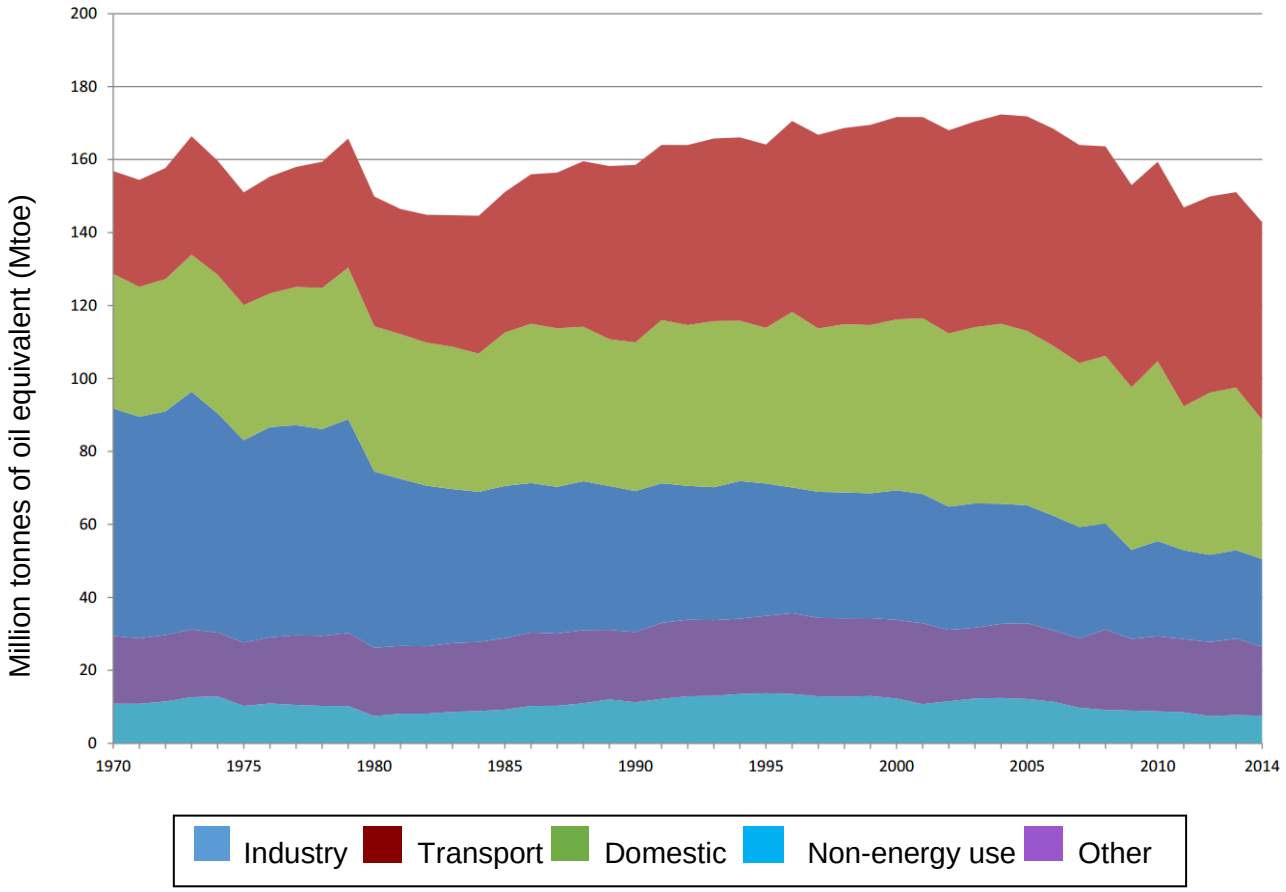


Figure 2.9: Final energy consumption by sector in the UK 1970-2014. Source: DECC (2015[b]), ECUK Table 1.05.

The use of renewable energy has been rising since the 1990s. In 2014, 7% of the UK's total energy consumption came from renewable sources which means the country is approximately 8% off meeting the EU's 15% target by 2020; energy consumption data for 2015 have not yet been published by DECC but it is assumed that renewable energy increased marginally from 2014.

	2010	2011	2012	2013	2014
Percentages of renewable energy contribution to the gross final energy consumption of the UK 2010-14.	3.8	4.2	4.7	5.6	7.0

Table 2.11 The use of renewable energy has almost doubled since 2010 and the publishing of the European Renewable Energy Directive in 2009. Source: DECC (2015[a]).

The proportion of renewable energy sources used in the UK in 2014 is displayed in Figure 2.10. 71% of the renewable energy produced was for electricity rather than heat. In input terms, bioenergy makes the largest contribution to renewable energy at 72%. However, using bioenergy to produce electricity is not efficient and it makes a 35% contribution to electricity generation (DECC, 2015[a]).

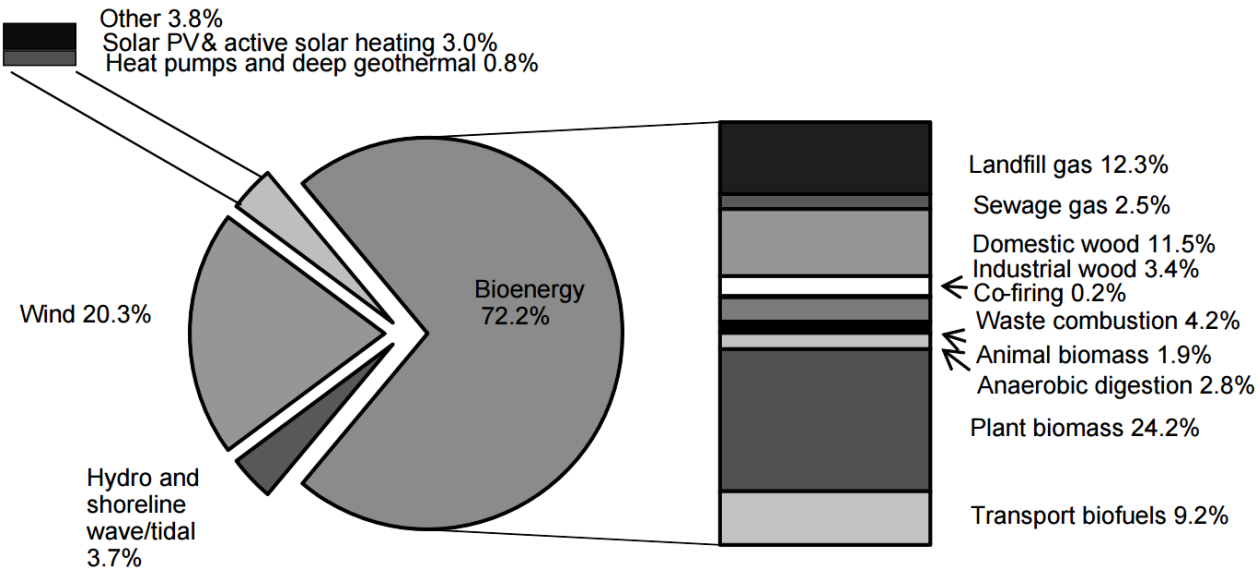


Figure 2.10 The proportion of renewable energy fuels used in the UK in 2014.
Source: DECC, (2015[a]).

Despite the inefficiency of electricity production using bioenergy, the amount of electricity generated from it was 25% higher in 2014 compared to 2013, primarily the result of a second boiler at the Drax power station being converted to a biomass feedstock on the back of government subsidies (DECC, 2015[a]). This feedstock includes wood harvested from forests and by-products of forestry activities (also known as forest residues), agricultural products including straw, sunflower seed husks, energy crops like Miscanthus and Short-Rotation Coppice (SRC) such as willow.

Wood is used in the UK's energy sector at a variety of scales, from firewood use in domestic settings to large-scale electricity production. At the largest scale, Drax produced 29% of its electricity from biomass in 2014, mostly in the form of wood pellets (Drax Group, 2015). However, as is the case across Europe, where power generators are increasingly using woody biomass to meet their renewable energy targets, Drax imports the majority of its wood pellets from the south-east of the US and from British Columbia in Western Canada (Table 2.12). The European demand for wood pellets has increased greatly since the European Renewables Directive in 2009. Between 2008-2014, the EU's net imports of wood pellets almost doubled by from 2.8 to 5.5 million tonnes, with the UK driving the demand using subsidies (DECC, 2015[c]). These subsidies include the Renewable Obligation Certificate (ROC) scheme whereby electricity producers are granted 'ROCs' for each unit of renewable electricity they produce. 'ROCs' are worth £45 per megawatt hour with Drax estimated to be receiving £550 million worth of payments per year (The Economist, 2013). Producers can trade ROCs with one another and are charged if they fail to produce the required number to OFGEM each year. The effectiveness of such an approach has been much questioned with Ehrig and Behrendt (2013) arguing it has been a cost-effective approach to reducing the UK's carbon emissions whereas The Economist (2013) argues the opposite given the scale of the subsidies and the often overlooked carbon emissions from the transportation and processing of woodfuel.

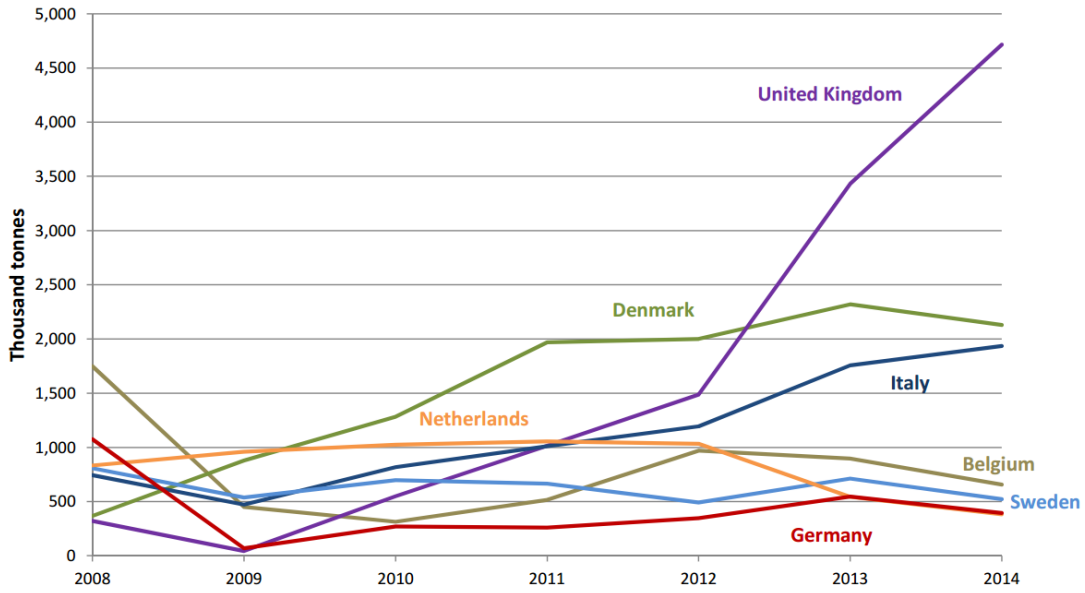


Figure 2.11 The EU's main importers of wood pellets 2008-2014 Source: DECC (2015[c]). Whilst the UK was the smallest importer in 2008, it became the largest in 2012. The UK, Denmark and Italy are the only EU countries which have increased their wood pellet imports since the Renewables Directive came into force in 2009.

Being a new market with few established pellet companies with supply chains capable of meeting the EU's demand, many of Europe's larger energy companies have made considerable investments in the US. Drax invested $120 million on a pellet plant in Louisiana where they can be shipped out of the Port of Greater Baton Rouge (Tilburg, 2013).

Country of origin	Tonnes of wood pellets	
	2013	2014
US	619,045	2,380,347
Canada	813,305	882,758
Latvia	47,621	307,114
Portugal	83,838	234,287
Estonia	-	151,196
UK	36,156	113,345
Germany	-	17,376
South Africa	-	5,304
Poland	-	914
Total	**1,599,965**	**4,092,643**

Table 2.12 The sources and amounts of wood pellets used by Drax power station. Source: Drax Group (2015). Less than 3% of the wood burnt by Drax in 2014 came from UK forests.

Based on these figures, Drax is, by far, the main driver for UK wood pellet imports. The UK imported just over 4.5 million tonnes in 2014, of which Drax used 3 million tonnes.

Given the scale of the import volumes, many environmental NGOs are concerned about the risk of over-harvesting North American forests and have questioned the greenhouse gas savings which electricity producers claim. Drax, for example, claims that they saved 6.1 million tonnes of carbon emissions in 2014 which includes life cycle emissions associated with the processing and transport of pellets. One estimate of net CO_2 emissions from the life cycle production, transport and burning of Canadian wood pellets in Europe was that they can be 50% less compared to the emissions from coal, heating oil or natural gas (Magelli *et* al., 2009). However, Bowyer *et al*. (2012:50), at the Institute for European Environmental Policy, claim there is "no basis for presuming that EU bioenergy use to 2020 will deliver emission savings, and a significant risk that it may result in additional emissions." Equally, the climate change policy officer at the Royal Society for the Protection for Birds remarked that it is the scale of the current global woodfuel industry which is concerning and they would prefer to see it being used at smaller scales: "The biomass sector is a disaster in the making. It is a very inefficient way to use a varied resource. We would prefer to see combined heat and power plants that are small scale and use local resources" (Pfeifer, 2013).

However, it is claimed that the majority of pellets are derived from by-products of other wood using industries and are manufactured from the saw dust produced as a waste product (Hoengels *et al*., 2014). Nonetheless, when the global demand for pellets is expected to grow by 9% per year (Pfeifer, 2013), there is the risk that the demand for wood as a source

of energy could encourage the harvesting of forests to meet the demand directly. At present, wood is already diverted from the pulp wood industry to pellet usres (Hoengels *et al*., 2014). Matthews (2015) notes that for biomass to become a global leading renewable energy source, the industry must improve the public and politicians' understanding as well as continuing to prove its sustainability, particularly at large scales. In 2012, at the largest European conference on biomass, one conclusion was that the industry must counter the environmental claims being made by campaign groups opposed to bioenergy:

"The entire bioenergy industry is based on the dual premises of GHG reduction and sustainability. It is essential that we convince governments and the public to continue supporting bioenergy, because without it, the bioenergy industry could vanish overnight (Murray, 2012 [online])*."*

The debate surrounding the environmental sustainability of the global woodfuel industry remains a dividing issue. As such, many environmental groups call for woodfuel to be used only at small-scales, with minimal transportation involved.

At smaller scales in the UK, wood is used to produce energy in biomass boilers which themselves are used at various scales; in Combined Heat and Power plants (CHP); in anaerobic digesters; and in domestic wood burners. In recent years, there has been a small but growing number of decentralised heat and power networks established by private entities, local communities and, occasionally, Local Authorities (Hannon and Bolton, 2015). These typically involve the supply of heat, powered by biomass boilers, or heat *and* electricity from CHP. A number of owners of rural estates across the UK have installed woodchip-fed biomass boilers for heating to reduce their reliance on expensive gas and oil. Bertoldi *et al*. (2015) explored the growth of small 'Energy Supply Companies' which are community-led projects focussing on renewable energy, often using local under-managed woodland to supply woodchip-fed biomass boilers to heat multiple buildings. As Rogers *et al*. (2012) note, such community-led energy projects typically occur on the periphery of the UK's energy network, creating local jobs, improving a community's energy security, and protecting against energy prices rises. Woodfuel projects are well suited to providing these benefits by creating demand for jobs in the woodland management sector to harvest and process woodfuel as well as the added benefit of managing, often neglected, woodland. Other small-scale renewable energy sources like wind and solar can rarely satisfy the energy requirements of a whole community (Wood and Rowley, 2011).

As Table 2.13 shows, in terms of energy input, wood was the most used renewable energy resource in the UK in 2014. For electricity production, its use is dominated by power stations like Drax where the majority of wood is imported. Wood grown as an energy crop, as in the

case of Short Rotation Coppice (SRC), like willow, is used to a smaller extent. For heat production, wood is used most in domestic environments where it is burnt on open fires, in wood burners and in 'AGA cookers' and in biomass boilers, usually as woodchips but also as pellets and firewood logs. The use of wood for space heating and hot water has increased markedly in commercial and public buildings like schools, hospitals, hotels, nursing homes, poultry farms and government buildings since the introduction of the Renewable Heat Incentive (RHI) in November 2011 (DECC 2015[a]).

	Renewable energy sources used for electricity production in the UK in 2014.	Thousands of tonnes of oil equivalent
Wind:	Onshore	1,600.30
	Offshore	1,152.60
	Marine (wave and tidal)	0.2
	Solar photovoltaics	348.2
Hydro:	Small scale	71.5
	Large scale	434.5
Bioenergy:	Plant biomass	2,912.90
	Landfill gas	1,654.60
	Biodegradable energy from waste	551.10
	Anaerobic digestion	330.80
	Sewage sludge digestion	277.40
	Animal biomass (farm waste)	224.8
	Co-firing with fossil fuels	25.1
		9,584.10

Table 2.13 Renewable energy sources for electricity production in the UK in 2014. Note that the 'plant biomass' category includes wood burnt in power stations, such as Drax. All possible uses of wood are highlighted green. Source: DECC (2015[a]).

	Renewable energy sources used for heating in the UK in 2014.	Thousands of tonnes of oil equivalent
	Active solar heating	52.1
Bioenergy:	Wood combustion-domestic	1,554.40
	Wood combustion-industrial	459.4
	Plant biomass	373.1
	Sewage sludge digestion	67.7
	Anaerobic digestion	43
	Animal biomass (farm waste)	34.5
	Biodegradable energy from waste	23.3
	Landfill gas	13.6
	Deep geothermal	0.8
	Heat pumps	107.6
		2,729.60

Table 2.14 Renewable heating sources in the UK in 2014. The 'wood combustion-industrial' category includes wood used by commercial and public sector buildings. Source: DECC (2015[a]).

As DECC (2015[a]) notes, data about the use of wood in domestic settings is not readily available and, until 2002, was based on a 1989 survey. This only estimated wood use on open fires rather than dedicated wood burners. Between 2002–2013, DECC estimated the volume of domestic wood burnt via anecdotal evidence from representative bodies of the woodfuel market, including HETAS (the official Government-recognised body which approves solid fuels) and the National Association of Chimney Sweeps. The estimates took into account the sales of wood burners which increased by 50% every 2-3 years between 2002-13 as well as average temperatures (DECC, 2015[a]). To gain a better indication about domestic woodfuel consumption, DECC commissioned a one-off survey in 2014 of 16,000 homes. Rather than asking people how much woodfuel they burnt, consumption data was based on the number of hours people used their wood burning appliances for. The reason for this being that previous surveys have demonstrated that people find it difficult to provide an accurate estimate due to differences in species, the moisture content of wood and whether it was sold by weight or volume (DECC 2015[a]). The results of the 2014 survey showed domestic woodfuel use was being greatly underestimated by a factor of 2.6. The current figure of 1,554 tonnes of oil equivalent is now used as the baseline figure and will be revised each year based on the upward trend of woodfuel appliance sales (DECC, 2015[a]).

Approximately half of all energy consumed is used for heating purposes in the UK, with 2% coming from renewable sources (DECC, 2013[a]). As part of efforts to meet the EU's Renewable's Directive and stimulate the renewable energy heating market, the Renewable Heat Incentive (RHI) was introduced whereby the Government makes tax-free payments to

individuals and businesses with an accredited heating appliance per kWh produced. A range of heating technologies are included under the scheme including: biomass systems; solar; air and ground source heat pumps; CHP and biogas. As Table 2.15 shows, the majority of RHI payments are for biomass. Payments to owners of properties used for commercial purposes (including apartment blocks) can claim money for 20 years whilst domestic owners can claim for 7 years. The theory behind the RHI is that payments will cover the cost of the appliance's installation and encourage people to use renewable heating (DECC, 2013[b]). As more appliances are installed, the hope is that demand for renewable heating will be sufficient for the market to continue without the support of government subsidies.

Technology Type	Accredited Installations	
	Number	% of total
Small Biomass Boiler (< 200 kW)	11,755	87%
Medium Biomass Boiler (200-1000 kW)	992	7%
Large Biomass Boiler (> 1000 kW)	29	0%
Small Solar Thermal (< 200 kW)	203	1%
Small Water or GSHP* (< 100 kW)	355	3%
Large Water or GSHP (>100 kW)	54	0%
Biomethane	38	0%
Biogas	37	0%
Air Source Heat Pumps	117	1%
CHP	0	0%
Deep Geothermal	0	0%
Total	13,580	100%

Table 2.15 Above: Commercial RHI uptake by technology type since its introduction in November 2011 to December 2015. Small and medium biomass systems have been the most popular with limited take-up of other RHI-funded technologies. *Ground Source Heat Pump.

Below: Domestic RHI uptake by technology type since its introduction in April 2014 to December 2015. Source: DECC (2016[a]).

Technology Type	Accredited Installations	
	Number	% of total
Biomass systems	7,924	43%
Air source heat pump	6,978	38%
Solar thermal	2,129	12%
Ground Source Heat Pump	1,452	8%
Total	18,483	100%

To manage the RHI budget, DECC introduced a “degression” system, whereby tariff rates for the more popular technologies are reduced. The payments for domestic users of biomass systems have reduced from 12.2 p/kWh when it was introduced in 2014 to 5.14 p/kWh in 2016. Commercial users of small-scale biomass systems have seen a drop in payments from 7.9 p/kWh in 2011 to 3.76 p/kWh in 2016. Meanwhile, payments for all other types of technologies listed above have increased.

DECC envisaged that RHI payments would be of most benefit to the 4 million UK homes which use more expensive, non-mains gas heating fuels such as electricity, Liquefied Petroleum Gas (LPG) and oil (DECC, 2013[b]); it costs approximately 50% more to heat a 3 bedroom house with oil than with gas and 100% more with LPG (OFT, 2011). These 4 million off-grid energy users are evenly split between rural and urban areas (DECC, 2013[b]). In urban areas, it is hoped the commercial RHI may stimulate the creation of biomass boiler heat networks. By contrast, DECC believes heat networks are not economic in sparsely populated rural areas and that most RHI payments will be made to owners of systems heating individual homes (DECC, 2013[b]).

In terms of the biomass systems eligible for RHI payments, only boilers which provide central heating through radiators or underfloor heating are allowed. These typically use wood chips or pellets, with some ‘log boilers’ also available. Woodchip and pellet systems can be fully automated, with wood being fed into the boiler automatically (Figure 2.13). Log burners are not eligible for RHI payments (Figure 2.14). The reason being that DECC fears coal could be burnt on such multi-fuel burners whilst people also claim RHI payments, thus defeating the objective of increasing renewable energy.



Figure 2.12: A large-scale wood biomass CHP boiler. This unit was designed by Urbas. Source: R&S Biomass Equipment (2012).



Figure 2.13: A 200kW woodchip boiler on a rural estate in Lincolnshire. This boiler is fed by wood harvested on the estate and provides networked heating for a large 5 bedroom house, including a swimming pool and greenhouses as well as two other 3 bedroom houses. Source: Author's own photograph. [Taken: 10/11/2013].



Figure 2.14 A 5kW domestic wood burning stove used in Birmingham. Such stoves are not eligible for RHI payments, but is one of the approximately 180,000 wood burners being installed across the UK each year. The wood burner's flue is highlighted, revealing that some building work is required to have one installed. Source: Author's own photograph. [Taken 8/6/2011].

For all biomass systems receiving RHI payments, wood must be purchased from a supplier on the 'Biomass Supplier's List'. Woodfuel suppliers can become accredited suppliers on this list if they can demonstrate that use of their wood leads to a 60% reduction of lifecycle GHG emissions against the EU fossil fuel average. The supplier's wood must also meet the 'land criteria' for woodfuel used for heat and electricity (DECC, 2014). These criteria are based on internationally agreed sustainable forest management practices including European standards (see Pan-European SFM Guidelines, 1998). Woodfuel users can find local woodfuel suppliers via DECC's database.

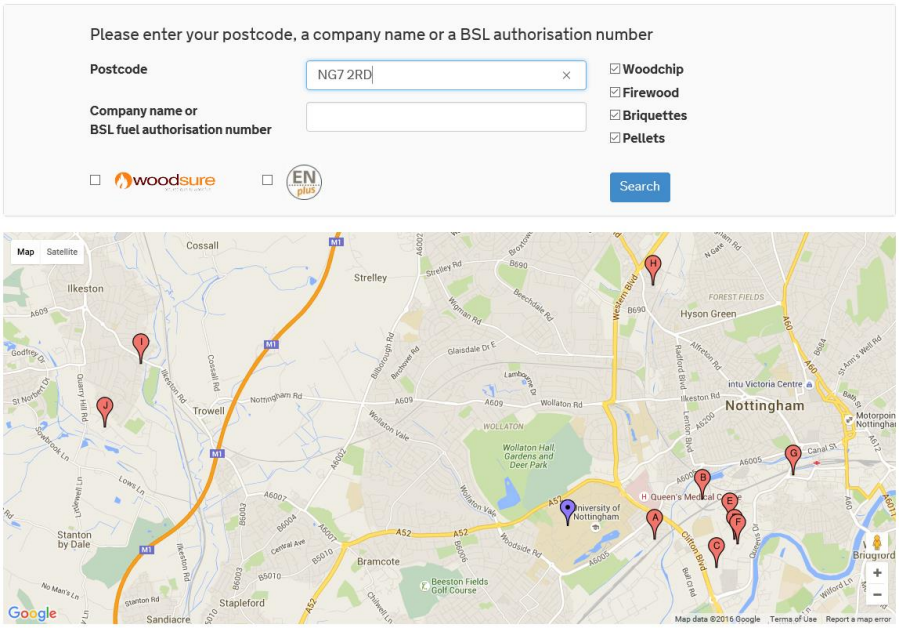


Figure 2.15 Woodfuel users can find local suppliers using DECC's list by inputting their Post Code. Source: BSL (2016).

DECC claims a mass market for renewable heating will be achieved if its current rate of growth continues. This mass market is defined, rather arbitrarily, when over 800 Mega Watts of renewable heating are being added to the UK's energy mix each year (see DECC, 2016[b]). Between 2009-2014, a yearly average of 194 MW were added. With biomass heating technologies being complex systems, requiring technical and logistical knowledge, DECC envisages that as more people become knowledgeable of these systems in the UK, the installation and maintenance costs will fall. Similarly, as the cost of European biomass systems fall, it should become cheaper to import them (*Ibid*., 2016[b]). With 42% of domestic users and 63% of commercial users saying they would not have installed their biomass system without RHI payments (*Ibid*., 2016[b]), the Government has committed to maintaining and increasing the annual £1.15 billion RHI budget to 2021 (HM Treasury, 2015), which provides confidence to future RHI applicants and woodfuel suppliers.

Whilst the RHI has been pioneering in that it is the first tariff-based mechanism to support the adoption of renewable heating technology, it has been criticised. Barkham (2015) argues it is affluent people who are only benefitting from the scheme (given the high purchase and installation costs) with biomass boilers being installed in large rural properties, paid for with public money. Secondly, the scheme has been criticised for promoting the wasting of heat energy because payments are based on the number of kWh produced (Monbiot, 2015). As such, there is anecdotal evidence of farmers using RHI-funded biomass boilers to heat empty grain barns, because they are being paid to use their boiler (Monbiot, 2015). A DECC-commissioned report in 2014 concluded that the scheme encouraged people to install over-sized boilers which can reduce their efficiency – which increases their carbon footprint because more wood is burnt – and reduce the boiler's life span (Luker, 2014). Monbiot (2015) summarises his grievances with the following: *"As hundreds of thousands languish in fuel poverty, forests are being felled so that rich people can burn wood with the windows open"*.

2.6 Summary

This chapter has contextualised the research, by exploring the history of woodland management and the recent economic trends in the forestry sector. The rise in the use of renewable energy, of which woodfuel is one form, has highlighted where the demand for woodfuel is coming from. The demand for firewood has come from the growing number of domestic wood burners whereas the demand for woodchip is coming primarily from RHI-subsidised biomass boilers being installed in domestic, commercial and public buildings.

Issues surrounding contemporary woodland management in the UK have largely been ignored by rural geographers in recent years. As Mather *et al*. (2006) note, the topic of land use change has been neglected by human geographers in the UK, despite having historical roots in this area. The Forestry Commission, economists, ecologists and independent consultants have carried out the most research, much of which has centred on woodland management from the perspective of the 'ecosystem service' framework with woodfuel often being listed as a 'provisioning service' (see Valatin and Sterling, 2010). However, such studies have largely been descriptive in nature, calculating the amounts of woodfuel which could be harvested, or the economic value of the woodfuel market to the wider economy. Equally, the use of woodlands in the UK has been much researched from the perspective of carbon sequestration, providing estimates of the amount of carbon currently stored, or how much could be stored with changes to forestry practices (see Read *et al*., 2009). There has been some research about attitudes to woodland creation and management (see Lawrence

et al., 2010) but there has been a lack of research about land owner's attitudes about woodfuel, despite its growing use in the UK. Furthermore, no research has focussed on woodfuel merchants who play a crucial role in the supply chain.

The current research will address these overlooked topics and aims to further the debate about post-productivism in the UK. This is a contentious area with Evans *et al*. (2002) doubtful that post-productivism has actually become a feature of British agriculture, even questioning whether the doctrine has any merit. Conversely, Mather *et al*. (2006) believe the UK's forestry sector exemplifies the post-productivist changes that have taken place across the rural economy. However, Mather *et al's* (2006) argument lacks an analysis of peoples' underlying attitudes about woodland management decisions. The current research focusses on peoples' attitudes to producing woodfuel and income from woodlands to explore Mather *et al's* (2006) view that a post-productivist shift has occurred in the UK's forestry sector.

Chapter 3

Methodology

This chapter reviews the methods used to conduct the research, exploring their theory and use by geographers and others who conduct rural research. For the purposes of understanding woodland owners' management objectives in particular, a mixed-methods approach was used, combining interviews with an online survey. The importance of field visits, photography, the collection of comments from internet discussion forums and the use of a field diary to aid with the design of the research are also explored.

3.1 Interviews

3.1.1 The use of Interviews in Rural and Environmental Geography

Urquhart (2008) claims that a methodological shift towards more participatory and qualitative methods has taken place in research into rural life in recent years. In human geography, this shift is part of the "cultural turn" which began in the 1980s as the focus of much research turned towards understanding individual's actions and perspectives (Cook *et al*., 2000) which was accompanied by an increase in the use of qualitative research methods such as interviews, ethnography and textual analysis (see Hughes *et al*., 2001). Since then, research into the reflexive relationship between people and the land has burgeoned with researchers using interviews and participatory methods to view landscapes as "social products" (see Mitchell, 2003) or "landscape[s] from within" (Setten, 2004). Before geography's "cultural turn", the majority of rural research was conducted using quantitative data and followed a positivist epistemology (Cloke, 1990). With an increasing recognition that farmers and other land managers possess great knowledge of landscapes and landscape change, many have developed interests in how environmental knowledge is shared across society and within particular communities as well as at the interface between practitioners and scientists (see Morris, 2006; Raedeke *et al*., 2003; and Riley, 2003). Setten (2004) has explored how farmers interpret and practice state-driven public policy and Fischer and Marshall (2010) use interviews to explore how people frame the debate surrounding the use of the Scottish uplands for restoring the native Caledonian pine forest or using traditional moorland management to improve hunting.

Harvey and Riley (2009) demonstrate the effective use of interviews in challenging widely supported metanarratives in their work with farmers in Devon and the Peak District surrounding the creation of the so-called 'National Farm' during the Second World War. The traditional narrative of the National Farm concept is one of patriotism and a united approach

to producing the country's food, but through the use of oral history interviews, Harvey and Riley (2009) reveal the complex relationship between farmer's actions and beliefs with the national policy of greater food production. In relation to woodfuel, the current national policy is for a marked increase in production and this study, therefore, seeks to explore the extent to which the policy has been accepted.

As Hoggart *et al*. (2002) note, interviews are useful to understand peoples' lives and decision-making. Given the aim of the study was to understand how people's behaviour and actions have changed in response to the growing demand for woodfuel, which necessarily involves investigating a complex array of different peoples' opinions and values, interviews were selected as the primary method for conducting the research. Furthermore, whilst there have been many quantitative studies which have estimated the potential volumes of woodfuel which could be harvested from the country's woods and forests, few studies have explored how woodland owners' objectives affect their behaviour in relation to woodfuel and woodland management. Neither have any studies explored the roles and experiences of merchants in the woodfuel sector.

Interviews are useful for a variety of reasons: they give people the opportunity to explain their decisions in greater depth in contrast with the closed-style questions often used in questionnaires; they can be tailored to an individual's circumstances; and interviewees can raise topics which they consider to be important (Valentine, 1997). In the current study, the interviews revealed a more in-depth understanding that data collected through surveys cannot. For example, one owner of a large agricultural estate in Lincolnshire explained that he has greater responsibility for looking after the woodlands on his land because of the relative lack of woods across the county. This partly explains why he has adopted a more sensitive management approach in his woods; he does not use harvesting vehicles because he believes this would be detrimental to the visual appearance of the woodlands. Granted, this information could be provided in open-ended questionnaires but people rarely go into this depth when not encouraged to do so. This example demonstrates the strength of interviews. Through the interview, the interviewee was able to explain how the geography of his estate affects his management strategy, something which would have been difficult to understand through a survey.

3.1.2 Development of the Interview Schedule

There is no unified set of principles surrounding the use of interviews as a method to collect empirical data (Denzin and Lincoln, 1994). The intention of the interviews was to create a dialogue between the researcher and the participant rather than attempting to extract as much information as possible. As such, the interview schedule remained flexible where new lines of enquiry could be pursued as they arose. A semi-structured interview approach was considered appropriate for this purpose. A list of broad themes with pre-determined questions was used during each interview but the flexible approach allowed for interviewees to introduce topics that they believed were of relevance and on many occasions, this led to discussions on themes that were not listed on the interview schedule.

During a literature review of studies on the silvicultural and socio-economic factors of woodland and woodfuel management, an initial set of themes and questions were produced bearing in mind the overall aim: an exploration of the ways in which the woodfuel market has affected woodland management and the role of the woodfuel merchant. As the literature review progressed, more specific lines of enquiry emerged such as the extent to which coppicing may be becoming more widespread given its ability to rapidly produce biomass as well as benefitting a woodland's variety of flora and fauna. The development of the interview schedule was therefore an iterative process whereby questions and themes were continually revised before being finalised (see Figure 3.1). The interview schedule consisted of a mix of closed questions such as how the amount of woodfuel extracted from woodland had changed with time and open-ended questions designed to understand the values that owners attach to woodland by exploring their reasons for ownership and management objectives.

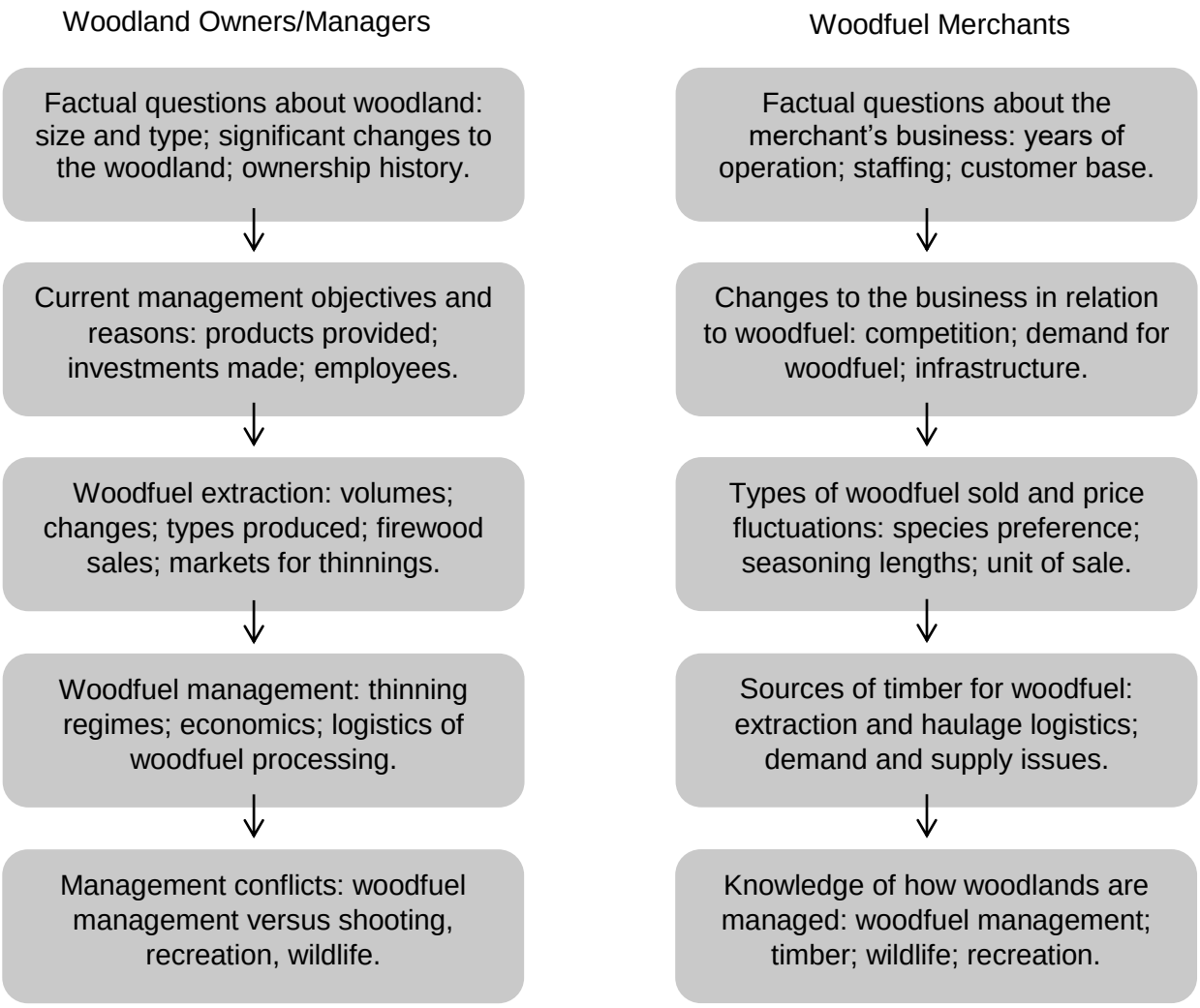


Figure 3.1: A schematic diagram showing the flow of themes addressed during the interviews. Two interview schedules were developed from these; one for owners and managers of woodland (including farmers and woodsmen), and one for the merchants.

Although some of the questions changed throughout the process of conducting the interviews as will be discussed in the Section 3.4, the first few interviews were treated as pilot interviews to gauge participants' responses and to make any changes to the interview schedule deemed necessary. An example of such a change was to remove a set of questions about the use of woodlands to store carbon. The original aim of these questions was to explore people's views about using woods to store carbon and whether they believed their management decisions affected the amount of carbon stored in trees and soils. It became clear during the initial interviews however that participants did not engage with this topic. The view was taken that the study would be more coherent if it focussed primarily on woodfuel production and woodland management and the perceived use of woods to store carbon was therefore removed from the interview schedule. As might be expected however,

many participants had more to say in relation to climate change more generally with many of them raising the subject without being prompted.

In a similar vein to Urquhart *et al's* (2010) study on private woodland owners' motivations and their ability and willingness to deliver public goods, different interview schedules were used; questions for firewood merchants and questions for owners and managers of woodland. The reason for this being that the questions for firewood merchants were designed to understand how they ran their business and their interactions with woodland owners whereas the questions for woodland owners were designed to understand how they may have changed their practices to woodland management in response to the growing woodfuel markets. Whilst there was an overlap in some of the questions asked during interviews with merchants and woodland owners, the different research angle meant two interview schedules were used.

The interview schedules were split into a series of 'thematic' and 'follow-up' questions. The thematic questions were designed to instigate a conversation, during which the follow-up questions could be asked. The following is an example of a thematic question with its related follow-up questions.

Thematic question:

Could you talk me through your current management objectives?

Follow-up questions:

What are the main services and products the woodland produces?

How important is making a profit from your woodland to you?

Have you experienced any difficulties in reaching your management objectives?

What are the main challenges in achieving your objectives?

Who carries out the management work?

Have you ever paid/considered paying a contractor to carry out management?

What are the costs to you of owning a woodland, if any?

Following Griffith's (1991) advice that asking factual questions at the start of an interview encourages participants to feel settled and provide longer, more contextualised responses as the interview progresses, the interviews typically opened with questions about woodland size, type and harvesting volumes. Questions then focussed on owners' management objectives with a focus on understanding their values and motivations for managing their wood. With woodfuel merchants, the interviews progressed onto questions about how the

market has developed, where they source their timber from and the logistics of the woodfuel supply chain. Whilst the interview schedules were used in every interview, they were not strictly followed to allow a natural conversation to develop. Furthermore, the topics discussed did not always follow the same order as they appear on the interview schedule because interviewees often raised topics before the interviewer introduced them. Occasionally, an interview technique described by Valentine (1997) was used whereby the interviewer asks unfinished questions to prompt participants to give longer answers when they were only providing brief responses which lacked context. Whilst there was little need for this approach, an example of this technique is given below whereby an interviewee might have been providing brief responses so a list of potential topics for the interviewee to consider was provided in the question:

Interviewer: What would you say are your main management objectives? Could they be related to recreation, conservation or the supply of wood products?

Whilst the same broad topics were discussed during each interview, on some occasions a more specific topic might have been discussed based on an interviewees' background and area of expertise. As such, prior to each interview, the interview schedules were reviewed based on any information collected during initial telephone calls or emails. For example, an interviewee might have commented on a particular aspect of the woodfuel market which could be explored in greater detail during the interview.

3.1.3 Sampling Strategy

Purposive sampling strategies have previously been used in studies which have explored changes to rural practices and landscapes using interviews (see O'Brien, 2005; and Riley, 2003). With a purposive sampling strategy, it is accepted that participants are not necessarily representative of the entire population but provide examples of the particular subject being studied. Baxter and Eyles (1997) describe purposeful sampling as the identification of 'information rich cases'. Following Glaser and Strauss' (1967) advice, interviewees were selected based on their theoretical relevance to the study. As such, potential participants were approached if they were found to have some connection with the woodfuel markets which was usually because they owned woodland and produced their own woodfuel, or were exploring the possibility of producing more woodfuel. It was not the intention of the study to only recruit participants who harvest the most woodfuel from their woods but to engage with a variety of owners, managers and merchants some of whom may only have been marginally involved with woodfuel production as an aside to other business ventures.

Interviewees were recruited using a mixture of cold calling and snowballing techniques (see Figure 3.2). The technique of snowballing is the process by which new participants are found following a suggestion from other participants (Valentine, 1997). The majority of woodfuel merchants were recruited via internet searches and cold calling to ask for their involvement with the study.

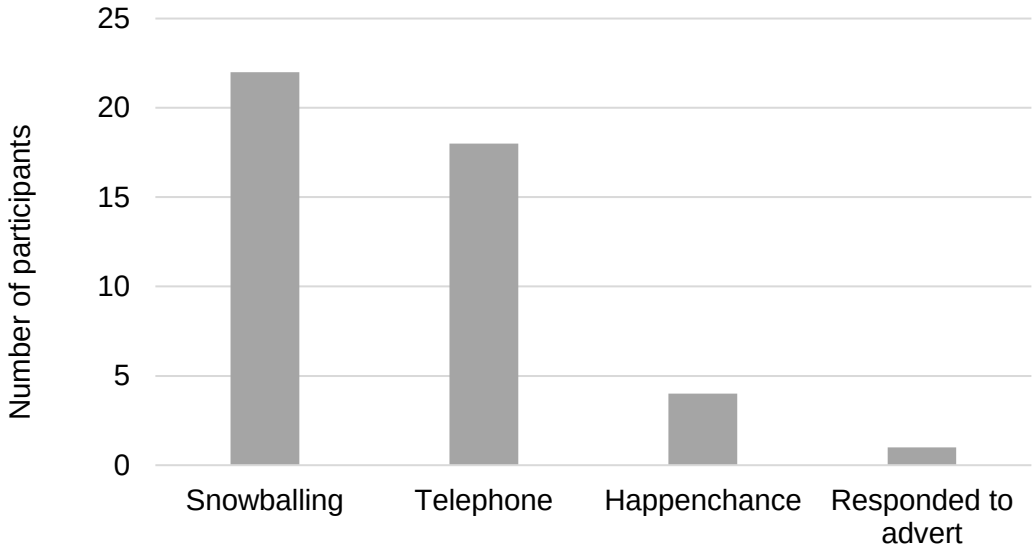


Figure 3.2 The number of participants recruited using each method.

Of cold calls made to merchants, two declined to participate. During each telephone call, an outline of the study was provided. Multiple phone calls were usually required to secure an interview as it was often the case that the most relevant person was unavailable. This was not the case with the many self-employed woodfuel merchants and an interview was often arranged with one telephone call. Because woodfuel merchants operate at a variety of scales with some delivering small volumes locally, and others delivering nationally, a variety of merchants were interviewed. With the merchants who supply nationally, an interview was often arranged with someone involved with the logistics of the supply network who could describe where their timber is sourced. It was often found to be the case that such interviewees had backgrounds in the forestry sector and were therefore keen to explore the impact of the woodfuel markets on forestry.

As Riley (2003) notes, the technique of snowballing has been most documented in medical studies of the AIDS epidemic in which the population is 'hidden' to the researcher and they need help recruiting the next set of participants. Not coming from a farming or forestry background, the researcher joined three organisations whose members are involved with the management of woods. These were the Royal Forestry Society (RFS), Heartwoods and the Small Woodland Owners' Group (SWOG). The RFS holds quarterly outdoor meetings to discuss woodland management, during which a number of interviewees were recruited. Heartwoods is a West Midlands-based initiative run by the national not-for-profit organisation, the Small Woods Association, set up to provide advice to woodland owners about woodland management. Further interviewee recruitment took place at the networking events organised by Heartwoods. SWOG is an online-based community of owners of small woods. Members of SWOG arrange meetings to discuss woodland management as well as producing a quarterly newsletter, in which an advert was placed to inform people about the research and to ask any interested parties to get in contact. These groups proved to be an effective way to meet a diverse range of woodland owners and managers.

Prior to many of the interviews, there was a communication stream via the telephone or e-mail. Many useful conversations occurred in these initial encounters and notes were taken of all conversations with interviewees both prior to and after a formal interview took place. For example, many interviewees talked about specific management issues during initial phone calls and these were logged and used to finalise the interview schedule prior to each interview.

Two interviewees were recruited through 'happenchance', whereby signs with "Firewood for Sale" along roadsides were used to identify a merchant selling woodfuel from their home.

On both occasions, the interviewee sold firewood in small quantities and as an aside to another business.

3.1.4 The Interview Process

In total, 45 interviews were conducted. As Figure 3.3 shows, the majority of interviewees were either merchants, woodland owners or forest managers.

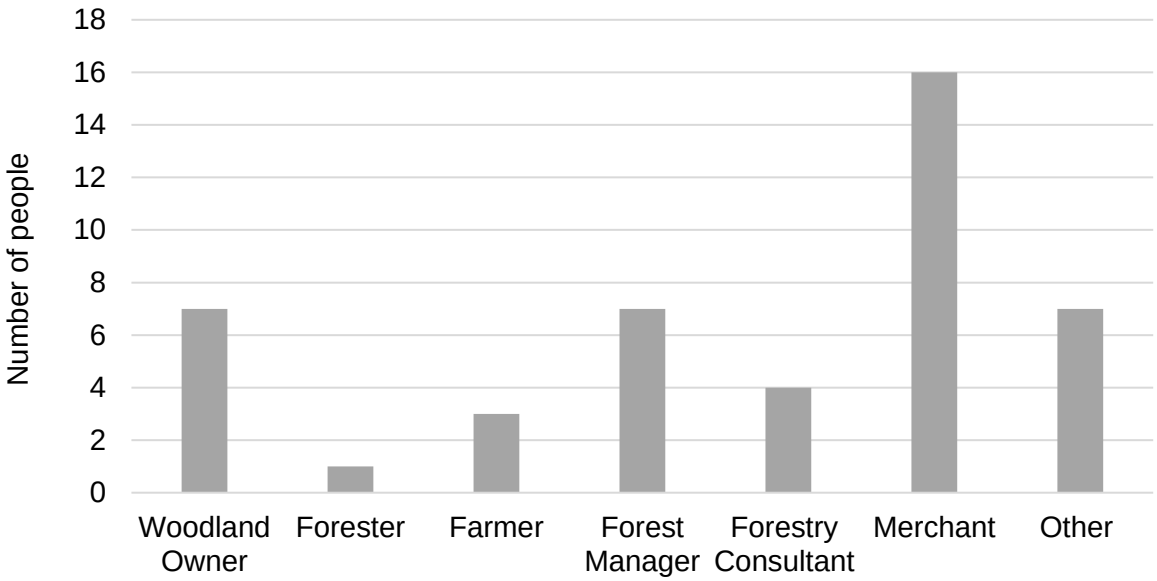


Figure 3.3 Interviewees fell into six broad categories.

Whilst there is some overlap within these categories (e.g. a farmer may also be a firewood merchant), the interviewees were categorised based on their principal involvement with woodland management and woodfuel production. Farmers were categorised as such if they spent the majority of their time farming (either arable or livestock) and had woods on their land. As such, whilst there are seven interviewees categorised as 'woodland owners', some of these were farmers and some of the merchants owned woodland too, but have been categorised based on their main role in the woodfuel sector.

The duration of interviews ranged from half an hour in the case of the 'happenchance' interviews to over four hours for some interviews with woodland managers who worked on large estates and were happy to provide tours of the land. However, the majority of interviews lasted between 90 to 120 minutes.

In the majority of interviews, a single individual was spoken to. Occasionally, multiple people were present such as an interviewee's partner or colleague. Interviews with farmers (all of whom were male) often started in their farmhouse and their wives would occasionally add to

the discussion. A similar interview setup whereby farmers' wives occasionally contributed was present in Riley's (2003) study on hay and silage production in the Peak District. Like Riley (2003), these interviews were classed as one-to-one but it is noted that many farmers' wives made valuable contributions to the interviews. This was often to correct their husbands on dates when events occurred and to supplement answers. On two occasions involving interviews with multiple forest managers, one often took the lead in answering questions.

3.1.5 Interview Location

Many authors have considered the impact of location on an interview (see Denzin, 1970 and Elwood and Martin, 2000). Riley and Harvey (2007) consider interviews that are conducted 'in the field' as opposed to interviews conducted in an office or house; like Grele (1979), they note that interviews that take place in the landscape being discussed help provoke the participants' memories of specific changes which leads to a greater embellishment of answers. Other authors have espoused the benefits of conducting interviews in the places and landscapes being discussed including Hearn *et al*. (2014) in their study of the re-appearance of the wild boar in North West Italy as well as Fish *et al*. (2003) in their study of land manager attitudes towards rural conservation and their levels of engagement with environmental protection schemes in the UK.

Figure 3.4 shows the number of interviews conducted 'in the field', in an office, over the telephone or in the participant's home.

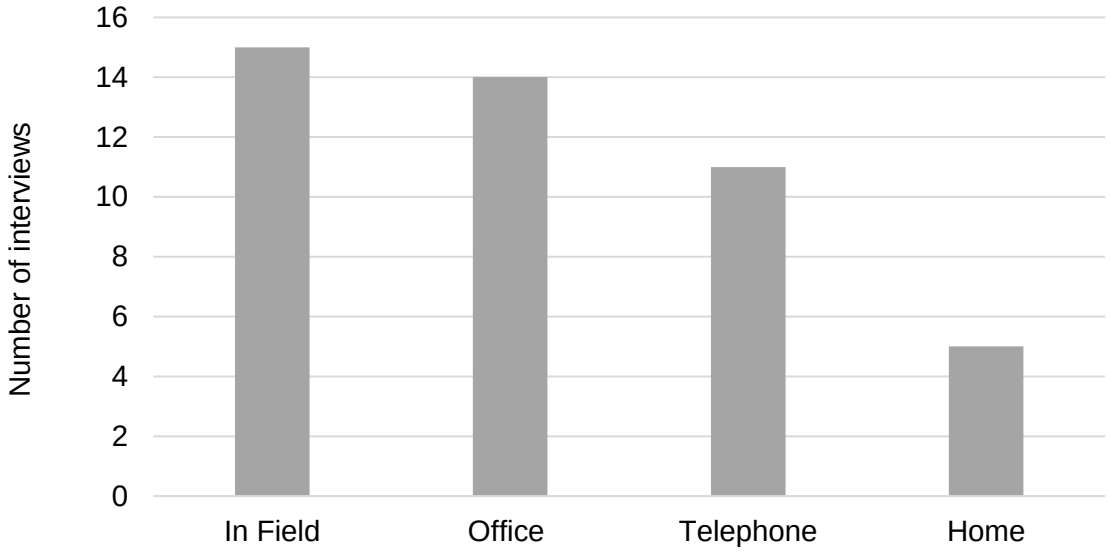


Figure 3.4 The location of interviews. 'In the field' interviews consisted of interviews which took place on the land being discussed or in vehicles being driven by the interviewee on route to a field site or firewood delivery.

Interviews which took place ‘in the field’ typically began in the participant’s home before a tour of their land was provided. One interview took place in a merchant’s truck during a firewood delivery round. One advantage of conducting interviews in the field was that a better insight of the participant’s thought processes with the management of their land was gained; during walks across people’s land, many interviewees talked through specific factors or challenges they had faced when they saw something in the landscape that reminded them of a particular experience. A reminder might have been a group of trees or a woodland ride which were part of a grant scheme which prompted them to speak about a particular experience. Another advantage of conducting interviews in the field was that participants often raised the topic of what they planned to do in future with their woodland when they encountered features they had specific plans for (e.g. for particular coupes or logistical issues relating to ride management). In this respect, the interviews were an opportunity for participants to consider their plans for their woodland and to reflect on how successful past management efforts had been. Whilst the interviews that took place indoors were invaluable, they lacked the same depth of discussion about the practicalities of woodland management which ‘in the field’ interviews prompted (e.g. how to extract timber from a steep or wet area of ground).

Artefacts like pieces of machinery often served as points of conversation too. Interviewee’s often demonstrated how particular pieces of machinery like firewood processors, harvesters, log splitters and chippers worked which reflects Cook and Crang’s (1995:67) comment that “people invest meanings and significance in the material objects around them”. Similarly, Riley and Harvey (2007) found that farmers commonly showed them equipment which they used in their narratives of changing agricultural practices in Devon and the Peak District.

Artefacts were invariably discussed more commonly during interviews that were conducted in the field as they were encountered on tours of the interviewee’s estate. The interviews conducted via the telephone tended to be more direct in nature than the interviews conducted in person. This being due to a better rapport developing with interviewees met in person, despite there being more ‘off-topic’ conversations which naturally occur during face-to-face discussions.



Figure 3.5 'In field' interviews: many objects led to discussions yielding useful insights which would have gone otherwise unnoticed. A – a hydraulic wood splitter led to a conversation surrounding the effort required in woodland management. B – This sheet was purchased from an Austrian supplier to keep wood dry and led to a conversation about the "Europeans' better knowledge about seasoning wood". C – An owner shows me one of the rolling pins she produces and sells. D – A log pile often prompted participants to explain the logistics of firewood production.

3.1.6 Recording the Interviews

A digital sound recorder was used during every interview. This was the case for both telephone and 'in-person' interviews. No interviewees objected to having their comments recorded using the device. The interviews were subsequently transcribed verbatim into *Microsoft Word* using the computer software *Express Scribe* and with the aid of a foot pedal. There were some difficulties in transcribing the interviews that took place outside due to background noise from the wind. However, applying a high pass audio filter using the computer software, *Audacity*, was found to reduce most of the noise and the majority of interviews which took place outside were fully transcribed.

Although a minimal amount of notes were made during the interviews, some annotations were made to the interview schedule about how to structure the interview based on the interviewee's comments. For example, many interviewees made comments which warranted further questions but it would have disturbed the flow of the interview by interrupting the interviewee. A note was therefore made at the appropriate place in the interview schedule to ask a follow-up question.

3.1.7 Analysis of Transcripts

Many authors have put forward formalised methodologies about how to analyse interview transcripts, which are ultimately based on a researcher's interpretation of interviewee's comments. Hoggart *et al* (2002) breaks the analysis of transcripts into 'mechanical' and 'interpretive' stages within which are a series of steps involving the categorising of interviewee's comments into themes and identifying interconnections between the themes. Despite attempts to do so, there are no unified formal approaches to analysing transcripts.

The intention of transcript analysis is to understand peoples' experiences and views more fully and to present their comments in such a way which is meaningful to others. The act of gaining a better understanding normally begins by placing interviewees' comments into categories or themes. As Kitchin and Tate (2000) note, the process of categorisation is a creative one and there are many different ways in which comments can be assigned to a specific category. Indeed, it is likely that different researchers will identify a varied set of themes. Many researchers then further divide the themes into sub-themes to allow for a more detailed analysis. Whilst the process of identifying themes and sub-themes may appear linear, it is generally not and is instead an iterative process whereby the researcher is required to revise themes as the analysis continues. As such, having been identified as standalone themes, two themes may be joined if deemed appropriate. This is why the analysis of interview transcripts requires an element of creativity. The iterative nature of transcript analysis is also the reason why the formal methodologies put forward are not

entirely accurate reflections of reality within which a researcher does not progress linearly through the analysis process but returns to the original transcripts in order to revise, remove or conjoin themes. One of the challenges of transcript analysis is retaining the context and complexity of interviewees' comments and presenting these appropriately to others (Feldman, 1995).

During transcribing, notes were taken when new ideas about how to categorise interview data were generated and to highlight any cross-linkages with other transcripts. This is known as 'effective transcribing' according to Kitchin and Tate (2000). Once transcribed, each transcript was uploaded to 'NVivo', a piece of software to aid qualitative data analysis. Within NVivo, "master" and "sub" themes were identified by categorising interviewee's comments. Figure 3.6 shows the structure of "master" and "sub" themes used to categorise the interviewee's comments.

"Master" themes	"Sub" themes
Management objectives	
	Amenity and recreational uses
	Woodfuel harvesting and shooting
	Woodfuel harvesting and timber
	Woodfuel harvesting and wildlife (incl. deer and pests)
	Management challenges
	Climate change and wider environmental issues
	Income through management
	The economics of management
	Logistics of management
	Managing public attitudes
	Preference for tree species
Markets	
	Firewood markets
	Woodchip markets
	New markets
Working relationships, quality of work and reputation	
	Contracts and the division of labour
	Positive experiences
	Negative experiences
	Professionalisation of the sector
	Knowledge sharing and new learning
Silvicultural systems and management	
	Coppicing and shorter rotations
	Different systems
	Diseases
	Grants and planning permission
	Machinery
	The need for flexibility and multiple markets
	Planting
	Under-management of woods
	Woodland ownership

Woodfuel (divided further into):

Economics of

- Production costs
- Purchasing timber
- Selling woodfuel
- Theft
- Changes/non-changes
- Competition with other wood products

Logistics

- Extraction
- Physicality of the work (time, emotional)
- Infrastructure of businesses
- Use of machinery, equipment and vehicles
- Production supply and demand
- Seasoning
- Transport and merchant's sphere of influence

Sale of woodfuel

- Accreditation
- Changes to sales
- Competition with others
- Entry into the sector
- Marketing
- Species
- Unit of sale

Sources of woodfuel

- Indirect sources
- Direct sources
- Supply difficulties
- Sustainability of production

Use of woodfuel

- Boiler technology
- Log burners
- Quality of woodfuel
- Use and experiences of RHI

Figure 3.6 The structure of master and sub themes used to categorise the interviewee's comments using 'NVivo'.

3.2 The Study Area

The geographic focus of the study is the 'English Midlands'. As Figure 3.7 shows, interviews took place across the counties of Nottinghamshire, Lincolnshire, South Yorkshire, Staffordshire, Derbyshire, Shropshire, the West Midlands and Warwickshire. The choice of this study area was made partly for logistical reasons, with the researcher being based in Nottingham. However, the geography of the region also made it a suitable area of study, with a mixture of large cities, towns and rural areas, across which are a number of large wooded landscapes including the Forest of Mercia (centred around Cannock Chase to the North of Birmingham), The National Forest (involving the planting of 200 square miles of woodlands across Leicestershire, Derbyshire and Staffordshire to connect ancient woods) and Sherwood Forest (in Nottinghamshire). Furthermore, there are a large number of rural estates across the region which presented an opportunity to study traditional estates which have adapted their forestry departments to provide properties with woodchip for biomass boilers. Many of these rural estates have a mixture of native broadleaf woods, lots of which are ancient, as well as coniferous plantations. This allowed for the study of how the firewood and woodchip markets were altering the thinning regimes in coniferous timber plantations and broadleaf woods used predominantly for wildlife and amenity purposes. Equally, the presence of The Small Woods Association in the West Midlands, with its headquarters in Telford, Shropshire, provided access to those involved with the woodfuel supply chain through its series of networking events.

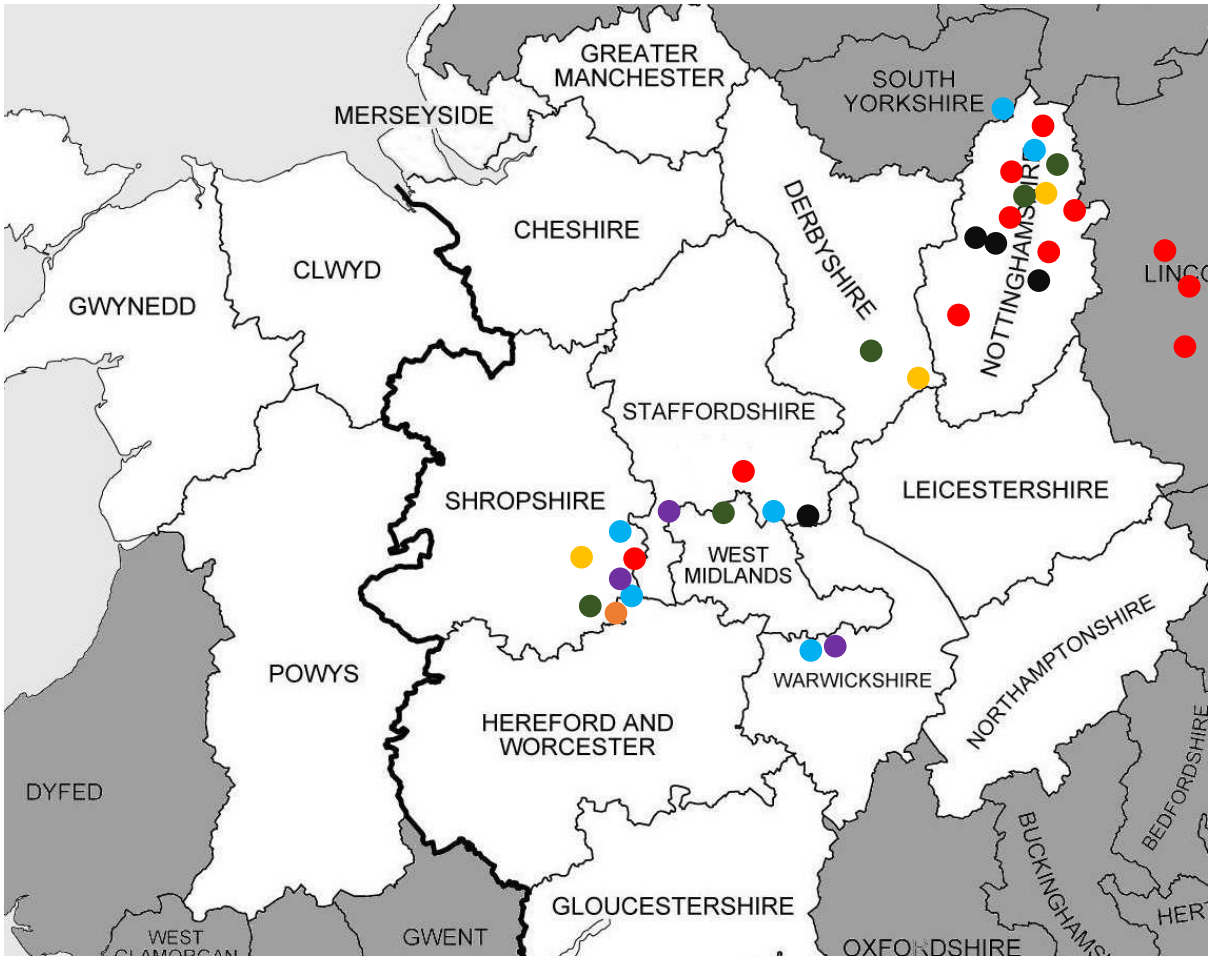


Figure 3.7 The approximate location of 'in the field' interviews and field visits across the study region. Telephone interviews are omitted.

Key

Woodfuel merchants

Farmers

Forestry consultants

Forest managers

Woodland Owners

Foresters

Other

3.3 Online Survey

In combination with the semi-structured interviews, an online survey was developed to gather primary data from woodland owners and managers. There were two reasons for running the survey. The first was to explore the implications of the woodfuel market on woodland management over a wider geographic area. That is, to increase the generalisability of the research. Generalisability, according to Silverman (2000) is the extent to which research findings are applicable to a wider population. The second reason was to corroborate interviewee's comments with the findings of the survey. Corroborating data from multiple sources, also known as 'triangulation', is one way to counter criticism towards the inherent subjectivity involved with analysing and drawing conclusions from qualitative data (Kitchin and Tate, 2000). Corroboration of results from different sources is viewed by some as a way to improve validity, defined by Altheide and Johnson (1994) as the extent to which a researcher's observations reflect reality. Woods (2010) notes that since the "cultural turn" in geography, the mixing of qualitative and quantitative methods has been limited with British geographers primarily using qualitative methods and quantitative methods being more prominently used in the United States, Australia and Europe. Madsen and Adriansen (2004) have called for greater integration of qualitative and quantitative research which they believe should produce a more complete understanding of research topics.

3.3.1 Development of the Survey

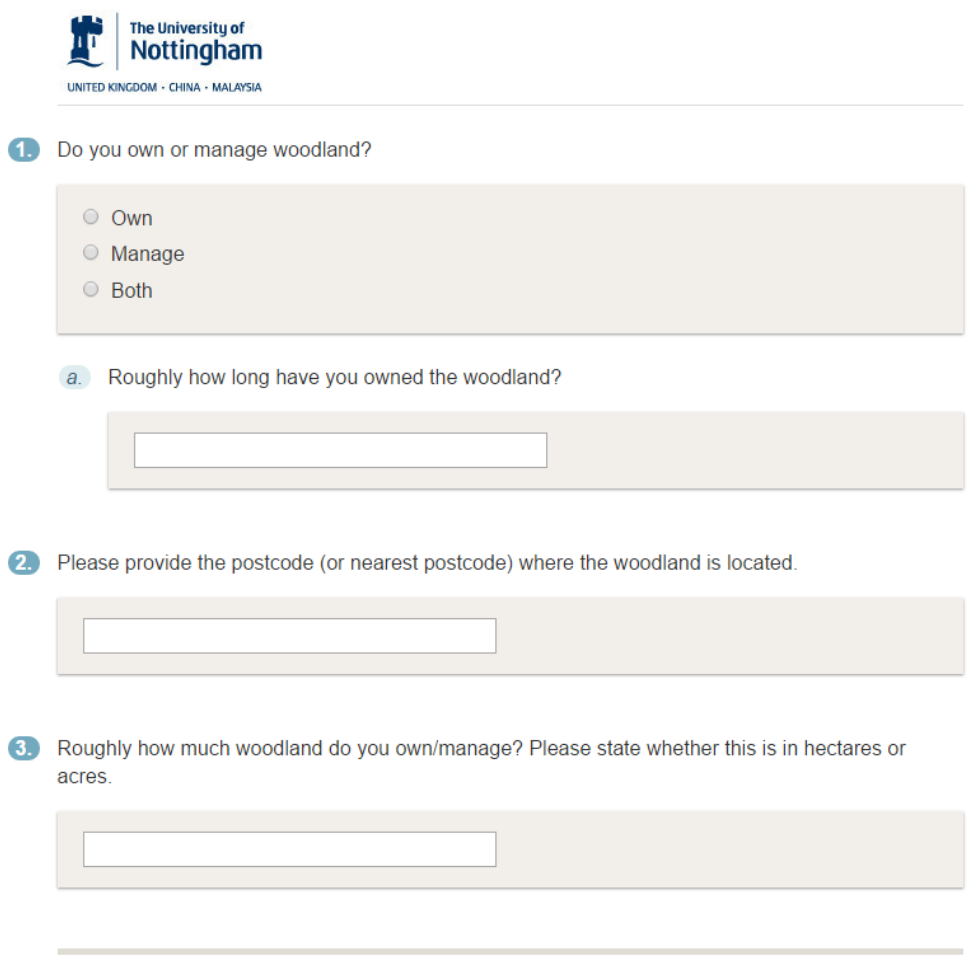
The intention was that the survey data would supplement the interview data and the results of the two methods could be combined to produce an account of woodland and woodfuel management. To ensure the questions in the survey complemented the topics discussed during the interviews, the survey was not designed until 10 interviews were conducted and the principle research themes had materialised. Figure 3.1 shows an outline of the themes addressed in the survey.

Three types of questions were used in the survey. These were: questions used to describe/classify people and their woodlands (e.g. size of woodland, main markets for wood products); questions about people's actions and behaviour (e.g. how the amount of management activity changed has changed in the past five years); and questions about people's attitudes, values and beliefs (e.g. reasons for woodland ownership). Across these question types were a mixture of open and closed questions so that respondents could provide more detailed answers if they wished.

The order in which questions are asked is important. As Shuman (1992) notes, previous questions can alter people's responses. This seems to occur because as people encounter new questions, they reflect on their previous answers and they re-evaluate their thoughts.

Whilst it is difficult to demonstrate how the order of questions might alter people's responses without running separate surveys, the order of questions was considered. Before any questions about woodfuel, respondents were asked about their wider management aims to understand what people value their woods for. If it were the other way round, people's answers about how they value their woodland may have been influenced having just responded to questions about woodfuel. For example, they might object to the idea of producing more woodfuel and wish to give the impression that they manage purely for wildlife.

The survey was designed and distributed using the Bristol Online Surveys (BOS) platform (accessible at http://www.survey.bris.ac.uk) which offers a variety of different question formats and ways for participants to respond. Figure 3.8 shows some of the various input methods available in the BOS system.



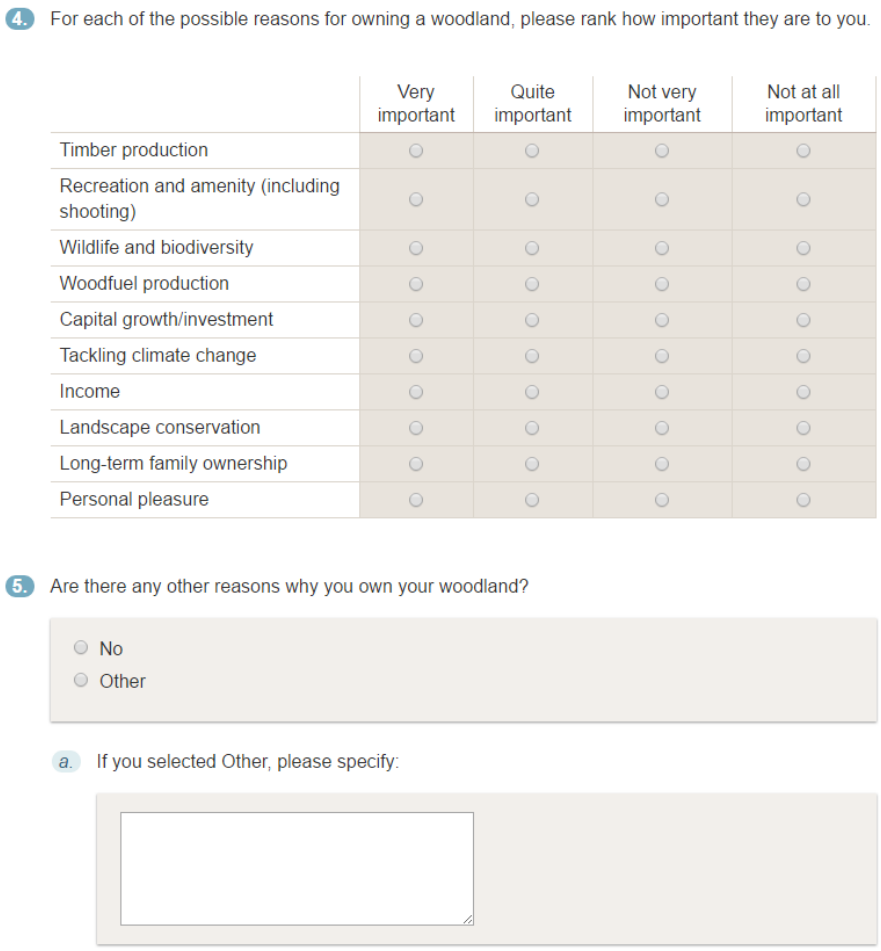


Figure 3.8 Example questions from the online survey. The advice of Parfitt (1997) was followed whereby a variety of different types of questions were used to provide different ways to understand respondent's behaviour. Using such an approach means there are multiple 'shots' at understanding a particular issue.

A draft version of the survey was sent to five previous interviewees with a request for feedback. Their views about the survey were asked for (e.g. whether it held their interest) and whether they had any specific thoughts about the questions asked. As Parfitt (1997) notes, the language and topics addressed in a survey must be appropriate to the target audience. This piloting process aimed to determine whether this was the case.

All feedback from pilot respondents was positive. Two respondents commented on the ways of inputting their responses and suggested the use of radio buttons whereby people click the option that is most applicable to them. They believed this would reduce the time it took to complete the survey which they all found to be approximately 15 minutes. Some of their comments about the survey included:

“It is very comprehensive and provided people are happy to spend the time on it you will gather a lot of useful information.”

[Pilot respondent 1].

“I've had a look and think it is excellent. It would be useful to add a box to ask people why they have responded "don't know" to questions where this is an option”.

[Pilot respondent 2].

In addition, the pilot respondents suggested new questions:

“Maybe you could put in a question about what is your primary aim for managing your woodlands and include wildlife and biodiversity in there? I would also suggest that you could ask about other woodland products”.

[Pilot respondent 2].

“Perhaps you could add a question as to whether you plan to manage younger woodlands in future for woodfuel, and if so, by what system (clear felling, continuous cover, coppice etc).”

[Pilot respondent 3].

3.3.2 Distribution of the Survey

Given the cost and time required to identify potential respondents and post surveys to them, often with limited response rates, the survey was only available online. This will have reduced the target audience. The survey was advertised in various newsletters and email membership lists belonging to the Royal Forestry Society, Heartwoods and the Small Woodland Owners’ Group. It was also advertised on social media outlets, including Facebook and Twitter, on the pages of relevant groups of people interested in woodland and countryside management and conservation.

3.4 Field Surveys and Photographs

Field surveys of woodlands were conducted during many of the 'in-field' interviews to gather information about a woodland's structure and species composition. Such surveys typically took the form of a guided tour of woodlands by the interviewee who would raise specific management issue topics as they walked into new areas of the wood and noticed relevant features. During such tours, notes and photographs were taken to document features being discussed.

Such 'walkover' surveys have an important role in forestry and woodland management, helping to identify a wood's main features. In Wilson's (2013:279) assessment of the adoption of alternative silvicultural systems used on PAWS sites in Great Britain, he used "a traditional forestry approach to evidence collection involving field desk/literature review, informal expert consultation and a targeted programme of rapid-appraisal photo-reconnaissance field visits". A similar approach was adopted for this study. Wilson (2013) bases his research on a larger body of field notes and photographs collected over many years and notes that the traditional 'touring forester' who kept detailed notes of their excursions and the forests they visited is becoming rare. The advantage of one person conducting a series of forest excursions is that 'the single observer' can then make comparisons across different woodlands and see how different silvicultural practices are applied in woods with similar characteristics.

During visits to woods, the aim was to observe the different types and extent of management, including the main species present and the logistics of how owners carried out management. A walkover survey of this type is often the first step used by new owners to produce a woodland management plan (Glaves *et al*., 2009). Whilst walkover surveys are invaluable, there is the risk of not covering an even spread of the woodland area because some areas might be hard to reach and it can be difficult to gauge what proportion of the woodland was viewed which means it is difficult to make generalisations about the wood as a whole (Glaves *et al*., 2009). However, all walkover surveys were carried out with the owner and/or manager present and any inaccessible areas could be discussed as well as the overall management objectives.

Photography is widely used by foresters and woodland managers to document tree species and a wood's structure. Photographs were used in this study to record the walkover surveys. In addition, written notes were made on the interview schedule sheets to supplement the field diary and the interview transcripts.

3.5 Field Diary and Participant Observation

As Valentine (2001) notes, field diaries are useful for documenting the context of interviews, how researchers felt during an interview and potential new lines of enquiry. A field diary was used throughout the research and served three purposes. Firstly, it was used as a reflexive tool to refine the interview process; notes about the interview process were continually made including the level of engagement that interviewees demonstrated and how interviewees responded to particular questions or topics. These notes were of greatest use during the first few interviews when the interview schedule was being finalised and the 'themes and follow-up questions' were being developed. The second use of the field diary was to aid with the data analysis process; any ideas about the thematic coding of the interviews or the analysis of the survey data were recorded. Immediately following an interview, notes were made electronically using *Microsoft Word*. Occasionally, the sound recorder was used following an interview to record the interviewer's immediate impression of the interview and these comments were subsequently added to the field diary.

The third use of the field diary was to document the behaviour and interactions of individuals involved with the study, as part of the participant observation process. Traditionally, participant observation involves researchers immersing themselves within the social group being studied and taking part in the activities its members undertake to understand how they 'work from within' (Cook, 2001). Impressions of the social group can be continually recorded using a variety of methods including field notes and photographs. Different forms of participant observation have been widely applied in ethnographic studies which Creswell (1997:58) defines as "a description and interpretation of a cultural or social group or system". When carrying out participant observation, researchers can choose whether to place more emphasis on the "observation" or "participation" aspects of the method. Junker (1960) describes the participant-observer spectrum from the so-called 'complete participant' to 'the observer as participant'. The present study placed greater emphasis on the observation of participants which occurred during the interviews including accompanying firewood merchants on delivery runs and speaking with foresters as they went about their work. The field diary was used to record the researcher's interpretations of these encounters. Often during 'roaming field visits', interviewees encountered others who were connected to the woodfuel market (e.g. a woodland manager saw a firewood merchant working in a wood, and he became involved with the study). Following these meetings, notes were made on the researcher's interpretation of the encounter such as any implicit findings relating to the social networking of firewood merchants.

Hoggart *et al*. (2002) note that there were few geographical studies which used participant observation but there was growing interest in it. Since then, participant observation has been used in many geographical studies on the ethnography of different social groups (see Watson and Till, 2010). Whilst Hoggart *et al*. (2002) note that most participation observation research involves the researcher *participating* with the social activities in question, they acknowledge that many studies are more concerned with *observing* the social group. This reflects the fact that different research contexts require different approaches and the great variety of environments and research aims and objectives means that doing participant observation should not be an overly prescribed process (Crang, 2001). In this study, whilst participant observation was not used as a principal method, the notes gathered about the interview format and the observation of interviewee's made a valuable contribution.

Participant observation has in recent years been used to study people's interactions on the internet. Referred to as 'cyberethnography' (Hoggart *et al*., 2002), it involves the analysis of the comments people make on the internet in discussion forums and on social media. Garcia *et al*. (2009) believe there have been few ethnographic studies about social groups connecting via the internet. There are a number of websites with discussion forums about woodland management, with some composed of woodfuel merchants discussing their experiences. One such online discussion forum is 'ArbTalk' (accessible at http://arbtalk.co.uk/forum/), aimed at bringing together UK aboriculturalists. Discussion topics range from the sale of equipment, management practices and firewood sales. The website was used as a source of comments from participants. Equally, interesting comments were made by people using the online auction website, Ebay, when purchasing firewood.

Given the analysis of text from internet discussion groups is a newly-emerging area of research with few guidelines, any user's comments were copied and coded thematically using the same approach to analyse the interview transcripts. By definition, the gathering of participants' online comments is done without their knowledge, the ethics of which must be considered. Such "covert" online participant observation techniques have been used in previous studies with the view taken that asking for people's consent for their comments to be used in the study could distort the discussions taking place (Soukup, 1999); some people may decide to withdraw from the discussion or withhold information if they know someone is using their comments for research purposes. The boundary between what is 'public' and 'private' in online discussions forums remains blurred. Given all the comments used in this study were made in a public forum and involved no personal information, their use is deemed acceptable. Furthermore, no potentially sensitive information about merchant's businesses was gathered.

3.6 Summary

This chapter has reviewed the methods used to conduct the research by exploring their theory and use by others who have studied agricultural changes, history and rural management. It has been shown that the research design is reflexive, in that the interview schedules have remained adaptable as the research progressed and new themes were addressed. The methods chosen are an effective way to study the economic and social factors behind the changes taking place to the management of woods in response to the growing demand for woodfuel. Importantly, by speaking with the actors involved with the woodfuel supply chain, the use of interviews enables the researcher to explore people's perceptions, which should be taken into account when developing future forestry policies in the UK.

Chapter 4

Woodland Ownership Patterns and Management Objectives

4.1 Introduction

This chapter explores the backgrounds of woodland owners across the Midlands, the majority of whom focus their management efforts to provide for wildlife and amenity purposes. The reasons for woodland ownership, and the variety of management objectives are explored with a view to understanding whether the growing woodfuel and timber markets are influencing decision-making. The extent to which yielding an income from owning a wood is examined as well as how important this is to owners during a time when the woodfuel markets present an opportunity to do so. The different management approaches used by owners and managers to benefit wildlife are analysed, with particular focus on the use of coppicing which some owners appreciate the aesthetics of and others do not. The extent to which the demand for firewood and woodchip is encouraging owners to bring areas of neglected woodland back into management is highlighted.

4.2 Woodland Ownership

Figure 4.1 shows the range of areas of woodland owned or managed by people who responded to the online survey, including the owners who were interviewed. Some people owned only small woods of less than one hectare while nine people owned more than 100 hectares of woodland comprising multiple blocks of individual woods. The average area of woodland owned or managed by people involved with the study was 145 hectares. However, excluding owners with over 400 hectares, the average falls to 32 hectares. 54% of people owned woodland of less than 10 hectares. The total area of woodland represented in the study was 7038 ha, corresponding to approximately 0.24% of the total woodland cover in Great Britain. As explained in the methodology, the interviewees involved with the study owned woodlands across the English Midlands. However, the online survey was open to all woodland owners from across the country to widen the potential number of respondents.



Figure 4.1 The range of woodland sizes (in hectares) owned by respondents to the online survey and woodland-owning interviewees.

As Table 4.1 shows, woodland owners had a variety of backgrounds. To highlight this, the list of owners was split into those whose occupations were related to woodlands or general land management and those with no occupational connection with woodlands.

Non-direct involvement with woodlands/land management	Direct involvement with woodlands/land management
Architect	Traditional Woodland & Coppice Craftsman
BBC engineer	Botanist/farmer
Civil Engineer	Conservation
Consultant nurse	Disabled ex farm-worker, web site designer
Cookstove manufacturer	Ecologist and woodland consultant
Engineer	Estate Manager
IT Manager	Farmer
Local government officer	Forest worker. Police Officer. Retired.
Park Manager	Forester
Part time farmer, retired solicitor	Forestry Agent
Pest controller	Forestry and biomass manager
Pilot	Green woodworker
Retired doctor	Horticulturalist
Retired Police Officer	Landowner
Retired school teacher	Nature Reserve Manager
University lecturer	RFS employee
University professor	Woodland management and furniture maker
	Woodsman/Estate Worker.

Table 4.1 The range of backgrounds of woodland owners involved with the study. Occupations are only listed once. Not all respondents stated their background.

Figure 4.2 shows how long the woodlands studied in this research have been owned by their present owner or the present owner's ancestors. Ownership duration ranged from a few months to hundreds of years. In one case, an estate's woodlands had been owned by one family for over three centuries. For some owners, their woods formed part of a larger woodland which has been purchased and sold off in smaller parcels to multiple owners. An interview was conducted with the owner of a company which does this by purchasing woodland and splitting it into smaller units of ownership. As such, some owners' woods were composed of an isolated block in the landscape, raising issues of access and the ability to make profit from a small, individual wood. Other owners' woods formed part of a larger wooded landscape where it might be possible for a group of them to work together by sharing machinery and paying contractors to bring harvesting equipment into the woods. Also worthy of mention are the small groups or individual trees in a landscape which were sometimes discussed during the interviews, particularly by farmers needing to work their tractors round them.

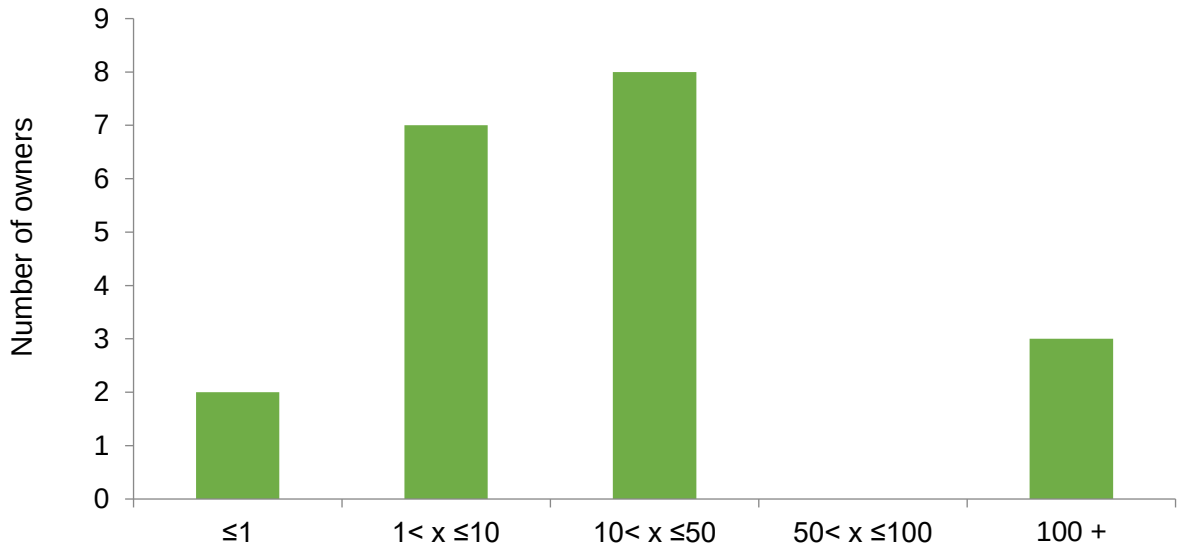
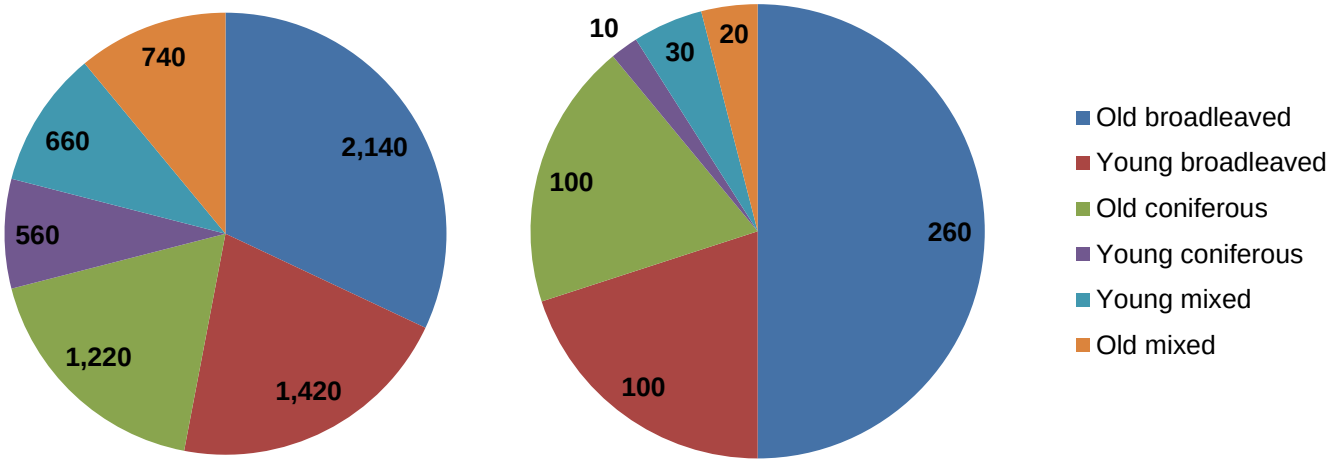


Figure 4.2 Ownership durations (in years) of woodland owners including respondents to the online survey and woodland-owning interviewees.

In terms of the types of woods involved with the study, the majority were old broadleaved woods (Figure 4.3). This was followed by young broadleaved (less than twenty years). Whilst the majority of these younger broadleaved trees were for amenity-based woodland activities, they would have limited value as timber trees due to their lack of girth. Some older broadleaved trees which have good form (i.e. straight and minimal branches) are felled and sold as timber. 68% of owners had some ancient woodland on their land. Figure 4.3 shows that when only woodlands of less than 100 hectares are considered, the proportion of old broadleaved areas increases to approximately one half. Old coniferous areas come next, followed by smaller amounts of young coniferous and mixed areas. These results broadly correspond with the FC's estimates of woodland types in England. The FC estimates that 74% of woods in England are broadleaved (FC, 2016[a]). As Table 4.2 shows, the majority of respondents to the survey owned English woods with only two owning Scottish and Welsh woods.



Woodlands of all sizes.

Woodland less than 100 hectares.

Figure 4.3 The types of woodlands involved with the study. The area of woodland (to the nearest 10 hectares) is given.

County	Responses	County	Responses
Devon	5	Cambridgshire	1
Cornwall	3	Hampshire	1
East Sussex	3	Northumberland	1
Dorset	3	South Yorkshire	1
Herefordshire	2	Lancashire	1
Kent	2	County Durham	1
Northamptonshire	2	Norfolk	1
Shropshire	2	Warwickshire	1
Lancaster	1	County of Inverness	1
Somerset	1	Lincolnshire	1
West Sussex	1	Monmouthshire	1

Table 4.2 The location of woods owned by respondents completing the survey.

4.3 Owners' Aims for Woodlands

The findings from the interviews and online survey reflect the growing movement towards managing woods specifically for multiple benefits, or 'multi-purpose forestry', which came to the fore of British forestry policy on the back increasing public and environmental outcry over the state-subsidised, tax-avoidance forest plantations during the late 1980s (Richards, 2007). Whilst woods have always been used for multiple purposes, the benefit of this research is that it provides insights into how the current policy and market demand for woodfuel can be combined with managing a wood for other common purposes like wildlife, amenity, shooting and timber production. This is particularly interesting in lowland broadleaved woods where owners may struggle with harvesting operations due to issues of access and lack of sufficient timber volumes to justify paying contractors.

One recent study of woodland owners' management aims and reasons for ownership was conducted by Nicholls *et al*., (2013). This built on previous work by Johnson and Nicholls (1989) as well as Watkins (1983) which explore the financial context of woodland management to serve multiple purposes. In Nicholls *et al's*., (2013) study, the top eight aims in descending order were found to be: personal pleasure, landscape conservation, biodiversity, timber production, long-term family ownership, other environmental benefits and sporting benefits. The aims of owners who completed the survey for the current study are presented in Table 4.3.

	Timber	Recreation	Wildlife	Woodfuel	Capital growth/investment	Tackling climate change	Income	Landscape conservation	Long-term family ownership	Personal pleasure
Not at all important	19	11	0	6	29	8	26	3	19	3
Not very important	31	3	3	14	29	24	24	25	19	0
Quite important	22	47	35	36	29	47	32	39	28	22
Very important	28	42	62	44	13	21	18	33	33	76

Table 4.3 Owner's aims for their woods. Results have been converted to percentages.

Personal pleasure, recreation and wildlife were, by far, the principal aims for the majority of owners. Whilst 72% of owners described landscape conservation as being at least 'quite important', it is not ranked as highly as was the case in Nicholls *et al's*., (2013) study which perhaps reflects the specific interests of small woodland owners who might be less focused on landscape conservation as owners of larger agricultural estates are. However, the two studies are not directly comparable because of a difference in the way the question was structured. Nicholls *et al*., (2013) only asked respondents to select aims for their woodland

from a list whereas the current study asked respondents to indicate how important each possible aim was to them, as shown in Table 4.3. It was believed this approach would produce a deeper understanding of which management aims are considered important or unimportant. To simplify the interpretation of the results, Figure 4.4 displays the percentages of owners who responded either positively or negatively to each woodland aim. 'Quite important' and 'very important' were classed as positive responses whereas 'not at all important' and 'not very important' were classed as negative responses.

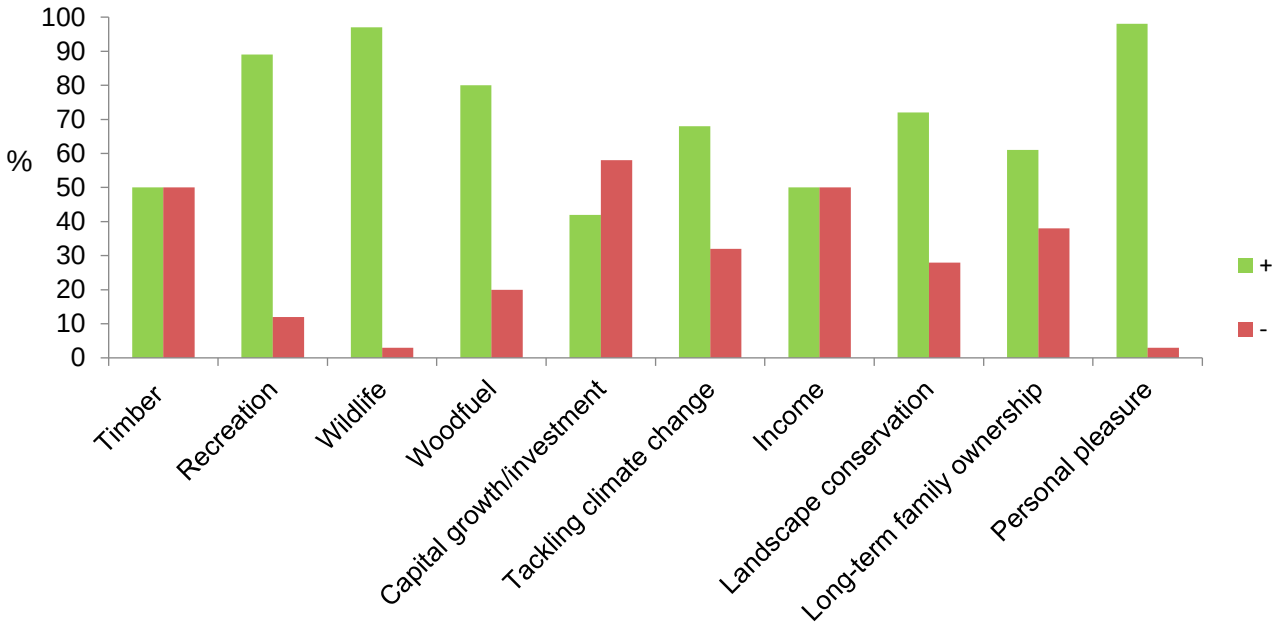


Figure 4.4 Owners' aims for their woodlands. For each aim, the green bars represent a positive interest whereas red bars represent a negative interest.

In Nicholls *et al's*. (2013) study, woodfuel was not listed as a management aim for respondents to select. However, many owners wrote 'firewood' as an 'other' aim and some cited it as the main aim of owning a wood. With a study focussed on woodfuel, respondents may have felt pressure to provide responses to 'please' the researcher and it is, therefore, unsurprising that it was listed as being an important consideration for owners with 80% of respondents describing it as at least 'quite important' (Table 4.3).

During the interviews, only one owner might be described as using his wood for a single purpose; to produce firewood and woodchip with the goal of powering a district heating scheme. Every other owner, manager and merchant interviewed spoke of the need to manage woodlands for multiple purposes. One manager of a large estate attributed this need to making the estate eligible for the widest possible range of woodland grants. Though a professionally-trained forester, he was explicit in his enjoyment of managing a woodland for the variety of products and services it can provide.

"Forestry should be multi-functional, to do it properly. I'm not in the business really of just wanting to produce cellulose. I want to manage a woodland. I don't just want to do silviculture which is just timber, it's bloody boring. The more diverse you make your woodland, the more opportunities you're going to have, you know, making the habitats better but also the more diverse they are, the more opportunities you've got for targeting different grants."

[Forest manager 7, 10/06/14]

Multi-purpose forestry management was also reflected in the comments of others, with many finding it challenging meeting multiple aims in a grant-led sector with competing pressures from land owners, neighbours and the public. This is especially so given the difficulty of making a profit through woodland management to re-invest in the wood itself.

"They might not want to clearfell because of the shoot or the impact sometimes, it might be landscape impacts, screening. It's a very difficult job I have to do sometimes because you've got so many things you know, the shoot, the economics, it may even be a village that can suddenly see a horrible sight so you've got many factors."

[Forestry consultant 2, 12/05/2014]

"Unfortunately the more woods you've got the bloody harder the decisions become on what you do."

[Farmer 2, 13/05/2014]

"We need to be managing those trees for every reason you can imagine."

[Woodfuel merchant 11, 16/03/2014]

"Partly to preserve the countryside, partly just somewhere to camp and play, partly for woodfuel, partly something to keep in the family and an asset which is independent to the banks and then I suppose the actual process of management."

[MD of a company selling woodland, 08/01/2014]

Managing woods for multiple objectives was the focus of a meeting of the Small Woods Association which is a national charity aiming to increase the management of small woods across the UK. The charity runs a programme of meetings for small woodland owners to learn about the range of opportunities to manage their woods and to meet merchants and contractors. That one such meeting was focused solely on multi-purpose woodland management reflects the drive by policy makers and the FC for owners of small woods to

take into consideration the range of products and services their woods can provide (see Figure 4.5).



Figure 4.5 An extract from a leaflet from the Small Woods Association about an event focussing on the multiple benefits to be derived from small woods. As highlighted, a range of topics were discussed. Of relevance to the woodfuel market are the economics of first thinnings and small-scale extraction methods for owners concerned about the use of large harvesting equipment in their woods. Source: Small Woods Association, (2013).

The findings of the survey and interviews corroborate well with Mather *et al's* (2006) conclusion that there is a positive trend towards multi-purpose forestry, this being one aspect of a post-productive landscape. Such a move is in part being driven by owners' genuine desire to manage their woods for multiple benefits but also by the grant system; as one forest manager stated, a more diverse woodland enables him to target more grants. Whilst woodlands have always been managed for multiple purposes, the current grant system, where timber production does not need to be the primary objective, is encouraging multi-purpose management. With a more flexible grant system, timber production is no longer the primary objective for most owners, highlighting peoples' interest in what Mather *et al*. (2006) term 'non-productive objectives'.

4.4 Woodland Management as a Commercial Enterprise

Past research into the reasons for owning woodland has shown that making money is not an over-arching objective for most owners. Of course, in the case of owners of plantation forests where the objective is to grow high-quality timber, income is important. However, for the owners of thousands of small woodlands across Great Britain, as well as owners of larger estates with woodland, income from woodlands has not been found to be of much importance. The value associated with landscape conservation, amenity and personal pleasure are instead recognised as being more valuable. Whilst the current study reveals broadly similar findings as Nicholls *et al*., (2013), it is clear that woodfuel is being viewed as an increasingly important means for owners to raise income. Furthermore, there is evidence that the strengthening timber prices, coupled with the growth of the woodfuel market is encouraging owners to think, and in some cases act, in a more commercial fashion.

In 2005, a study of lowland woodland owners highlighted the depression in forestry between the 1960s to the early 2000s (Nicholls, 2005). From the same study, in the 1960s, only half of estates with woodland were making profits from their woods. Despite ongoing management in their woods, most estates continued to experience difficulty in financing their woodland management activities with 57% of estates making a loss from their woods between 2000-2005. Nicholls' (2005) study was therefore one which emphasised the deterioration of profitability of woodland management. However, comments from interviewees and the survey data reveal the situation may have changed somewhat. The growing demand for woodfuel, particularly firewood with some larger estates also producing woodchip, is allowing owners to make small, but important incomes which encourages them to carry out further management.

As Figure 4.4 shows, those who completed the online survey are roughly split in half in terms of those who class their woodlands as some sort of economic asset and those who do not. It is debatable whether 'timber' as a woodland management objective can be regarded as a measure of how interested an owner is in using their woodland as a commercial enterprise; they may purely be interested in the silvicultural techniques of growing it. Given the growing of quality timber raises the value of a woodland and the final intention is generally to sell it, it is assumed the majority of owners who classed 'timber' as either a 'quite important' or 'very important' management objective regard it as a commercial side to their woodland. Once again, owners were split in half with 19 viewing timber production as at least 'quite important' and 19 viewing it as 'not very' or 'not at all important'. Only 5 owners regarded their woodlands as being 'very important' as a type of investment. Overall, however, half of the owners listed the more commercial management objectives as being at least 'quite

important', again revealing that income is not an over-arching objective for woodland ownership. When asked about their overall management strategy, however, only 7 out of the 37 who answered the question selected answers which suggest they are primarily focussed on the economic aspects of woodland ownership: 4 people ticked 'The woods are managed commercially' and 3 ticked 'The woods are managed to minimise outgoings' (see Table 4.4).

Overall Management Strategy	Responses
The wood(s) are managed as they have been since I've owned/managed them	12
The woods are managed largely for personal pleasure	9
Other	7
The woods are managed commercially	4
The woods are managed to minimise outgoings	3
The woods are not managed	2
The woods are managed to comply with the reuqirements of the relevant grant schemes	0

Table 4.4 The overall management strategies of woodland owners. The findings appear to reflect that the majority of owners involved with the study are principally involved with amenity and recreation.

When looking at the financial aspects of woodland ownership, there are differences between owners of different sized-woods (Table 4.5). Small woodland owners consider income to be less important than owners with more woodland, perhaps a reflection that small woodland owners often purchase woods using disposable income and are not looking to make a profit. Timber production is more important for owners with more woodland which is likely indicative of having larger areas of coniferous plantations used for traditional forestry saw log production. Interestingly, owners of larger estates are less interested in viewing their woods as a type of investment which is perhaps the result of a lack of profitability in the forestry sector in the latter half of the 20th Century, which has produced a negative perception of woodland profitability.

Woodland size (ha)	Timber		Capital growth/investment		Income	
	+	-	+	-	+	-
1 ≤ 5	37	58	53	47	37	63
5 ≤ 30	33	67	17	83	50	50
30 ≤ 100	60	40	40	60	40	60
100 ≤ 3000	88	12	38	63	88	13

Table 4.5 The importance that owners of different sized woods attribute to the commercial management objectives. Note that + is an amalgamation of 'very important' and 'quite important' responses whereas – is an amalgamation 'not very important' and 'not at all important'. Note that figures have been converted to percentages to ease comparison.

One owner of a Lincolnshire estate with 500 hectares of woodland believes the history of woodland management on his estate reflects the wider issues which have affected the management of wooded estates in Great Britain. He believes the recent increase in the value of timber was initially due to the growth of the firewood market. The small incomes to be made through firewood sales enabled him to justify paying for some woodland compartments to be brought back into management by re-introducing thinning regimes. As the value of timber grew with the woodfuel market, the value of his woodlands to his overall estate has risen. Over the past decade, his woodlands have been in profit which is a marked difference to the majority of the 20th Century.

"We went through a period like most estates did from like the 1930s right the way up to the early to mid-1990s in which there was no money at all in forestry. So nothing happened in forestry. Then the timber market started to pick up, mainly for firewood. It achieved a relatively small value so suddenly you are able to thin a compartment but you wouldn't make any profit from it but you would at least be able to bring it back into rotation. And then over the last 8 or 9 years we've really seen a profit coming back in in a fairly strong way."

[Estate owner and woodfuel merchant, 10/11/2013]

Whilst this particular owner's woods have produced a profit in the previous decade, he made the point that this is not a principal objective of his. Instead, landscape conservation and, biodiversity in particular, are more important to him. He recognises that he could make more money from his woodlands if he did not choose to use more sensitive harvesting techniques; he rarely uses harvesters in his woodland which he believes lessens the visual impact of felling, opting to fell trees using the motor manual method (using chainsaws).

"We were finding that the harvesters where having to chop trees down to reach others and just to make extraction routes so we're only motor manual. I do all the spraying myself."

[Estate owner and woodfuel merchant, 10/11/2013]

Owning a woodland in Lincolnshire, a county "not renowned for having a lot of woodland" has given him a sense of greater responsibility to manage his woodlands in a more sensitive fashion. Interestingly, he believes the manner in which he carries out management is different from other estates, suggesting he knows of other owners who may be more commercially-orientated. Given he personally carries out the marking of trees for harvesting himself by spraying them with coloured spots (as indicated in the previous quote), it is clear this is an owner who is interested in ensuring his woods are managed to the manner he so desires. Having an interest in woodland management and their visual appearance may be

one factor as to why the owner has pursued low-impact forestry practices.

"We manage the woodlands in a unique way on the estate, we manage them to break even because woods are very emotive."

[Estate owner and woodfuel merchant, 10/11/2013]

In interviews with people who carry out consultancy woodland management work on larger estates, concern was expressed that some owners are seeking to maximise profit to the detriment of their woods. While the price of timber is higher than it has been for a decade, these interviewees believe that owners who have little interest in woodland management are willing to forego the future value of better quality timber and sell their standing stock today. As one forester who is also a woodfuel merchant revealed, a local estate owner chose not to follow his advice of adopting a management approach of carrying out an initial light thinning of trees. Despite being informed of the risk of reducing the value of his timber in the future, this estate owner elected to carry out a heavy thinning because timber prices had risen. The risk of more intensive management by removing too many trees is that it promotes the growth of epicormics, or side branches, in the remaining trees which reduces the value of timber as saw logs.

"We have a local estate who are busy decimating their woodland. They are not managed by us but we know them and we've offered them sort of informal advice but they're systematically going through their woodlands and they're hitting the market when it's high and they're over-thinning their woodlands."

[Farmer, forester and woodfuel merchant, 21/02/2014]

One might imagine that woodfuel merchants would be in favour of more intensive thinning regimes in woodlands which would increase the supply of timber and woodfuel. Especially when many merchants spoke about the increasing struggle of finding timber sources, hardwood in particular, a theme which is explored in the following chapter. As the above quote from one merchant demonstrates, some appreciate the risk of over-thinning the country's woodlands, especially at a time when the forestry sector is enjoying relative economic buoyancy. Concern about the risk of over-thinning semi-natural broadleaf woodlands was expressed by other merchants:

"You can see old estates like [name of estate]*, they're kicking the shit out of their woodland at the moment because it hasn't been touched for donkey's years and, all of a sudden,*

there's a bit of revenue out of it so you have got a lot of management going on whereas for a long time, a lot of woodland has been neglected."

[Woodfuel merchant 8, 27/02/2014]

On other larger wooded estates, whilst landscape, public amenity and wildlife were listed as being of principal concerns, it was evident that the management of woodlands for timber production was a top priority. Many are concerned with growing high quality timber to sell to saw mills but are increasingly recognising the financial returns to be made through the woodfuel markets. So, despite many owners and managers stating landscape conservation and wildlife to be their primary management objectives, they typically resorted to speaking of woodland management in financial terms. Whether that be through carrying out thinnings to improve the quality of standing timber or the sale of lower value timber produced by such thinnings, most interviewees from estates demonstrated that the commercial aspect of woodland management is in the forefront of their minds. However, this is not to suggest that these interviewees are purely interested in making a profit from woodland management. Rather, it is a reflection of the fact that much woodland management work will not happen unless there is a market for the material which can pay for the work to be done.

"What are the overall objectives of the woodland estate?"

"It's sustainable supply of timer that we can sell off. Landscape conservation, public amenity, employment…woodland and biomass, it's enabling us to utilise what is very very low value timber from first, second and third thinnings. Particularly for second thinnings, we would struggle to sell it."

"It's essential that we're getting them thinned, larch for example, otherwise it stunts it's growth. Some of the woodlands wanted thinning 20 years ago but they didn't because there was no market for it. Now there is, so we can hit those and that's going into biomass, plus we still sell off the high value saw logs"

[Forest manager 7, 10/06/14]

The increasing use of woodchip to feed biomass boilers which many estate owners are having installed to reduce their energy bills seem to have increased the extent to which their woodlands are regarded as a commercial asset. With rising energy prices, improved biomass boiler technologies and RHI funding, woodlands are increasing in value for estate owners who view them as a source of energy. This is especially the case in woodlands which were specifically planted on estates for commercial gain as the following quote from a forestry consultant highlights.

"I look after more than twelve large estates which are traditionally managed. Some are very much amenity but also there is elements of commercial woodland within their infrastructure and this is why they've brought me on-board with some of them, especially for the woodchip because they decided 4 to 10 years ago to go down the woodfuel road."

[Forestry consultant 2, 12/05/2014]

The extent to which some environmental charities, NGOs and other nature organisations are regarding woodlands as commercial enterprises was explored in some interviews. Understandably, wildlife and landscape conservation were listed as the principal management objectives. However, there was evidence that they are beginning to explore the possibilities of operating with a more commercial framework with the Nottinghamshire Wildlife Trust has recently employing someone specifically to explore woodland income streams. According to one of their forest managers, this is a marked change in strategy coming from the senior management of the charity and they are not alone in looking for new sources of income with other environmental charities doing the same. The Wildlife Trust forest manager made the point that, although looking to new income sources may be a new strategy for the senior managers of the charity, it is something that those directly involved with woodland management have been doing for a number of years but has gone unnoticed by the charity as a whole. The sale of firewood and other wood products such as small diameter rods and sticks have enabled woodland managers to raise modest incomes which have now come to the attention of the higher management structure.

"Is there any pressure coming from the higher management who are thinking "well this is a nice bit of income, in relation to firewood sales?"

"No, they've not noticed it to be honest, up until recently…whereas they have now, we've got a lad now promoting products and his idea is to promote the idea of making money out of the estate so it is something that they're doing…and lots of other conservation organisations are going down that line in that they're actually starting to think that they can make a profit on the estate but it's a new departure. It's only…we've been doing it for years, it's just that they haven't noticed [laughs]. *Bless them!"*

[Forest manager 3, 24/10/2013]

Of woodland management more generally, this particular forest manager spoke about the need to market material produced to prevent managers being left with timber that they cannot sell. To him, woodland management invariably involves producing a product, and whether a woodland is owned by a charity or not, that product can be marketed and sold.

Finding a market for wood products may require creativity and networking, as the following quotes highlight. Whether or not the charity as a whole moves towards a more commercial outlook with its woodland management, this forest manager uses a variety of outlets to raise income.

"You can't manage them [woodlands] *without producing a product. So if you don't market the product, you've got a lot of volume of product that you've got no idea what to do with. So either that or you don't take the product so you don't manage it."*

"The story they [higher management] *always tell you is there's no market for this, we're just doing it for conservation and that's not the case. There's definitely a market for it, it's just that you've got to be a little bit creative and look for the market."*

"There's a chap that comes in and buys all this stuff for schools. He literally buys thousands and thousands of rods and cuts them into little lengths and then they go out to these woodland school workshops and they provide these school kids with rods and those rods have come from here. It's fantastic."

[Forest manager 3, 24/10/2013]

During an interview with a North Nottinghamshire-based farmer who has recently started processing and selling firewood, it was mentioned that local Wildlife Trust-owned woodlands may be one source of timber. The farmer believes Wildlife Trusts are suitable organisations for woodland management contractors to work with because they are becoming more commercially minded but lack knowledge about how their woodlands could be managed to raise income. The following quote demonstrates the growing value of woods from the perspective of merchants like this farmer who look for local sources of timber to process into firewood. It also highlights the growing economic value of woodlands from the perspective of the Wildlife Trust.

"The Wildlife Trust has sort of expressed an interest in me working with them because they are becoming more commercially minded now. And they have got a product development manager and they're starting to think, rather than let him have that wood for £500 which he then sells for £10,000, let us keep that in-house. But they rely on volunteers, or not particularly motivated and knowledgeable staff so it would probably be an opportunity for an outside contractor to work with them".

[Farmer 3, 21/05/2014]

The Wildlife Trust also leases some of its woodlands for shooting which one woodfuel merchant who identifies himself as a conservationist questions given the charity's objectives to protect wildlife. Once again, this highlights that it is often woodfuel merchants who are showing concern for the management of woods and the wildlife living in them.

"I've been working in Treswell [a Wildlife Trust owned Nottinghamshire wood] *many times and all of a sudden there are these twenty men with guns in there shooting everything that moves and you ask "is this conservation?" It's not."*

[Woodfuel merchant 11, 16/03/2014]

In an interview with a landscape officer who carries out woodland management for another Nottinghamshire-based charity, focussing on landscape heritage and conservation, a similar move towards a more commercial outlook was present. This charity owns woodland as well as offering advice to owners on landscape conservation. He spoke of the need to maximise value in the products from woodland management, which he said can be difficult given the volatility of the market. The interviewee said that he encourages owners to think in a commercial fashion and recognise that whilst they might initially incur financial costs through management, these can be recouped and turned into a profit as more wood is sold. Speaking generally, he believes the conservation sector should take a more commercial outlook with firewood sales being an obvious route.

"We should be starting to understand the commerciality of how it works".

"People have got to make a contribution and if you can show them that the contribution is coming from the ability to use wood to sell, whether you're selling it to a company to process or doing it yourself, it's something that we encourage people to be open to."

[Forest manager 4, 09/12/2013]

Speaking of one case study involving a plantation of mature Corsican pine on a golf course, the landscape officer said the initial intention was to convert it to native broadleaf over a fifty year period. However, the officer said he is likely to write a new plan centred on the extraction and sale of timber over a shorter timescale rather than conservation which, again, may be indicative of nature organisations willing to take a more commercial outlook.

"We'll probably put a new grant application in, designed around the extraction rather than the conservation side of it or with the emphasis changed. So, because of the age of the trees, in many ways it would be a lot better to clearfell areas, not even to take coups or anything like that but to be able to wholesale take bigger sections out." [Forest manager 4, 09/12/2013]

As mentioned by other managers, finding markets for wood products can be difficult and, unless outlets such as the small diameter rods for school children mentioned earlier can be found, woodfuel is an obvious choice for many. For the landscape officer at the conservation charity, maximising the value of wood products is of key focus for him and his colleagues.

"Without bigging people like us up, it's a complicated process to get it right, to get the right products, that you're maximising the value coming out of it".

[Forest manager 4, 09/12/2013]

A woodfuel merchant also emphasised the need to combine conservation with a commercial outlook, his comments effectively summarising the adage that "a wood that pays is a wood that stays". As a self-employed merchant and forester, he works in many woods owned by conservation charities across Nottinghamshire. He argued that if nature charities find themselves struggling financially, they would be willing to fell larger coups. As he points out, he himself must act commercially to earn a living despite being a conservationist.

"Bottom line stuff, absolutely, they would fell more woodland. When there's no money, it's exactly what they will do."

"Fundamentally I'm a conservationist but I've got to be realistic because I'm not employed by a Wildlife Trust or anybody else who is going to pay my mortgage so we've got to be productive as well as thinking about conservation but I like that idea because I think actually conservation is a real luxury and we'll only have conservation while there is plenty of money around."

[Woodfuel merchant 11, 16/03/2014]

Similarly, as the FC becomes increasingly distant from the Government, a Land Manager working for the FC said they are increasingly looking towards making a profit. The objective of the FC, he said, remains the same: to manage land productively whilst providing recreational opportunities for people and protecting and enhancing the natural habitats which organisms depend on. However, with less public funding, he intimated that the FC will need to run itself more commercially if it is to continue providing the public benefits and managing the public forest estate with a reduced budget.

"We're in a process of moving further away from Government. What that means is we have to act more like a business. So over the last few years we've been developing a much clearer focus on the bottom line. Instead of being funded by Government and just spending

money without any real consideration for it, we're now very focused on making our land productive."

"It's not just a matter of putting trees there so they look pretty, we're still very focused on trying to make sure in future they're going to turn a profit."

"Ultimately, that's what it has to be, irrespective of all the wonderful romantic dreams, something has to be financially viable."

"It's alright when the times are good, through the late '80s and '90s, there seemed to be a lot of public money about, but now, we need to blend those with some sort of commercial imperative."

[Forestry Commission Land Manager, 26/06/2014]

With cuts to Council's budgets, wood products from Council-owned woodlands are also being looked at to supplement income. The Birmingham City Council owned and managed Sutton Park is an 800 hectare woodland classed as a National Nature Reserve and SSSI to the North of the city. The Park is not managed to make a profit but to provide the public with a recreational opportunities in an otherwise urban environment. When the Park budget was not cut or threatened, all timber harvested from the Park due to old age or health and safety reasons, were made into park furniture or given away as firewood for free with no commercial objective. Now, with a smaller budget, the Park's managers are exploring other sources of income.

"There was no commercial activity previously, we're here to provide a service and obviously when you get less money coming in to provide that service that you want to provide, then you start exploring how you can generate income to maintain it. That's where we've been heading for a number of years."

[Forest manager 8, 07/07/2014]

In this case, the Park's managers are looking towards the woodfuel markets as a source of income. The Park used to have crates where the public could collect firewood for free but its increasing value led the managers to place a charge on this as they look to supplement their income.

"We used to have bays where people could take it [firewood] *away for free. Obviously we've had to curtail that because the timber need to go somewhere else where we can get money for it. It's always been the plan to be able to sell firewood to people."*

[Forest manager 8, 07/07/2014]

A forest manager working for the National Trust spoke of a split within the charity with some holding the view that managing woodlands for commercial gain should not be their objective. He admitted that what the National Trust views as commercial forestry differs from traditional commercial forestry but was clear that timber and commercial forestry remains a principal management objective in the coniferous woods on the estate he works on. However, a precedent had been set on the estate as a member of the family which donated the land to the National Trust was interested in commercial forestry and had planted a sizeable area of coniferous woods. As such, the National Trust has taken the view on this estate that commercial forestry is acceptable. Something it does not do on all of its estates.

"We've got a member of the donor family who back in his day planted a lot of conifers so because of that we still continue the commercial aspect. There are quite a few people in the National Trust who would argue that we shouldn't be doing it, because…conifer bad, oak good. But here, we actually do have a genuine precedent to carry on in a commercial fashion which suits me very well."

[Forest manager 5, 12/03/2014]

This split within the National Trust regarding the use of commercial forestry and pine plantations rather than native broadleaf is implicitly reflected in the comments made by others that a commercial outlook is inherently the wrong approach to managing woodlands if landscape conservation and wildlife are objectives. One example of this is present in a quote presented earlier where the owner of an estate said he manages his woodlands to "break even because woods are very emotive". This implies that managing them to make a profit would be damaging. Furthermore, in the quote below, the forest manager is implying that a more commercial strategy would not lead to management work being "done properly".

"I'm trying to get the best commercial out of it but it's not my over-riding thing, so I want to make sure that the job is done properly."

[Forest manager 3, 24/10/2013]

On why they purchased their woods, many owners said it was a result of having more disposable income as well as a belief they would enjoy the amenity and interest value associated with woodland ownership. Often, the purchase of woodland could be described as a fortuitous purchase because many of the owners interviewed described woods being put on sale at a time which coincided with them having more disposable income.

"I had some spare cash, that was there for sale and actually I lived with a partner then and we bought it to enjoy…it was always for its amenity value."

[Small woodland owner 5, 28/01/2014]

"I got left a bit of money and if you get left with money in your mid-40s, it's not terribly helpful because you tend to have got your house by then. I'm quite keen on nature."

[Small woodland owner 2, 07/01/2014]

"It seemed a good idea at the time. We've asked ourselves that question many times! I think one of the answers is because it was there and we could afford it at the time. And it was a little bit of an interest."

[Small woodland owner 4, 18/08/2014]

The reasons for the purchase of a wood was often linked to the interviewee's economic status, that is, having disposable income. Interestingly, however, the use of woods to invest money was regarded as being "not that important' or 'not at all important' by the majority of small woodland owners completing the online survey (see Table 4.3). One interviewee, in his early 50s, explained that his lower income having become self-employed meant he was in a lower tax band which reduced the benefit of placing his money in a pension fund. He regarded the purchase as an investment which would be passed on to his children.

Other small woodland owners had clearly purchased woodland specifically for wildlife and landscape conservation. One owner, who was explicit in her enjoyment of wildlife throughout the interview explained how she was able to extend a wood she had purchased in 2007 onto adjacent arable land when the previous owner, a farmer, was looking to sell it. This could once again be described as a fortuitous purchase, but unlike the other purchases described, it was made with the direct intention of managing the wood to encourage wildlife.

"The farmer who owned it before was buying some land across the road. What he was doing was swapping poor land for good arable land. This is not a good piece of arable land. It's marginal, flooded land really. This is good land for forestry and wildlife conservation because it's wet. I mean look how the alder have grown and the willow is loving it."

[Small woodland owner 3, 10/08/14]

Another owner – also a woodfuel merchant – explained that his management decisions were guided principally by a desire to promote wildlife and that he was prepared to incur costs to do so.

"I never bought the wood to make it profitable, I bought it because I like the conservation side and we try to attract as much wildlife as possible. Also, we're not going to try and do everything on a commercial basis. Some of the things we do will be purely for wildlife".

[Woodfuel merchant 8, 27/02/2014]

During discussions with small woodland owners about income and woodland ownership, some regarded their woods much more as commercial enterprises than others. At the time of interview, one owner was making plans to construct a small district heating scheme using woodchip derived from his 30ha wood as well as establishing a firewood business. This owner was approaching retirement and hoped that the income generated through the district heating scheme, subsidised by RHI payments, would enable him to live in comfort in old age. The interview took place during a walk around his wood, accompanied by a forestry consultant who the owner had employed to advise him.

"Is what we need then not so much a woodland management plan as a woodland business plan?"

"Those who are interested in a little bit of arty impact, that's fine. That's a way of doing it sure. It's not my style."

"I'm a practical conservationist."

[Small woodland owner 4, 18/08/2014]

In contrast to the business approach used by the owner above, a different small woodland owner described the range of wood products she makes and sells for income including small volumes of firewood. She produces a range of cord pulls, wooden 'mushrooms', garden dibbers, tool handles, rolling pins, honey dippers and foot massagers. This is the owner referred to above who purchased and extended her woodland with the principal intention of promoting wildlife. She also runs a series of photography workshops as well as guided nature walks and talks through the woodland to groups of visitors. She described the competition she faces for wood products from larger retailers. Her comments highlight the need to achieve a balance between the hours put in to produce wood products and the income she receives. Despite the small-scale of her enterprise, she remains aware of the need to maximise the added value of the wood products she manufactures.

"I make wood scented candles and they'll say well I can get those for £1.99 in B&Q. Well, no you can't because what I'm using is sustainable eco-wax but they don't see that. So we can't sell things that take too long to make. Otherwise, we're putting in a lot of effort to sell something for a fiver."

[Small woodland owner 3, 10/08/14]

Whilst the promotion of wildlife and personal pleasure objectives are, by far, the dominant objectives for this owner, she does think of her woodland in terms of financial profit and loss and has clearly used her wood to supplement her income in a variety of ways.

"We turnover a fair bit. On our last open day we sold over £100 worth of stuff. We have nine of them a year so a decent income. And I do the photography workshops so I have six to eight people paying £20 to do the course so I get about £120 to £160 a day for them and do five or six of those a year. It does add up, you get the money back in."

"It's probably starting to be much less of a loss now than it used to be and could be more of a profit in the future. But we didn't start it for profit"

[Small woodland owner 3, 10/08/14]

A similar sentiment was expressed by another small woodland owner who purchased her woodland primarily for amenity and wildlife in 1995. Whilst repeatedly saying that she did not buy the 32ha broadleaf wood to provide income, she admitted that as she approached retirement, she was exploring the possibility of it doing so.

"I've never really looked for it to provide an income. Until, well I'm sort of retiring and I thought maybe it could provide *at least a modest income."*

[Small woodland owner 5, 28/01/2014]

Furthermore, during the previous year before the interview, the owner had re-introduced a coppicing regime across the wood. Coppicing had only taken place in two separate half hectare compartments but the timber was extracted by a woodfuel merchant who removed approximately 200 tonnes of timber at £15 per tonne, totalling £3000 worth of income. The merchant had paid her to harvest the timber as he would then process it into firewood. There was, therefore, no cost to the owner for the coppicing work. Since purchasing the wood, other than occasional thinning to provide firewood for herself, the owner had not had any considerable volume of timber harvested from the wood. When asked why the coppicing was being carried out, she said:

"Partly monetary because I was not getting the income."

"Well it's interesting because always before I always had a good [architecture] *practice, it was very profitable, money was not an issue. Money is more of an issue now."*

[Small woodland owner 5, 28/01/2014]

A forestry consultant expressed concern that a new client of his lacked a sufficient amount of woodland to fulfil his plans supply timber to the woodfuel market. Despite the owner's enthusiasm to bring their woodland back into management, the consultant – who typically works on large estates – doubted there would be enough material present to interest either timber suppliers or woodfuel merchants. This reflects the intentions of another small woodland owner with an interest in capitalising on the woodfuel market as well as the consultant's suspicion of small woodland owners' ability to supply woodfuel commercially.

"Whether a new client who's just got an eight hectare wood would bring it into management. I don't know. I'm a bit sceptical whether that will happen because they just haven't got the resource, the volume, to make enough money."

[Forestry consultant 2, 12/05/2014]

According to the owner of a company which sells woodland to private individuals, prospective owners have become increasingly interested in using their woods to source woodfuel. It is for this reason that he strives to purchase woods which already have good access for cars to ease the transport of firewood from within the wood. Whilst owners are predominantly interested in the wildlife and amenity aspects of owning a wood, this interviewee is well-situated to comment on the growing interest in the use of woods to produce woodfuel.

"Has interest in the use of woods to source woodfuel from changed much in recent years?"

"Yes, very much, it's gone from a very small minority to getting onto about half of people, who for buying, getting their own woodfuel is a major reason for buying their own woodland."

"Location is very important. Location is critical. I think accessibility... I think people like a bit of woodland edge, so woodland that fronts onto a field but accessibility is very relevant for woodfuel. I mean the general rule is that virtually every wood we sell you can drive a car into and that's important if people are getting woodfuel."

[Managing Director of a company which sells woodland]

One woodfuel merchant with a background in farming and forestry carries out woodland management work in many privately-owned woods and spoke of the initial reluctance for owners to admit that they would like their woods to produce an income. Again, this is indicative of a perception that making a profit from woodland is viewed negatively. There are many potential reasons why this might be the case but it is likely connected to the negative public sentiment towards felling trees, regardless of the reason for doing so. As will be explored later, many woodland workers and owners described the vitriol they receive from passers-by when felling trees, despite attempting to provide a greater range of habitats for wildlife to live in. The merchant described what he often finds to be the case during preliminary discussions with owners about their objectives.

"As you walk around the woodland with them, you work out what is of value to them and initially you might think it's conservation but you can tease it out of them and find out it's not, it's actually about money. And whether or not they are admitting that themselves or not is subconscious but you know. You get to the end of the trip around the woodland and you generally have an idea of what they want and also what the woodland can give them."

[Farmer, forester and woodfuel merchant, 21/02/2014]

It therefore appears that whilst many small woodland owners do not formally identify 'income' as a management objective, they do think about how their woods might generate income (or offset the cost of purchasing woodfuel from merchants and retailers by harvesting it from their own wood) and are prepared to rely on it to supplement their income when needed. Furthermore, there is evidence that many small woodland owners are starting to take a more commercial outlook in their management plans, especially with the growing demand for firewood and woodchip. An interviewee who works for a charity promoting landscape heritage across Nottinghamshire described that a change has taken place in the nature of people's questions over the last three years, with greater emphasis being placed on the economics of management.

"I've been here coming up to five years, it was probably an additional question when I first started but probably for the last two to three years, it's one of the main questions that people come to us for. Can I make money from this? Has this got the potential to add to my business? Most of them tend to be people who have got a bit of money."

[Forest manager 4, 09/12/2013]

With the growth of the woodfuel market and strengthening timber prices, the Small Woods Association, mentioned previously as a national charity working to promote woodland management, held a 'Woodfuel Dating Event' in Shropshire in December 2013. The event was specifically organised to encourage owners to carry out more management in their woodlands by looking towards the woodfuel markets to make money. Approximately thirty owners were in attendance. They heard speakers with forestry backgrounds explaining how to carry out basic inventories and calculations of species and volume of timber present as well as from woodfuel merchants who explained how timber sales take place. Once again, such a networking event hosted by this charity is evidence of the growing interest in managing small woods commercially. Equally, the comments made by many of the owners in attendance demonstrate an interest amongst some to capitalise on the growing value of timber and woodfuel.

"We are purposively concentrating today's event on the commercial aspect. The cost of doing a job and timber prices and that sort of thing."

[Small Woods Association representative]

"Me being an accountant would like to make some money out of it [woodland ownership]*. We haven't started chipping, we're thinking about it. If we build a stockpile of timber over the next year or two, it might be worth something. We own twenty-four hectares*."

[Small woodland owner 8]

Although it appears there is growing interest in the use of woodlands to derive income, certainly amongst large estate owners and to some degree amongst small woodland owners, a third of owners who completed the online survey were unsure of whether their woodland had made a profit or loss in the previous five years (Table 4.6). Approximately a quarter of woods had made a profit with just under a quarter making a loss. A fifth of owners reported to have broken even. These results differ from the findings of Nicholls *et al*. (2013) who found that 64% of woodlands had made a loss in the previous five years. The implication of these results is that the financial losses associated with woodland ownership have lessened in the past 2-3 years or that the owners' perception of their wood's profitability has changed. The latter implication assumes the majority of owners do not maintain detailed financial records of all costs and income and therefore base their opinion using a qualitative assessment. As Nicholls and Young (2005) note, many owners do not maintain full accounts detailing the costs and income from management activities and it is therefore likely that their response to this question was based on their perception of woodland profitability as it stands.

	Number of responses (%)
A profit	9 (24)
A loss	8 (22)
Broken even	7 (19)
Don't know	13 (35)

Table 4.6 Woodland profitability in the past five years.

Thinking about the future, woodland owners have a positive financial outlook (Table 4.7). No owners believe their woodlands will become less profitable, whereas half of owners think they will become more profitable. Again, this suggest owners' perceptions of their woods' profitability has become more positive in the wake of the rising woodfuel demand.

	Number of responses (%)
More profitable	19 (51)
Less profitable	0
Stayed the same	15 (41)
Don't know	3 (8)

Table 4.7 How owners think their wood's profitability will change over the next five years.

The common view expressed during interviews was that making a profit from woodland management is difficult and requires careful planning. Breaking even was often recognised as being the most likely financial outcome, highlighting that the size of profits generated through woodland management are typically small, but nonetheless important.

"It is hard work [making a profit] *but you can if you do it right. You don't make a lot of money from it, don't get me wrong, but you can cover your costs and make a bit if you've got any sense."*

[Farmer, forester and woodfuel merchant, 21/02/2014]

"Last year we were in profit. We sold 6,000 tonnes of timber but that was the first time in ten years."

[Forest manager 7, 10/06/14]

"The object would be to make the wood pay for itself. Just to make sure it manages itself, because at the moment, we've put a fair bit of money into it. You need to look at some level of return."

[Small woodland owner 7, 04/04/2014]

"It is tough if you're working on a small scale. To make money out of forestry is bloody difficult…at the end of the day if we come out of this having broken even then that's lovely."

[Farmer 2, 13/05/2014]

Therefore, there is evidence that using woodlands for productive purposes, primarily to supply woodfuel, is returning following a prolonged period of neglect in the latter years of the 20th Century. This is occurring in woods of all sizes, from those on large estates where owners are interested in producing woodchip for biomass boilers to more isolated small woods where owners are hoping to produce more firewood. The fact that conservation organisations, like the Wildlife Trusts, are seeking to capitalise on the woodfuel market, is indicative of a general move towards producing more woodfuel. This is contrary to what a number of authors have stated is occurring in Britain's rural areas which they have described as being post-productive.

Mather *et al*. (2006) argue that Britain's forestry sector exemplifies the post-productive transition in that the primary management objective for owners is not timber production but conservation. The evidence presented hitherto indicates that whilst this remains the case, the demand for woodfuel is encouraging owners to harvest more and ask for advice from consultancy services about achieving this. The demand for woodfuel is not something which Mather *et al*. (2006) considered, and highlights how a change in market conditions can drastically alter peoples' behaviour.

As Wilson (2001) notes, the transition from productivism to post-productivism is a spectrum and the changes which have taken place in woodlands in response to the demand for woodfuel highlights this point. Whilst conservation remains the primary objective for most owners, this is not always the case and some are willing to over-harvest from their woods to sell more woodfuel. To what extent the greater production of woodfuel can be interpreted as a reversal of what Mather *et al*. (2006) describe as post-productivism is debatable. However, the debate is pertinent because it draws attention to the wider debate within forestry centred on the balance between producing wood products and conservation. As the quote from the National Trust manager demonstrates, the organisation is at odds with itself as to whether it should be carrying out commercial forestry because its primary objective is conservation. Likewise, there are owners of large estates who feel responsible for managing their woods sustainably and maintaining their aesthetic beauty at the same time as needing to make an income. If it were not for the woodfuel market, many of these woods wood remain unmanaged. Whilst conservation and amenity remain the principal management

objectives, the fact that woodfuel harvesting is increasing implies that describing the UK's forestry sector as post-productive is not entirely accurate.

4.5 Diversification of Woodland Owners

There have been multiple studies in recent years documenting the changing pattern of rural land ownership, including woodlands. The general trend has been a gradual transition towards more woodland owners coming from non-farming backgrounds, with new owners often being retirees looking to enjoy a rural environment (Lawrence *et al*., 2010). In the current study, three of the small woodland owners interviewed came from a non-farming background with each of them being retired or nearing retirement. As Ficenec (2015) notes, demand for woodland has grown in recent years with over £151 million spent on them in 2015, more than double the amount spent in 2013. Demand for woodland has been coming from private owners and institutional investors such as the Church of England which became the largest owner of UK woodlands in 2014 (*Ibid*., 2015).

In an interview with the Managing Director of a company which purchases woodland and then sells it in smaller parcels to private owners, the changing nature of woodland ownership were explored. The majority of woods bought by this company once belonged to private owners who he described as "passive investors" whose accountants advised them to purchase for tax-saving reasons. However, because of the limited financial returns and lack of desire to spend money on management, they sell their woodland to companies such as his. He then splits the woodland into smaller units and sells them on. His company oversees approximately one third of all woodland sales in the UK.

"What we've introduced is wider woodland ownership. It's just a different model."

[MD of a company selling woodland, 08/01/2014]

This "different model" of ownership represents a move away from larger areas of woodland which may be neglected or managed for timber production with large machines used for thinning or clearfelling. By adopting this ownership model, the company believes they are creating a more diverse ownership base, with more people entering the market from non-farming backgrounds and little experience of countryside management in general.

"We're churning up the countryside and turning it on its head. We're spending a few million every year buying woods and re-selling them. But it's not like we just buy and sell them like someone who is making a return on them, we're buying them and selling them to a different breed of owner and it's changing the countryside which is our objective."

[MD of a company selling woodland, 08/01/2014]

This diversity of owners, according to the interviewee, means there is a greater diversity in management aims and, therefore, the ways in which woods are managed. This is compared to the situation where large areas of woods are clearfelled and replanted for timber production or left neglected because owners have no interest in them.

"That's a model that works for some but we're trying to subvert that model and we're doing it fairly successfully on a reasonable scale because smaller woodlands, the owners managing them themselves using smaller bits of equipment works enormously well and because the industrial model gives the owners such a poor return, it's sensible for owners to think in terms of cutting out the middle man."

[MD of a company selling woodland, 08/01/2014]

The interviewee believes the diversity of owners and management objectives will have a positive impact on wildlife because it will lead to a greater mix of habitat types. Furthermore, he believes the changing demographics of woodland ownership means a greater amount of woodland is now being managed. An important difference between the "old" and "new" models of woodland ownership is that more management is carried out by the owners themselves, not by contractors. Neither is it generally being overseen by consultants or managers. Work generally takes place on an *ad hoc* basis and, therefore, woodfuel (typically in the form of firewood) is harvested from the wood and taken home or shared with friends. The trend for a greater number of woodland owners with smaller woods may create the demand for woodfuel merchants who work at smaller scales with smaller pieces of harvesting machinery. When an owner has just two hectares of woodland, it is unlikely they will pay for a contractor or merchant to carry out coppicing or thinning. However, when the wood is part of a larger woodland, groups of owners may group together and pay a merchant to coppice or thin larger areas of the whole site, or, share the cost of renting machinery. This is something taking place with the managing director commenting that his company help owners make contact with one another for this purpose. An interview with an owner who purchased his wood from the company in question revealed this is the case.

"I've asked to be put in touch with the new owners when it completes. So yeah, because the woodland was planted at the same time, we all have a collective interest of how we're going to manage this. So yeah, the intention is to look at a co-operative approach."

[Small Woodland Owner 7, 04/04/2014]

Whilst the managing director admits that their policy of splitting woods into smaller units makes them harder to manage commercially – because contractors want a minimum amount of timber to harvest– he claims people gain more value from their woods because they spend more time in them, doing the work themselves. Where the will to do so is present, the changing pattern of woodland ownership may contribute to the growing number of community woodland groups whereby locals take a greater interest in the management and governance of woodland. Ambrose-Oji *et al*., (2015) has previously noted the growing number of such community woodland groups and described the social and economic benefits they have on connecting people with each other and with the outdoors, as well as producing woodfuel for local use.

"The woods that we sell, the process of selling them, stops them being so easy to manage commercially. But we don't worry about that because we think that if the owners manage them, they really get involved and get higher values for their wood and the fact they can use the firewood themselves instead of selling it off."

[MD of a company selling woodland, 08/01/2014]

Despite reducing the commerciality of a woodland by dividing it into smaller units, the market for woodland has been supported by the demand for firewood. Whilst the interviewee said the demand for firewood has not increased the average price of woodland, it has increased the value of certain woods which need thinning and therefore have a large volume of stored wood which could be sold as firewood. Therefore, younger woods are less appealing because they do not have such a stored volume of potential woodfuel.

One forestry consultant questioned the philosophy of the company in splitting woodland into smaller units of ownership because it can make it more difficult to manage them using larger pieces of harvesting equipment; he made the point that it is not worth the business' time to harvest from a wood unless there is a minimum of 600 tonnes of wood to extract. However, this is the management model which the company is attempting to subvert. The consultant appreciated the benefits that encouraging people with different backgrounds into woodland ownership has but was wary of the difficulty of finding common management objectives for a group of owners. He compared the situation of woodland ownership with Switzerland whereby the boundaries of woods are blurred and owners are often unaware of what belongs to them. As such, many of the country's privately-owned woods are collectively managed and people harvest woodfuel from a variety of owners' woods. This is not the case in the UK and the consultant questions the likelihood of owners working together for a common cause.

"Well it's sort of a cultural shift isn't it? If it's bringing more people into woodland ownership then that has to be quite good rather than leaving it in the hands of the landed gentry. But there are downsides. It's easier to have a decent size. I mean, look at mechanised harvesting. I sell quite a lot of standing timber on bigger holdings and they won't really look at parcels unless it's got 600 tonnes to come out. They say it's not economical. In Switzerland, there's an extraordinary system whereby, because there's a mass of woodland which is in private ownership, all in tiny packets and for the most part the people who own them don't even know they own them! They don't always bother to find out who owns a bit of woodland. But if it's a bit of non-descript woodland that they think "oh, somebody must own this but we don't know who it is", it gets lumped in with publically-owned forest and the management of that is that they can just go in and do something and nobody minds. They're quite happy for the state foresters to do something and they say "give us a bit of our wood, we'll have a few logs".

[Forestry Consultant 3, 18/08/14]

Whilst the owner of the woodland-purchasing company believes more private owners are carrying out management themselves and "cutting out the middle men", some expressed the view that the FC should take a greater lead on woodfuel production and woodland management. Some interviewees believe the FC should take a more active role in not only producing woodfuel, but also encouraging landowners to work together, like the Swiss model of woodland ownership. One interviewee criticised the FC's current system of issuing felling licenses because no consideration is made to the way in which adjacent areas of land are managed. Rather than promoting the often called for landscape-scale approach to management whereby different owners work together for the common good (see Agnoletti, 2014 and Agnoletti and Santoro, 2015), the felling license system encourages owners to work independently because they are issued to individual owners rather than to whole woodlands. One forest manager argued that the FC should act as the body which brings landowners together, enabling more thinning and woodfuel production. He compared the UK to continental Europe where he thinks a more structured programme of forest management takes place which contributes to a greater 'woodland culture' whereby the population understands the need for management.

"On the continent they've got a lot more woodlands that are managed and the population is more used to seeing it happen. The whole thing is much more structured. People think we need more woodland but it's not really in the psyche that we should be managing them. I think one of the things that is lacking in this country is that it needs to be co-ordinated. The

Forestry Commission, they should really be looking at a way of getting a cycle going across all the woodlands."

[Forest Manager 3, 24/10/2013]

Upon initial inspection, the changing pattern of woodland ownership supports Mather *et al*. (2006) when they assert that UK forestry has undergone a post-productivist shift with more owners coming from 'non-rural' backgrounds. Equally, with more owners being retirees who are more interested in amenity than making money from their woods, it might appear that the UK's woodlands are in a post-productivist phase. However, the move towards smaller pieces of woodland being owned by a greater number of people has led to more management. According to the managing director of the company selling woodland, most new owners are interested in actively managing their woods for amenity and conservation purposes. The result is that more thinning is taking place with more wood being harvested as a result. This is not evidence to support the post-productivist theory. However, at the same time that woods are being split into smaller units, it becomes increasingly unlikely that bulky forestry equipment will be used to harvest large quantities of timber, which does suggest a move towards post-productivism.

Once again, the debate about whether the UK's forestry sector has undergone a post-productivist transition is revealed to be complex. Whilst timber production remains relatively low on the list of management objectives, woodfuel production has increased. As Wilson (2001) suggests, it is therefore appropriate to view any transition to post-productivism as a spectrum. Furthermore, the majority of interviewees expressed the view that more thinning should take place for the benefit of wildlife. Whilst this accords with post-productivism in that it places more emphasis on benefitting wildlife than on producing goods, it invariably results in more wood products being produced. This highlights that the term itself – post-*product*ivism – is misleading.

4.6 Woodland Management for Non-market Benefits

Whilst woods can be managed to produce a variety of wood products, they also have an intrinsic value derived from the pleasure people experience from simply being in or near to them. Defined as 'non-market', 'non-priced' or 'non-consumptive' benefits, they might include walking through woods and enjoying their aesthetic qualities or gaining pleasure from working in them. Many attempts have been made at placing an economic value on these non-market benefits (see Garrod and Willis, 1992; Price 2003; and Tyrväinen, 1997). These often involve hedonic price models which use surrounding house price data, travel-cost models which estimate the price people are willing to pay to travel to woods and contingent valuation whereby people are asked how much they are willing to pay to enjoy a particular activity. Equally, woods are valued for the ecosystem services they provide, ranging from their ability to store flood water, their soil-producing qualities, their ability to shield buildings from noise, their carbon storage properties as well as the production of woodfuel (Valatin and Starling, 2010). Such attempts to place an economic value on woods are typically conducted with the intention of highlighting the unrecognised contribution they make to the national economy, thereby highlighting the need to protect them.

When discussing management objectives and their reasons for owning a wood, many people spoke of the significant personal pleasure, or non-market benefits, they derive from their woods. The range of non-market benefits identified by the interviewees fit broadly into three categories: legacy, aesthetics and personal pleasure. Legacy relates to the longevity associated with woods. Granted, they can be felled at any time but owners who value making positive contributions to the landscape clearly hope those changes will not be undone in the immediate future. Equally, some owners attach value to the belief they will be remembered for planting or managing a woodland. Aesthetics relates to the value owners attach to woodlands purely for their visual appeal. Some owners attach greater value to woodland managed in a particular way which gives rise to a woodland structure which they find pleasing. Finally, personal pleasure relates to the value owners attach to working in a woodland and enjoying nature. Owners also derive satisfaction from seeing a management project progress from the planning stage through to fruition. Included within the personal pleasure non-market benefits category are the memories people have of working in their woodland as well as sharing time with friends and family in their wood. Understandably, people assign different values to this range of non-market amenity uses of woodlands. However, Yarrow (2015) believes they are potentially of greater value than the marketable products and services that woods provide. It is certainly the case that the growing number of owners who derive value from such non-market benefits is indicative of the post-productive aspect of forestry.

For a number of owners, the ability to make a physical, long-lasting change to the landscape is important. This is described as the legacy value people attach to woodland ownership. The longevity associated with woods means they are widely regarded as a good way to make a long-lasting contribution to the landscape. One farmer commented that no one will remember him for growing wheat whereas he would be if he plants a wood. When the majority of farmers are disinclined to plant woods which do not yield the same income as arable crops or livestock, the income from woodfuel may be sufficiently attractive to convince the few farmers that are interested in woodlands to plant more trees.

"No matter how nice a crop of wheat you grow, next year, it's gone. Whereas if you can put a bit of woodland in, then you're grandchildren can say well that was my Uncle Stephen's wood, he planted that."

[Farmer 3, 21/05/2014]

In a similar vein, some owners derive pleasure from the belief that they are making a positive, long-term contribution to a neglected or under-managed wood. Many owners appear to have a mental image of how their wood should look which they aspire to produce. This image often involves making changes to the structure of the wood and reflects the current trends in forestry, namely the movement towards continuous cover, multi-purpose management. As referred to the in the quote below, the interviewee believes such an approach is more 'natural', reflecting the phases of canopy formation and structural diversity which take place in woods untouched by people.

"Ultimately what we would like to leave is a legacy of woodland that's properly managed with something of a more natural continuous cover approach. What we want to leave when we get too old to manage it is something that you can turn round and say well actually I'm quite happy with the way that is."

[Small woodland owner 7, 04/04/2014]

Interviewees generally assigned great value to the aesthetics of woodlands and this has an impact on their management objectives as well as the ways in which management is carried out. Indeed, much work is carried out principally to improve the visual appearance of a wooded landscape. One farmer who was particularly interested in trees and woodland management, described his failed attempts at convincing his neighbours to bring their woods into management to improve his view of the landscape from his fields. Interestingly, this farmer admitted that he had not always had such an interest in the management of his woods and trees. During the interview, it became apparent the farmer had become keen on

management as he explored the possibility of producing electricity using a Combined Heat and Power (CHP) biogas station, powered by woodchip from his woodlands. This occurred during the interview in much the same way as the forestry consultant described earlier; that owners are hesitant to admit that they hope to make an income from their woods. If the farmer's proposed CHP station is not feasible, he hoped to start selling firewood. Whichever venture the farmer pursues, his desire for woodlands which he believes contribute to the visual appeal of the landscape is clear.

"I've realised nice woodland has to be managed. Our neighbours with woodlands aren't keen on managing them at all. We tried to push them because they're bloody horrible to look at."

[Farmer 2, 13/05/2014]

Elsewhere on his land, the farmer had used arable land to plant a wood, specifically to block the view of a quarry on his boarder.

"So you've got a strip of woodland here that we planted and deliberately never touched because this is our boundary with the quarry. We wanted it to be as thick as possible."

[Farmer 2, 13/05/2014]

Woodlands have a long been used to screen unappealing features in the landscape. This use of woodlands to improve a landscape by blocking unfavourable features was referred to by one consultant employed by a number of large estate owners. He also raised the move away clearfell management strategies because of the visual impact to wooded landscapes.

"They may have other ulterior motives [for woodland ownership]*, screening, there's lots of reasons. And also, they don't want the impact of clearfell, replant, clearfell, replant. So they do irregular smaller areas and keep and maintain a continuous cover policy."*

[Forest consultant 2, 12/05/2014]

During a tour of his woods, one farmer criticised some work his father had carried out in a small area of woodland where grass had been laid down after a thinning. His father had little interest in the woods on the farm whereas the son has taken the opportunity to begin managing them with the view to produce more firewood to sell to locals. The farmer lamented the lack of shrubs and saplings in one corner of a wood which, as is evident in Figure 4.6, yields no supply of firewood other than the few birch trees.

"It's just a bloody wilderness. It's just a grassy wilderness, there's nothing nice about it at all."

[Farmer 2, 13/05/2014]



Figure 4.6 A Farmer's displeasure at the lack of shrubs in the understorey of this corner of his wood following his father's decision to lay grass down. Elsewhere in a different wood, he was happy with the amount of undergrowth, as shown below. [Author's photograph. Taken: 13/5/14. Shropshire].



An owner of a larger estate whose woodlands are gradually being brought into management to provide woodchip for a biomass boiler commented that the woods he had chosen to manage were the "prettiest ones" which he visits the most and hopes to enjoy in old age.

"In terms of forestry management, I've taken the approach, which isn't particularly scientific, I'm felling the prettiest areas. So the areas in my lifetime that I want to see look the best I'm felling at the moment."

[Estate owner and woodfuel merchant, 10/11/2013]

One National Trust forester described his preference for mixed woodland over monoculture plantations, recognising that visitors are more likely to prefer the same.

"I think the aesthetic of mixed woodland is arguably nicer and I think our paying members enjoy that more so I think this is much more how I see a National Trust wood."

[Forest manager 5, 12/03/2014]

Other woodland owners and managers made comments about the visual impact of specific management activities in their woods. One small woodland owner revealed her dislike of coppicing because of the initial visual impact. She had only recently re-instated a coppicing regime based on the advice of a woodland manager and a desire for the income. She had let a firewood merchant coppice one hectare of her 32 hectare wood but the result was not to her liking (Figure 4.8).

"I hated the first set of coppicing. It looked awful. We went in and it looked like the wood had been ravaged. He'd left it really untidy."

[Small woodland owner 5, 28/01/2014]



Figure 4.7 Looking North towards the wood's southern edge. The wood is a mixture of oak, ash, beech, sycamore, willow and elm. Author's photograph. Cheveral Wood, Nottinghamshire. [Taken 6/12/2013].



Figure 4.8 One year's growth following coppicing during the previous summer. The right photo is a regenerating ash stool with one year's growth, with likely deer damage. Author's photographs. Cheveral Wood, Nottinghamshire. [Taken 6/12/2013].

The owner subsequently used a different merchant to coppice another hectare compartment (Figure 4.9). In a later interview with this new firewood merchant, he believed the reason she did not like the initial round of coppicing was that the merchant used a forwarder to extract the felled wood, leaving tyre tracks in the soil and compacting it. They also left material not removed as woodfuel – the brash – behind which the owner did not like the look of.

"*I think extracting it they just used a conventional forwarder and tractor you know so they made quite a big impact and they left, you don't really see it now in there, but they left a lot of material on the ground. And when they felled the trees, they just stacked all the brash where they just felled it so she didn't like it."*

[Woodfuel merchant 1, 06/12/2013]

Whilst she preferred the outcome of the work, she remained dubious about the act of coppicing itself as well as questioning whether there are people with the skill to coppice to the standard she believes existed historically. Describing the wood as looking like it had been "worked" rather than "ravaged", she values a wood which gives the impression of being managed for its utility.



Figure 4.9 A new compartment, coppiced in November 2013, by a different firewood merchant. Author's photograph. Cheveral Wood, Nottinghamshire. [Taken 06/12/13].

"He's [the new merchant] *been a lot more workman like and it looks like a worked wood rather than a ravaged wood but I'm not that convinced about how much I like it…It's the act of coppicing and the result. I bet people when they did it in the past and people did it all the time they were proper coppicers so they knew exactly how to do it, when to do it, how to get it out."*

[Small woodland owner 5, 28/01/2014]

The same negative impression of coppicing was present in the words of one farmer, revealing that coppicing is not liked by all, despite being talked of by others as a sign of a "well-worked" and "well managed" wood.

"How much coppicing do you do?"

"We don't actually do much at the moment. I was never very keen on it to be honest with you until I started doing a bit and going around other folks' woodlands where they've actually done a lot of coppicing. It's better than you think actually!"

"So you weren't a fan of it aesthetically?"

"No I wasn't. But actually but once you've seen it done quite nicely in biggish patches, say quarter acres at a time, it does produce quite a good result so I think I'm probably converted now."

[Farmer 2, 13/05/2014]

In contrast with the owner described above, the general opinion amongst many people is that coppicing produces an aesthetically pleasing wood.

"We'd all like to have nice coppiced woodlands."

[Forestry consultant 2, 12/05/2014]

Unsurprisingly, many merchants and managers spoke about limiting the visual impact that management activities have in a wood. This typically involves avoiding working in wet weather when soil is easily carved into by harvesters and forwarders. Equally, leaving "tidy" woods behind after management was an important consideration.

"You can see this is the wettest part of a wet part and this is the most damage that we will do. And that's bad for us. If this wasn't the wettest part of a wet wood we wouldn't have made those marks. *Ideally we would have been out of here a month ago and then everything would be tidy."*

[Woodfuel merchant 11, 16/03/2014]

The final non-marketable amenity use of woodlands identified during the interviews, 'personal pleasure', was reflected through owners' comments about the enjoyment they experience from working in a natural environment and being in the wood with friends and family and the associated memories these bring. Identifying and counting sightings of plants and animals is of value to many owners and is also regarded as 'personal pleasure'.

"I was wondering with my son, we were wondering off the rides and, there was this thing on the ground. As we pulled it over you could see the imprint on the underside and it said this holt of oaks was planted by her Grace the Duchess of Rutland. I think it was in the year 1829 and I thought that's just magic. But we also found that hunting horn. I took my daughter's partner's niece, she was just 16, she kicked that up and it's just…it's full of different things."

[Small woodland owner 5, 28/01/2014]

"This clump here I'm particularly proud of. At the end of the summer last year, for the first time I was able to sit leaning against the trunk of one of those alder trees in the shade. I sat with my back against this tree which is now sturdy enough to do that. And looking out, I thought "wow!" There was enough shade from the leaves and it was a hot day, I was sitting in the shade and I thought "this is wonderful!". This is actually a wood, it's not a field with twigs in it."

[Small woodland owner 3, 10/08/14]

4.7 Woodland Management Systems

Both the online survey and interview data reveal that a range of management principles are applied in lowland woods, with many owners and managers describing their use of 'Continuous Cover Forestry' (CCF) techniques. CCF is an umbrella term for a variety of silvicultural approaches, including coppicing, and selecting individual trees, or blocks of trees, for removal rather than clearfelling. Whilst it is expected that the majority of owners of lowlands woods avoid clearfelling, it is interesting that many referred explicitly to continuous cover as a phrase for management. CCF as a management principle is not new, having been discussed in European forestry literature since the 19th Century during debates about the use of even-aged forestry techniques and more irregular stand techniques for timber production (Mason *et al*., 1999). However, CCF is a modern phrase to cover the range of management techniques which avoid felling larger groups of trees and it is evidently one that owners of smaller lowlands woods believe applicable to their management systems. Under CCF, the aim is to retain some woodland canopy at all times by avoiding clearfelling. As Wilson (2013) notes, CCF has been encouraged in Britain over the past 10-15 years with the publication of the 'Continuous Cover Forestry Group's Principles' in 1998 and the promotion of 'alternative silvicultural approaches to clearfelling' in the *UK Forestry Standard* and the *UK Woodland Assurance* Standard. One of the current appeals of CCF is that it is well suited to

'multi-purpose' forestry where timber production is mixed with other purposes like public access, recreation, aesthetics and ecosystem services (Wilson *et al*.,1999). Furthermore, Helliwell (2015) believes that the CCF approach can produce equally high quality timber as the more traditional forestry practices which make use of the clearfell-replant system. As Humphrey (2005) remarks, CCF is now applied to thousands of hectares of woods across Great Britain, both on commercial forestry plantations and amenity woodland. The rise of CCF forestry, with its focus on multi-purpose forestry for wildlife benefits, is in harmony with Mather *et al's* (2006) view that UK forestry is in a post-productive stage. Once again, however, the increasing production of woodfuel suggests otherwise.

Whilst clearfelling remains used in coniferous lowland woods and some broadleaf woods, the majority of owners pursue management practices which maintain a continuous canopy, and therefore a consistent supply of woodfuel. Often, clearfelling is used for plantation on ancient woodland sites (PAWS). In the case of Figure 4.10 below, the owners clearfelled an area of conifers with the intention of converting it to broadleaves. Here, the owners of the 30 hectare wood manage it specifically for firewood production and pheasant shooting which they believe compliment one another. The owners believe a balance can be achieved between harvesting trees for firewood which lets sufficient light in for undergrowth to develop which provides the pheasants' habitat:

"We find that we don't actually upset the birds which is what people think we do. If we're making an opening into a very thick or very cold wood. That's with lots of canopy and no undergrowth. We need to let light in. It has to be managed. What we do is understorey planting so that when we're taking the bigger trees out, we're opening an area for our pheasants to reproduce. We don't just go in there and cut all the trees down all at once because it's going to be even worse."

[Woodfuel Merchant 10, 13/12/2014]



Figure 4.10 A mixed woodland site following the clearfelling of a block of conifers. Staffordshire. Author's photograph. [Taken 14/04/2014].



Figure 4.11 Rearing pheasants and firewood production are considered complimentary management objectives by the owners of this woodland. Shown are gates to the pheasant pen where sufficient undergrowth is present under the conifers. Staffordshire. Author's photograph. [Taken 14/04/2014].

Felling trees and rearing pheasants for shooting are activities which have not traditionally been considered to complement one another. As Robinson (2000) highlights, the noise of crashing trees can cause pheasants to disperse through a wood and beyond, much to the annoyance of gamekeepers. However, one interview with the owner of a wood used for shooting and woodfuel production was adamant the two activities can take place well together. He said the felling of trees does not cause pheasants to disperse as much as people believe, claiming pheasants are curious animals and are happy to remain in an area where chainsaw harvesting is taking place. Furthermore, by removing trees from a conifer stand planted in rows, merchants remove the straight fly paths of birds which gamekeepers do not like. A more diversely structured wood forces birds to alter their flight paths upwards, around trees, which is precisely what the gamekeepers wish to achieve. The lighter, warmer conditions created by thinning or coppicing an area also creates the type of environment that birds seek. The interviewee said the development of an understorey layer to the wood following a thinning created the ideal nesting conditions for pheasants. The interviewee believed the main cause of antagonism between woodfuel merchants, owners and gamekeepers is their relationship. With positive working relationships, he said merchants and gamekeepers can work well together. Historically, this has not been the case and it has led to the view that felling and shooting do not go well together.

"God don't I hate bird nesting season! But at the end of the day, I think I use a bit of common sense, we go in, we look at the trees and what we're going to fell. Really, you've got to get in there and work with them [gamekeepers] *and you've got to try and get on their side because traditionally gamekeepers tend to look at people like myself as the enemy because we're in there disturbing their birds and all the rest of this."*

[Woodfuel merchant 10, 13/12/2014]

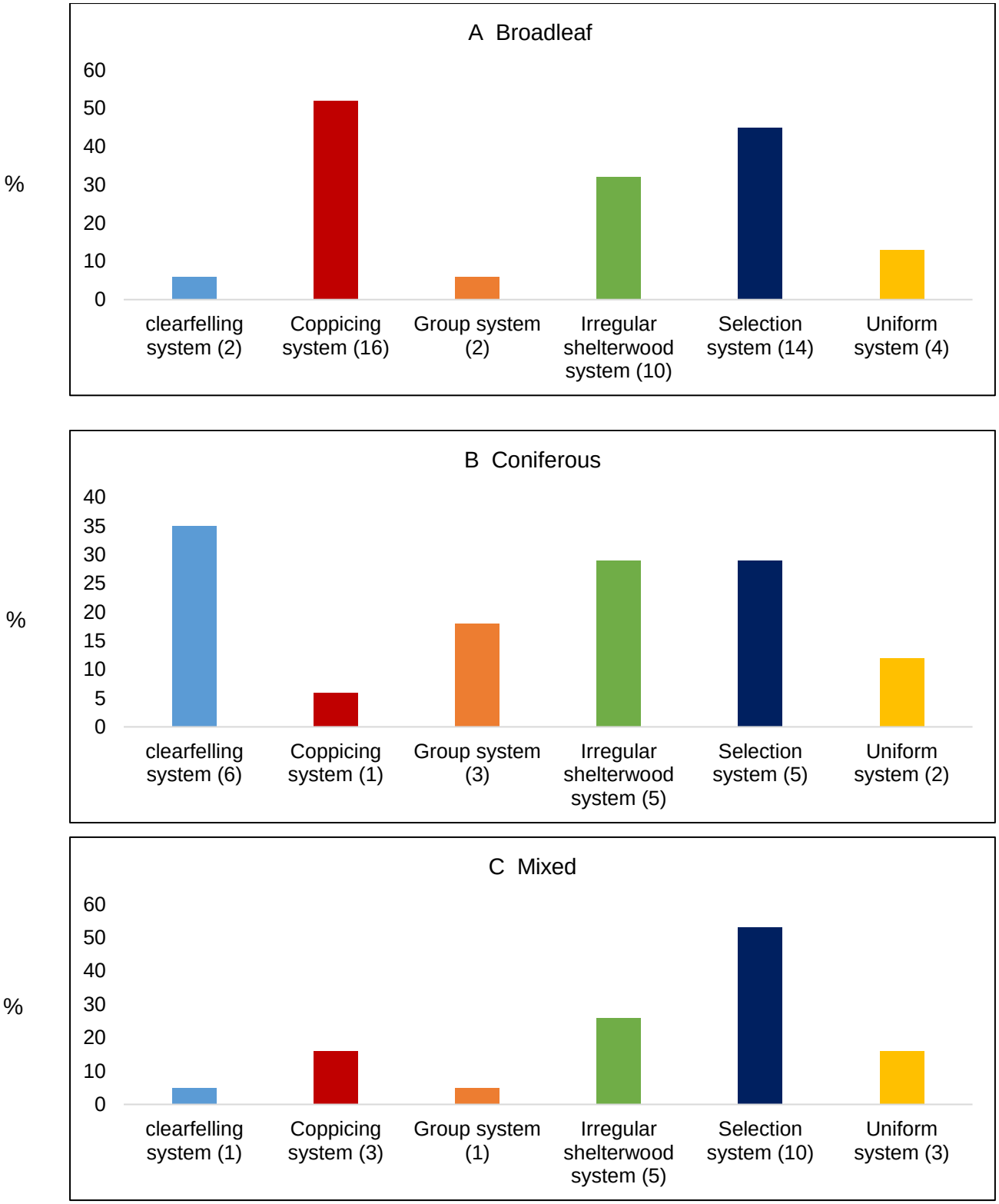


Figure 4.12 The different management systems used in (a) broadleaf (b) coniferous and (c) mixed woods by owners completing the online survey. % are shown on the y axis, the numbers in brackets denote the number of responses. Note that some owners use multiple types of management (e.g. clearfelling and CCF approaches). The results show that the CCF approach is the preferred option across all woodland types with coppicing, group, shelterwood, selection and uniform systems being more widely used than clearfelling, even in coniferous woods.

Amongst woodland owners with more areas of coniferous stands, the continuous cover approach has become popular in recent years according to one forestry consultant who works with multiple owners of wooded estates across the Midlands.

"I've noticed a big change probably over the last 5 years, certainly that landowners don't want to do so many clearfells. They want you to thin and almost may be at the point where it wants clearfelling but they will say just give it one last thin".

[Forestry Consultant 2, 12/05/2014]

This view was supported by another interviewee.

"Instead of taking out all of that softwood, mature larch and Corsican pine and so on, instead of taking all that out at once, they have a different modus operandi, they want to take it out as they need it. Woodfuel changes the way that people manage woodlands from a clear-cut approach where they cut a whole area down to the ground to a more gradualist approach."

[MD of a company selling woodland, 08/01/2014]

The result of this is that owners do not receive blocks of income through the sale of a timber stand, however, they will be able to produce a steady supply of woodfuel from the thinnings taking place. The upward trend of the woodfuel markets is such that owners could achieve a regular income from woodfuel sales by delaying the harvesting of the whole stand. The consultant also believes owners are less likely to fell a whole stand at present due to uncertainty regarding the woodland grant schemes to subsidise the costs of re-planting and protecting saplings from browsing animals. He explained that the income from timber often does not cover the cost of re-planting and protecting saplings from grazing animals, which need to be maintained for 20 years. Many owners and managers reported a growing deer population which means more costly fencing is required. As such, many owners are choosing to thin stands rather than carry out a clearfell.

"The balance between the big clearfell and the cost of re-stocking, even though you've sold the timber, there's still a big gap. To do clearfells actually costs the owner a lot of money. The client knows that when you do a clearfell, it's not just the economics of felling it, restocking it. They've got to pay for the restocking. You've then got 15, 20 years of maintenance and it's costly."

[Forestry Consultant 2, 12/05/2014]

And on the theme of an increasing deer population.

"Lots are coming out of here. Muntjac are moving northwards here [Cannock Chase] *and roe deer have been moving southwards and then we've got fallow deer, small population of red deer in this area."*

[Forestry Commission Land Manager, 26/06/2014]

"We've planted trees in a windblown area in 2007 and they only just got away from the deer. So the growth has been pathetic really."

[A Lincolnshire-based small woodland owner and woodfuel merchant 8, 27/02/2014]

Like deer, rabbits (*Oryctolagus cuniculus*) can considerably damage saplings by girdling the tree at its base. If the sapling's bark is removed completely around its circumference, then it will likely die. Evidence of rabbit damage was found in the majority of woods visited (Figure 4.13).



Figure 4.13 Minor rabbit damage on an alder sapling (*Alnus glutinosa*) in a Staffordshire wood. Author's photograph. [Taken 10/08/2014].

"You can't actually get rid of rabbits, I don't think you can. Everyone has tried, the rabbit is a survivor. I believe that what we should do is manage them so that the number is acceptable."

[Pest controller, 13/12/2014]

The same cost issue relating to the traditional clearfell-replant model was described in an interview with another consultant. He made the point that natural regeneration is more prevalent in Europe where, he believes, owners do not experience the same browsing pressure from deer. If browsing becomes a problem, he said Europeans do not have qualms to shoot them which is sometimes the case with the British. The gradual adoption of CCF has required a cultural shift in Britain, away from what foresters were traditionally trained to do which is clearfell an area and then replant it. However, such a model became

less financially viable, and it became a grant-led industry: *"It's* [forestry] *definitely grant-led. Which is the way it has been for the last decade... The grants are going to go down."* [Forest Manager 7]. Even with grants, many interviewees mentioned the difficulty of turning a profit. Now, with an expected reduction in the amount of grant money available, the reduced costs of using CCF seem to be encouraging its use. Davies and Kerr (2015) argue that the costs of CCF need not be more expensive than clearfelling and replanting so long as the natural regeneration of trees is successful. As one forestry consultant explained.

"I think there's a cultural thing in this country, we have tended over the last century, you can loosely say towards the thought that the best thing to do is to clear areas of land and plant back what you think is a crop you want. Everybody's aware that the problem with planting is the cost. You sell a stand for timber and you think "oh that's a nice lump of money in the bank". We made this money but we spent it and more besides just getting another crop in. So that then spurned the thinking, known as continuous cover forestry which avoids the clearfelling, and if done well, it works well and you get a sustained yield."

[Forestry consultant 3, 18/08/14]

The adoption of CCF principles in lowland woods may also be attributed to the perceived wildlife benefits it brings, reflected in its alternative name 'close-to-nature forestry'. When CCF is used, a wider range of different-sized trees with a diverse canopy structure develops and this is believed to provide for greater biodiversity (Kerr, 1999). Given woodland owners list wildlife as one of their top management objectives (see Figure 4.4, page 93), it is understandable why CCF with its diverse mixture of tree sizes and canopy coverage is attractive to owners whose principal interests in woodland ownership are wildlife and personal pleasure. On the topic of wildlife, 97% of owners responded positively when asked how important they consider their woods are for wildlife, stating their woods were either 'very' or 'quite important' for wildlife (Table 4.8). Interestingly, 97% of owners responded positively to an earlier question asking them how important wildlife as a management objective was to them. The results of these two questions implies that owners believe they are successful in achieving their wildlife management objectives.

How important owners consider their woods are for providing habitats for wildlife (%)	
Very important	27 (75%)
Quite important	8 (22%)
Not very important	1 (3%)
Not at all important	0 (0%)

Table 4.8 How important owners believe their woods are for providing wildlife habitat.

In smaller woods, management decisions were often found to be based around individual trees, or small group of trees, with wildlife and woodland structure of key concern. One small woodland owner described how she was hoping not to isolate wildlife as she thins the wood's boundary to let more light through the canopy.

"We'll leave these two oaks, take that hawthorn out and then take out most of the holly and the hazel on the boundary and then that gives a nice light area. We've still got contiguous canopy around for things like dormice. We don't think we've got dormice but we're trying to make sure we're not leaving them stranded. So we're not taking out a huge…, you know, maybe about 10 or 15 metres only out of the boundary but that will regenerate nicely."

[Small woodland owner 3, 10/08/14]

Providing for wildlife was clearly the most important factor in the woodland management decision-making process for this owner, maintaining cover for ground-dwelling fauna. She recognises that a diverse woodland structure as being important in providing habitat for a range of species, emphasising that she leaves a significant area of the woodland as open habitat.

"We've got the maximum amount that you're allowed of open habitat in the woods because again we want the contrast and the mixture."

[Small woodland owner 3, 10/08/14]

Equally, the owner described the importance of creating a woodland which has non-linear lines of trees which she said was to the benefit of wildlife. Three years prior to the interview, the owner purchased the field adjoining their ancient wood to extend the woodland. Rather than planting in linear blocks with straight woodland tracks, she planted lines of trees in curves as shown in Figure 4.14.



Figure 4.14 The planting of new trees in curved lines to produce a more "natural" look.

"We felt the curvy corridors were a little bit more natural. The key thing for wildlife is that they don't like having a direct sight line."

[Small woodland owner 3, 10/08/14]

The owner talked of the range of benefits that individual management decisions might have. Whilst she is focussed on managing to attract wildlife to the wood, she also manages her wood to produce a steady supply of firewood which she sells locally. Furthermore, planting ground cover, like willow (*Salix alba)*, for nesting birds may also encourage more valuable timber species like oak to grow straight. As such, this owner's woodland is a good example of the application of multi-purpose forestry on a lowland site managed primarily for wildlife.

"The stuff you plant is going to have benefits for habitat and other things as well. For example, if you're planting the willow, it will produce a quick crop of woodfuel but it will also produce quick habitat for animals and it grows quickly and you can use willow or fast growing species as nurse species for oak so they'll grow a good form for timber."

[Small woodland owner 3, 10/08/14]

The same use as willow as a useful species for wildlife was raised again by a forest manager at a different site. Here, he appreciated the tree's lack of value as timber, but recognises its usefulness for habitat creation.

"*If I was a forester. I wouldn't leave that willow but willow is a really brilliant tree for the wildlife"*

[Forest manager 3, 24/10/2013].



Figure 4.15 Cloned white willow saplings (*Salix alba*), planted as part of the creation of a new wood adjacent to the owner's ancient woodland. Author's photograph. Staffordshire. [Taken: 10/08/14].

Throughout the owner's wood were scattered piles of logs and poles which she intended to process into firewood for sale.



Figure 4.16 Various piles of drying wood scattered throughout a wood for processing into firewood and kindling. None of the piles were covered to protect the wood from rain. However, elsewhere the owner had constructed a woodshed where they are under cover. Because the owner sells firewood, she maintains a constant supply by adding to these piles throughout her wood as she thins areas. Wildlife management and firewood production for commercial purposes therefore compliment one another here. Source: Author's photograph. [10/08/14].

As has already been recognised, many small woodland owners base the decision about which tree(s) to fell on the impact they believe it will have on the wood's structure and wildlife. Recognising that the canopy structure they hope to achieve could take years to establish itself, these decisions are long-term. With a history of under-management for the majority of small woods visited during the study – and indeed across Britain – most owners described themselves as in the "catching up" stage of management, aspiring to produce a diverse woodland structure. This structure is typically composed of multiple canopies and based around a coppice-with-standards system which the owner or manager hopes will be of benefit to wildlife by providing diversity and sufficient ground cover of young saplings and shrubs. Occasionally, planting was found to have been undertaken to introduce a particular

species or as part of a plan to establish a coppicing system.

One owner of a 4 hectare wood purchased in 2012 talked through his intention to re-introduce coppicing. His wood is composed of approximately 60% Sitka spruce and 40% a mix of broadleaf species. The entire wood had been clearfelled and replanted approximately 20 years ago and the Sitka spruce therefore require a first thinning to encourage the best timber to grow upwards. As is increasingly common, this owner's wood forms part of a 16 hectare woodland purchased whole and sold off in smaller parcels. The plan for this wood involves completing the first thin on the Sitka spruce – with the aim of producing economically valuable timber – and encouraging a tiered canopy structure in the broadleaf area. However, many of the broadleaves have not developed fully and a dense layer of bracken has grown. The intention is to crush the bracken and under-plant beneath the existing trees to establish a continuous canopy cover and shade out the bracken.

"We're thinking very carefully about what to do with the broadleaf area…what we will probably do is plant into the gaps [created by crushing the bracken] *in order to try and develop some continuous cover."*

"In this part of the wood [the stands of Sitka spruce] *we may say simply, from an economic point of view, extract some selective timber in order to manage the woodland but shift it back to something of a more natural continuous cover approach."*

[Small woodland owner 7, 04/04/2014]

In a similar fashion to many other owners whose management decisions are guided principally by wildlife, this owner said he will leave some parts of his Sitka spruce stands untouched where there are badger sets. The following comment was made when asked what a "properly managed wood" meant after he used the phrase himself.

"And a woodland that is properly managed, what does that mean to you?"

"Good mixed habitat for wildlife… It probably will mean not touching any of the Sitka in the area where the badger set is. It's a long established badger set, it's like a Swiss cheese in that part of the wood. It's not a big area, probably about a quarter of a hectare. So it's nothing from an economic point of view, they were here first. It's quite nice having them there. There's no cattle farmers around though. This business about bovine TB is a complete load of nonsense."

[Small woodland owner 7, 04/04/2014]

Managing a wood on a *per* tree basis, as promoted under the principles of continuous cover forestry, was something that many managers working for conservation and wildlife organisations do. Ordinarily, if the intention is to grow trees for timber, the standard practice is to create competition between trees to encourage them to grow upwards towards sunlight. This typically leads to straight trees with narrow crowns. A conservation organisation, however, is interested in maximising the amount of habitat each tree provides which means promoting wide crowns to provide habitat for birds. As such, the opposite approach is taken with some trees removed to reduce the competition for light and encouraging the remaining trees to grow wide crowns. The removal of trees to promote wide crowns therefore produces a supply of wood, again highlighting the positive relationship between managing for wildlife and producing a small but continuous supply of firewood. An interview with a woodland manager from the Wildlife Trust revealed their approach to managing a woodland for birds in particular. In the following quote, the manager recognises that the Wildlife Trust could produce higher quality timber for milling but his effort is instead concerned with maximising wildlife habitat.

"You see that big oak there, I want that to have a big crown. Oak hates competition and in this current condition it will get drawn up and will form a nice thin tree which from a processing point of view probably isn't a bad thing but we want that tree to have as large-a-crown as possible so it's not going to have any contact with any other tree and it will grow out big. That will give a higher yield from a wildlife point of view than the same amount of crown on a whole load of different trees…So what you want is a big old, round nice tree."

[Forest manager 3, 24/10/2013]

Whilst the woodland structure which most owners wish to achieve is based on the intention that it will benefit wildlife, many expressed a desire to re-create the management system and practices they believe were historically used to manage their wood. Importantly, firewood sales might help finance the cost of contractors or the cost of small-scale processing equipment and sheds for drying firewood. Coppicing is often the preferred management option for owners interested in wildlife. For some, the use of machinery to harvest logs was viewed negatively – often associated with the soil compaction caused by forwarders – and they spoke of a desire to use horses to drag timber from their wood. Re-introducing a coppicing regime and the use of horses was therefore recognised as some owners' attempts to return woods to what they perceive to be its former glory.

"This has got the sort of structure…you know if you walk round the woodland today this is a window on the past, this is what woodland structure used to be like. And this is what you don't normally see is it? I mean how many woods do you see like this?"

[Forest manager 3, 24/10/2013]

"…the wetness of the wood…My best thing would be to get a horse logger in to do it. When I was ten years younger, we had a horse, my daughter's horse who actually would pull. She'd have pulled those logs out easily, a big strong mare. I think that would do the least damage to the wood."

[Small woodland owner 5, 28/01/2014]

"There are people around who work horses for logging...Horse logging is great if you've got some nice expensive timber to extract but run of the mill spruce, I can't see it really. I'm sure the wife would love to take the photographs of horses logging in our woods but I just don't see it from a practical point of view so it's going to be blokes, chainsaws, small forwarders, and therefore that's labour intensive and therefore costly."

[Small woodland owner 7, 04/04/2014]

Coppicing is a popular practice for conservation organisations because of its relative cheapness and its perceived wildlife benefits. Of the four coppicing systems asked about in the survey, 'simple coppice' and 'coppice-with-standards' were most commonly used (Figure 4.17). As expected, given the low number of documented cases of Short Rotation Forestry (SRF) in the UK, few owners said they practiced it. Smith and Watson (2011) claim there to have been fewer than ten small-scale SRF plantings in the UK in 2011. The low number may be a result of the intensive nature of SRF to produce biomass for energy which may deter landowners. Given the wildlife and landscape conservation interests of most woodland owners, it is unsurprising that SRF does not meet their objectives. However, one small woodland owner stated that if he were to plant a new woodland, he would use SRF with the intention of maximising the production of firewood.

"If I'd be doing it again now, if I was looking with fresh eyes [at designing a new woodland]*, we've got 16 acres all together, what I would do now would be short rotation forestry specifically for woodfuel production. With the short rotation stuff, you plant it deliberately in a line so you get the maximum amount of wood. If you're going for firewood, that would be a cracker."*

[Small woodland owner 6, 25/02/2014]

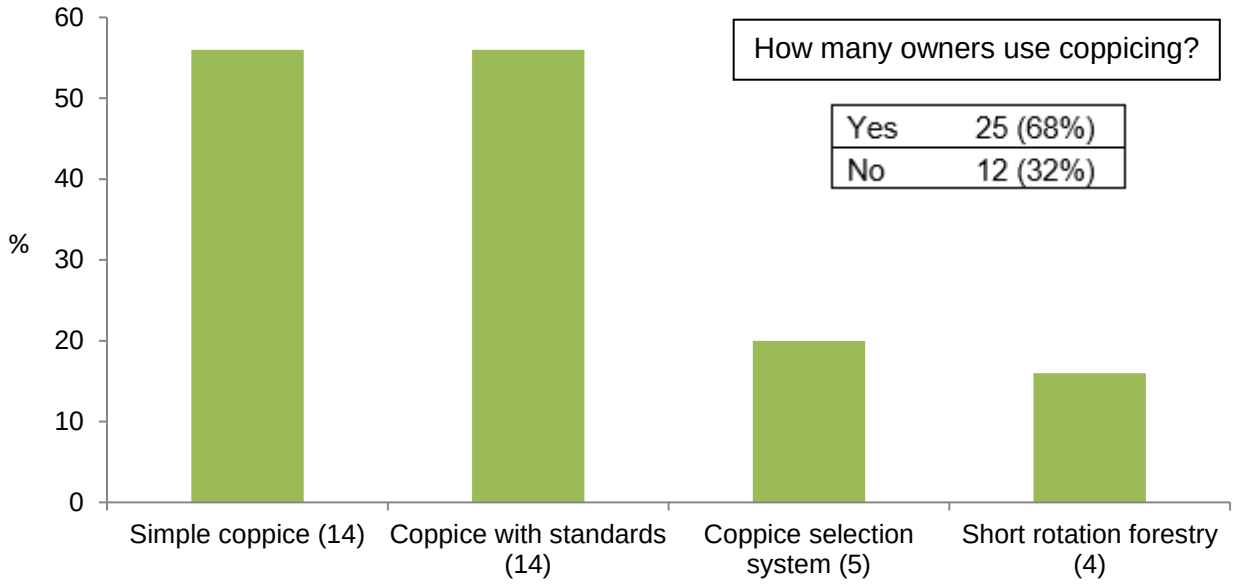


Figure 4.17 The types of coppicing practices used by owners completing the online survey (numbers of owners in brackets). Some owners apply more than one type of coppice practice. As the table shows, 68% of owners carry out some form of coppicing.

Few owners said they use a coppice selection system whereby the weaker stems from a single coppice stool are cut and the stronger stems are left to grow. This is in contrast to a comment from one interviewee.

"The woodfuel market has changed the way they [owners] *manage coppice as well because there has been a move to single coppice as it's sometimes called, more so in Kent and Sussex. In other words, if you've got about ten stems from a chestnut coppice, people will leave the central one, or one of the strong ones in the middle and cut the others. They quite often do that for firewood."*

[MD of a company selling woodland, 08/01/2014]

As discovered during field visits, the majority of owners either coppice every tree in a given area or they use a coppice-with-standards system to create structural diversity. As the following quote demonstrates, the impact of management is carefully considered by most owners who take into account multiple factors like which species will benefit from a changing climate as well as the impact of tree diseases. The owner had planted a mixture of hazel and ash saplings with the intention of coppicing the hazel and selecting the best ash trees to retain as standards (see Figure 4.18 below). However, the appearance of *Chalara fraxinea* in the UK has prompted her to accept she will lose the ash standards, and therefore the upper canopy layer.

"We'll thin out the kind of weedier trees and then leave it to grow until it's coppiced then cut it and then let it re-sprout from the bottom. And one or two, we'll leave as standards or for bigger pieces of wood. The ash was planted to be standards but obviously they're not going to be now because I suspect most of them will succumb [to *Chalara fraxinea*]*.*

[Small woodland owner 3, 10/08/14]



Figure 4.18 Planted hazel and ash coppice with the intention to develop the area into a coppice-with-standards system. The saplings were deliberately planted overly-dense with a view to removing the less competitive trees. Author's photograph. [Taken 10/08/2014].

In a Wildlife Trust-owned wood in Nottinghamshire, a mixture of management systems is used to create structural diversity across the 50 hectare woodland. Figure 4.20 on the next page displays the layout of the wood's compartments and their management systems. In compartments D1-D5, a coppice-with-standards system is used across the stands of ash, hazel and oak. Figure 4.19 below is a photograph looking into this mixed stand on a 20 year rotation of cutting. The quote associated with the photograph highlights the manager's objective of developing a more complex canopy.

"We cut that 4 years ago. So all those scraggy things that are left standing and everything else is re-growth from that. It's still structurally relatively simple. So in another 15 or 20 years, you'll be able to take out some of standards…there'll be some twenty year old material that you'll be able to leave standing as well so you'll end up with this tiered structure. So this now has a very dense understorey which is fantastic for nesting birds."

[Forest Manager 3, 24/10/2013]



Figure 4.19 The creation of a tiered canopy structure in a hazel, oak and ash stand in a Wildlife Trust-owned wood. Author's photograph. Treswell Wood, Nottinghamshire. [Taken 24/10/2013].

Across the rest of the woodland there is a mixture of coppice-with-standards on shorter, 7-year cutting rotations (compartments G and F), a selection system on a 20-year rotation in compartments B and C, and areas where no management takes place (compartments I and J), see Figure 4.20.

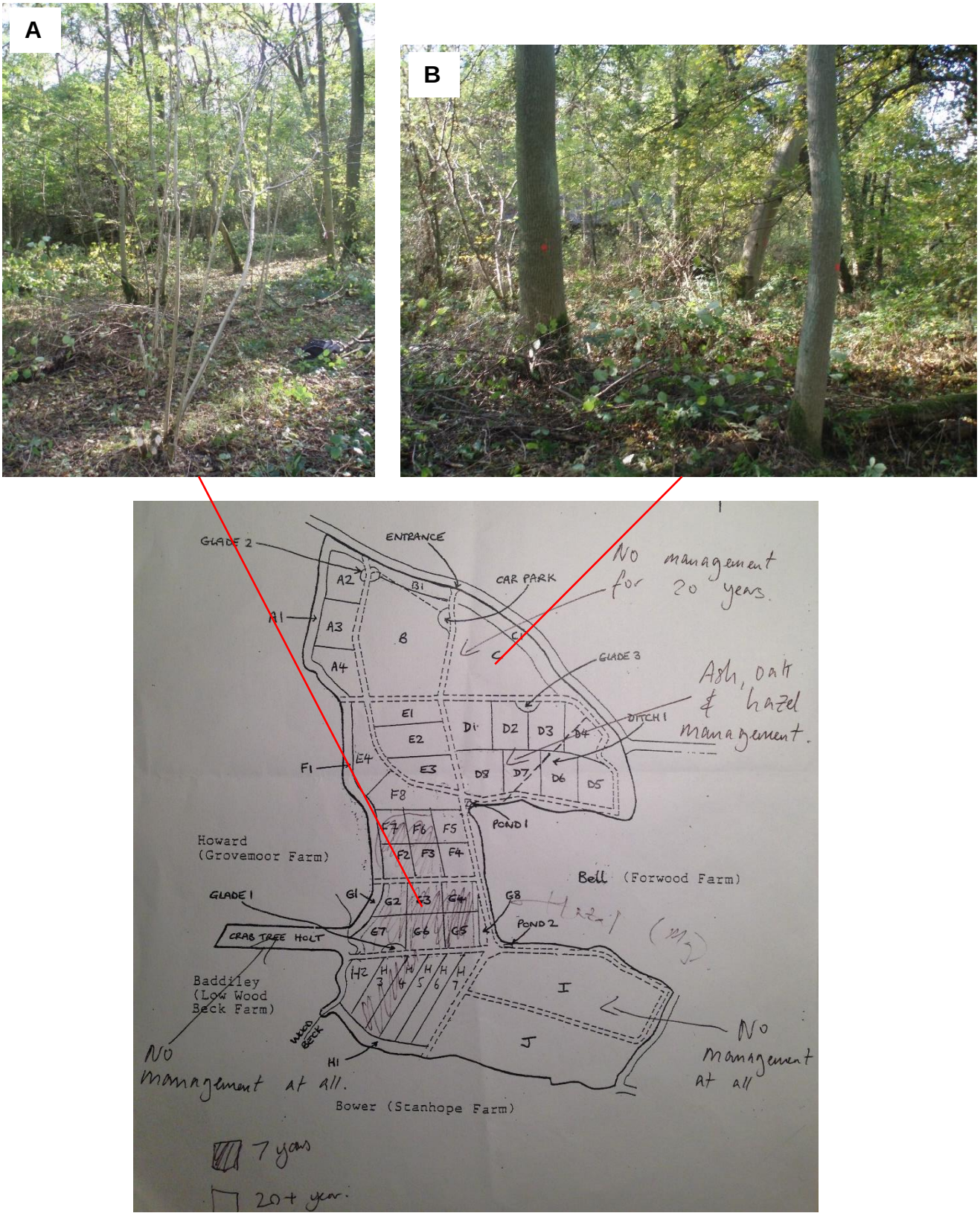


Figure 4.20 A map of the Wildlife Trust-owned Treswell Wood, North Nottinghamshire. The wood is divided into a series of compartments on different cutting cycles to create structural diversity. Source: Personal correspondence (2013). Photograph A was taken in the G compartments, where recent coppicing has taken place. Photograph B was taken in Compartment C where very little management has taken place for 20 years. A surprisingly under-developed shrub layer is present. Note the marking of standard trees in preparation for felling. Source: Author's Photographs. [Taken 24/10/2013].

On the topic of wooded areas where no management takes place, 28 out of 36 owners (78%) from the survey have a designated minimum intervention area (Table 4.9). When asked how much of their wood was actively managed, the average was 68%, implying a third of most owners' woods are classified as minimum intervention areas. Older broadleaved areas are the most likely woodland types to be designated as such areas with the majority of owners assigning areas of them to minimum intervention management.

	Owners who assign an area of woodland as minimum intervention areas (%)
Yes	28 (78%)
No	8 (22%)

Table 4.9 Above: The number of owners with minimum intervention areas in their wood.

Below: Where minimum intervention areas are designated across woodland types.

Woodland types	Where is minimum intervention used: the number of owners who use minimum intervention in each type of wood (%)
Old broadleaved	25 (89%)
Old coniferous	6 (21%)
Old Mixed	4 (14%)
Young broadleaved	3 (11%)
Young mixed	2 (7%)
Young coniferous	1 (4%)

Whether minimum intervention approaches are beneficial to wildlife and species diversity in ancient woods is debatable with Fuller and Warren (1993) arguing that British wildlife has developed around the historic use of coppicing over hundreds (sometimes thousands) of years. Therefore, to stop coppicing on ancient woodland sites will change the structure which may not be to the benefit of the species adapted to living in it, particularly those requiring open woodland habitat. One owner filling in the survey wrote of a risk associated with assigning too much land to non-intervention, arguing that active management, via "good forestry" is sustainable and beneficial to the environment. Managing a wood invariably produces wood products (whether that be woodfuel or timber) and therefore the quote below reflects the belief that productive management and wildlife fit well together. Similarly, a farmer being interviewed commented on the greater diversity of birds he believes inhabits his actively managed wood compared with other unmanaged mature woods he has visited.

"Good forestry does provide sustainable environmentally friendly products. We cannot afford to have very large nature reserves with non-intervention!"

[Online survey respondent]

"Nice woodland has to be managed. If you've got a neglected woodland it's a pretty horrible place, there's no growth in the bottom, there's no wildlife in it to speak of, the birds don't even like it. You look at the difference between woodland we've got which is natural regeneration, the amount of bird species in it compared to a mature woodland that's unmanaged, there's a hell of a difference.

[Farmer 2, 13/05/2014]

Based on estimates of the area of neglected British woodland, a large proportion of the country's woods have essentially been under minimum intervention management since the latter half of the 20th Century. A forest consultant explained that in the woods he manages, this has resulted in large volumes of unmarketable timber, particularly in coppiced woods that were last managed many decades ago. The consultant adopts a gradual approach to management using CCF practices to reduce the impact that management could have on wildlife. Interestingly, the consultant classed woodland for "amenity" and "non-man intervention" as the same. The implication being that amenity woods do not require management and do not produce income.

"Even these big private estates, we've found that their woods were being managed probably at about 60% and then 40% were left for amenity, we call it non-man intervention. And it's because they weren't viable to work in and part of that is the coppicing because, we found that the woodland had got very little sellable material because it had been left about 35, 45 years since it was last coppiced commercially and once you've lost that cycle. It's not a quick fix, you can't just return it and also we have to do it very gently, very methodically because of the impact on the wildlife and habitat."

[Forestry Consultant 2, 12/05/2014]

Whilst it appears the majority of owners in the lowlands prefer the CCF management approach, clearfelling is still used occasionally, especially when the objective is to remove conifers. Owners may use CCF by thinning a stand of conifers and under-planting with broadleaf species or they may clearfell a site. As one farmer explained, he clearfelled scattered blocks of conifers and used a mixture of planting and natural regeneration to replace them, following the advice of the FC.

"This is what the Commission wants us to do. Either clearfell or thin and allow natural regeneration. We did clearfell some of the woodland and allow it to re-grow, about 8 acres 7 years' ago. This was Corsican pine commercial plantation and it was over mature and so they [the Forestry Commission] *accepted that we could just have the lot out and allow regeneration, let birch back in."*

[Farmer 2, 13/05/2014]



Figure 4.21 Left: A Corsican pine (*Pinus nigra*) plantation on Shropshire farmland.

Right: Silver birch (*Betula pendula*) regeneration occurring after the clearfelling of Corsican pines on the opposite side of the track in 2007. Author's photograph. Shrophsire. [Taken: 26/5/14].

In other stands of conifers, he intends to carry out what he described as a heavy thinning involving the removal of 70% of the trees (see Figure 4.22).



Figure 4.22 A stand of conifers identified for a 70% thinning. Author's photograph. Shropshire. [Taken: 26/5/14].

"That conifer woodland is going to almost be clearfelled, we're going to probably do a 70% fell on it."

[Farmer 2, 13/05/2014]

In one case, a woodland owner who has witnessed native broadleaf species out-compete some of the conifers on his land, is resorting to clearfelling to remove the remaining blocks of conifers. Being a firewood merchant, he will have a considerable volume of softwood to sell following the clearfell. Financially, it makes sense to clearfell the conifers to sell whilst the price of firewood is relatively high.

"Our wood was cleared in 1959 and then planted with conifer in 1963. In some areas, the ash and oak have taken out the conifers now so it's getting back to natural. In other areas, you've got blocks of conifer…there are areas that we will eventually clearfell and replant with native species."

[Small woodland owner and woodfuel merchant 8]

However, a number of interviewees and survey respondents expressed concern about the potential harm done to a wood due from clearfelling or over-thinning. As one interviewee points out, the damage risks not only wildlife but also the longer-term profitability because its value as an economic asset is rapidly degraded; if an owner clearfells a wood, it will take decades before it can yield valuable timber or raise income through shooting rights.

"I would like to see more continuous cover forestry management of conifer woodlands, which has big wildlife gains. I am sceptical about just converting productive conifer woodland back to "native" broadleaves and semi-natural woodland just by felling."

[Online survey respondent]

"People who are going in heavy and seeing the money, you know, it's not how we do things unless we're told to do it. If somebody wants that block felling for them then we will but we'll try and advise against it and give them other options…I hope people realise that they can't just go through the farm woodlands or estate woodlands and do too much because too much change in any one year doesn't do a great deal of good. The landscape and the habitats have to adapt. If you go in and thin an area, you've displaced an enormous amount of wildlife there that has to go to another area. You know, it will bounce back but if you do everything in one year, it's not good."

[Farmer, forester and woodfuel merchant, 21/02/2014]

As expected, the use of clearfelling is used most in coniferous woods. In some cases, owners use the clearfell-replant model to produce timber crops. Others might clearfell areas as part of PAWS restoration projects with the intention of introducing broadleaf species. The survey results show that clearfelling is used more by owners with larger areas woodland: the average area of woodland owned by someone who clearfells is 660 hectares whereas the average for those who avoid clearfelling is 85 hectares. This is understandable given owners with larger estates are more likely to have coniferous stands on their land, from which they produce high quality timber. However, as one forestry consultant raised, the demand for clearfelling even these sites is falling due to the costs of replanting and the profits to be had from woodfuel production from forest thinnings.

One might imagine owners who clearfell are likely to list timber production as very important. However, only two owners using clearfelling listed timber production as "very important". One of these two owners stated they clearfelled to remove a PAWS, suggesting they do not use it for timber production. The other owner owns 2,800 hectares and uses the clearfell-replant model. It therefore appears that only one respondent owns an estate where traditional timber production takes place. This is perhaps unsurprising given the survey was aimed at 'woodfuel and woodland management' which may have deterred owners of larger estates focused on traditional forestry practices. However, it could also reflect the declining number of estates with dedicated forestry departments as well as a move towards the use of continuous cover forestry to grow timber. For most owners of amenity woodland, therefore, clearfelling is reserved for projects associated with fulfilling the wildlife and conservation aims of woodland ownership. As one survey respondent wrote: *"We have cleared a conifer plantation and parts are being restocked with broadleaf for conservation purposes."*

4.8 Summary

This chapter has explored the management objectives of woodland and estate owners, highlighting how woodfuel production fits comfortably alongside the most commonly cited management objectives. These being wildlife, personal pleasure and recreation. Whilst half of woodland owners view income as being at least 'quite important', some owners are reluctant to admit they would like to make money from their wood. This view was shared by a forester who finds owners are hesitant to tell him they wish to sell timber and supply the woodfuel markets. With the growth of the firewood and woodchip markets, many owners are looking to bolster their income. For the many woodland-owning retirees, the woodfuel markets are a relatively easy method to produce small, but much-welcomed income. Meetings with owners and managers on larger estates revealed that the perception of

woodland ownership being a loss-making exercise is not as pronounced as it was just a few years ago, with 92% of owners believing their woods will either be more profitable or, at least, remain as they are, in five years. Nonetheless, making a profit from a woodland can be difficult. The ability of owners to install RHI-funded biomass boilers and self-supply their woodchip is likely an important factor behind the increasing confidence that woods can be profitable on larger estates. Evidence was collected that conservation charities are becoming more commercially minded, with some establishing networks with woodfuel merchants who use low impact machinery on sensitive sites. However, a debate remains regarding the extent to which conservation bodies should produce income through their woods. Some within the National Trust hold the view that commercial timber production, yielding a continuous supply of marketable firewood, should not be the focus of management efforts. Equally, the FC is searching for new business opportunities as it becomes increasingly distant from Government. Whilst some owners are being encouraged to manage their woods to produce the more diverse canopy structures they believe will benefit wildlife, anecdotal evidence was collected that some are over-thinning their woods to make quick profits from woodfuel sales. At the same time, clearfelling on estates with traditional forestry departments is now less favourable and owners are looking to carry out more thinning operations to supply the woodfuel markets. This appears to be part of the general move towards CCF practices.

Mather *et al's* (2006) assertion the UK's forestry sector has entered a post-productivist phase has been challenged. This is despite the move towards multi-purpose forestry where environmental and recreational objectives remain the primary reasons for owning a wood. The woodfuel markets are encouraging owners to produce more. In many cases, woods that had been left unmanaged for many decades are now being brought back into management. Furthermore, owners and charities who purchased small woods for environmental reasons are engaging with the woodfuel markets. Woodfuel production is providing owners with an impetus to manage with the Government actively supporting greater production through grants and the RHI. Simultaneously, other wood products, like coppice poles, are being sold where owners are creative and identify market outlets. It is for these reasons that it is too early to claim that forestry is in a post-productivist era.

Chapter 5

Growing Demand: Woodfuel Merchants and Markets

5.1 Introduction

Having explored the reasons for woodland ownership and their management, an analysis of the firewood and woodchip markets is presented. The chapter opens with a description of the recent growth in demand for woodfuel, based on the experiences of merchants and forest managers. Many merchants expressed the view that there is a lack of a supply of timber to meet this demand. This view is compared with the comments from interviewees who do not share it, using the FC's latest survey of the country's woods and forests. The merchants' modes of operating in a market which has undergone rapid expansion in just a few years are then described, with an analysis of their backgrounds and entry into the sector as well as their formal and informal working relationships. The chapter concludes with an assessment of the increasing standardisation of the way in which woodfuel is sold with particular focus on the lack of regulation of the firewood market and the competition that merchants have with those willing to sell cheap, unseasoned wood.

5.2 A surge in demand

All interviewees, regardless of their role in the woodfuel sector, commented on the rapid growth of the market in recent years. Merchants of both firewood logs and woodchip have found demand has increased greatly towards the latter half of the 2010s. The majority of interviewees talked about this growth occurring over the past few years, attributing the demand for firewood logs to a large increase in the number of wood burners being installed and the demand for woodchip to the Renewable Heat Incentive (RHI). For firewood logs in particular, approximately 2005 appears to be the year that most merchants remember as the time when they realised demand warranted a greater investment in firewood processing equipment and delivery vehicles.

"There was a demand for it [for firewood]*. We had a demand for it ourselves and then more people heard that we'd got woodland and asked us slowly, bit by bit, the demand grew. In the nineties, the market for logs was still quite low and you had to work very hard to earn any decent income from it so it didn't warrant a machine or any sort of significant investment because the market had been fairly static for years. It was only sort of 2005 that we really got into it."*

[Farmer, forester and woodfuel merchant, 21/02/2014]

"We've grown from zero in 2006. In the last company year, we supplied 40,000 solid cubic metres of timber as woodfuel."

[Woodfuel merchant 12, 27/06/2014]

Many merchants spoke of their gradual realisation that there was a growing demand for firewood logs and cited a number of sources of evidence which alerted them of the growing firewood market in the mid-2000s. Merchants said they heard from others about the growing demand as well as reading about it on internet chat rooms and receiving questions from the public about firewood. This led to a significant growth in the number of people starting firewood businesses which provided people with their main source of income or which acted as an aside to other businesses like tree surgery and gardening.

The growing number of domestic wood burner installations has also been well documented. Many national newspapers published stories covering the growing demand for wood burners between 2010-2013 with 180,000 (Wallop, 2013) and 175,000 (Osborne, 2013) being estimated as the number that were installed in 2013. The number of installations appears to have remained steady with Kelly (2015) stating 180,000 were installed in 2014 which was five times the number of burners installed in 2007. Many woodfuel suppliers quoted the approximate number of burner installations, highlighting their knowledge of the market demand for firewood. Importantly, knowledge of the number of wood burners being installed gave merchants confidence of a growing market as well as allowing them to predict the approximate demand for woodfuel.

"How has growth been for your business since you started"

"Yeah, very big growth. We probably did 10 loads in our first year [2010] *and we probably do, I don't know, 400 loads now. Yeah, because everyone is having wood burners put in."*

[Woodfuel merchant 5, 12/02/2014]

"The large number of wood stoves…everyone creates a stream of demand you know, so it's on-going demand for woodfuel so I would say that your installed capacity of woodfuel burners has meant now there is a good steady and predictable demand for woodfuel."

[MD of a company selling woodland, 08/01/2014]

"The prices will go up and up and up because thousands and thousands of people are having log burners fitted. Every year we're sort of doubling the amount that we're selling so prices will keep going up."

[Woodfuel merchant 5, 12/02/2014]

One factor responsible for the growing demand for wood burners is they have become an object of fashion for many people. Indeed, the market for wood burners includes burners designed to look attractive in modern homes in urban areas. Osborne (2013) quotes the manufacturer of a London-based wood burner supplier who describes the change in tastes for wood burners: "Until recently, stoves were very much a backwater. They were for people who lived in big draughty homes in the country…That has changed radically. In particular, we are seeing a new metropolitan, urban taste for wood burners". In the context of the growing use of wood burners, many interviewees' comments reflected this trend towards a wider group of people using them.

"I would say it's [the woodfuel market] *developed enormously, it's gone mainstream I suppose. It's not seen so much as an eccentric minority interest; it's seen as a normal thing to do."*

[MD of a company selling woodland, 08/01/2014]

"What we're finding is that not only are people putting that wood burner in and they're putting it in for economic reasons, they're putting it in because they're seeing potentially oil and gas prices going up, they're putting it in because they want that certainty of fuel, to a certain extent they're also putting it in as a lifestyle choice."

[Forestry consultant 1, 13/12/2013]

"Who are you main customers? Rural, urban?"

"We do both, but percentage-wise it's a lot more urban because there's a lot more people in the city I suppose. West Bridgford and around there." West Bridgford is a town immediately South of Nottingham and is well-known for being an affluent area of the city with house prices being approximately a third higher than across Nottingham (Home.co.uk, 2015).

[Woodfuel merchant 5, 12/02/2014]

The growing use of wood burners in urban areas is a prominent feature of the growing demand for firewood and some merchants believe there to be a stark difference between their urban and rural customers; urban customers are evidently content with higher prices whilst those living in rural areas were described as being more knowledgeable about burning wood, able to season wet wood themselves and more likely to ask questions about the wood's quality. Whilst there could be an element of bias in the comments made by the farmer quoted below given he has lived in the countryside his whole life, it reflects the general trend towards a greater number of people installing wood burners for the first time and needing time to learn how to use them.

"So you think there's a divide between urban and rural people then?"
"Yes, absolutely. Unless they're really educated, generally the urban people will pay a lot more for just convenience and no hustle whereas someone who lives in the country will ask "could I have a log which is slightly bigger?" Or it might be slightly wet because they can deal with it."

[Farmer turned firewood merchant, 12/11/2013]

Whilst the buoyant cost of standing timber and the economics of the woodfuel market are the key reasons for a greater number of people entering the market, it appears that a combination of greater media coverage and conversations taking place amongst suppliers' personal networks of customers and competitors has contributed to a growth in confidence to invest in the woodfuel market. Furthermore, based on the comments made by merchants about the increasing number of competitors as well as the buoyant price of standing timber, it appears that the woodfuel market is still growing and merchants will continue to invest in processing and extracting equipment for the foreseeable future. Indeed, a number of merchants had invested in forestry machinery, processing equipment or delivery vehicles since 2010.

"The guy I used to contract it [a small forwarder designed for low impact forestry work]*, he bought his machine probably about 15 years ago but he found it hard to pay for it. I bought this knowing that the woodfuel markets had picked up. I've owned this for three years now and I wouldn't have bought it if I didn't know the woodfuel markets were on the up."*

[Woodfuel merchant 11, 16/03/2014]

"The one thing that has changed is that this year we invested in another system of delivering. Because we only had a trailer when we first started which we took the logs off by

hand or we did big bags or whatever. So we have a truck that's got three cages with two cubic metres. And one thing we've found, we've got more people taking four and six cubic metres. They're taking bigger volumes."

[Woodfuel merchant 8, 27/02/2014]

Some tree surgeons started to supply firewood because they were getting more questions from passers-by about the destination of the trees they were cutting and whether they could take some wood home for their own use.

"This last year [2013]*, I've really noticed it. From doing tree surgery, a lot more people are asking. I used to either sell the firewood in bulk without it being split and stuff and just, you know, get rid of it like that or give it away and more and more people were saying to me when we were doing trees, they'd stop in their cars and say "can I have your wood?" More and more people now when we do a job with tree work are saying can I have the wood for a friend who's got a wood burner? Or the neighbour wants it and stuff like that."*

[Woodfuel merchant 6, 17/02/2014]

Some forestry companies and individuals attributed the rising cost of standing timber to the growing demand for woodfuel and used their 'insider knowledge' of the sector to base their decision to invest more in firewood processing equipment. Some forestry companies said they were achieving higher prices for their clients' standing timber which led them to enter the woodfuel market themselves. Furthermore, many foresters said the amount of work they were getting has increased recently which reflects the trend of growing timber prices in the UK currently.

"We were selling timber on our client's behalf and the prices we were getting were creeping up and the phone was ringing more, people wanted firewood, they wanted to buy it in the round, they wanted to buy it standing…I can't remember how we noticed, but it was just a realisation that there was a stronger demand for firewood than there ever had been."

[Farmer, forester and woodfuel merchant, 21/02/2014]

"We've picked up two contracts this month which we're struggling to fit in because they both need to be finished very quickly. I'm off to look at a big estate on Friday so there's a lot of work out there which is good when you've got quite a few machines to pay for."

[Forester 1, 12/03/2014]

'Arbtalk' is a website which promotes the discussion of various aspects of arboriculture in a set of internet discussion forums. One merchant described how he kept track of the prices of standing timber on this website which led him to realise that the demand for firewood was growing. In this case, the merchant was expressing his surprise at the low cost of one FC-owned stand which led him to conclude that merchants with larger pieces of harvesting equipment (his competitors) can carry out the work more cheaply.

"That Arb talk website. That's useful. There was recent talk about a Forestry Commission auction going for £44 a tonne standing. You know? Wow! We were blown away! Then everyone's scratching their heads thinking "how are they going to turn that one around"? Unless you come in, I don't know how it works out using like a harvester, you know, one of those mechanised…if you didn't have to cut it all by hand. I don't know."

[Woodfuel merchant 1, 06/12/2013]

The announcement of the Renewable Heat Incentive (RHI) in 2011, which initially provided subsidies for the non-domestic use of woodfuel, led to many merchants entering the woodchip market. Many owners of large buildings like schools, hospitals and leisure centres installed biomass boilers which created a large demand for woodchip. Based on merchants' comments, the RHI appears to have had a considerable impact on the demand for woodchip with many merchants choosing to purchase wood chippers with the ability to produce chips of a specific specification for use in biomass boilers.

"What has the demand for woodfuel been like recently?"

"Yeah, that was down to the Renewable Heat Incentive. The RHI has driven the market massively".

[Woodfuel merchant 12, 27/06/2014]

One woodchip supplier spoke of the increase in sales following the RHI's introduction. Prior to this, they said many people were burning chipped wood from pallets but the market has now become more formalised with the RHI. More expensive, complex boilers are being used and people want to use woodchips which will not cause breakages in the boiler.

"The commercial RHI is what has created the demand for our heating woodchip. We started the woodchip at the same time as the logs and the logs were to tide us over while the heating woodchip got going and it sort of pottered along at a very low level until last year [2013] *when we got our fist wholesale contract and it went up. This year, we've picked up*

two new customers who have both put in boilers on the RHI and they don't want to put in pallet waste".

[Farmer, forester and woodfuel merchant, 21/02/2014]

Whilst the market for illegal pallet waste is still present, the woodchip supplier said the large demand for high quality woodchip for RHI boilers is more than sufficient to keep them in business.

"A lot of people out there are burning pallet waste illegally and we don't do pallet waste, we do good quality chip that we grow so we know the provenance and where it's from. So the pallet waste guys, the market has always been there sort of pottering away in the background but recently we've noticed that there is an increase due to the RHI so we are commanding a better price for the wood."

[Farmer, forester and woodfuel merchant, 21/02/2014]

Whilst the recent growth in demand for firewood appears to have occurred approximately five years before woodchip, the demand for woodchip outstrips its supply.

"We can sell every chip that we produce without hesitation."

[Farmer, forester and woodfuel merchant, 21/02/2014]

One forestry consultant spoke about the increasing number of wooded estates which have started harvesting timber for woodchip. The woodfuel market has encouraged estate owners to carry out thinnings in their woods because they can now make a profit on an activity which until recently was a cost. Furthermore, the increased use of mechanised equipment and harvesting machines by some merchants means woods can be thinned faster and owners are achieving higher payments for their timber from competing merchants.

"When you think of a harvesting team with a machine, plus a machine extracting, they need to do at least 60 to 90 tonnes a day with a harvester [to cover their costs]*. They can give you a good mark up on the woodchip because only a few years' ago, nobody wanted it but now everybody is hungry for it so the woodchip is quite a substantial percentage of their timber now."*

[Forestry Consultant 2, 12/5/2014]

As such, the demand for firewood and woodchip has grown over the past five to ten years with the growing use of wood burners and the RHI's introduction. As aforementioned, the perception of wood burners as a fashionable object for some people has contributed to their rising popularity. However, many merchants recognised the cost of gas and electricity as

the primary reason for the thousands of wood burners and biomass boilers being installed. Equally, the high cost of using heating oil for rural dwellers who are not connected to the gas grid was listed by many as the primary reason for switching to wood burning in the countryside with DECC also recognising that rural residents using heating oil represent areas where the RHI could be the most attractive option given the high cost of off-grid energy consumption.

Figure 5.1 shows the average annual UK domestic gas and electricity costs from 1996-2014 in real terms and highlights the rising cost of both forms of energy from 2005. Interestingly, despite energy bills in the late nineties being roughly the same as prices in the mid-2000s, the surge of wood burner installations only started proper in the mid-2000s at the height of the Global Financial Crisis. As the scale of the effects of the Financial Crisis were being recognised in 2008, average annual domestic energy prices had reached approximately £1000 and this period coincides with the start of the trend towards having domestic wood burners installed. It appears that the rising cost of energy in the mid to late 2000s coupled with the increasing recognition of wood burners as a lifestyle choice and fashion statement led to their growing use.

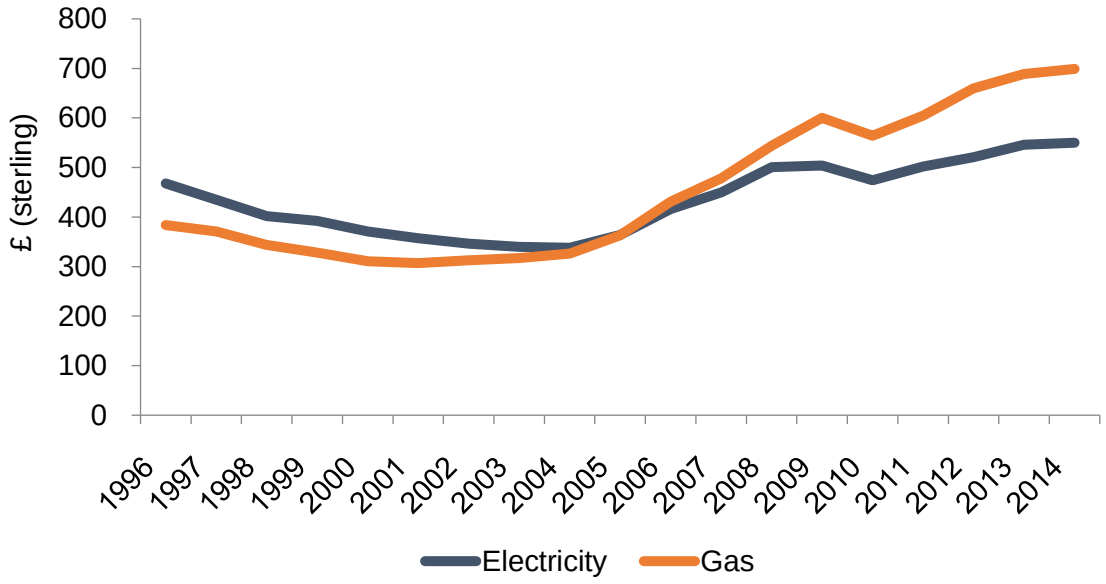


Figure 5.1 Average annual UK domestic gas and electricity bills 1996-2014 in real terms. Electricity bill is based on a consumption of 3,800 kWh year^{-1}. Gas bill is based on a consumption of 15,000 kWh year^{-1}. Source: DECC (2015).

5.3 A Surge in Demand…but is there enough?

In terms of the availability of timber across the UK and in the study area in particular, the majority of merchants and a number of forest managers and farmers expressed concern about a lack of supply to meet the growing demand for woodfuel. The two principal reasons given for this were insufficient volumes of timber being extracted and a lack of forest cover from which to extract. For many merchants, there is great concern that there are not enough woodlands from which to extract timber. Those who expressed this concern based it either on the relative lack of tree cover in Britain compared to Europe or on other specific difficulties they have had with sourcing timber. Hardwood species in particular were regarded by many merchants running smaller businesses as becoming more difficult to source.

"What's your biggest challenge to growing in the future?"

"The supply of timber. Customers are coming to us fairly well but it's making sure that we keep pace."

[Woodfuel merchant 4, 13/12/2013]

"No, nothing like enough trees. I think in another 15 years, in this country we're going to say "that's it, we haven't got any wood". It's something that if this country is serious about burning wood, there has got to be a real incentive scheme to plant woodlands now."

[Farmer 3, 21/5/14]

A forest manager and the accountant of a large estate with a well-established internal woodchip supply chain for two biomass boilers spoke critically of the lack of woodlands both in the UK and abroad to supply the global woodfuel biomass market. Interestingly, this is despite them working on an estate where they estimate there is enough woodland to sustainably supply its two boilers indefinitely. Their comments therefore reflect their view regarding the supply and demand of timber in the sector as a whole.

Accountant: "*The estate office boiler was only consuming about 300 tonnes a year so it's very small in terms of the overall growth that we have across the estate so it was really a case of we knew we had enough timber for that one so it wasn't really much of a problem."*

Forest Manager: "*I calculated what timber volume we produce annually. It's about 80,000 tonnes theoretically. It's an educated guess. Even with a low yield class, that's about what we're getting. The problem with all this biomass in this country and abroad is there isn't enough woodland to sustain it."*

Accountant: *"If they develop every biomass scheme that's got permission at the moment, there will be a shortfall in five years."*

[Forest Manager and his colleague, 10/6/14]

Merchants running firewood businesses often recounted examples of when they have struggled to find timber. In many cases, the need to maintain sufficient seasoned stock led to merchants widening the geographical area to source timber. This is despite the considerable added travelling costs of moving timber and the general consensus that people ought to buy and sell locally. One Shropshire-based firewood merchant who started his business in 2009 described the rapid growth of his business and the difficulty of securing sufficient quantities of wood to meet his customers' demands.

"And how far do you go to get your wood?"

"We're currently bringing it in from Eastbourne [harvesting from a timber stand] *which is the furthest we've ever had to go…it's costing us far more than we would like to pay but it's a case of…we were desperate, we had to."*

[Woodfuel merchant 4, 13/12/2013]

Furthermore, a number of merchants rely on importing timber from Europe. The European countries commonly listed as being used for imports being the Czech Republic, Latvia, Lithuania and Poland. Some merchants supply all of their timber from these countries whilst others only import to supplement their stock if they have an insufficient volume of seasoned logs.

"A lot of these companies, they dry a bit of wood themselves and that's 10% of their business. The other 90%, they do the same as us, they import it, and on their website, it all says this is all British woodland, all this rubbish and then in small print it says "when we run out we import it" and they normally run out in about 10 minutes."

"Where are you sourcing your kiln dried logs from?"

"Lithuania."

"What's the reason for that?"

"It's because it's one of their biggest industries."

"And I take it that it's cheaper to import them at the moment then?"

"Well Lithuania is covered in forest, you can get them from Latvia, Poland, Czech Republic, any of those places and Italy."

[Woodfuel merchant 5, 12/02/2014]

“In 2010, again, we had to supplement what we had by buying in some logs from Latvia as well.”

[Woodfuel merchant 4, 13/12/2013]

Furthermore, three of the merchants interviewed who own woods and harvest their own firewood have been required to purchase timber from elsewhere due to the increasing demand.

“If I told you here, we are doing on average 800-1000 tonnes of firewood a year, and we think of ourselves as quite a small set-up. So not only the woodlands that we’re managing here to extract the timber from but we’re actually bringing it in by the lorry load now because we cannot keep up with demand basically.”

[Woodfuel merchant 10, 14/04/2014]

Hardwood firewood in particular was commonly listed by merchants with smaller businesses as becoming more difficult to source. Numerous merchants had either experienced difficulties sourcing timber or believed it would become more difficult. The implication of a lack of hardwood has led many merchants to believe there will be a greater reliance on softwood in future. This is relevant to the firewood market given merchants believe their customers prefer hardwood species because it burns slower and produces a different kind of warmth to softwood; encapsulated by the quote that it produces a “more homely” kind of warmth. However, whilst merchants believe their customers prefer hardwoods, many of them personally value softwood as firewood, but recognise that it requires more skill to burn if it is to produce the same heat output as hardwood. The difficulty they believe they face is therefore convincing their customers to burn softwood.

“There are folks who will say “I want to sell more softwood to folks but I can’t convince them of that”. It is true, you have to put twice as much on the fire to get the same heat out of it so it feels very wasteful. It isn’t so long your price per tonne is the same.”

[Farmer 2, 13/5/14]

“Woodfuel producers tend to shy away from pine, it’s not well thought of and it’s not well sought after but actually pine has got a huge calorific value.”

[Woodfuel merchant 11, 16/3/2014]

"Do you think the demand for woodfuel is greater than the supply?"

"I don't think it is at the moment but I don't think it will be very far off. Say in five years' time because then we'll probably have to use softwood. Certainly some people, they are selling mixed soft and hardwood to eek it out sort of thing. But I think we'll end up having to go onto softwood. But we're not there round here yet anyway."

[Woodfuel merchant 8, 27/02/2014]

"There is an increasing demand for hardwood timber and that will have a knock-on effect to what we look at in the countryside basically."

[Farmer, forester and woodfuel merchant, 21/02/2014]

"I did see a thread on ArbTalk recently about supply and demand and people struggling to get hold of hardwood from the suppliers, forestry suppliers. For me, hardwood comes in when it comes in."

[Woodfuel merchant 6, 17/02/2014]

Fifty websites of firewood merchants were analysed to see what type of wood they supply. These were identified through an internet search of firewood suppliers across the study area. 31 merchants only sold hardwood with 14 selling a mixture. 5 websites did not specify what type of wood was sold.

Whilst merchants prefer hardwood, there is an acceptance that it will likely become increasingly difficult to source and they will purchase and process softwood if it is the only type of wood available. Some merchants sell mixed loads of soft and hardwood, believing this will appease their customers who want hardwood. Ash remains highly valued and sought after by many merchants but there is a recognition that they cannot be overly-selective when purchasing timber if they are to maintain a sufficient volume of seasoning stock to guarantee meeting their customers' demands.

"Are there any species that you supply the most of?"
No, I can't comment on that because you get what you're given really. There is no way of sorting that out at all."

[Farmer turned firewood merchant, 12/11/13]

"I just keep taking whatever I can get hold of because, you know, the guy who delivers timber to me, I'm quite happy if he delivers me probably species of timber that I don't necessarily want as long as I get some ash and sycamore to go with it. The guy who's struggling is probably the guy who only wants ash. So you will soon find that if you only

wanted to buy ash, you'd probably end up paying £70 a tonne for it. I tend to use it so that people get a good mix."

[Woodfuel merchant 8, 27/02/2014]

Sourcing timber for woodchip does not appear to have presented merchants with the same difficulty as firewood has. It is likely this is because most woodchip suppliers use softwood which, as aforementioned, has been found to be more readily available. Furthermore, some merchants do not like putting hardwood through their chipping machines because it blunts the blades faster than softwood does. The apparent over-supply of softwood may be the result of the period of British forest history when many ancient woodlands were cleared and planted with conifers which has left the country with a large standing volume of softwood timber. One interviewee commented on the FC's practice of using coniferous species as a nurse crop to promote the growth of broadleaf species which has also contributed to its surplus. The plan was to remove the coniferous species over successive thinning operations. However, due to the downturn in forestry during the latter half of the 20th Century, many remained in the ground given it was generally not economic to manage woodland. This is a good example of how the history of state forestry policy has had an impact on modern day operations and markets. Not only is the supply of softwood for woodchip coming from PAWS restorations, but a significant amount of woodchip is also produced from arboricultural work and small diameter pieces of wood which are more easily sourced than hardwood timber.

"The Forestry Commission in the 50s and 60s, you'd plant broadleaf-conifer, broadleaf-conifer and the idea was that over the thinning cycles you take all the conifers out but that didn't happen so that's why you've got a lot of conifers in broadleafs. And also, it was uneconomic to thin it because there was no market but of course now everybody wants woodchip so "wow, get that softwood nurse crop out! Get that PAWS out!" you know, and that's why you're doing it now so is the woodchip market dictating what we do? Yes, it is to an element because the material is worth money in those right areas."

[Forestry consultant 2, 12/5/2014]

"I don't think there's such a concern for chip. I think there is plenty of chip out there and it's roundwood and arb-waste and brash and things but there is still a supply of chip out there. It's mainly the logs, the hardwood logs because the market has been told to that the only log you can burn safely is hardwood, and it's not. If you go to Scotland or Wales, you go to Scandinavia, they all burn softwood, it's only really lowland Britain that has been conditioned to burn hardwood."

[Farmer, forester and woodfuel merchant, 21/02/2014]

However, some woodchip merchants felt it is becoming increasingly difficult to find the raw material because more people are retaining the wood produced during tree surgery and site clearance work.

"I'll tell you what we're finding a lot of, we're doing trees in peoples' gardens and we might need to work with the local tree officer with trees with TPOs…but people are actually switching on now and keeping the wood because they want the woodchip. So whereas five to ten years ago, you couldn't get rid of it for love nor money, now you can't get hold of it, it's becoming quite a hard thing to get hold of."

[Woodfuel merchant 10, 13/12/2014]

The demand for woodfuel has therefore grown significantly in recent years, with merchants finding it more difficult to source timber or expecting it to become more difficult as the hardwood resource is diminished. However, the owner of a Lincolnshire-based forest consultancy business, which also supplies firewood and woodchip, believes the demand for firewood is coming predominantly from the merchants themselves rather than the end-users. The end-users, he believes, are unlikely to struggle to find a firewood supplier:

"Do you think demand for woodfuel is greater than its supply?"

"No, I think if people want it they can get it. I think the demand that the firewood merchants are placing on the woodland owners is probably greater than the supply. Now whether or not then end-users can't get hold of any wood I don't know, I don't think so, I think there's always access in some form or another. But I know that people are shouting to get the wood and a lot of people, smaller people who either are home-owners who use a lot of timber and they want 25 tonnes in their garden because they've got the room and they leave it for two or three years or whatever and they've got three log burners. Or they want to set up in logging and they want access to an articulated lorry load of timber, they're struggling to get it and we have noticed that. So we're quite pleased that we've got access to the markets via our suppliers. But it is a worry."

[Farmer, forester and woodfuel merchant, 21/02/2014]

The difficulty of sourcing firewood in particular, and in some cases woodchip, is presumably a function of the many new entrants to the market in recent years. Whilst owners of wood burners and biomass boilers can readily find a supplier because of their sheer number, the suppliers themselves have more difficulty in sourcing the raw timber. Of course, if this situation continues, end-users will begin struggling to find suppliers with stock. To prevent this, either more woodland owners need to start supplying the woodfuel market or more

woodlands need to be planted. One potential risk is that the UK may become increasingly reliant on imported firewood. Currently, however, end-users have a great range of suppliers from which to choose.

This aspect of the firewood market was reflected in merchants' comments about the ways in which many end-users are driven predominantly by cost and willing to change supplier, implying they have a range of suppliers to choose from. If customers believe a merchant is over-charging or a merchant does not have enough stock to fulfil their order, they are likely to find another. Merchants believe this is especially the case for customers who have started burning wood for the first time and are unaware of the need for seasoned firewood, basing their buying decision on cost alone and not taking into account the need for sufficiently dry wood. However, there is also a belief amongst firewood merchants that customers will eventually come to buy from those who sell a well-seasoned product, but generally after they have had a poor experience with a merchant selling 'green wood'.

"Yeah, there is a lot of competition in Nottingham. You know, it's a tough market because people are trying to get the best deal they can because they're realising that by burning wood they can be saving money so I tend to find that people will flip around different suppliers, look for good deals and they'll see a deal, go with that and realise the wood is not as good or something like that. It's very competitive. There's a lot of people selling a lot of rubbish as well."

[Woodfuel merchant 6, 17/02/2014]

The need to have sufficient storage space to store timber being seasoned was referred to repeatedly. This could be in barns, either owned or rented, or in sheds at the merchant's home. Storage can therefore be costly to the merchant but it is crucial for them to maintain sufficient stocks of timber which they can supply customers throughout the year with. Timber may need seasoning for up to two years which means merchants need considerable space to store enough stock covering two years' worth of business. An economy of scale is therefore useful whereby merchants have the capital to buy sufficient volumes of timber and enough space to store it. It is for this reason that merchants operating at smaller scales appeared to be finding it most difficult to supply customers.

"To the price point but I've got no problem with that [merchants selling firewood at lower costs] *because it's just business. You can get it from the guys selling it at forty quid down the road, no problem, crack on. But at the height of winter, January or February, have they got the wood? Generally no. So that's where we come in* [laughs]*. People soon learn that they are going to get a slightly better product than the bloke down the road. But then when you add it all together, you've got the other companies who are charging £120 quid for the*

same bag that we're sending out and people are getting a bit savvy about that as well. It's a lot of money. I think competition is good. It keeps you more efficient….So if you get it right, they'll keep coming back, if you get it wrong, you won't see them again."

[Farmer turned firewood merchant, 21/02/2014]

"Of course, the process of harvesting woodfuel isn't just harvesting the stuff and bringing it into the boiler or stove, you've got to have some sort of drying out regimes where you let it dry out for a couple of years. You need to have a stock."

[MD of a company selling woodland, 08/01/14]

To maintain a rolling stock of timber, some of which is seasoning and some of which is ready to be delivered, many merchants purchase timber 12-18 months in advance of being sold. Contracts therefore need to be secured with reliable timber suppliers or woodland owners from whom they can harvest timber from. As has been reflected in the interviewees' comments presented hitherto, some have resorted to supplementing their timber stock through imports or through purchasing from other merchants to guarantee supply. A number commented that they had resorted to selling under-seasoned firewood because they ran out of seasoned stock or they had heard from others of doing the same.

"What tends to happen is people run out of stock and then end up selling unseasoned wood, I think that's what ends up happening."

[Woodfuel merchant 6, 17/02/2014]

"The winter before we were struggling for stock so we did put some single year seasoned beech out and it got a lot of negative feedback on that. People said this just isn't burning as well. If it's wonderful, they tell nobody, if it's crap they tell everybody. It was a case with customers, that's the only wood we've got, do you turn them down or do you supply them with that?"

[Farmer 3, 21/05/14]

"Regarding the demand for it, there are a lot of other people at it.
Some people are selling a bit of green stuff. We're quite happy the way it is, we don't want it too big. Because we don't want to run out of wood."

[Woodfuel merchant 13, 18/08/2014]

The number of merchants who commented about running out of stock or hearing it happen to others is indicative of the seasonal nature of the woodfuel market as well as the growing difficulty in sourcing the raw timber from either a timber supplier or woodland owner. The

ability to deliver seasoned woodfuel throughout the year, especially during winter, was something which some merchants used to claim won them customers or that their business was superior to the many others in the sector. Nonetheless, reaching and maintaining the ability to supply at all times of the year has been difficult for many merchants, again reflecting the competition for timber especially during periods of peak demand.

"Part of the ability to win business is the ability to guarantee supply. And that's to do with holding enough stock. So we always make sure…we have a lot of customers under contract and we always make sure we've got enough stock to be confident of supplying them right throughout the year."

[Woodfuel merchant 12, 27/06/14]

The challenge which faces merchants because of the seasonality of the market was raised by a variety of the interviewees. Firewood and woodchip demand predictably rise during the winter months. However, the length and harshness of the winter is unpredictable which means merchants can be left with too much stock if the weather is mild or run out of stock with prolonged cold temperatures. Both scenarios are worrying for merchants because each means they may potentially lose customers. Struggling to sell their stock can also lead to a poor cashflow situation which is particularly detrimental for firewood merchants who run smaller businesses. Whilst a particularly cold winter means some merchants might run out of stock, it typically leads to a greater demand for firewood during the summer because customers have depleted their own stocks. To reduce the risk of selling out of firewood, merchants stockpile firewood months in advance of peak winter demand and encourage customers to buy before the winter. However, many of the new urban users of firewood are less likely to have the storage space for large volumes of wood.

The first quote below is from the Operations and Planning Manager for the FC's Central England District. Not only is the impact of the seasonal market discussed but it also encapsulates the growth of the timber market generally; that despite a lower demand for firewood during one mild winter, the price of the FC's standing timber did not fall.

"We did have the fluctuations the year before last that was, about two or three years' ago when it was a really mild winter. The firewood market was on the up, everybody bought in advance and then all of a sudden, it was a mild winter and the firewood yards, you just drove round and everybody was stacked to the gunnels with firewood. It didn't drop in price [the FC's standing timber price] *but what we did notice is it just plateaued and nothing moved and everybody hung on so on the following year, we didn't offer any for sale because we still got stuff that was waiting to be worked. It just took a longer period of time for that to move*

through the markets. But then everybody ordered the firewood the following year, all the stocks went down and it got back to normal again. It is very variable."

[Forestry Commission Operations and Planning Manager, 26/6/14]

The same mild winter was referred to by the Managing Director of a forest consultancy based in Northamptonshire. Their comments also highlight the detrimental impact that a mild winter can have on firewood demand.

"Firewood is an interesting one, it's very dependent on the weather. We found that 2011 for example, we barely had a frost this side of Christmas. We found that there was a lot of supply just waiting to go and the demand wasn't there and so if people were burning three loads of firewood a year, they were only burning two. That's a third of the market potentially just gone on something we cannot predict. This year's [2014] *been the opposite. We had people keeping their log fires going well into May and they were starting to draw on supplies that were already ear-marked for September/October time and as a result the summer market has been very buoyant as people have been trying to bring their stock levels back up for this winter so we're in a pretty buoyant market at the moment with regards to firewood, not only is the supply but the demand is increasing and the weather has been on our side particularly towards the end of last year."*

[Forestry consultant 1, 13/12/2014]

More evidence also emerged of the reliance on woodfuel imports that some merchants have when discussing the seasonality of the woodfuel market.

"There are, I would say during the summer, there is an excess of capacity, obviously it's seasonal demand. In the winter time, there is scope for imports and there are people who import into the country certainly."

[Woodfuel merchant 12, 27/06/2014]

When discussing the issue of supply and demand, the Drax Power Station was referred to by numerous interviewees. This is despite it being powered mostly by wood pellets as opposed to firewood or woodchips. A range of opinions were expressed about the sustainability of importing great volumes of pellets from predominantly North America to produce electricity in the UK. In relation to the power station's sustainability, people typically based their beliefs on the large scale of its operations, with thousands of tonnes of pellets being transported across the Atlantic Ocean in ships. Many questioned the sustainability of the supply coming from North American forests as well as the carbon savings which the

Drax Group claims are made when transporting and burning wood instead of coal. People felt that it is for predominantly financial reasons why Drax is importing biomass, either to avoid paying the penalties for burning fossil fuels or because of the savings associated with economies of scale, rather than sourcing its biomass from the UK.

"All these projects [large-scale biomass use] *are about companies like Drax not paying penalties. So if the penalties are greater than the cost of using wood, they're going to keep using wood. I don't think wood should be used at that scale. You're not going to grow it fast enough. It can't be reducing carbon emissions, I mean just the transportation…it's nonsense."*

[Woodfuel merchant 8, 27/02/2014]

In 2014, the Drax Group imported 80% of its biomass from North America (58% from the USA and 22% from Canada) with 3% coming from the UK (Drax Group, 2015). Table 5.1 shows the range of biomass sources Drax uses. Of the UK-grown 3% used by Drax, the majority is in the form of straw and miscanthus with only a fraction (4%) coming from woodlands.

	Saw dust	Sawmill residues	Forest residues	Diseased wood and storm damage	Thinnings	Clear felled virgin timber	Long rotation forestry	Short rotation forestry	Short rotation coppice	Agricultural residues	Straw & miscanthus	Total
USA	168,829	222,047	942,039	164,410	805,815	-	12,374	-	-	64,834	-	2,380,347
UK	711	457	3,912	-	-	-	-	-	6,154	4,589	97,520	113,343

Table 5.1 The amount of different biomass fibre type sourced from the UK and the USA used by Drax Power Station in 2014. Figures are in metric tonnes. Source: Drax Group, 2015.

"Why is an outfit like Drax Power Station sourcing its wood pellets from the USA? What's gone wrong?"

[Nottinghamshire County Council employee, 13/03/2014]

The question as to why Drax does not source more of its biomass from British woodlands was reflected in many interviewees' comments. Some believe Drax threatens not only the North American forests from where its biomass is derived but also UK woodfuel merchants' businesses. It seems some merchants are transferring the difficulty of finding timber sources into the debate surrounding the large-scale burning of biomass for power generation. Indeed, one firewood merchant linked the increasing difficulty of sourcing hardwood with Drax's demand for biomass.

"It's when you've got people like Drax who come along and need six million tonnes of biomass a year or something like that. Well that's got to come from Canada or wherever from which I just don't see how that can be massively green. We're only little old firewood producers and all I know is that it's getting harder and harder to find hardwood."

[Woodfuel merchant 8, 27/02/2014]

Others, however, commented on the relative lack of forest cover in the UK and the difficulty of managing contracts with the thousands of woodland owners required if Drax were to source more biomass from the UK. Most appreciated the economy of scale which Drax achieves by importing pellets from the USA but were dubious about the validity of the forest management and carbon emissions criteria used by the Drax Group.

"Yeah yeah, that's craziness to me [importing woodfuel]*. Our woodlands are mostly small and are always on the horrible bit of clay land and really awkward places to work, you know, lowland England. And they're in thousands of different peoples' ownership so I can see the economy is much more straight forward when they're importing it from somewhere like Canada or God knows where else, but it doesn't make much real environmental sense. It just seems like the easy way to go. These small woodlands that we've got here, they really ought to be the ones that we're supplying from. Otherwise it's not sustainable."*

[Forest manager 3, 24/10/13]

An Information Officer who works for both the FC and the Biomass Energy Centre made the point that the electricity and heating woodfuel markets are distinct due to their different scales of operation. Because biomass power stations like Drax import the majority of its biomass, the interviewee believed the use of woodfuel for electricity production would not have an impact on firewood and woodchip merchants.

"Electricity is a very different market and instead of buying a few tens or hundreds of tonnes, you're talking about hundreds of thousands of tonnes per annum. It's such a different market that the economics are completely different."

[Forestry Commission Information Officer, 24/01/2014]

Whether or not the woodfuel electricity and heat markets are distinct, the interviews highlight genuine concern amongst firewood merchants in particular that the large-scale use of biomass could harm their businesses. Not only do they question the environmental sustainability of the imports but they also believe timber is being diverted to the electricity producers, reducing its supply to the firewood and woodchip markets. This belief appears to be borne out of the difficulty many of them have had in sourcing hardwood. One forest

manager spoke of one project involving the removal of a Corsican Pine plantation in Nottinghamshire owned by the FC which was being chipped and sold to Drax. The intention of the project is to restore native broadleaf trees to the site and demonstrates that in some cases, material is being used by Drax that could otherwise be purchased by smaller woodfuel businesses. Though no other examples were found of timber from woodlands being sold to Drax, it highlights that the option is available to managers.

"The arisings are being chipped and going to Drax mainly, they're taking almost all of it. It's making back some of its money in the fact that it is profitable at the moment for Drax to take it and hit their targets. There seems to be a huge call from Drax for woodfuel, well for any kind of biomass fuel and that seems to be a big catalyst for being able to do things. It's a huge amount that they import to hit their targets but they're still crying out, so long as it's within whatever they're willing to pay for it and haulage costs and things like that."

[Forest manager 4, 09/12/2013]

The majority of merchants source the majority, if not all, of their timber from a small number of sources with some using a single timber supplier. When sourced directly from a woodland owner, most merchants typically relied on two or three owners. Building good working relationships is therefore of much importance. The sources included private wooded estates and small woods and woodland owned by charities like the Wildlife and National Trust as well woodland owned by the FC.

"We've managed to find secure local suppliers from three local estates so we will carry on as normal but a lot of other people…the supply doesn't seem to be there for them so anyone can order 25 tonnes today but it's whether you can do it consistently every week and whether you can get it in".

[Farmer turned firewood merchant, 12/11/2013]

"I get nearly all my logs from a timber merchant. You know, you can pick up the phone and get other people involved but he looks after me alright at the moment".

[Woodfuel merchant 8, 27/02/2014]

Given the growing difficulty woodfuel merchants spoke about when sourcing timber, particularly hardwood, it is perhaps surprising that they do not actively seek new sources. Granted, it is possible they simply did not mention this during the interviews. Alternatively, it could be indicative of merchants exaggerating the difficulty of sourcing timber and therefore

happy to continue using the same timber supplier. However, given the majority of merchants mentioned it was becoming more difficult to find hardwood timber, it is certainly appears that this is a legitimate issue for the sector.

"The supply of the firewood markets is very much under-supplying the demand that we've got. We need to be able to get more wood to the market because the market is crying out for it at the moment. That is coming from more people putting in more wood burners. That's at least 175,000 boilers going into the market".

[Forestry consultant 1, 13/12/2013]

There are a variety of reasons for the small number of timber sources which merchants use: the difficulty of actually finding timber sources and winning new contracts by networking; loyalty to long-standing suppliers; the difficulty of finding reliable and trust-worthy suppliers; and the work associated with agreeing a new contract with an unknown owner on an unknown piece land. The ability to network and develop business relationships with others is therefore important to merchants and was raised multiple times by interviewees. When timber is purchased, for example, there is an element of trust involved in that the buyer trusts the supplier to give them the volume they agreed and the supplier trusts the buyer to pay promptly. Unfortunately, there remain many people willing to abuse the trust of others.

"*We've not been paid yet for the work so that's a little bit…That's just what happens with one of these jobs".*

[Woodfuel merchant 1, 06/12/13]

One interviewee described the working relationships between merchants and timber suppliers as a "fragile balance" as timber suppliers do not wish to upset long-time buyers by selling to someone else and running out of stock. Equally, they want to be able to satisfy a number of timber buyers to widen their customer base. As the following quote shows, this can make it difficult for new merchants to establish a working relationship with a timber supplier, highlighting the importance of networking.

"You don't want to upset someone if you deliver to someone else so there is an infrastructure in place but it is fairly tenuous and it's making it harder for the new guys to get going but it sort of works in a fashion!"

[Farmer, Forester and Woodfuel merchant, 21/02/2014]

Woodland owners must trust merchants to harvest their woods appropriately and it takes time for this trust to develop which often requires the merchant to carry out at least one harvesting operation. Some contracts are just verbal and the owner therefore must trust the merchant to complete work to an agreed standards, like removing the debris following a harvest. As the previous chapter explored, woods are "emotive" for many owners and they do not want to harm their structure to support wildlife. This need for trust could partly explain why merchants focus their efforts on working with a fewer number of suppliers than actively searching for others. This is despite finding it increasingly difficult to source hardwood timber. The following quote reflects one forest contractor's desire to complete work to the standard expected by the owner. Often, this requires the contractor and owner to walk through the wood to discuss what the management objectives are. This contractor can produce a mental image of how he thinks a wood might look after management, but he is required to understand whether this is what the owner wants.

"We need to find out what the owner wants, and work with them to get the best outcome. As a contractor, you can see what you like before you've done the work, but you've got to make sure that what you see is what they want to see because otherwise you're not going to work there again…it's all word of mouth, it's a small industry".

[Forester 1, 13/12/2013]

Many people commented on the labour-intensive nature of processing and delivering firewood and woodchip and were acutely aware that growing their business would be difficult unless they employ others. This could also explain why merchants are reluctant to find more timber sources; by definition, more incoming timber means more processing is required.

"How busy do I want to be? I always want to be busy but I don't want to be that busy. Do I go on seven days' a week? I do that already. I can't do anymore so I would have to stop something else to do that".

[Farmer 2, 13/05/14]

"An old friend of mine is in it in a lot bigger way than I am. I got too much to do. And I don't want to be working all the time. I don't need to work all the time".

[Woodfuel merchant 13, 10/11/2013]

5.4 A Surge in Demand…perhaps there is enough?

Despite the concern expressed by some firewood merchants of there being a lack of timber, other interviewees did not share this concern. In two separate interviews with FC employees, one being involved with the recently completed National Forestry Inventory (NFI) and the other working in the Forest Research Department, both were of the view that many woodlands remain under-managed with potential for a lot of timber to be extracted for woodfuel. Their views encapsulate the FC's ongoing efforts to encourage more landowners to manage their woodlands by emphasising the increasing financial returns to be made via the woodfuel markets and the widespread lack of woodland management occurring in the UK. To encourage the management of woodland for woodfuel production, the FC offered £10 million in grants between 2011-2014 which covered up to 60% of the costs for owners to harvest more woodfuel (FC, 2011).

Given the FC's drive to encourage woodland owners to carry out more management, the NFI itself is worthy of comment because the data produced has been used to provide confidence in the country's timber supply. One timber forecast officer from the FC hopes this will encourage potential investors in the woodfuel sector to continue doing so. The methodology used to conduct the NFI was revised in 2010 to produce more detailed information about the UK's woodlands. Prior to 2009, the survey was known as the National Inventory of Woodlands of Trees (NIWT) which was established in 1924 and updated every 10-15 years. The last survey was completed in 1999. Compared with the original NIWT, the NFI contains a more detailed description of the distribution, composition and state of woodlands across the UK. Whereas the NIWT only surveyed woods that were larger than two hectares, the NFI surveys woods larger than 0.5 hectares and will be updated every five years to maintain a database of changes to woodland area and composition. 15,000 sites were surveyed to collect data about the wood's composition, structure and size. The intention is to maintain a record of woodland change using a combination of satellite imagery and field visits. The level of detail of the NFI demonstrates the FC's desire to produce accurate data to provide confidence that the country has sufficient timber supplies.

On the FC's NFI website, users of the data include those looking to invest in the woodfuel markets. The quote below indicates that the NFI is designed to encourage and guide investment in a sector where there was previously much uncertainty.

"Users of inventory data include…government and non-government agencies formulating forestry policies, [and] public and private investors in the countryside…There is also uncertainty over medium-term domestic softwood availability and quality coupled with increasing demand for this material from the wood energy market. This is a marked change

from the historic position of continuously rising supply and, in the absence of better information, is likely to lead to insufficient or inappropriate investment in wood use. This in turn will undermine the capacity of the forestry sector to deliver national forestry strategies and associated public benefits." (Forestry Commission NFI website, 2015).

Equally, the FC employee who worked on the NFI repeatedly referred to the importance of the data to woodfuel businesses and to outside investors. The implication of this is that the NFI forms part of the FC's drive for greater woodfuel extraction; by providing countryside investors with more information about the timber resource available.

"Of course they know woodlands aren't mapped, course they know there's a lot of broadleaves, course we know we are not managing them like we used to do…the thing I saw ahead [of the NFI]*, was to come out in hard facts and figures on how much, where and what type. Because that's the sort of information that people need before they go off and invest in whatever facilities you might have to have in place to utilise this timber."*

[Forestry Commission, Production Forecast Officer, 18/08/2014]

He also emphasised the unprecedented detail of the NFI which he hoped would change the perception that the UK's timber stocks are diminished. The desire for continued investment in the woodfuel markets was given as one reason for the collection of such detailed data. With concern over the sustainability of its supply, one of the aims of the NFI was to find out how much woodfuel could be harvested produced and from what parts of the UK. Based on the most recent data, the FC's Production Forecast Officer believes the perception of there being a lack of timber for woodfuel is wholly incorrect.

"This is the largest mensuration exercise that's ever been undertaken in Britain, we've never done that before to this extent. One of the reasons we've done that is because there are big questions over how much biomass can Britain supply. Will that take away from the existing domestic timber process sector? Is it going to expand? Is it going to contract? So if you do get a little bit surprised that this is not what you used to know, things have changed, and there's an evidence base behind it."

[Forestry Commission, Production Forecast Officer, 18/08/2014]

The FC Production Forecast Officer appreciated he may have given the impression that he was in favour of a more industrialised approach of managing woodlands for woodfuel, perhaps using Short Rotation Forestry practices or coniferous monocultures and so he emphasised that he describes himself as an environmentalist. He believes the majority of the country's woods are under-managed which is not benefitting wildlife.

"I am actually quite a greedy hippy type who cares about wildlife and nature. And at the moment we've got a very universe forest structure because it was all levelled in the Second World War. It's grown up, it's thick, it's thicketed, it's dark, that canopy is closing in, we are seeing less light into the forest floor. I personally think from a biodiversity point of view we'd be better going in thinning those spans, increasing diversity, getting more light to the floor."

[Forestry Commission, Production Forecast Officer, 18/08/2014]

The view that the country's woods are predominantly undermanaged was shared by a number of other interviewees, including some forest contractors who sell woodfuel. Indeed, many people believe the country's woods are not managed to their productive potential, reflecting the FC's drive to get more owners managing their woods for woodfuel. He views the lack of management as a loss of income and rues the fact that woodlands could be producing more products whilst supporting more wildlife.

"*The woodlands aren't being managed to maximise their full potential. That is all opportunity as far as I can see, and loss if we don't pick it up. We are taking out less than they are growing and the amount of standing volume in forests is going up, up and up…Certainly, there's potential for massively expanded biomass consumption or consumption of timber per se and you still wouldn't be eating into your capital, your natural capital or whatever it is…you've got a massive under-utilisation of income."*

[Forestry Commission, Production Forecast Officer, 18/08/2014]

The FC Forecast Officer talked through the data about the country's timber stocks. In England, he said the age profile of both conifer and broadleaf trees is such that the majority are approaching an age when they would traditionally be harvested for timber. This finding which came from the more detailed NFI surprised even him. The graphs below highlight that the majority of coniferous and broadleaf woods in Great Britain are in the 21-40 years age bracket, and therefore reaching an age where they can be harvested, or at least thinned.

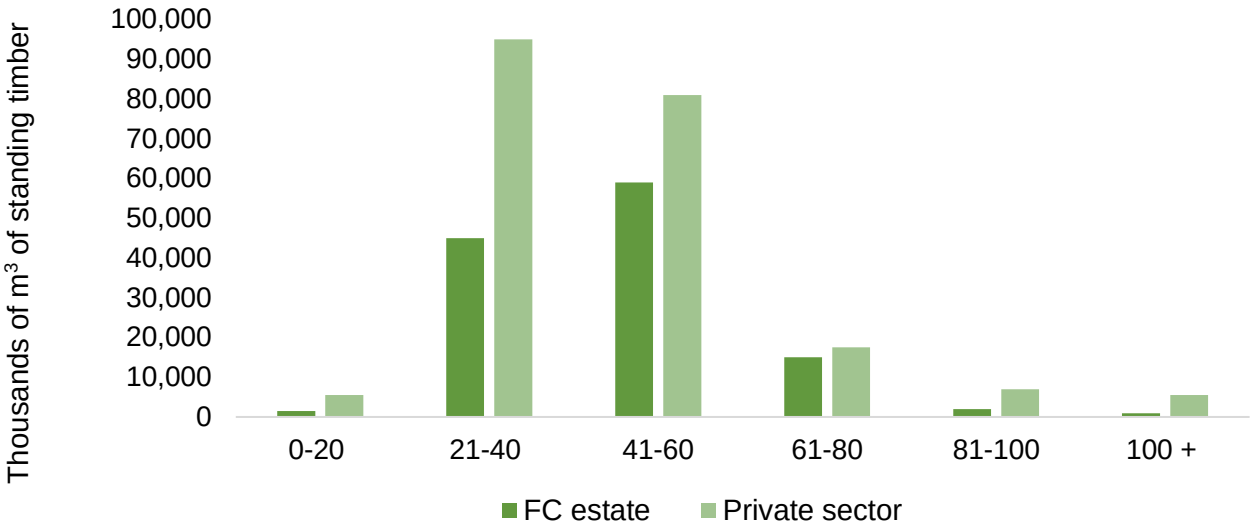


Figure 5.2 Standing volume, by age, of Great Britain's coniferous trees in public and private ownership in 2012. With the majority of conifers between 20-60 years old, many will be reaching an age for harvesting. Source: FC (2012).

Of broadleaf trees, the majority are between 60-80 years old and the forecast officer believes a large volume of this could be harvested, with a significant proportion reaching a harvestable age over the coming two decades (Figure 5.3).

"There's a lot of timber in broadleaves. Some big old trees but there's far more younger trees that are going to come online at some point."

[Forestry Commission, Production Forecast Officer, 18/08/2014]

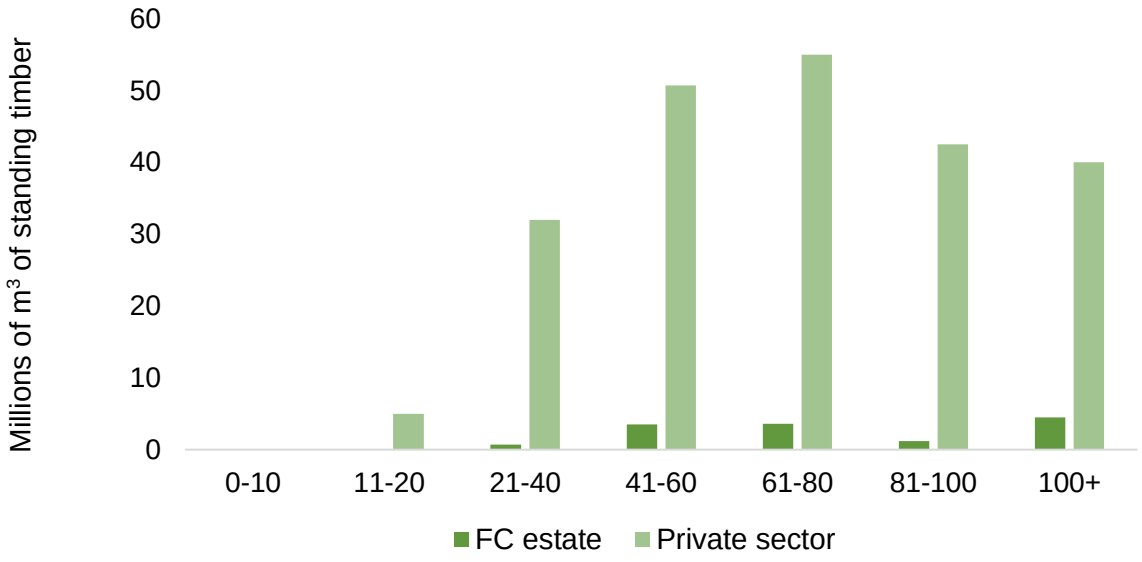


Figure 5.3 Standing volume, by age, of Great Britain's broadleaf trees in private and public estates in 2012. Source: FC (2012).

To further support his argument for a greater harvesting programme, he claimed that the NFI found there to be both a greater and denser coverage of trees in Britain than previously thought as well as there being an increase in the rate of growth of trees.

"W*e found that there was more woodland in Britain than we previously thought. So for a starter, we've got more woodfuel availability than what we previously thought. We've also found that the trees are growing faster and we've also found that we've got more trees per hectare than we previously found. And this all adds up to a significant increase in availability."*

[Forestry Commission, Production Forecast Officer, 18/08/2014]

In terms of the distribution of broadleaf woodland across the UK, south-west and south-east England have far more than other regions. Excluding southern England, The East Midlands and West Midlands are more wooded than the northern regions of England (see Figure 5.4).

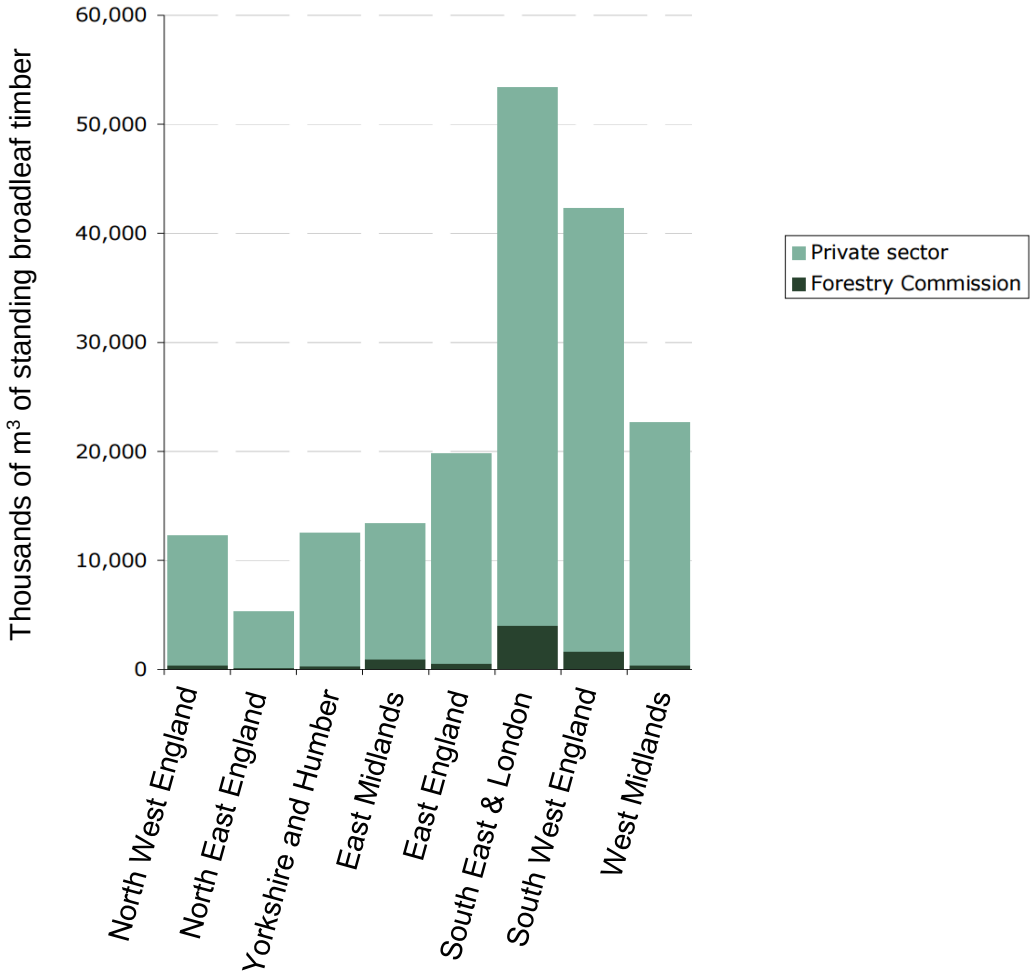


Figure 5.4 Standing volume of all broadleaved species by ownership across England. Source: FC (2016[c]).

During an interview with a different member of the FC, an information officer, the issue of waste wood was raised with the interviewee believing more wood is available from this source than from woods themselves.

"There's a huge amount of wood there that can be used, there are also huge quantities of waste wood. I mean far more than wood from forestry, there's greater quantities of wood from waste wood and recycled wood and that ranges from clean, untreated wood for old pallets and cable drums and packing cases and so on."

[Forestry Commission Information Officer, 24/01/2014]

However, as raised by one of the merchants, there is a market for illegal pallet wood – particularly as woodchip in biomass boilers – and he would prefer that customers purchase from merchants who sustainably harvest timber from British woods. After claiming the market for waste wood is under-utilised, he later confirmed that a lot more wood can be harvested from woods.

"In terms of heating, we can do a huge amount of heating with the wood that we've got locally, locally as in the UK."

[Forestry Commission Information Officer, 24/01/2014]

As such, the two FC employees were not concerned with a lack of supply of timber for the woodfuel markets. Indeed, they were of the view that if a more intensive harvesting programme could be established, the country's supply of timber will still be greater than it is today.

"Sometimes people don't quite get that we can actually work these woods and still have more at the end of it than what we've got now…What I can say is that you've got a lot of woodland, it's growing very quickly, it's going to continue to grow very quickly and you can take a lot of that out without damaging sustainability or what we've got there today."

[Forestry Commission, Production Forecast Officer, 18/08/2014]

Both the FC forecast and information officers appreciated the concern amongst merchants about there being a lack of timber to support the woodfuel markets. Interestingly, the production forecast officer was more concerned about the supply of softwood than hardwood which many merchants claim to be increasingly difficult to source. The forecast officer therefore questioned merchants' fear of there being a lack of supply of hardwood, believing this to be a perception that does not reflect reality.

"The reality is that in Great Britain and England, we have almost unnoticed forest resource particularly when it comes to broadleafs that we've hardly touched. It is significant, very very large. Half of what we've got in Britain is broadleaf. We tend to think about the conifer supply and the potential dips in future supply but there's this broadleaf resource that's just compact which might lend itself very much to the biomass market."

[Forestry Commission, Production Forecast Officer, 18/08/2014]

Others in the woodfuel supply chain also shared the view that the country's timber stocks are sufficient to meet the demand for woodfuel. Though they still maintained an element of concern about future shortages of supply.

"The annual increment nationally has been far above what was being harvested so there's an awful lot of catching up to do but where it meets it and starts to exceed it, I'm not sure."

[Farmer, forester and woodfuel merchant, 21/02/2014]

Like the FC forecast officer, some merchants and foresters appreciate that a lack of woodland management has led to a large store of biomass now ready for harvest. In some cases, owners have enjoyed the amenity aspect but have carried out minimal management. The fact this was raised by some merchants adds credence to the suggestion by the FC employees that the threat of timber shortages is propagated through a perception than through a genuine lack of supply. It also highlights where the greatest demand for woodfuel is present; not at its end-use but at the point of sale between merchants, the timber suppliers and woodland owners.

"I think there's a lot of woodlands that aren't managed and I think that it will probably open folks' eyes up to "well we might have a bit done". But we've got lots of woodlands where the wood is only used for shooting and they may have had a bad contractor in in the past that took them for a ride. They get their amenity value from it which is more important. But, you know, from a wood that's that small to some of the woods that you come across that are a couple of hundred acres, and they've never had nothing done, and you get the right manager in there and you're on it."

[Forester 1, 12/03/2014]

"We don't chop enough trees down in this country. We have acres of forest that need chopping down and cutting back and nobody does it, there's no incentive to do it over here whereas it's a big industry in Eastern Europe."

[Woodfuel merchant 5, 12/02/2014]

5.5 Entry into the Sector: woodfuel merchants' backgrounds

It is straightforward to believe the underlying reason for someone to enter the woodfuel market is to make money from the growing demand for firewood and woodchip. Nonetheless, the interviews reveal a range of reasons why people chose to enter the sector and the different decisions they made regarding the purchase of machinery and how large they wish to grow their businesses. Merchants enter the market from a variety of backgrounds too and this has an impact on their decision-making. Farmers, for example, are more likely to own or have access to space to store timber than tree surgeons. Many merchants are also environmentalists and believe they are helping wildlife by managing woods as well as reducing people's reliance on fossil fuels. The aim of the following section is to explore the reasons why people have entered the woodfuel market and how their businesses have developed, taking into account the challenges they have faced. After discussing some of the general experiences shared by merchants, some case studies of individual merchants and their businesses is presented.

Understandably, a number of the merchants interviewed have a background in tree surgery and/or woodland management; being involved with this sector gives them an understanding of the work required to produce woodfuel as well as the economics of buying and processing timber. Tree surgeons and foresters typically have the experience of using pieces of machinery and vehicles often used in the woodfuel supply chain including forwarders, harvesters, trailers and log splitters which provide them with the confidence for carrying out the physical work required to run a woodfuel business. Merchants also develop connections with others in the sector and share or purchase equipment from one another. Dependent on the conservation status of a woodland, some types of management require specialised machinery such as low impact harvesters and the range of log splitters and wood chippers means a network of merchants from which to rent or buy second-hand machinery is important. Having a background in tree surgery and forestry and the connections with others in the sector has helped many merchants' businesses.

Many tree surgeons started selling firewood as an aside to their main business in response to its growing demand. However, there was of course a firewood market before the recent sharp growth in sales and it was interesting to hear from someone who was involved with the market before its growth in the mid-2000s. This merchant described how the market has changed since then with merchants carrying out more 'in-house' processing of firewood; by cutting and splitting logs, merchants are maximising the added value to the final product which they can sell for a premium. In the 1990s, the merchant sold firewood in two metre lengths which is in contrast to the shorter cuts produced today. He also described how

firewood processors have become computerised, being able to automatically adjust the cutting length of a log.

"Quite a few years ago now, well I'd say about the late 90s. Most of the time I would sell it as roundwood then you know. Chop it up into two metre lengths and then forward it out to the edge of the wood. But at the time the price for firewood was pretty low really. £16 a cube so you didn't really make a lot of money doing it. It's got a lot better."

[Woodfuel merchant 9, 15/3/2014]

Many merchants view themselves as educators on the best practices of wood burning. The majority heat their own homes using wood and therefore felt well-placed to offer advice to customers on the practicalities of storing, seasoning and burning firewood. Many customers evidently struggle to use their wood burners initially, especially the use of air vents to control the rate at which wood burns and many merchants have helped customers with this.

"You've got people out there who are installing a log burner for the first time ever and you have people who don't know how to light a fire basically. So if they get green wood, they just don't know what to do with it. You have to try and educate them a bit."

[Woodfuel merchant 8, 27/02/2014]

Many merchants came from a farming background which is understandable given they often have access to the land required to store a sufficient volume of wood to run a business as well as access to the capital to purchase machinery and build storage units. Furthermore, many farmers own their own woods, and have farming neighbours with woods, providing them with a ready source of timber. Again, farmers are generally used to using the type of machinery for processing firewood and chipping logs and may therefore be more comfortable starting a woodfuel business as opposed to someone with no background in forestry or agriculture.

"Can I ask what your background is?"

"Farmer. We know how to deal with wood!"

[Farmer turned woodfuel merchant, 12/11/2013]

"It [the woodfuel market] *lends itself to farmers diversifying. That's probably where we will, as foresters, slip up in the end because the farmers have got the wherewithal to do that."*

[Woodfuel merchant 11, 16/03/2014]

"We looked at the market and thought we can do something different to what the old boys used to be doing with the pick-up loads and we looked at it and worked out that we could do it more efficiently, more effectively using our machinery on the farm and our resources here and doing it in a more professional way."

[Farmer, Forester and Woodfuel merchant, 21/02/2014]

Despite a lack of experience in the sector, some merchants entered the market with no experience of using the processing machinery or of tree and woodland management in general. This is perhaps indicative of the fact that it is relatively easy to establish a small firewood business, something which many interviews said; one person with a chainsaw and an axe can theoretically start a firewood business. However, there is a legal requirement for all employers, including the self-employed, to have a recognised qualification before using a chainsaw. If someone is not qualified to use a chainsaw, they can buy firewood from a UK supplier or import it, typically in a shipping container from Europe. There are few accreditations needed to establish a woodfuel business and people do not necessarily need to have direct experience of the sector or of one of the related agricultural and woodland management sectors. There has, therefore, been a rise in the number of merchants who have entered the sector hoping to capitalise on the growing market. Many people spoke about a surge in the number of one-man firewood businesses in their local area with men who are willing to work long hours for a small profit.

"These people that are selling builder's bags at £40 are not living, they are not doing it sustainably. These lads, they're probably happy to work all Saturday and Sunday afternoon and have £50 in their pocket and that's a bit of beer money, they're not in it for the long-term, they're not trying to make a business out of it. And, of course, the trouble with wood is it grows on trees. So it's by right everybody's for free. There's wood lying all over the countryside, fallen branches everywhere."

[Farmer 3, 21/05/2014]

"There has been a huge growth in little one man tree operations now, certainly around here [Bridgnorth, Shropshire]. *Whereas 10 years' ago, 15 years' ago, there was probably only one or two, there's now 20 or 30. And they're all doing bits of tree surgery, coming in doing bits of woodwork and selling the firewood."*

[Farmer 2, 13/05/2014]

Before entering the market, a number of merchants recognised the potential for a more professional service whereby deliveries of woodfuel are made on time and to a higher standard of product. There was a view that many merchants were supplying 'wet' or 'green' firewood, coupled with poor customer service. By improving the delivery mechanisms – using cages on the back of trucks rather than dumping wood on people's lawns – some merchants are now delivering more presentable, clean wood.

"Why did you start selling woodfuel?"

"Why? Too many idiots out there selling rubbish. And there was a gap in the market. Really I just found a bit more about what was going on, did a bit of investigation and realised there was just nobody doing it properly. So I just started up and it absolutely just snowballed from there."

[Farmer turned firewood merchant, 12/11/2013]

"So why did you get involved with the woodfuel market?"

"Because I couldn't find any decent wood suppliers for my own fire."

[Woodfuel merchant 5, 12/02/2014]

"There's one or two chaps around here and they know local woodland owners and they ask whether they can go in and clear up the fallen and dead trees. Well if you're not looking at it from a habitat perspective, to get your fallen trees cleared up, it makes a wood look tidier. The fact, it's some of the best habitat in the wood, it's irrelevant [to the owner]. *So of course they're fetching out decaying wood which they're then selling, so again, they're already dealing with a sub-standard product but they're willing to take in a little tractor and a trailer and handball it do a lot of work for not a lot of money. I'm not a professional but I would say that's very amateurish. You know, where we operate* [primarily Wildlife Trust woods and County Council woods]*, you've got to sort of have some credentials to go and work on these sites. They don't just open them up to anybody with a saw."*

[Farmer 3, 21/05/2014]

5.6 Merchant Case Studies

A North Nottinghamshire-based Farmer (in his mid-40s)

Primarily a livestock farmer, this interviewee admitted he knew “nothing about this game” of harvesting and selling firewood. His interest in the woodfuel sector arose by working with a friend he had known for over twenty years who works in woodland management and had been selling small amounts of firewood as an aside to his business. His friend occasionally asked him if he would like to work a few days doing woodland management jobs and it was through this that he learnt about the machinery involved to extract timber and process into firewood. To establish the firewood business, he successfully applied for grant funding from the RDPE (Rural Development Programme for England) and received 40% of the cost of a firewood processor, a small crane to move large bags of firewood and a barn in which to process timber into firewood. He put £100,000 into establishing the business, much of which is borrowed from a bank.

“We’re on borrowed money but I thought, well money is never going to be cheaper than it is now. So now just seemed like a good opportunity to do something...you could stand by on the side lines forever and just think, I’ll just wait and see what happens there.”



Figure 5.5 The barn built as part of the farmer’s investment into his firewood business. White barrow bags containing processed firewood can be seen stored on the right hand side. The crane used to lift firewood bags and timber is attached to the back of the tractor on the right. Source: Author’s photograph. [Taken: 21/05/2014].

Prior to purchasing the firewood processor, the two of them had hired a machine for £450 a day. They were able to produce 25 bags per day, costing them £18 per bag, excluding the cost of diesel. The processor had been recently purchased when the interview took place and the farmer admitted they were still getting used to operating it. This was due to their time being taken up with the lambing season.

"We've only had that machine a few weeks. We've lambed and it's been stood still for a while. Over lambing we did nothing so we've only really just kicked up again so it's still very much in its infancy. So we're feeling our way."

On why he became more involved with the selling of firewood, he listed farm diversification as one reason which he hopes will give him and his family a more secure income, as well as establishing a business which his sons could continue. As many of the other interviewees said, the farmer could devote more time to his firewood business but instead treats it as an aside to his main business of livestock farming as the quote above demonstrates. Nonetheless, he intends to grow his firewood business and views it as becoming a significant source of income. As he gets older and his sons return to work on the farm, he views the firewood business as financial security.

"My farming enterprise was never going to be big enough to support another family member. I rent all the land I farm on annual agreements so come February, I've not got a clue what land I've got for the year. And we farm probably 100 acres and it's off about eight different people…I've got no security on my farming business. This was something I had more security over, more control over, so I thought well if for some reason two of my landlords sell that would rather knacker the farming business. If we can grow this side, it then just spreads the risk. I could give this more time than I do. It was just a way of maybe having an opportunity for one of the children if they want it."

The farmer also said a large part of his decision to start the firewood business was to help his friend who introduced him to woodland management. The farmer recognised that his friend was unable to grow his firewood business due to a lack of funds and space to store timber. He was also concerned about the amount of physical labour his friend which he recognised would become increasingly difficult to do with age. Again, having a contact in the sector and access to the expertise of woodland management and using the processing machines was important to the farmer.

"He's got even less land than me. He has a nice house in the village but that is the extent of his premises. He's nowhere of his own to operate out of…I've seen him struggle and he's a good bloke. There was no way he was ever going to afford a machine and he's working outside under sheets in winter and I sort of said, you know, "look, you're nearly fifty, this is

not the way to be carrying on". So, honestly, to some degree, out of benevolence, I said "I'll help you". But I'd like to think there's going to be something in it for me. I could see firewood as a growing market so there was the potential to build another arm to the business".

The current business relationship with his friend is flexible but tenuous. At present, his friend is charged £20 per cubic metre of firewood sold which are delivered in quarter cubic metre barrow bags. The farmer considers this a reasonable charge given it was costing £18 (excluding fuel) to produce a bag of firewood when using a rented machine. Dependent on the species of wood, customers are charged £80-£100 per cubic metre of firewood, leaving the farmer's friend with £60-£80.

"For things like birch, he's charging £20 [per bag] *so that gives you £80 per cubic metre. For your heavy hardwoods like your beech and your oak, he's charging £25* [per bag] *so then you're on £100 per cubic metre. So I've said £20 out of £100 is £80 which still leaves you a margin."*

However, the farmer suggested the business partnership will be reviewed given his friend has struggled to make his payments on time. As the business grows and they produce more firewood, the farmer appreciates their informal agreement will need to change.

"Yeah, it's a sore point. The idea…the intention is that he kind of pays but that's a bit slow at the moment so he's not paying for the barn and I'm kind of just letting him use the barn for free… I'm doing it all in £20 so I think he's getting a good price at the moment so we will review it in the light of… any sort of co-operative, sort of venture, it's got to suit both people."

The farmer hopes to develop the business such that he offers a service to local landowners to have trees cut and processed into firewood. He said this would flip the nature of the agreement between him and his friend who would either need to start working for him or paying more to use the firewood processing equipment. This situation highlights the relatively strong position that this farmer has in diversifying into the woodfuel market because of his access to capital and space. This potentially leaves his friend, someone who has worked in woodland management his whole life, on his own in competition with the farmer.

"At the moment it's working but I want to develop it beyond collaborating with him in terms of offering a service to private landowners as a firewood processing contractor. And I wouldn't say go for woodland management but the felling and the processing of the wood to provide them with logs that they can use and sell."

The farmer described the profit margin associated with running the firewood processor as "tight". The following calculations highlight the cost of producing one bag of firewood in relation to earning back the money to cover the cost of the processor over a five year period, plus the number of bags required to be sold.

Cost of firewood processor: £30,000

Per year cost to make a return in five years: £30,000/5 = £6000 (+ interest) = £7000 (approx)

Per day running cost of machine (diesel and replacement parts): £50

If 20 bags of firewood are produced per day, each bag costs: £50/20 = £2.50

If £15 is taken as profit, the number of bags required to cover the 'per year cost' of running the machine: 7,000/15 = 467 cubic metre bags.

"We've got to do roughly 500 cubic metres [per year] *to cover its running costs which is well within its capabilities, easily. If you wanted to work it 200 days a year, 20 bags a day, that's 4000 bags. And it could do more than that."*

These calculations exclude the cost of labour and the cost of timber which means the £15 profit on each bag sold is less once these have been accounted for.

The farmer identified competition from other small-scale firewood merchants as the main threat to his business. Echoing the comments made by others about a rise in the number of firewood businesses in recent years, the farmer said there are a number of people in the sector hoping to make money quickly and are willing to work very long hours for a small profit. He prides himself on selling well-seasoned firewood, and criticised those who sell unmarked, under-seasoned logs. For this farmer, some merchants are not in the sector "for the living" and there are many who do not appreciate the "primeval" nature of handling wood which he respects.

"It [other businesses] *just takes the cream off my operation because maybe that extra 20% of your profit is going to these, I wouldn't say non-professionals, but opportunists. They cut a bit of wood and they're not in it for the living, it's something they do at the weekend".*

The farmer is eager to grow his firewood business beyond the current setup with his friend processing on a per contract basis. He hopes to be using his newly purchased firewood processor closer to its capacity through contract work on other farmer's land and he is willing to import timber to increase his stocks and supplement his firewood sales. He has a Polish friend who has explained to him the ease with which people can buy timber in Poland given the greater amount of forest cover which has been managed for many years, unlike the situation in the UK. As such, the farmer admitted being tempted to import "lovely straight

clean wood". He appreciated the irony that he purchases his machinery from Germany and his timber from Poland but he wants the British public to buy British products.

"Importing is soon going to come. Which if you can't beat them [those importing wood]*, join them. I've got a good friend, he's polish. He came to look at this machine and he's keen to get involved with firewood back home and he says "I can buy as much firewood on lorry loads as I want, our woods in Poland have been managed for years, it's lovely straight clean wood" and I'm thinking well to give the business a boost, get some supply in. It sounds like it's a quality product. But there's something about provenance. As farmers, they'll buy the German cars and the German machinery but expect the British public to buy British meat. We're not buying British products but you better buy our stuff!"*

Like many other firewood merchants, the farmer is considering kiln drying his firewood which would make him eligible for commercial RHI payments if he heated it using a biomass boiler. The farmer was considering buying a shipping container which he would convert into a kiln and heat it by burning waste wood. Whilst he questions the usefulness of kiln dried firewood because it needs packaging immediately to prevent moisture vapour from re-entering the log, he views it as another way to market his logs to the growing number of urban firewood users:

"We are setting ourselves up as professionals. The man with his chainsaw on a Saturday afternoon is not doing kiln dried".

<u>A Shropshire-based firewood merchant (in his late 40s)</u>

This interviewee started a firewood business in 2009, having been made redundant from a German-owned industrial business during the 2008 Financial Crisis. He established the business with a friend who came from a farming background. They initially sourced their firewood by asking farmers if they could chop and remove any fallen trees from their land. Initially, the firewood processing required a great amount of manual handling as they did not have access to a processing machine. These two men, therefore, represent the "opportunists" or the "unprofessionals" as described by other merchants who believe they are losing business to those willing to spend many hours producing firewood using minimal machinery.

"So in 2009, day one, we had two chainsaws and two axes and we found ourselves in various farmer's fields cutting down and chopping up fallen trees, scavenging whatever we could".

The two men spent a great number of hours manually chopping and splitting firewood and they struggled with meeting the demand which predominantly came via online sales to local customers. Stockpiling a sufficient amount of seasoned firewood during winter was of particular concern during their first year of operation.

"It soon became a big problem that production was less than the demand".

They subsequently travelled to Bulgaria to learn about the firewood supply chain in a country which has a more established firewood sector and woodland cover; approximately one third is wooded (Veen *et al*., 2010). In Bulgaria, they purchased a shipping container of oak firewood to supplement their supply. A year later, they imported more oak from a Latvian supplier. In November 2010, they built a kiln using a shipping container to increase the rate at which they could produce seasoned firewood. This enabled them to produce logs with a moisture content of less than 20%, a figure often quoted on merchant's websites. The shipping container is heated using gas which the interviewee admitted was not the ideal fuel given its rising cost. However, the growth of the business was such that he has been able to afford the "cheap fix" of gas and he is looking to heat the container using wood itself which would make him eligible for the commercial RHI.

"So your output has gone up but your costs will have gone up as well with your kiln?"

"Absolutely. I mean the gas…because we are growing so quickly, we've had some growing pains and we've had to sort of do things quite quickly on the fly to keep up with demand. Gas is not our chosen fuel obviously. It's quick and an easy way to do it. Biomass is the way forward obviously".

In February 2011, they purchased a semi-automated firewood processor which they used for a year before upgrading to a more automated processing machine, manufactured by *Pinosa*. This machine processes small diameter branchwood and is able to cut multiple pieces of timber at the same time which has allowed them to produce 40-50 cubic metres of firewood logs per day. The Italian manufactured machine is computer-operated and measures a log's diameter before calculating how many pieces it should be chopped into. The more automated machine enabled them to tailor log sizes to meet customer demand; any logs less than 6" in diameter have an additional £10 charge per cubic metre given the extra time required to fill a bag. Wasted wood in the form of unusable short-off cuts are minimised as it has a circular saw which adjusts to each log's length. Now able to produce many more firewood logs, the interviewee said the difficulty was then being able to season the wood fast enough to meet demand. They therefore built a further two kilns, allowing them to dry 135 cubic metres per week. Three quarters of their sales are now kiln dried firewood whilst the

remaining quarter is either dried under their own barns or purchased green by customers who wish to season it themselves.

The interviewee was clearly pleased with the amount of growth the business has experienced; in the 12 months prior to the interview [13/12/2013], it had experienced growth of more than 100% with a target to supply at least 4,300 cubic metres of firewood in 2014. They now supply firewood nationally using a pallet distribution network. They became HETAS accredited-suppliers in 2012 and were included on DECC's RHI Biomass Supplier's List in October 2014.

Farmer, forester and woodfuel merchant working throughout the East Midlands (early 40s)

This interviewee is a Lincolnshire-based farmer who purchased a wood in 1996. His family produced firewood using a log splitter and sold excess firewood to others as loose loads. However, with firewood demanding low prices in the 1990s, the farmer said he produced charcoal as a side-product because he did not want to invest in expensive firewood processing equipment having observed the market remain static for years. In 2000, he established a forest management company and started managing other farmer's woods and as well as conservation and County Council-owned woods. Having established the forest management company, the farmer started supplying woodchip for biomass boilers. During the initial years of running this company, the farmer stopped managing his own woodland as he believed it was more economic to spend time managing others, providing an income for himself.

"We found that we were neglecting our own woodlands because it was economically sounder to invest our time in managing other people's."

Initially, the farmer sourced his timber for woodchip by purchasing it from clients who paid him to carry out management work. The difficulty arose in that he felt the need to quote a price for the timber higher than the market rate to ensure his woodland management company was not accused of under-valuing their clients' timber when purchasing it for themselves. Not only was this clearly uneconomic for his business, but the farmer said he still encountered customers complaining about their quote, claiming to have been offered higher prices for their timber elsewhere. For this reason, the farmer elected to stop sourcing his timber from clients and he now buys from independent timber suppliers.

"We have some hauliers and timber buyers for our own stocks and where they get it from is anyone's business, it doesn't matter, providing it's the right stuff for us and it just means that it's a bit of a cleaner system so we're not accused of robbing someone's wood. And we

have been and we've never done it but you felt as if you had to offer more just to be seen as being squeaky clean and then that wasn't economic so it's cheaper for us to buy through a third party."

In 2005, the farmer hosted a tour of his woodland to the Royal Forestry Society when it was criticised for the lack of management taking place. This prompted him to explore how he could add value to his own timber and he decided to start supplying firewood from his own wood again.

"2005 was a bit of a turning point when we realised that we couldn't manage other people's woodlands while we neglected our own. It just didn't make sense so we re-looked at our management and realised that if we were to do it and it was going to wash its face, we had to do something with the products so we couldn't just sell timber standing or sell timber at roadside, we had to do something that added more value to it. So, we looked again at the log market and that was just increasing."

Like other merchants, he believed he could offer a better service than the "old boys" who delivered loose truckloads of firewood. Having researched the firewood market, the farmer concluded that his current farming machinery was sufficient to run the business on a larger scale and he started suppling logs in cubic metre bags so his customers knew what volume they were buying.

"To be fair, it was quite easy to get into the market because demand was outstripping supply. We're keen to expand. Growth is about between 30% and 40% a year and it has been for the last 5 years [2009-2014] *so it's a good rate of growth and I can see that holding at that level for some time. So there is room in the market for sure".*

Today, the majority of the farmer's woodfuel is sold as woodchip, the demand for which he believes is driven by the RHI. 2013 was a particularly successful year for woodchip sales and in 2014, he gained two new customers running RHI-subsidised biomass boilers. This coincides with the introduction of the domestic RHI scheme in April 2014. He delivers woodchip to within a 25 mile radius of his farm using a tractor and trailer or customers come to collect loads in pickup trucks which are weighed using a weighbridge. The farmer was unable to say whether woodchip or firewood sales were more profitable for his business but did say he preferred selling woodchip because it requires less time to process and it commands a greater economy of scale. On the other hand, the greatest added value can be made to hardwood firewood logs but the costs associated with this are higher because it requires more manual handling. All his hardwood timber is sold as firewood and all his softwood he sells as chip. Despite the significant growth of the business, on remaining profitable, he remarked: *"It's not easy, not easy at all".*

Something the farmer has found particularly challenging is gauging the volume of woodchip required to meet customer demand during the winter. Any excess woodchip has been sold to a wholesale retailer which has provided him with a secure market. The downside is that he achieves a lower price for this than selling to end-users. Furthermore, like other merchants, the farmer had at times resorted to selling under-seasoned woodchip because of a lack of supply. He once sold too much to the wholesaler and ended up chipping timber which had been stored outdoors, uncovered from rain. The difficulty of predicting how much timber required for seasoning and processing was repeatedly raised as one of the many logistical challenges facing merchants, with the farmer admitting that 2014 was the first year he managed to correctly gauge the correct volume of timber to meet demand.

5.7 Increasing Competition, Increasing Professionalism: insights into the business of woodfuel merchants

With rapid growth in the size of the woodfuel market and the number of competitors, many merchants appreciated the need to improve the level of customer service they offer as well as ensuring they provide customers with high quality firewood and woodchip. In woodfuel terms, high quality predominantly means well-seasoned. However, with a growing customer-base composed of more affluent urbanites, some merchants felt their customers wanting: *"good looking firewood logs, free of dirt and insects".* With some merchants having developed reasonably large regional or national businesses and others operating within a 25 mile radius , sometimes only at weekends, the woodfuel suppliers market has become stratified, composed of different 'types' of merchant with varying aims and objectives. Merchants know that customers are happy to switch woodfuel suppliers if they can get a cheaper or potentially better quality product elsewhere. The ease of swapping woodfuel suppliers is therefore one reason why merchants know they need to provide a good service as well as well-seasoned wood, especially when it is marketed as such; some merchants do advertise 'green' or unseasoned firewood for sale at a lower price. With woodfuel becoming more commonly used, there has been increased discussion amongst merchants and regulatory bodies to protect end-users from poor quality woodfuels. With a growing appreciation for customer service, the increasing use of high specification machinery as well as protection for consumers, the sector has undergone somewhat of a "professionalisation".

"Certainly all of them [merchants] *have moved forward in terms of a greater…you can describe it as more commercialised. There certainly is a lot of movement towards a more professional service."*

[Forestry Commission Information Officer, 24/01/2014]

Merchants were generally acutely aware of their competitors; both from small, one-man businesses, as well as larger, national suppliers. Often, the small, "one-man band" merchants who work for "a bit of beer money" were listed as the primary threat to business. It seems to be the case, or at least a perception, that there are a significant number of men willing to work extremely long hours for little pay to produce firewood.

"Our bigger concern is the threat from other firewood producers…the smaller guys. More competition at the moment. There's a lot of people thinking they can earn some money from it. There's guys who think their time is worth nothing. They'll sell one of those bags for £30 and that's £30 in their pocket. If they can do three or four a day, that's a good day's work. It's just a race to the bottom."

[Farmer 3, 21/05/2014]

For some, these 'unprofessional', small-scale businesses are simply looking to make a quick profit and are not interested in operating long-term. As one merchant described them, these men are the "opportunists" of the woodfuel sector, drawing a small percentage of customers away from the more professional merchants. Merchants are fearful that people who are new to wood burning lack knowledge about the need for seasoned wood and choose to purchase wood from the opportunists, being guided by price over quality.

"The are significantly more people now [in the sector]*. You know, adverts, tonne bags of wood, £45. And they're popping up from all over. And of course people are swayed, they only go once. But, you know, they ring up and ask, how much are your logs? Well, they're £80. Well such and such is doing them for £45. It's a difficult barrier to cross because, not being unkind, but there's a lot of uneducated people in this country. They can't see beyond a price."*

[Farmer 3, 21/05/2014]

Some raised questions over the sustainability of merchant's businesses which are selling cubic metre bags for as little as £45 per cubic metre.

"I saw an advert in the paper for builder's bags logs, £40. Well, we sell builder's bags for £70 so I thought I'd see what they were like so I ordered these £40 ones and they were absolute shit. You can't do them at £40. I mean, even if you're getting your wood for free. There's not a lot in it if you're delivering in individual bags for £40. At the end of the day, the main thing is to have decent wood."

[Woodfuel merchant 8, 27/02/2014]

"We're not, you know, a 50 quid a bag and we'll stack it for you in your greenhouse type of company. There are people out there like that but we have people coming back to us saying your logs are really good. But even though our logs are really good, people will buy from someone else if theirs is cheaper and then they come back to us. So it's a bit frustrating. I'd rather do it that way than have a cheap price and get rid of it all and then run out and realise you didn't make any money over the winter because it's a hard way to earn a living."

[Farmer, forester and woodfuel merchant, 21/02/2014]

As well as competition for new customers, merchants described the competition for sourcing timber, especially in relation to the increasing difficulty that many claimed to be the case. It became apparent during discussions with merchants that a series of formal and informal networks are in place where information is shared about upcoming sales of timber and new business partnerships. The FC, for example, places the majority of their timber sales out to competitive tender, but they still receive complaints from merchants who failed to see the formal tender and criticise the FC for agreeing private contracts with others.

"Oh yes, they gossip! [the merchants]. *They're a funny lot. We know they gossip between us. If we've a got a parcel being worked and they haven't seen it being sold, they're all gossiping "well, I don't know how he bought that!?" Because all of our stuff is done on tenders, we don't sell anything by negotiating with the merchants apart from if it's very very small like a load of timber just sitting at the side of the road that's left over then we'll just offer it to somebody."*

[Forestry Commission Operations and Planning Manager, 26/06/14]

A Land Manager within the FC believes that one source of information about upcoming timber sales is through the timber hauliers. Given the distances they travel and the many woodland sites they visit and contacts they develop, this FC employee believes the hauliers are well positioned to spread both information and misinformation about timber sales. He noted the rise of the internet has lessened the impact of this timber haulier information network but it still remains in operation.

"That information network is through the hauliers. It's the lorry drivers and it's always been like that in this business…they're visiting one merchant site, they'll be over here one day, then they can be here. So they're moving round on a constant basis and then they're going to the mills. They are in a really good position for spreading information and disinformation."

[Forestry Commission, Land Manager, 26/06/14]

A Forest Manager within the Nottinghamshire Wildlife Trust said that having put a management project out to tender, he still finds the same men working in the woods. This is because companies will often sub-contract work, and due to a lack of people able to carry out low-impact management work on conservation sites, the same people end up completing the work.

"Very often you put it out to tender and there may be three or four different companies that come and then you come to the wood and it's always the same blokes cutting it down! It's like "oh! It's you again! I thought it would be someone else!" It's nearly always cheaper just to ask them the question directly. That's part of the problem that there's not enough people around."

[Forest Manager 3, 24/10/2013]

Following this comment, three merchants who work with the above forest manager were interviewed and the degree of competition between them became apparent, though they do occasionally work together and share or rent machinery. At the time of interview, one merchant was letting another use his forwarding trailer and he hoped to use their forwarder in future. One of the merchants had attempted to establish a co-operative with the others, whereby work and profits are shared. This was: *"a few years ago but he's* [one of the other merchants] *not all that keen on co-operatives"*. Evidently they could not agree a price at which they would sell firewood. So despite the Forest Manager believing these three merchants to be consistently getting work from him, they are very much in competition for woodland management work and raw timber to produce woodfuel. However, the sharing of equipment and the ability to work with one another when needed is of benefit to each of them.

Merchants often referred to potential woodland sites they hoped to manage and were clear that this information was not to be divulged to others for fear of them attempting to under-cut them, or risk damaging the working relationship.

"I've just been to seen a farmer who's got a wood over in Gainsborough, don't tell him [another merchant]*, it might worry him, it's not really anything…it's just that he's got a whole load of wood out there and that's one where I'm going to chip because there's lots of elder there that is only sort of this in diameter."*

[Woodfuel merchant 9, 15/03/2014]

One interview took place with a merchant during a round of making firewood deliveries. He stopped at a barn to pick-up some timber where the merchant who had proposed a co-operative happened to be processing firewood. The interview continued with the two of them exchanging their views of the woodfuel market, during which one reminded the other that he would like to buy timber from a wood they were working in. This subtle reminder highlighted the underlying competition for raw timber amongst this small group of merchants.

"The wood you're working in would be absolutely ideal because it's three minutes up the road but you're pretty established in there aren't you? We're not trying to unseat you. I've tried to buy some of that timber this year but…you need it don't you? Well anything that will go through this machine we'd like to buy."

[Woodfuel merchant 11, 15/03/2014]

In a later interview with this merchant who made the enquiry, he described the competitive relationship that exists between them. He claimed they will not attempt to win contract work in the woods which the other has historically worked in. This competitive relationship seems to be based on the tacit agreement that it is of mutual benefit not to undercut one another. However, the mild pressure he placed on his rival during the earlier interview reflects this tenuous working relationship. As such, merchants are required to maintain positive relations with the timber suppliers and woodland owners as well as with other merchants to maintain their access to sharing machinery and labour.

"He's a big competitor of mine but I kind of keep off his patch and he keeps off my patch in some ways. It's a bit of an uneasy sort of truce that we have. Otherwise, we would totally undercut each other and cause problems for each other so I wouldn't say it's a cartel but it's along those lines."

[Woodfuel merchant 11, 16/03/2014]

Many small-scale firewood merchants commented on the competition they had with larger businesses. There exists concern amongst the smaller businesses that they will struggle to compete with the larger businesses as the market continues to develop. Small-scale suppliers are increasingly struggling to compete as more farmers enter the market and larger woodchip businesses currently supplying the RHI biomass boiler market start supplying firewood too. This struggle to remain competitive seems to have encouraged some merchants to import firewood to meet the scale of demand and maintain their customer base. In future, some merchants see themselves working less for themselves and more for farmers and larger businesses as they increasingly struggle to sell at the same price as their these competitors.

"I think in a few years time the little people will probably be pushed out of it by the bigger farmers or whatever…maybe in future, [farmer's name] *will just get me to fell a whole load of timber for him."*

[Woodfuel merchant 9, 15/03/2014]

"It's the woodchip and biomass going to large scale which is affecting me. The guys like Stobart. I think that's what skews the market because you're just taking too much."

[Woodfuel merchant 8, 27/02/2014]

One merchant described the loss of work as a larger competitor started applying for and winning contracts across the areas he worked in. These were predominantly on wooded sites in North Nottinghamshire and South Yorkshire.

"He did come into this area for a while and he was competing with us all and he took a couple of contracts off me actually. I didn't like it too much"

[Woodfuel merchant 11, 16/03/2014]

One contract this merchant lost was on offer from Rotherham City Council, involving the thinning of 500 tonnes of beech. Described as being a "very sensitive site", he said the other business had offered a lower price because they owned a large harvester and forwarder which increases their economy of scale. Evidently the Council was concerned about the impact of the larger machines on the site but awarded them the contract, dependent on a successful demonstration of the machines on a sample plot. The merchant expressed a dislike of the use of large machines on such sensitive sites and said he would never wish to own one, even if he could afford one. This example reveals the nature of the competition that one-man woodfuel businesses face. In this case, the "small-scale" merchant who had been supplying customers with firewood logs for many years was simply being out-competed by a larger woodfuel business which sell woodchip destined for the RHI-funded biomass boiler market as well as firewood. It also shows the shift towards the small-scale merchants working increasingly under contract with larger woodfuel businesses rather than independent merchants.

"They've got the wherewithal to bring in the big machinery that I haven't got. I haven't got it and I don't want to use it and I don't think it's appropriate at this stage. They don't do any of the work, they sub-contract to people like us and I am not in that league. A big forwarder is a quarter of a million and a harvester is a quarter of a million and I'm never going to be at that stage. I don't want to be. So effectively, if you're going onto the big machinery, it's not

us, we work on a small scale. So they will just contract, he uses others a lot. I won't work for him."

[Woodfuel merchant 11, 16/03/2014]

With more merchants in the market, end-users have great choice over who to buy from, highlighting the firewood and woodchip markets as being very much buyer's markets. It is for this reason, coupled with an increasing awareness of the importance of using seasoned firewood, which had led to merchants investing in more processing machinery, kilns and delivery mechanisms to provide a better product as well as better customer service. This encapsulates the "professionalisation" of the market.

"Almost before, they [end-users] *had to be grateful if there was somebody who would deliver them a load of firewood but we're not in that situation now. They can pick and choose."*

[Forestry Commission, Land Manager, 26/06/2014]

In recent years, many merchants have focussed on improving the efficiency of their business, principally by increasing the use of mechanised equipment and limiting the number of miles driven on delivery rounds. It was through buying machinery and increasing the rate of output that many merchants could out-compete the "old-boys" of the sector. That is, the few merchants who sold small loads of firewood of questionable quality. Much thought goes into the logistics of processing woodfuel, with timber yards organised to reduce the number of times wood has to be handled as it is cut and split into firewood or chipped. Merchants actively seek ways to save time and question whether they are using the most efficient system like where they store timber in relation to their machinery (because moving timber requires forwarders and time) or processing directly into bags for delivery. Again, the view that is easier for larger businesses to operate more efficiently was made in this respect. One merchant believed some of the new entrants to the market under-estimated the logistical challenges and physical demands of the work.

"A lot of people who have set up in logging haven't got the facility to get a quality product, they haven't got the space to store it, they think it's just cutting wood up and it goes up a conveyor into a trailer and it's not. You have to re-handle it, you have to grade it. It has to be right when it goes out and that's caught a lot of people out. It's not as easy as they think on a small scale. It's easier on a bigger scale."

[Farmer, Forester and Woodfuel merchant, 21/02/2014]

Many merchants who have purchased large harvesting equipment bear a significant amount of financial responsibility. Not only do such machines cost in excess of £300,000 but they require fuelling and on-going maintenance. As one operator said, there are very few engineers in the UK capable of fixing the large harvesters which means if they need repair, they will likely need to wait some time which can greatly disrupt their business. He said he had paid £500 for an engineer to examine the machine when it needed repairing, with no guarantee of a fix being found.

"The engineers are worth their weight in gold, it's no good trying to save money with one of these because when it's not working it's costing you money and it makes more sense to pay the money and keep it running."

[Forester 1, 12/03/2014]

"These guys [the operators of large harvesters] *are very professional. They're taking all these risks on your behalf. You've got to understand that they're dealing with an awful lot of stuff like, that morning they might have held the button too long and ripped the head off the harvester. People are working really hard and taking on a lot in being in the industry."*

[Forest manager 5, 12/03/2014]

During the research, it became apparent that a broad set of categories of different 'types' of woodfuel merchant operated across the sector. Such categories are based on the volumes of wood traded, the equipment used to harvest and process wood, modes of transport and business logistics (see Table 5.2). The proposed set of categories include: the 'traditionalists' who operate at small-scales and have often been involved with supplying firewood for a number of years, even before the recent growth of the market; the 'opportunists' who are new entrants to the firewood market in particular, hoping to make quick profits and have little regard for the quality of firewood they sell or customer service; and finally the 'entrepreneurs' who operate at medium to large scales of business, purchasing large expensive harvesting and processing equipment and often own timber yards. Today, the 'traditionalists' find themselves competing in a complex, highly commercialised and more professional woodfuel market that did not exist a decade ago. To stay in business, they must compete with the 'entrepreneurs' and 'opportunists'. The 'entrepreneurs' have led the way in offering a more professional service with regards to wood quality, standardisation, marketing and customer service. They typically operate across multiple counties, often delivering firewood and woodchip across the whole country. Like the 'entrepreneurs', the 'opportunists' are new entrants to the market but their scale of operation is much smaller and their logistics of harvesting and processing woodfuel are more

inefficient. Often, they do not intend to establish long-term businesses given the ultimately unsustainable modes of processing firewood by hand.

Merchant category	Background	Woodfuel quality and type	Harvesting and machinery	Woodfuel Storage and Seasoning	Marketing	Transport
Traditionalist	Woodland management/ Arboriculture/ Woodland owner. Supplements income.	Mostly firewood and kindling. Occasional use of woodfuel accreditation schemes.	Largely motor-manual. Small, low-impact harvesters and forwarders. Borrowed or rented firewood processors. More manual handling.	Cutting logs in wood to transport home. Small sheltered area at merchant's home. Small volumes. Use farmers to rent barns.	Word-of-mouth. Adverts on side of road. Local newspapers.	Anything available. Pick-up trucks and trailers. More reliance on customer pick-up.
Opportunist	Arboriculture/ Woodland owner/ Farming. Supplements income.	Virtually all firewood. Little concern for quality or standardisation.	Often buy-in timber rather than fell it themselves. Mostly motor-manual. More manual handling.	Cutting logs in wood to transport home. Small sheltered area at merchant's home. Small volumes.	Word-of-mouth. Adverts on side of roads. Local newspapers. Basic internet websites.	Anything available. Pick-up trucks and trailers. More reliance on customer pick-up.
Entrepreneur: medium-scale	Farming/Woodland management. Supplements income/primary income source.	Mixture of firewood and woodchip. Increasing use of woodsure accreditation schemes.	Increasing use of large harvesters which both fell and cut timber. Tractors and trailers. Owned and/or rented processors and chippers.	Converted/purpose-built barns. Sometimes force dried.	Word-of-mouth. Adverts in local newspapers. Increasing range of other goods sold too (e.g. log storage units).	Pick-up trucks with cages. Some customer collection. Growing use of pallet network to deliver.
Entrepreneur: large-scale	Woodland management/ Farming. Primary income source.	Increasing amounts of woodchip. Sometimes pellets. Firewood. Widespread use of accreditation schemes.	Increasing use of large harvesters which both fell and cut timber. Tractors and trailers. Owned processors and chippers.	Purpose-built barns with stirrers to promote woodchip drying. Sometimes forced dried.	Word-of-mouth. Increasing use of more advanced websites. Adverts in national newspapers and industry magazines.	Pick-up trucks with cages. Pallet delivery network. Increasing use of HGVs with woodchip blowers.

Table 5.2 A proposed set of categories of woodfuel merchant encountered during the research.

As Table 5.2 highlights, there are some trends present as one moves from the 'traditionalist' down to the 'entrepreneur'. There is an increasing use of more automated, more expensive machinery which carry out more than one process (e.g. harvesters that both fell and cut logs; firewood processors with cutting blades which automatically adjust to the width of a log; woodchip blowers which transfer chip from a delivery truck into a customer's storage unit). There is a decrease in the amount of manual handling involved because of the greater use of more automated systems, often involving conveyor belts which transfer firewood automatically into bags for delivery. Without conveyor belts, merchants must "handball" wood which reduces their rate of output. The woodfuel supply chain therefore becomes more sophisticated as one moves down Table 5.2.

One merchant who could be classified under the 'opportunist' category described his method of firewood production. He has found the work harder than he envisioned, particularly because he is using a more manual, less mechanised approach than others using semi-automated firewood processors. His comments reflect those of others who described some merchants spending more hours than necessary processing firewood because they lack machinery.

"There's a lot of work with it, you don't realise…I mean, you've got to take them down, chop them into lengths, put them on the trailer and bring them up to the yard, put them under cover. When you want some logs, you've got to put them on the work horse, cut them into lengths, put them on a trailer, take them under cover there and I've got a wood splitter on the back of the tractor and split them. The other day a bloke wanted a particular length size, he wanted 15 to 18" long and he wanted 4 tonne so I thought I'd split this 1 tonne of logs into this 15-18" long and thought I won't do anymore. I'll take it to him and see what he wants, to see if they're alright. Anyway, he didn't want them."

[Woodfuel merchant 7, 21/02/2014]

This proposed set of categories of merchants is a spectrum; a merchant might share features which span across the set of categories and it is possible for merchants to move from one category to another. For example, with sufficient capital and motivation, a 'traditionalist' could grow their business and become a so-called 'entrepreneur' as could an 'opportunist'. This was the case with the two men who started their business with just chainsaws and axes, harvesting wood from farmers' land before learning more about the firewood supply chain in Bulgaria. It should be noted that not all merchants will demonstrate all features described in Table 5.2, as there are a variety of ways in which merchants engage with the market. Some merchants, for example, do not carry out any harvesting

work themselves and will therefore not own any harvesting equipment. This categorisation of merchants is not a conclusive one and not all merchants can comfortably be assigned to any one category.

5.8 The Sale of Firewood

There is little legal regulation of the sale of woodfuel in the UK. The Weights and Measures Act 1985 states that Local Authorities can choose to enact a bye-law whereby merchants are required to sell woodfuel by net weight. The Law was roundly criticised by merchants for this because the weight of wood is heavily influenced by its moisture content. As such, a merchant could theoretically charge more for selling heavy wood because it has a high moisture content through a lack of seasoning. This does not protect consumers and allows unscrupulous merchants to legitimately charge higher prices for under-seasoned firewood. Unless the bye law is enacted, merchants can sell woodfuel using any metric they choose. Currently, there is no legal obligation to state how much wood is being sold or its moisture content. Butterworth (2010) heavily criticises the lack of legal regulation of the firewood market. He states that the majority of merchants choose to sell firewood by the unspecified 'load' which could be any amount of their choosing, be it the back of their truck or any other container, like recycled potato boxes and builder's bags of no specified volume. One woodland owner criticised the manner in which the unstandardised firewood market operates, with 'the load' still used as a unit of sale.

"How we buy logs in this country is a bee in my bonnet. You just buy a load, you don't buy a cord or a tonne, you buy a load which is ludicrous. The ridiculous way we buy woodfuel and the way to get round it by measuring volumes. Can I have a load of petrol for my car please, here's some money?"

[Small Woodland Owner 6, 25/02/2014]

Whilst the same minimal legal requirements applies to woodchip as it does to firewood, Butterworth (2010) notes that the woodchip market is different because it is generally sold by weight. It is therefore easier to purchase a uniform product in the more standardised woodchip market. The need for a uniform and standardised woodchip market arose because biomass boilers require chips of a specific size and moisture content. Whilst unseasoned wood can be burnt in wood burners, unseasoned or wrong-sized woodchips can cause costly breakages to a biomass boiler. If chips are too large, they jam the feed-in mechanisms, leaving whole buildings without a source of heating. Standardisation of the woodchip market has therefore been a necessity, especially with the mass market created by RHI-funded biomass boilers being installed.

"In the case of woodchip, in the early days, there was much more of a feeling of "oh well, wood burns, here's some chips, it's got to be okay". Quite rapidly, it was learnt that if you don't have good quality chips you'll get blockages in augers and then you lose the power or

the wrong moisture content will cause it to trip out. The firewood market has been around considerably longer but, it's not had the same pressures on such parameters as fuel standards."

[Forestry Commission Information Officer, 24/01/2014]

When sold using an unspecified quantity such as 'the load', it is impossible for end-users to compare how much actual energy different merchants are offering. In the case of electricity, gas and oil, users know how much they pay for each kWh of energy they use. Different species of wood have different densities and therefore do not contain the same amount of energy. Furthermore, the moisture content of firewood considerably affects the amount of energy released when burnt. If the quantity, species and moisture content is stated, users can calculate the theoretical number of kWh in their pile of firewood, and therefore how much merchants are charging them for energy (Butterworth, 2010). However, whether end-users will know how to perform this calculation is questionable. Furthermore, given many firewood deliveries are composed of multiple species with varying moisture contents, any attempt to calculate the energy content of a 'load' of firewood will only be an approximation.

50 firewood merchant's websites, based across the study region, were analysed to see what units are used to sell firewood. 48 of the 50 firewood merchants sold by volume. One merchant sold by weight and one by number of logs. Of the 48 who sold by volume, 10 did not specify the dimensions. In these cases, firewood was sold by the unspecified 'load' or simply 'builder's bags', the dimensions of which can change. Sometimes, 'a load' was referred to as a 'tipped load' from their truck, but again, no dimensions were provided. As such, the unspecified 'load' of firewood was not found to be commonly used. Whilst the majority of merchants state the volume of firewood for sale, there was criticism that some deliver less than the volume advertised.

The move away from 'the load' as a unit of sale appears to have occurred since 2010, a time when Butterworth (2010) described the market as "shambolic". One merchant who had been selling firewood logs before the market's rapid growth said he used to sell it by 'the load' but switched to volume when he decided to grow his firewood business in response to rising demand.

"Before, it was just a load. Whereas, [upon growing his business] *we started doing it in cubic metre in bags so people knew what they were getting."*

[Farmer, forester and woodfuel merchant, 21/02/2014]

Another interviewee, a woodland manager, spoke of 'firewood fairs' he used to run in one of the woods he worked in. These fairs were run in the mid-2000s and the price of firewood was based on a much more qualitative assessment than appears to be the case today.

"In the old firewood events we did, everyone and their dog showed up with a trailer and it was difficult to work out volumes and prices so there were all sorts of creative ways of working out the price!"

[Woodland manager 3, 24/10/2013]

Furthermore, whilst most merchants' websites state the volume they purport to sell, there are many merchants who do not operate a website and simply advertise logs for sale from the side of roads. Figure 5.6 highlights the more informal side to the firewood market.







Figure 5.6 Roadside firewood logs for sale in Lincolnshire. Such a situation is quite distant from the increasingly standardised units of sale by more commercialised businesses which specify moisture contents and volumes. Interestingly, there is clearly faith that people will not steal. Author's photograph. [Taken: 10/11/13].

On the ‘ArbTalk’ website, one merchant described why he changed from selling firewood by approximate weight to volume. For fear of being criticised for under-selling, he reminds customers that a one cubic metre bag of loose logs will not measure one metre cubed when stacked.

“I sold for years in half ton-1 ton loads (appx) now in cubes, I even tell new customers once they stack it, it will lose a third with air space. As a sales pitch I think a ton sounds better than 2 cube but I wouldn't do that now.”

[Woodfuel merchant ‘ArbTalk’ Forum quote, 19/08/2010]

One of the reasons for the switch away from selling by ‘the load’ is that customers can now compare the price of firewood easily using the internet. This encourages merchants to sell by volume so that customers can compare one merchant with another. When the unspecified ‘load’ is used, merchants risk turning customers away because people do not know how large ‘a load’ is. The ‘traditional’ firewood merchant typically supplied wood for a smaller number of people and they would have become used to how much wood they brought in the back of their pick-up truck: ‘the load’. With a much larger customer base, which has the ability to quickly compare prices, the use of ‘the load’ to sell firewood is becoming redundant. Nonetheless, many merchants still use the term ‘a load of firewood’ even when they sell by specified volumes, highlighting how common the phrase was in some people’s vocabulary.

The great majority of merchants’ websites have sections which explain why they sell by volume and not weight. This demonstrates how keen merchants are to educate customers about the dangers of buying firewood by weight which risks them being over-charged for logs with high moisture contents. Again, this demonstrates fear amongst merchants of the impact that the ‘opportunists’ have on their businesses.

“The weight of wood varies between species and on moisture content. If we are selling dry wood by weight, how can we possibly compete fairly with someone who is selling wet wood by weight? A cubic metre is a cubic metre, whether wet, dry or indifferent and is therefore a fair and practical measure.”

[Woodfuel merchant website]

As such, the UK Law covering the sale of woodfuel under the Measures and Weights Act 1985 does not protect consumers as it inappropriately states it must be sold by net weight if Local Authorities enact a bye-law.

"How can I sell by weight when the weight changes because of its moisture content? The Law is an ass."

[Woodfuel merchant 12, 27/06/2014]

A number of merchants inaccurately state on their website that they are legally obliged to sell firewood by volume. Where this confusion has come from is unknown but it could be the result of merchants referencing what they have read on other websites.

"Contrary to popular belief, under UK law, (The weights and measures act) firewood sellers are not allowed to sell logs by weight."

[Woodfuel merchant website]

Other merchants demonstrate awareness of the Law (or lack of) in relation to the sale of firewood.

"Unless there is a local statutory instrument in force, there will be no such statutory weight for deliveries of wood."

[Woodfuel merchant website]

With regards to customers, there remains some confusion about how firewood should be purchased. A good example of this is a conversation thread on the online auction website, Ebay. Someone interested in purchasing firewood made the following comment in November, 2013.

"The firewood "industry" makes use of bulk bags made for the building industry…The trouble is, firewood is a lot less dense than sand, so a "1 tonne bag" will actually only hold about 250Kg of firewood.

Any thoughts on Ebay policy (and the legal position) of listing using the words "1 tonne bag of firewood" when there's clearly nowhere near that much included? Does the fact that it's the name everyone uses for the bags mean it's OK?"

This customer sought advice from the online Ebay community. Some replies to this person's message reveal the confusion in the sector from the consumer's perspective.

"In my opinion this is only acceptable if the weight of wood is also included."

"I think that for the most part domestic users of logs are ripped off because they have no way of weighing a pile of logs."

"If the listing says One tonne of firewood then they should be reported."

"What if the listing was for a 1 tonne builder's bag? Would you seriously expect the bag to weigh 1 tonne?"

The Ebay customer eventually got this response from an experienced firewood user. Their advice might be described as "common sense" but the fact it needed to be explained in this way to the Ebay community reveals the lack of understanding present.

"We often get in firewood for home, and frequently buy it by capacity [volume] *instead of weight…you need to also state the type of wood and how seasoned (dried out) it is, as well as a good idea of cut eg logs, bars, kindling etc. So get your tonne bag, measure width height and depth (metres), multiply the three together and call it cubic metres."*

The confusion is perhaps indicative of the number of first time users of firewood who lack the experience of buying and burning wood. As many merchants described, an aspect of their business is to educate people on how to use, and buy, firewood. On the 'ArbTalk' website, some merchants' comments reveal the friction between merchants and their customers, caused by the confusion surrounding firewood's unit of sale.

"Best to tell firewood customers whatever they want to hear, can be a funny lot firewood buyers, they always think you're out to rip them off..."

[Woodfuel merchant quote from the 'ArbTalk' website, 19/08/2010]

Some customers still expect firewood to be sold by weight, much to the irritation of some merchants.

"It's mixed seasoned hardwood, it's 2.3 cubic metres, I don't know or care how much it weighs, it's £130 cash on delivery, I press tip then I leave. I hate log customers generally. "Well old Tom used to deliver a ton". Yeah, right, in his VW Caddy pickup…"

[Woodfuel merchant quote from the 'ArbTalk' website, 19/08/2010]

A variety of containers are used to sell firewood. As the review of 50 merchant websites revealed, 10 failed to give the dimensions of these containers on their websites. The range of containers include:

- The back of trucks
- In cages on trucks
- Recycled potato boxes
- Wooden crates
- Fertiliser bags
- Builder's bags
- "Dumpy bags"
- "Dinky bags"
- Bins
- Barrow bags

One of the more 'opportunistic' merchants described his approach to selling firewood. He sells by weight, which means he can charge customers more for wet logs.

"We deliver tonne loads in big fertiliser bags with the trailer. Well I say approximately a tonne because there's no way of really weighing them so you'll say approximately a tonne. You get some folks who will go and weigh it and if you haven't got the correct weight, you're in the shit! The bags are little 25 kilo bags. There's about 20 logs in a bag.

[Woodfuel merchant 7, 21/02/2014]

The merchant does not have a fixed price per tonne, as revealed when asked how much he charges.

"I don't know. I'd normally charge £100 for a big bag full, a tonne bag."

[Woodfuel merchant 7, 21/02/2014]

Firewood is often sold "loosely filled" in these containers which means consumers get fewer logs than is the case when it is "hand-stacked" or "hand-packed"; by definition, a loosely packed $1m^3$ bag has fewer logs than a neatly packed $1m^3$ bag. To the unaware customer, therefore, a $1m^3$ bag of firewood at £80 may be more tempting than the $1m^3$ hand-stacked firewood crate at £110. Some merchants specify they deliver hand-stacked crates of firewood but the majority do not. By far, the most common method of delivery is in loosely

filled builder's bags. Those who do sell hand-stacked firewood are careful to explain this on their website.

"We are one of only a handful of firewood suppliers who offer hand stacked firewood in crates. Most firewood suppliers sell firewood logs by the cubic metre choosing to supply the logs loose at random in a pick-up truck or trailer. Our firewood logs are hand stacked and as a result we are able to cram up to 30% more logs in a cubic metre of space than those suppliers selling loose loads! What does this mean for you? Value for money, plain and simple!"

[Woodfuel merchant website]

This confusion regarding firewood's unit of sale and the desire to sell accurate volumes as advertised demonstrates merchant's commitment to providing good customer service. Barring the 'opportunists', merchants appreciate that confidence in the sector depends on a collective move towards improved customer service and ensuring accurate amounts of firewood are delivered. As such, merchants have gone to great lengths to ensure they deliver what they specify and warn customers of the merchants willing to exploit people.

"We struggled for many years trying to pin down how many cubic metres made a loose cubic metre. And literally, the only way I could find out was to cut a measured volume and measure every log that went into it. So I did it on a particularly cold day about 8 years ago to work out that roughly a cubic metre of roundwood makes 2 loose cubic metres."

[Farmer, forester and woodfuel merchant, 21/02/2014]

One particular point of concern regarding firewood's unit of sale is that some merchants state on their website they sell firewood in $1m^3$ bags when the actual dimensions are less. One firewood customer said he measured a "$1m^3$" bag of logs upon delivery and found it to be $0.5m^3$. One merchant believes many of his competitors falsely assume that all "builder's bags" are $1m^3$.

"A lot of people still think that a builder's bag is a cubic metre. And then you've got people out there that when they say the back of their pickup is 2 cubic metres, it never bloody well is."

[Woodfuel merchant 8, 27/02/2014]

"If you measure the 1m^3 bags, they aren't actually metre cubes. The ones I've got, if you fill them just to the brim you've got half a metre cubed, it's staggering. My missus said that can't be right so I measured it again and it was less than half a metre cubed."

[Small woodland owner 6, 25/02/2014]

"Hardly anybody is giving correct information."

[Farmer 3, 21/05/2014]

It is for this reason that some conscientious merchants carefully explain on their websites that builder's bags come in different sizes. Figure 5.7 highlights the difference in size between three builder's bags. It is possible to envisage that some merchants and customers falsely assume the middle bag is 1m^3.



Figure 5.7 The range of firewood bag volumes offered by one merchant on their website. From left to right, the dimensions are: 1m^3, 0.73m^3 and 0.5m^3. Source: Reproduced with kind permission from the merchant's website.

Many merchants have produced "how to" guides on their websites about purchasing firewood, stating the importance of knowing the volume on offer as well as other specifications such as moisture content and whether it is hard or soft wood. Once more, this is indicative of the modern firewood market being youthful in terms of the level of education of its customer base; many people are not used to using wood for domestic heating and there is a collective effort from merchants to educate the public.

The majority of merchants (90%) specified whether they were selling hardwood or softwood. Out of the 50 websites studied, 45 stated what type of wood was on offer. 28 out 50 merchants (56%) specified the species of wood being sold. 25 of the 50 websites specified the moisture content of firewood. Most merchants simply stated that moisture contents were "less than 30%" or "less than 20%" with some quoting a specific figure. Only 12 of the 50 (24%) referred to the seasoning length of firewood, but as Table 5.3 shows, merchants rarely gave a precise period of time.

References to seasoning length
2 years
8-18 months
>1 summer
>6 months
>12 months
1 summer
1 summer
3 years
1 season
"Many months"
1 summer
13 months in a wood and 6 months in a timber yard

Table 5.3 All 12 references to seasoning lengths from the 50 merchant's websites.

The interviews demonstrated, that overall, a shift towards better quality firewood has occurred with merchants recognising the benefit to their business if the industry as a whole offers customers more information and a better-looking product. Whilst only a minority of merchants have accredited themselves with the UK's only woodfuel assurance scheme, 'Woodsure', the majority recognised the sector is becoming more professionalised, with more information (moisture contents and seasoning lengths) offered at the point of sale. As the British market has developed, many merchants agree that customers are demanding better quality woodfuel. One interviewee said he believed that before the recent growth of the market, end-users put up with poor quality firewood but this is no longer the case.

"The industry will live or die on quality, and price to some extent. If we can't get the quality then people won't choose us and that goes for chips and logs."

[Farmer, forester and woodfuel merchant, 21/02/2014]

One merchant regarded the changes to the sector as being indicative of the growing maturity of the market.

"Users of woodfuel expect increasing levels of quality, particularly in relation to standardised quality. Whereas before, woodfuel was seen as being a little bit quirky and if you didn't get quite the correct specification of woodfuel then you would put up with that. But now customers are becoming much less tolerant of out of spec. fuel. And that's an increasing trend which is a sign of a maturing market. I think customers are becoming more savvy."

[Woodfuel merchant 12, 27/06/2014]

Others recognised that more work is needed to improve confidence in the market.

"What I would like to see and what is beginning to happen is increasing professionalism so that when people buy woodfuel, they know exactly what they're getting."

[Forestry Commission Information Officer, 24/01/2014]

Despite increasing standardisation of product, only a minority of merchants have accredited themselves with 'Woodsure', which requires that firewood contain less than 25% moisture if it is dried naturally (i.e. without the use of a kiln). Of the 50 merchant websites analysed, 15% were accredited suppliers. A variety of reasons were given for the lack of accreditation. The most common being that merchants believed customers were not concerned with the accreditation scheme as long as their wood burns satisfactorily. One merchant said he did not think his customers would know of the accreditation scheme and he therefore decided it was not worth the paperwork and time required to become an accredited supplier. Another admitted he could not guarantee he could produce firewood to the specified 'Woodsure' moisture content.

"Are you accredited with Woodsure?

No no. Our customers know what it's like. I don't need Woodsure, it's a load of rubbish."

[Woodfuel merchant 5, 12/02/2014]

"Personally I don't think many customers are educated enough to know about Woodsure and HETAS. I don't think they're interested as long as it burns and it's good quality. It's a bit like whether your gas comes from British Gas or wherever, as long as it's burning and at the right price then they're not bothered."

[Woodfuel merchant 6, 17/02/2014]

One merchant said he was not a Woodsure-accredited supplier because he would be required to sell smaller logs which his customers do not like. This is surprising given the HETAS scheme allows merchants to produce firewood of up to 52cm in length and 15cm in diameter. His suspicion of the scheme seems to be based on an occasion he purchased HETAS logs from a supplier and received complaints from customers about their size. This merchant therefore focuses on producing logs of the size asked for by his local customers.

"They don't like the slivers, we get more complaints when the logs are smaller. For some reason, people around here [Central Lincolnshire]*, they like a great big tree to throw on the fire! So we tend to produce a larger log as opposed to the smaller ones because that's what our customers seem to be happier with. And I don't think it matters a jot to the customers we're selling to. You know, they never ask if we're HETAS registered, they ask if the wood is dry. How much is it and is it dry?"*

[Farmer, forester and woodfuel merchant, 21/02/2014]

Nonetheless, some merchants have accredited themselves with 'Woodsure' to provide confidence to their customers that their firewood is of higher quality.

"We've tried to go for the quality market through HETAS and Woodsure which has taken off in the country but not the county [Lincolnshire]*."*

[Estate owner and woodfuel merchant, 10/11/2013]

Further comments about the 'opportunists' involved with the market were made in relation to accounts of 'green' or unseasoned firewood being delivered to customers when it is not marketed as such.

"A few customers that I've been to have said that they've had wet wood. I delivered to a new customer last week and she said that she had a load of wood delivered and as soon as they tipped it off, it was all wet through, like it had been out in the rain so it's obviously wet but it's unseasoned as well. So you don't really know what you're getting."

[Woodfuel merchant 6, 17/02/2014]

"There's still plenty of people selling firewood that's relatively green and they'll say "Oh yes, it's seasoned!" and it patently isn't."

[Forestry Commission Information Officer, 24/01/2014]

If selling unseasoned wood, the more reputable merchants honestly market it as such. Some merchants only sell unseasoned woodfuel when they run out of seasoned stock. As many merchants described, this is a common occurrence during periods of peak woodfuel demand. Other merchants supply unseasoned year round but at a discounted price. Some merchants, however, refuse to sell unseasoned woodfuel because customers attempt to burn it before seasoning it themselves, which causes creosote and soot collecting in the wood burner, and further customer complaints.

"We don't sell it if it's wet, we don't sell green logs because people will always try and burn it and it won't burn so we don't sell green wood at all unless it's in the round…it only ever goes out if it's dry enough and if it's not dry enough, well then we'll close the door."

[Farmer, forester and woodfuel merchant, 21/02/2014]

5.9 Summary

This chapter has considered the growth in the markets for firewood and woodchip and how merchants have adapted their businesses in response. Evidence for the growth of the market was explored through merchant's comments about hearing and reading about the rapid uptake of domestic wood burners, which have become an object of fashion for some people, as well as the introduction of the RHI in 2011. Firewood demand appears to have increased a few years earlier in the middle of the 2010s when many tree surgeons were being questioned by the passing public about the destination of their wood. Consequently, many merchants invested in firewood processors and wood chippers as well as trucks with delivery cages. Concerns about a potential lack of timber supply, particularly hardwood, were addressed, with merchants attributing the increasing difficulty of sourcing timber due to a lack of thinning taking place in woods as well as a lack of woods themselves. Some merchants criticised the large-scale use of biomass, like Drax, for increasing the demand for woodfuel. The opposite view that there is a sufficient supply of timber was explored, particularly based on the FC's most recent survey of the country's woods. Equally, the view that there is a large market of waste wood from wood-processing industries, like the pallet manufacturers was taken into account.

Some merchants have attempted to convince end-users to burn more softwood given this is apparently easier to source, and the fact that many Scandinavian-manufactured wood burners are designed for softwood burning. To some extent, merchants regard themselves as 'educators of the public', on the best practice of wood burning and to warn them of the dangers of burning unseasoned wood. The difficulties merchants face in maintaining

sufficient stocks of woodfuel to keep pace with demand has been explored, with reference to the seasonality of the market. These difficulties have prompted many merchants to import their firewood from mainland Europe as well as building home-made kilns, to maintain continuous supplies. This chapter has also considered the networks that exist between merchants, woodland owners and timber suppliers with fragile working relationships in a market where competition for raw timber is high. The backgrounds of merchants have also been examined, where it has been shown that farmers are well-placed to enter the market. A stratification of different 'types' of merchants was proposed, whereby the more entrepreneurial merchants use semi-automated machinery whilst other more 'opportunistic' merchants are willing to spend long hours carrying out manual labour. The chapter concluded with an analysis of the sale of firewood, highlighting the confusion present about whether this should be by volume or weight.

Chapter 6

Woodfuel and Woodland Management

6.1 Introduction

The previous chapters have explored the multi-purpose management of woods in the context of a growing woodfuel market and the ways in which firewood and woodchip merchants operate across the changing market. This chapter builds on these themes with a focus on how the firewood and woodchip markets are encouraging land owners, like the FC, to reconsider their management objectives, with a view to growing wood for energy as opposed to high-value timber. The potential use of coppicing to produce woodfuel is revealed as a topic of much debate within the FC as well as within conservation bodies and communities of craftsmen using coppice products. The role of the forester as a provider of timber, and wood as an energy source, is therefore explored through the interviewee's comments. With growing demand for woodfuel, the competition for the raw material from the arts and crafts markets is also examined. The chapter concludes with an analysis of the degree to which the woodfuel markets are reducing the effects of 'cultural severance' by providing an economic reason to manage unfavourable land.

6.2 Woodland Management for Energy

Historically, the FC's aim has been to plant and grow high quality timber for use in the construction and manufacturing industries. In recent years, however, with the rise of multi-purpose forestry, the FC has diversified its interests and now manages its estate with the aim of maximising the public benefits that its forests provide. The FC has increasingly recognised the importance of forests in providing recreational opportunities and a range of ecosystem services. During interviews with the FC, it was found the organisation is actively exploring woodfuel production as a management objective across parts of its estate. Prior to the recent growth of the UK's woodfuel market, the use of forests to produce firewood, has not been recognised by the FC as an important management objective in its own right. The quote below encapsulates the view amongst some working in the forestry sector that they should be focusing on producing high quality timber as opposed to specific wood products. For many, woodfuel remains a waste product and an aside to traditional forestry and woodland management practices. As such, managing an area of woodland to grow what is considered to be a waste product, let alone a product of high quality, will require a cultural shift in UK forestry and woodland management.

"My whole philosophy is about growing for quality and let the products sort themselves out. Grow for quality and people decide what they're going to use it for. If you grow for a product, you reduce your options and since we're working on such long timescale, how on Earth can we guess what's going to be in demand in 20 years' time, let alone 50, 60, 70 years."

[Forestry Commission Land Manager, 26/06/2014]

This view that the forestry sector should not concern itself with the production of woodfuel was reflected in comments made by a number of people, including end users and foresters. A common view held by those who consider firewood production outside the job specification of foresters and woodland managers is that they should not occupy themselves with growing wood for energy production. Many people would rather see wood turned into products than burnt. For some, the purpose of coppicing is to produce specific products, not to produce woodfuel, which highlights the challenge the market faces; using wood for energy is a waste of a product that could be used for other purposes. The market for coppice products – fencing in particular – is a competitor market to the woodfuel market. Mangers of coppice woodland remain keen to reserve the straight material for the craft markets and only use the bent poles as firewood or woodchip. Even though owners and managers can achieve higher prices for coppice by selling it to woodfuel merchants, they are hesitant because of the perception that it is a waste of a good product.

"Mostly it's fencing and firewood. I've got to admit, even still today, firewood is still the better market. But you are trying to produce coppice for what it's grown for. Nice clean straight material, that's the whole point, it grows straight up like totem poles. Hazel is your stakes, ash, sweet chestnut is your fencing, even oak coppice fencing. But obviously once you've got the bent material, you find it's not very good for that market, so it goes into the woodchip or the firewood market."

[Woodland Consultant 2, 12/05/2014]

"…it's a quality product, you don't want to put it in a biomass boiler!"

[Woodfuel Merchant 1 and hazel hurdler, 06/12/2013]

"We are now harvesting very good quality hardwood timber and it's going for firewood which as a forester is difficult to come to terms with because some of the stuff, you know, I've been here as a forester for 30 years, thinned them and improved the quality over those three decades and now, instead of going into furniture, it's all being burnt. But that's where the money is. I mean, at the end of the day, firewood gets better prices than top quality conifer parcels these days. It's just as it is at the moment."

[Forester 1, 12/03/2014]

Recently, however, the FC appears to be reconsidering its position on growing wood for energy. With the economics such that the FC now makes a profit through coppicing its woods, the organisation is exploring the potential of producing firewood and woodchip from its coppiced woods. Until recently, coppicing was a cost operation and the FC carried it out principally for wildlife and conservation purposes. However, rising firewood and woodchip prices has enabled coppicing to become a commercial activity. This marks a departure from the FC's traditional forestry philosophy and potentially signals the return of coppicing at larger scales. With coppice products being diverted to the firewood market, greater pressure is being placed on artisans and craftsmen on where they source their wood. There is evidence for this already occurring with one forest manager referencing the increasing competition for hazel coppice. Furthermore, the hazel hurdler quoted above believes the form and quality of coppice has improved in response to the improved management taking place in woods across the East Midlands. This is a result of the woodfuel market encouraging owners to carry out more thinnings to produce firewood and woodchip. As such, not only is competition for woodfuel increasing, but the competition for coppice as a craft material is rising concurrently. The hazel hurdler in question has developed a long-standing business relationship with a Wildlife Trust Manager in Nottingham who grants him access to their coppice woods, some of which he believes produce the best quality coppice in the East Midlands.

"The competition is certainly growing. You wouldn't think there's many people about [people making coppice products] *but there's actually good competition to get this hazel."*

[Forest Manager 3, 24/10/2013]

"The quality has got better with the coppice. The figures have gone up too [returns from selling coppice products]. *It's the best in the East Midlands."*

[Woodfuel merchant 1, 06/12/2013]

The practice of coppicing is being looked at particularly favourably in response to a profitable woodfuel market because it improves a woodland's structural diversity whilst yielding a profit. Furthermore, there are no re-planting costs after coppicing which the FC managers said was an important factor. With rising firewood prices, the FC can manage more of its estate, including marginal land on steep slopes with poor soils. The FC managers based in the Central England District said the price per tonne of firewood at the roadside had increased from £3 to £15 in "a few years".

"The increase in firewood prices and demand has allowed us to manage areas that were otherwise not commercially viable to manage so like the sort of low grade broadleaf woodlands on heavy sticky clays on the steep ground people didn't need to work those because they could get as much [timber] *as they wanted down here where it's easy. Whereas now, the demand is such that they can actually cover the working costs and make a profit."*

[Forestry Commission Land Manager, 26/06/2014]

"We can look at our estate and say "now we can manage all of it". The market conditions are such and that's not always been the case".

[Forestry Commission Operations and Planning Manager, 26/06/2014]

The planned changes to the FC's management of its woodlands involve the re-introduction of coppicing across many of its Northamptonshire Woods. The coppicing cycle they will be instigating involves 30 year rotations over 5 hectare coups. Larger forestry vehicles will be used in the newly-coppiced woods which is viewed as necessary to be profitable.

"If we're going to do this economically, you've got to depend on machines now for harvesting…if we put things together into 5 hectare coppice coups then we might get 1000 tonnes [of firewood] *out of that. Straight away, that makes economic sense for somebody to buy…and there's still a margin in there for a profit. A few years ago, there was just no way you could do it".*

[Forestry Commission Land Manager, 26/06/2014]

"You've got to have a significant price for your product to make it worth even extracting and that's where we're at at the moment. There's a differential between the working costs and the re-sale cost that means you can afford to pay for the contract work and haulage and there's still a profit margin in there for the merchant."

[Forestry Commission Operations and Planning Manager, 26/06/2014]

There has been considerable debate within the FC as to whether the re-introduction of coppicing across some of its estate is the right course of action. Commercial coppicing, as opposed to coppicing for nature conservation, is a marked departure from the FC's forestry philosophy. For some in the FC, the shorter timescales of 15-20 years carries risk because it is based on the premise that the woodfuel markets remain buoyant. Clearly, this cannot be guaranteed; the market for woodfuel could be threatened if the price of fossil fuels fall. Other types of renewable heating technologies could be deployed at greater scales which could threaten the woodfuel market. DECC, for example, predicts that heat pumps will come to be used more widely in the renewable heating sector than biomass due to upcoming changes to the energy performance requirements of buildings. Longer term, DECC believes that biomass will be used more widely in local heat networks than in individual biomass boilers (DECC, 2015). Such heat networks are envisaged to supply high energy-using industries.

"We'll be tightening the energy performance of buildings from 2016 onwards and high fabric efficiency buildings don't need high temperature heating systems so increasingly something that is supplied by flame, so gas or biomass will become less competitive compared to lower temperature heating sources like heat pumps."

[DECC Representative, 18/08/2014]

Given these threats to the woodfuel market, and the fact that foresters have traditionally produced timber, some people believe the FC's focus should remain on producing high quality timber which has multiple market outlets. As mentioned by one FC manager, veneer quality oak burns equally as well as low grade oak, but it can be worked more easily if required. However, there is the risk of the FC failing to capitalise on the growth of the firewood market if it does not make woodfuel production one of its management objectives. With the FC beginning to focus on woodfuel production, it is difficult to claim that the forestry sector is in a post-productivist era.

"It is, in my view, folly to plant and manage a crop for between 40 and 150 years to grow a product. Much better to grow trees which will produce quality timber and allow the markets in generations to come how best to use, and value it. If we grow crap and the fuelwood market evaporates we have nowhere else to go."

[Forestry Commission Land Manager, 26/06/2014]

Initially the interviewees claimed the decision to re-introduce coppicing across the Central England Division was carried out using cost-benefit analysis which demonstrated that coppicing was a better investment opportunity than growing timber on poor quality land.

Growing timber on such unfavourable land has been increasingly questioned by the FC and, with public money financing its activities, the interviewees expressed their responsibility to invest in management practices which deliver the greatest returns, calculated using cost-benefit analysis. However, one of the interviewees admitted their decisions are ultimately subjective, with an assessment of the growing woodfuel markets.

"*In practice there is a long timescale between investment and return and much can change and so forestry has always been practiced by altruists who use educated guesses about the future to inform their plans much more than concepts like market analysis."*

[Forestry Commission Land Manager, 26/06/2014]

The interviewee who made the above comment had initially been dubious of the change in policy towards coppicing, as demonstrated by his earlier comments regarding managing woodland to produce a particular product like woodfuel. At the start of the interview, he argued against the increasing use of coppicing, due to the risk of the collapse of the woodfuel market. It appeared that the negative connotations associated with SRC energy crops, such as willow (*Salix spp*.) and poplar (*Populus spp.)* have contributed to the lack of enthusiasm for using coppice products as a source of energy. Kerr (2011), wrote a report for the FC in which he criticised these SRC species for not being suitable for firewood for a variety of reasons including their low density, their high moisture contents and the need for specialist machinery for harvesting. It was for these reasons that Kerr (2011) explores the potential of Short Rotation Forestry (SRF) practices to produce woodfuel, but even this was met with scepticism due to a lack of reliable growth data and the intensive management style of management.

The process of being interviewed about the change in the FC's strategy to introduce more coppicing re-shaped the interviewee's thinking. As the two managers debated the merits of commercial coppicing, they became more confident about its use, recognising that they would be making money from unfavourable land which currently provides no return.

"We're getting money from those woods where we wouldn't do otherwise if we weren't doing it for firewood. So actually thinking about it, we're not taking a risk at all. The only risk is that in 30 years time, there might not be a market for it but if there's no market for it, we're not in any different position to where we are now in that we've got a lot of low grade broadleaf. We stand to lose nothing, we're potentially gaining quite a bit more for the future. We're aiming for quality timber production and if in 150 years' time somebody wants to burn that on their wood burner then it's not for us to say they can or can't is it?"

[Forestry Commission Land Manager, 26/06/2014]

The expanding woodfuel markets have also prompted private owners to manage neglected coppice woods. One forestry consultant described that wood cut from a first thinning operation used to be considered a waste product, but is now being used as woodchip in the thousands of RHI-funded biomass boilers being installed. The woodfuel markets are also encouraging the removal of 'non-native' species.

"If we're re-instating it back to coppice, the first cycle which would normally be cut to waste, we put into the woodchip because it's got to be cleared. We've got to get the arisings off the ground to let the light in….What we're finding now is most of the estates are for internal use but we've got a few now where we're thinning, removing non-natives, doing all the traditional forestry practises and, again when it was just normally cut to waste, it was almost cut at a cost or even a loss, we now know that that goes into woodchip so that reassures the owner and me as the manager that we are producing a material that's sellable which is great."

[Forestry Consultant 2, 12/05/2014]

Regarding the size of coppice coups, the two FC managers disagreed with one another. One manager wants 10 hectare coups whilst the other wants 5 hectares. Other colleagues had evidently argued for larger coups, believing this would maximise the potential environmental gains to be made by diversifying a woodland's structure. The Central England Division chose 5 hectare coups which they believe will be easier to protect from deer and rabbit browsing.

"I just consider we've got to be able to manage it as well and we've got to assure ourselves that we can protect these areas so that we do get the regeneration of coppice back up because it would not be good if we ended up with 10 hectares that we don't protect and it doesn't happen and that's quite a big punt whereas I think that 5 hectares is a manageable area."

[Forestry Commission Operations and Planning Manager, 26/06/2014]

Salcey Forest is an example of an FC-owned lowland site where 'traditional' silvicultural practices, like coppicing, have been re-introduced. The predominantly oak-ash-hazel forest is 6 miles south-east of Northampton and covers 500 hectares. The FC has raised income by selling small diameter coppice material, much of which has been used as firewood and some for crafts (see FC, 2013). Partly owned by the Wildlife Trust, Salcey Forest is as an ancient woodland site, areas of which have been planted with conifers following the Second World War. In recent years, the forest has been subject to an ongoing PAWS restoration project. In Medieval times, Salcey was a royal hunting forest and the typical woodland

management practices as described by Bussell (1997) would have been applied. These included a mixture of coppicing and pollarding interspersed with enclosed areas with higher vegetation to provide shelter and fodder for deer. Re-introducing these practices is often described as using the CCF approach which has become more popular across the UK's forestry sector. One reason for this being the reduced re-planting costs but also the extra income to be had from carrying out more thinnings to produce firewood.

As has been the case for the majority of lowland woods across Britain, the demand for small diameter poles fell during the 20th Century but the firewood and woodchip markets are creating a demand for such material once again. Increasing the use of CCF has been one of the FC's objectives in Salcey Forest and the woodfuel market has created a demand for small diameter poles enabling this to happen. In some parts of the forest, group selection fellings of 150 year old oak have taken place to increase the area for "productive coppice regrowth" (FC, 2013: 3), highlighting the need for a sufficiently large area of coppice to make it economic to manage. Such group fellings of oak standards with a view to converting to coppice management represents a significant change in the FC's philosophy and demonstrates the impact of the woodfuel market on forestry practice (see Figure 6.1). Despite the increased costs of carrying out what the FC describes as more "sensitive silvicultural working", the intention is that coppice-with-standards will become the dominant management system in Salcey Forest. As the following photographs demonstrate, the effect of the new management regime will produce a more open forest structure.



Figure 6.1 The coppice-with-standards structure the FC is aiming for, Salcey Forest. Note the greater spacing between the oaks with more developed coppice beneath. Source: (FC, 2013).



Figure 6.2 Oak timber following the thinning of high forest as part of the conversion to coppice-with-standards. Source: (FC, 2013).



Figure 6.3 Mid-rotation oak standards with recently cut coppice, Salcey Forest. Source: (FC, 2013).



Figure 6.4 Mature oak standards being thinned to allow for coppice re-growth, Salcey Forest. (Source: FC, 2013).

Despite the FC's efforts to increase woodfuel production from its own woods, one merchant who works primarily in smaller, often ancient woods, criticised the FC for failing to adapt quickly enough in response to the demand for woodfuel. He believes the FC should be planting and designing new woods with woodfuel production high on their list of management objectives. This would allow him and others to manage the country's existing broadleaf woods for conservation purposes. He views himself more as a conservationist than a woodfuel merchant and believes the FC should be focussed on actively developing the country's woodfuel supply chains. At present, he welcomes the income the woodfuel markets provide him with but is concerned the demand for woodfuel will lead to unsustainable harvesting from lowland broadleaf woods. For him, the FC is overly concerned with growing good quality pine timber which he attributes to its history as the nation's timber supplier. Woodfuel production, according to this merchant, should be carried

out at larger scales where large machines can be used without the risk of damaging existing ancient and semi-natural woodland. He sources much of his woodfuel (which he sells as firewood) from smaller woods and therefore uses smaller forwarders to limit the soil compaction taking place.

"They [the FC] *don't want to plant woodfuel forests so what they're saying* [to us] *is get into the woods and manage them. That's a cop-out. We should be managing these for conservation, we shouldn't be managing them for anything but. These little pockets of woodland that we've got left, these are seedbanks, these are special sites and that's why I'm managing with that little machine because I know what I'm after. If you were doing this for woodfuel you would have a wacking great machine that gobbled it all up and that's the way it will have to be but these little woods that are left shouldn't really be raped like that. We're not doing that but we would have to if the Forestry Commission get their way and these produce the woodfuel for Britain. We need to be planting millions of acres under trees and the Forestry Commission should be doing it but their cop-out is that they're foresters and they'll keep growing their pine and let silly little buggers like me go and produce the woodfuel. Which I'm quite glad to have the opportunity. But that's the truth, it needs to happen on a massive scale and these aren't massive."*

[Woodfuel Merchant 11, 16/03/2014]

The photographs below demonstrate the difference in size between two machines used for harvesting and extracting operations at different scales.





Figure 6.5 (on left) An *Alstor* forwarder being used to extract birch and ash standards from a 65 hectare, Wildlife Trust-owned Nottinghamshire Wood. Trees were being felled with chainsaws before being moved with the forwarder shown. The cost of such a machine is approximately £35,000. Author's photograph [Taken: 17/2/14].

Figure 6.6 (on right) A *Valmet* harvester being used on a 1,200 hectare, National Trust-owned, Dudmaston estate in Shropshire. This costs approximately £300,000. Author's photograph [Taken: 12/2/14].

Both machines are owned by merchants operating at different scales, with the owner of the small forwarder explaining he makes all attempts to reduce his impact on the soil. He had already delayed working in the wood where the interview took place to limit time impact of the forwarder's tyres on the soil (Figure 6.7). The owner of this forwarder has no desire to use a large harvester like the one in Figure 6.6 which he described as "*too big and too ugly"*. The same merchant had earlier referred to the need to treat ancient woods as seedbanks which need protecting from over-harvesting for woodfuel.





Figure 6.7 (on left) The tyre tracks left by the small forwarder following wet weather. Work had already been delayed to minimise the damage to the soil. Gamston Wood: A Wildlife Trust-owned site in North Nottingham. Author's photograph [Taken 17/2/14].

Figure 6.8 (on right) A coppice-with-standards system being applied to the wood. Ash and oak standards have been left with some pines in the distance. Author's photograph [Taken 17/2/14].

One merchant who works on ancient woodland and Wildlife Trust-owned sites expressed his fear that he will be increasingly out-competed for work by merchants using large harvesters. As the woodfuel sector continues to expand, he believes that even conservation charities will hire merchants who use large harvesters.

"The Wildlife Trust, the people above the managers in the woods have got to pay their bills and they've got to pay their staff and they've got to pay for their nice offices and when somebody comes along and says "right, we need 100 acres of your wood this winter that we're going to produce chip for local offices and factories and we're going to pay you £200 a tonne for that". Well, we're [small-scale merchants] *out of the picture, forget it. We can't do it. And they* [the large-scale merchants] *can come in here with a big harvester and they will take this out in a fraction of the time and it will be very good, wonderful, but we've gone, the local little producers."*

[Woodfuel merchant 6, 17/02/2014]

For some firewood merchants, the growing number of RHI-subsidised, woodchip-using biomass boilers threatens their businesses because the scheme does not subsidise the use of firewood.

"That's the danger of grant money, it doesn't create real markets. The Renewable Heat Incentive is going to stuff us big style. It's not about logs. It's obvious it should be logs. It will be the downfall of people like us because we will now have to sell the fuel that we produce here to somebody who can them process it into chip. That takes the power from us because I deal directly with my customers and that will remove that, unless I invest in huge amounts of equipment and storage and transportation systems for chip or pellet. Every village should have a woodland, there could be a couple of men who provide the whole of the energy requirements for that village."

[Woodfuel merchant 11, 16/03/2014]

One forestry consultant referred directly to his profession's fondness for growing trees which will offer the highest value, rather than producing specific products of lower value, like firewood. For him, however, coppicing is a useful management practice to produce woodfuel because of the shorter rotations involved and the predictable volumes of wood produced. Indeed, he was in the process of encouraging a client to use coppicing to produce woodchip as part of a local district heating project. Nonetheless, the cost of protecting coppice re-growth from browsing animals was, once again, referred to as a drawback.

"Traditional foresters like me have always thought that any system that perpetuates a production of pretty much the lowest grade timber is rather unambitious because you're better using a system that produces higher value logs. As a profession, we're more inclined to say "we know we'd like to do good-sized logs and therefore we'll overcome the problems of handling by having big machines". It's shifted a bit because the gain of coppicing is that it is a relatively short rotation, and time is everything. It's one of the burdens of the forest. You have to wait so long to get your money back."

[Forestry Consultant 3, 18/08/14]

Another interviewee believed the forestry sector, as a whole, is reluctant to change its practices and that following a clearfell, large landowners are unlikely to take woodfuel production into consideration because they remain principally concerned with saw logs, highlighting that productivism remains a priority for some owners.

"When, say the Forestry Commission or bigger owners plant after a clearfell, whether they're influenced by the woodfuel market, not very much because I suspect when they plant they think it will all go to saw logs. It's a very conservative industry. Slightly reactionary. And it's very much driven by fashion and I don't think yet woodfuel has changed much the fashions in planting but I might be wrong."

[MD of a company selling woodland, 08/01/2014]

Coppicing is the preferred method of producing more woodfuel for many people because it produces a rapid volume of biomass and habitat diversity. The head forester of a large estate with over 1500 hectares of woodland argued the case for coppicing for woodfuel production given its rapid rate of growth. He also criticised successive governments for continually changing forestry policy which has caused a lack of focus on woodland management for woodfuel production.

"It gets managed bitty, all the bloody governments can't get their act together, they should just leave us to get on with it really. We need to plant more woodlands and we need to do more coppicing…quick rotation coppicing is a useful way to supply biomass. The ideal is continuous cover forestry."

[Forest Manager 7, 10/06/14]

The desire to plant and manage more woodland as coppice was made by a number of interviewees. Harmer (1995), writing in an FC-produced publication about coppicing, predicted that coppice management would become more popular in the UK based on the growing movement for community forestry and public involvement with their management. He wrote that an interest in wildlife and the "potential to yield produce for local use" (Harmer, 1995:1) would promote the creation of new areas of mixed coppice. In 1995, there was limited evidence to suggest the woodfuel market would become the size it has; the author noted that willow and poplar were being used as short rotation energy crops but no reference was made to the woodchip and firewood markets. As such, Harmer (1995) presumed the demand for coppicing would come predominantly from community engagement and wildlife interest and not from woodfuel demand. Whilst wildlife conservation is certainly one of the main drivers for coppicing, it is the income from woodfuel which seems to be prompting the practice to be used. It is due to this market demand that coppicing can be carried out for profit than at a cost. As explored in Section 4.4, Chapter 4, many conservation bodies are now using the woodfuel markets to supplement their income. The benefit that many conservation bodies have is that they can rely on volunteers to carry out some of their management. As one forester explained, one of the reasons that coppicing

has been used by the conservation movement is because it is easily carried out by volunteers and cheap. The benefit for conservation bodies is that they are now yielding higher prices for their coppice.

"Coppicing has been enjoyed by the conservation organisations but one of the reasons for that has been that it's an easy system without bringing in expensive machinery and so they adopted a system that they can do."

[Forestry Consultant 3, 18/08/14]

6.3 Woodland Woodfuel Case Study

"What we need is not so much a woodland management plan as a woodland business plan."

One small woodland owner with a 30 hectare wood described his plans to construct a woodchip-fed district heating scheme to supply heat to a number of residential properties in the village of Binton, Warwickshire. The owner had already been granted planning permission and was eligible for RHI payments through the Commercial RHI scheme. The owner has been selling firewood for a number of years. However, with a view to selling an engineering business he owns, the owner had been seeking ways for his wood to provide more income during his retirement. He and his woodland manager believe the wood is not reaching its productive potential because it is not regularly thinned. The district heating scheme, therefore, provides an outlet for material at the same time as it raises income.

"There's no doubt, the market says this is needed, absolutely no doubt about that. We've got 80 acres of woodland here and it's under-performing, it's just being used for selling a few logs around and it could be turned into a reasonably rapid cycle biomass supplier."

The heating project would involve first installing a smaller biomass boiler to heat his own property and three of his neighbours. The success of this, he believes, would encourage others in the nearby village of Binton to buy heat from him. It is marketing the project which the owner regards as particularly challenging, rather than the management and engineering logistics; he fears people will be unwilling to sign a contract to source heat from a biomass boiler, something they are unfamiliar with. The residents of Binton are not connected to a gas grid and typically heat their homes with oil or liquid gas and he believes switching to a biomass-fed heating system, a seemingly new type of technology, may be a considerable hurdle for many. He compared the situation with the Czech Republic where he described towns which make great use of wood for heating, out of which has developed an intrinsic wood culture and acceptance of the co-operative model.

"I go to the Czech Republic a lot and the whole infrastructure of a town is built around wood heating. We would have it built around a village green, it's built around the market square. And the market square isn't a market square, it's the woodland heath market and it's got a central boiler which supplies everything around on district heating, you can buy cord wood, you can buy chips, you can buy everything there. The local farmers or foresters drag in their timber, they sell it and the central organisation which is owned as a sort of co-operative by everybody turns it to whatever is required for the heating."

The owner's plan is to install a biomass boiler either in the wood, or in a field adjacent to it. A 4" underground pipe would transfer hot air to the houses where it would enter a heat

exchanger to provide their central heating. The owner has calculated that he needs a minimum of six home owners to purchase heat to make the business financially viable. He has also calculated that his wood can supply 20 average-sized properties using just the wood's annual increment. If more homeowners were to sign onto the scheme, then he would look to his woodland-owning neighbours – one of whom is the FC – to purchase material from their wood or establish a co-operative.

"*Imagine that we did 50, 60 houses in the village of Binton, suddenly the market forces you to pull it all together. There's no way that we could feed it all with the wood here and so the very obvious thing would be to go to* [his neighbour] *and say we need chips out of your wood. The total acreage we could put together within 5 miles is quite a lot."*

The last comment about the need to source biomass from multiple woodland owners is interesting given previous comments made by the owner of the company which splits woods up. The management model put forward by him and his company deliberately encourages woodland to be managed in smaller blocks, which they argue means more woods gets managed by a diverse group of owners. However, district heating scheme being proposed for Binton demonstrates the challenges of such a model of woodland ownership. The logistical and financial challenges associated with establishing a district heating scheme fed by multiple owners would likely be too great for many unless the infrastructure is already in place. As the interviewee points out, people such as him need to demonstrate to others that wood heating systems in villages such as Binton can work before they are adopted more widely. He views himself as a pioneer in this regard and, like others, believes the FC could take a more active role to help him realise the project. At present, he believes he is needing to "work the system" rather than the grant system supporting his plans. Whilst he has no plans to clearfell, he is considering writing this into the management plan so that there is no doubt from the FC's perspective that there will be a sufficient volume of timber to supply the boiler.

"The earlier adopters have to persuade people of what's required and I think we've got a powerful argument here for doing that. We've got a wonderful story for the Forestry Commission. They can even use me as a sort of poster boy for the process, and come on, we need a bit of help here because we've got to get it efficiently managed."

To maximise the volume of woodchip he harvests, the owner will gather as much fine branchwood material as possible. Typically, a large volume of branchwood is left in the wood as it breaks off from larger logs during transport through the wood. Therefore, the owner intends to bring his chipper to the felling site where whole trees, including the finer branchwood, will be chipped into a trailer. Moving the heavy chipper and a trailer load of

woodchips necessitates that a better quality road is built through the wood and the owner believes it is of such importance to minimise the loss of biomass that he is willing to pay for this if the FC do not provide a grant. Stokes and Watson (1991), in a study on different harvesting operations, found that an average of 16% of a whole tree's biomass (including all branchwood, tops and stumps) is lost through breakage as it is felled and dragged through a wood for processing. This figure indicates why an owner interested in maximising biomass production is concerned about woody debris being left on the ground.

"*You really want to chip as you fell because you get much more material because all the little side shoots just drop off otherwise. Now you may argue that that's where the nutrients are. That, I don't know but for the business of biomass, we need to chip and we need to bring the chipper to the felling area. I've got to have a roadway so we can frequently, anytime we want, get the chipper and take a trailer load away."*

The owner's comments indicate he is aware there is potential that a more intensive removal of fine branchwood material could adversely affect nutrient availability. Theoretically, removing a greater volume of biomass from a wood and leaving less to decompose would reduce the soil's nutrient availability. However, whilst the tips of fine shoots, twigs and roots are more nutrient-rich than the rest of a tree (Hemery and Simblet, 2014), previous research on the topic of biomass harvesting and nutrient loss appears inconclusive. This is partly the result of the broad range of factors which influence a soil's nutrient content, including the specific site conditions and tree species present. Hart (1991) notes that broadleaf woods are unlikely to suffer from nutrient deficiencies, though sites with a long history of coppicing may have lower amounts of phosphate. Equally, Lewandowski *et al*. (2016), in an experiment on aspen (*Populus tremuloides*), found that soil nutrient availability did not change as the intensity of biomass removal increased. As such, further research is required to determine the impact that more intensive biomass removal has on a woodland's nutrient cycle.

The owner views himself in competition with woodfuel merchants who import wood from Europe. Understandably, he wants to produce woodchip more cheaply than it costs to import them. The following quote reveals an interesting insight into how the owner views his wood and the success of his proposed district heating scheme. He vehemently believes in the need for efficiency to render the project a financial success. No other owners emphasised the need for such efficiency in the way their woods are managed. Interestingly, his words also reveal he would not describe a wood as "used" unless it is managed for economic gain. These comments are perhaps unsurprising given his entrepreneurial spirit and background in starting and running an engineering business.

"You've got to be able to do it economically. You know, it's no good saying "we could get a horse in here", it's all very lovely. Don't talk to me about horses! The point is you're never going to use this wood unless you can get the material to roadside cheaper than you can bring it in from Poland. Because the point is obvious isn't it? You're going green! We're bringing in the wood from Poland or something, how nuts is that? I mean we need this so it can happen close by very efficiently so it can compete with wood coming in from Poland or the Czech Republic or whatever. And everybody feels better about it."

6.4 Woodfuel Production and Wood Culture in the United Kingdom

With woodfuel growing in popularity in the UK and greater areas of woodland being managed as a result, the question of how people are learning (or re-learning) and sharing the skills of managing woodland and the merits of different types of tree species for woodfuel is an interesting topic. Despite the apparent simplicity of seasoning wood and lighting fires, the comments from merchants in the previous chapter demonstrate that there are many customers who struggle, particularly with controlling a wood burner's oxygen intake, and there is much debate about the best types of wood to burn. As one merchant described, the UK has lacked a 'wood culture' for some time.

"We need to re-learn the skills. We need to get back to a woodland culture, a forestry culture."

[Woodfuel merchant 11, 16/03/2014]

There is much non-academic literature available on the internet about the benefits of different types of wood and there are many internet forums where merchants and users discuss the quality of different woods and seasoning requirements. Although some argue the species of wood is irrelevant and it is the manner of burning which is important, there is clearly an active and on-going debate amongst merchants and users regarding the best species to use as firewood and woodchip. Some people use the internet and books to learn about burning woodfuel. Indeed, a number of recently written books on the subject of woodland management and woodfuel include chapters about the qualities of different species. See for example, Lars Mytting's *Norwegian Wood: Chopping, Stacking and Drying Wood the Scandinavian Way* (2015); Vicent Thurkettle's *The Wood Fire Handbook: The Complete Guide to A Perfect Fire* (2012); Dirk Thomas' *The Woodburner's Companion: From the Lore of an Ancient Art to the Science of 21st Century Woodburning Technology* (2006); and John Butterworth's *Woodburning: The Greener Way to Fuel your Home* (2010).

Other than the internet and books, users learn from experience and making mistakes and speaking to merchants and other users. There is, therefore, a sense of collective (re-)learning taking place in the UK about woodfuel and woodland management.

Despite the many opinions about different types of wood having different energy outputs, all wood, regardless of its species, releases the same amount of heat energy, per unit weight. This is the case for hardwoods and softwoods and is based on experimental evidence conducted by Matthews and Mackie (2006). Whilst hardwoods are denser, and therefore release more energy per unit volume, the same weight of softwood with the same moisture content will release approximately the same amount of energy. Mytting (2015) writes that all wood species provide approximately 5.32 kWh per kilogram of completely dry wood and the FC (2009:1) notes that the calorific value between species is “extremely small” when they have the same moisture contents. Matthews and Mackie (2006) calculated the number of kWh per dry tonne of wood, demonstrating that different species release approximately the same amount of energy (Figure 6.9).

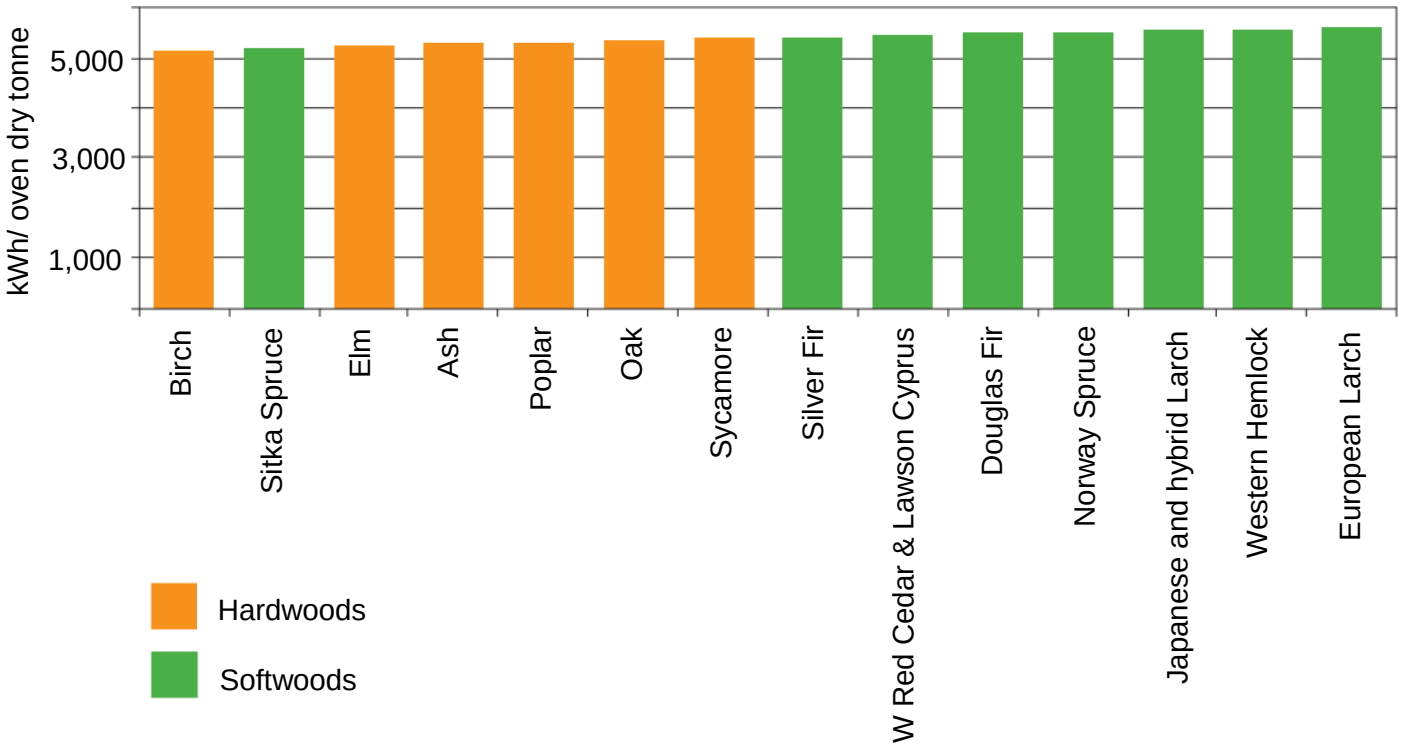


Figure 6.9 The calorific value, by species, of different woods. Soft and hardwoods release broadly the same amount of energy per oven dry tonne. Source: Matthews and Mackie, (2006).

What appears to be causing confusion about which species are the best woodfuels is that some have lower natural moisture contents when felled (ash being the best known for this), therefore requiring less seasoning. Furthermore, because wood is generally sold by volume, a bag of hardwood contains more energy than a bag of softwood; the reason why merchants charge more for hardwood. Some firewood users mix unseasoned logs with seasoned, which they believe produces a longer burn. The different approaches to buying, splitting and burning wood has thus led to much debate about which woods are preferable.

Based on a number of the interviewee's comments, it appears there is a flow of knowledge and technology about wood burning from mainland Europe, which in part reflects there being more of a 'woodfuel culture' in Europe than the UK. A number of interviewees referred to European-manufactured technology as well as woodland management and seasoning practices they had adopted from the continent. These range from the installation of specialised woodchip boiler technology to the purchase of tarpaulins to protect wood piles from the rain. The fact one UK-based forest manager resorted to purchasing a water-resistant cover from Austria, rather than sourcing it from the UK, demonstrates the lack of seemingly simple pieces of equipment for woodfuel processing in the UK.

"We have taken the best practice from the mainland of Europe, we've taken the learning which they have built up, quite frankly over centuries, in designing flu systems to run biomass fired heating systems."

[Technical Advisor on Biomass Heating Systems, 18/08/2014]

"The heat networks, which have obviously been a very big industry in Europe for some time, in the UK, have been relatively small and we see quite a bit of potential there."

[DECC Representative, 18/08/2014]

"W*ood burning stoves. Who developed them? Where do they come from normally? Scandinavia! What do the Scandinavians burn? Softwood! If I can get all my customers onto softwood then we'll be doing great."*

[Woodfuel Merchant 10, 13/12/2014]

"We cut them a metre long, split and stack. We follow a bit of the Scandinavian way because they've been doing it a hell of a lot longer than we have."

[Farmer 2, 13/05/2014]

"The problem with having a stack like this it was getting soaking wet and it was reabsorbing water. It's a bit like blotting paper. This membrane came from Austria. We're finding it works well because you don't get that damp fungus growing conditions."

[Forest Manager 7, 10/06/14]



Figure 6.10 The Austrian-purchased 'membrane' referred to above used to protect drying logs from the rain. Author's photograph. [Taken 10/06/14].

Interestingly, a similar flow of technology from Europe to the UK occurred with respect to pieces of large forestry equipment in the 1990s. The UK is now in a position where it manufacturers its own harvesters, rather importing them from Europe. With merchants currently describing the wide-spread use of Scandinavian-built wood burners, a similar trend may occur in this market. As one supplier of harvesters in the UK notes:

"The early days were spent importing good second hand machines sourced in Scandinavia and brought to the UK for refurbishment prior to delivery…The late 90's noticed a big change in the UK forests with good used machines starting to appear which allowed our market to become more or less self-sufficient. Recent years have seen increased export of many machines from the UK back into not just Scandinavia but most other European countries as well."

[A harvesting manufacturer's website: Jas P Wilson (2016)]

A number of woodfuel users commented on their enjoyment of burning wood, derived from watching the flames, light and smells produced, the warmth they provide and a sense of being connected to nature. Modern wood burning, using firewood in particular, is an activity which people generally enjoy doing, despite the work involved. The following quotes reflect the same attitudes to wood burning which Mytting (2015) vividly describes in Scandinavia in his book exploring the culture of wood burning.

"You literally are bringing the sunshine into your house in the winter and so many people say I would rather sit and watch my fire than the telly. The mess aside, the fact you're having to cart wood in, there's a feel good factor. They'd rather do that than go out drinking, smoking or whatever their vices are."

[Famer 3]

"What heat it chucks out! Because this is a jolly cold house. You walk into this room where it's not centrally heated and it's a lovely heat, it's a weird heat. I don't know what it is."

[Small Woodland Owner 5, 28/01/2014]

"We don't really have the heating on in the evening. We just use the log burner. We do have central heating. We put that on in the morning because it comes on automatically and warms the house up. The wood's a significant helper from our point of view because it's halved our heating bill at least."

[Small woodland owner 3, 10/08/2014]

To some extent, people are still learning about the logistics and operation of woodchip boilers. A number of people commented that they had built their woodchip hoppers too far from the boiler which meant extra, unnecessary, handling was required. Some experienced foresters had mis-calculated the volumes of timber required to supply biomass boilers.

"When we first got the boiler, we did some maths and went out thinning like men possessed and we produced a stack that actually lasted about 5 years and it was spruce. And we found that after about year 3, there was so much rot in the stack that it was basically wasted. We were putting it in the chipper and there was just dust coming out the other end. So we work on about 3 years' ahead."

[Forest Manger 5]

One woodland estate owner chose to buy woodchip during the first year of using his boiler because he lacked the ability to self-supply using his own timber. Many merchants commented on their customers' lack of knowledge about seasoning and burning wood but noted that they are being asked more questions about its quality. One interviewee commented on the growing use of moisture meters to test logs.

"A lot of people now are buying moisture meters and I think that's because they've had bad experiences, because, you get a bit of nice stuff on top of a load and the stuff inside is wet old spruce. There is a developing understanding amongst the residential customers for firewood."

[Forestry Commission Land Manager, 26/06/2014]

Previous studies have explored societies' use of firewood based on peoples' local knowledge of tree species and their heating properties. Ramos *et al*. (2008) highlights that denser wood which naturally have lower moisture contents are preferentially harvested as firewood by communities in North Eastern Brazil. The same is true in the UK where many woodfuel merchants commented on the desire for more hardwood species. There is a great amount of literature on the internet and in books concerning the quality of different species of firewood. The different burning properties of wood have also become ingrained in folklore, principally driven by Lady Celia Congreve's *The Firewood Poem*, published in The Times newspaper in 1930 (the full poem is found on page 307). This poem is routinely referred to by people on internet discussion forums and was raised by a number of interviewees. Many people commented on their surprise at the difficulty they have faced with burning a particular species of wood. To counter this, some people mix 'fast' and 'slow' burning species for greater control over their stove's heat output. Whilst many people argue that unseasoned wood should not be burnt at all, others burn freshly felled, 'green' firewood, to lengthen the burn time.

"I find it fascinating taking the logs out of the wood and learning how to use them to get the best out of a fire. Because actually, I use a lot of very wet wood because it burns slowly and, you can up the flame, give it some draught and get a really good long burn out of a log, whereas with the dry stuff, woof and it's gone."

[Small Woodland Owner 5, 28/01/2014]

The science underlying the burning of wood has often been overshadowed by peoples' perceptions and experience. As Bushway (1992) notes, wood burning is as much an art as it is a science. The conversations and debates regarding the merits of different species is indicative of its greater use.

There are many websites – produced by merchants and forest consultancies – with information for end-users about the quality of different types of wood for burning. These websites share information including the speed at which wood burns, how easy it is to split, how long species should be seasoned for and the amount the wood 'spits' when burnt. The following table has been extracted from one such website as an example.

Species	Burning Speed	Comments
Ash	Good	Low moisture content when green - little seasoning needed
Beech	Good	Season for a year; excellent deadwood species
Hornbeam	Good	Season for a year; more common in southern Britain
Hawthorn	Good	Season for a year; thorns make handling more difficult
Crab apple	Good	Gives off pleasant smell - useful for cooking
Oak	Good	Season for a year; excellent for keeping fire lit overnight
Field maple	Good	Season for a year; grows better on more fertile soils
Elm	Good	Season for a year but often found dead and ready to burn
Hazel	Good	Good coppice species; important for wildlife conservation
Birch	Fast	Burn with slow burners such as wild cherry
Wild cherry	Slow	Burn with fast burners such as birch; pleasant smell
Blackthorn	Slow	Season for a year; burn with fast burners such as birch
Rowan	Slow	Burn with fast burners such as birch; attractive berries
Holly	Slow	Burn with fast burners such as birch and alder
Alder	Fast	Burn with slow burners such as wild cherry
Poplars	Fast	High moisture content - season for a year
Willows	Fast	High moisture content - season for a year
Lime	Slow	Good coppice species; burn with fast burners such as birch
Rhododendron	Good	Very invasive non-native species on acidic soils - eradicate
Sycamore	Fast	Invasive in ancient woodlands - eradicate
Sweet chestnut	Fast	Not invasive but gradually remove and replace with hazel
Conifers	Fast	Season for a year - pine, spruce,Douglas fir, larch burn slower.

Table 6.1 The burning qualities of different woods. This information was produced by a business which offers woodland management guidance for owners across the Midlands. Source: Native Forestry (2013).

Interviewees found the topic of wood burning to be engaging, with many describing their preferred and least preferred species. One forester criticised aspen (*Populus tremula*) for failing to burn. This is interesting given Hemery (2014) suggests that aspen could be considered as a potential biomass short rotation energy crop because of its rapid growth. Furthermore, John Evelyn, in a 1665 book on trees, wrote: "of the Aspen our woodsmen make Hoops, Fire-wood and Coals". Despite the following interviewee's dislike of aspen as a firewood, it has been used as one for centuries.

"I tried burning some [aspen] *the other day and it put the fire out. It was bone, bone dry, completely cracked to pieces but it was like a heat retardant material. I always thought if you got anything dry enough it would burn. But we had a piece in a nice stove at 7pm and it was still there at half 10 at night. And normally, that stove would get through something like that in a few minutes. Aspen is a species that I'd be looking at eradicating because it's more or less useless. A terrible, terrible firewood."*

[Forest Manager 3, 24/10/2013]

Another interviewee held a similar sentiment for elm (*Ulmus procera*). This is despite it being described as 'good' by Native Forestry (2013) as Table 6.1 shows. However, it receives criticism by Lady Celia Congreve in her *Firewood Poem*:

Elm wood burns like churchyard mould,
E'en the very flames are cold

Esoteric advice about cutting, splitting and burning firewood is being shared by people on the internet. One topic of conversation was about the best time of year and weather conditions in which to split different species and their seasoning lengths. The following quotes come from an internet discussion forum (The ForestryForum.com) in response to a question about elm as a firewood. The responses offer practical advice about splitting elm and a critique of its burning properties, highlighting the type of knowledge currently being shared and, in some instances, 're-learnt'.

User 1: *My brother in law has asked me to help remove a huge dead elm…Does elm burn well? If so, it should finish out my firewood need for the season and I can start on getting wood to sell. I have never burned elm and don't know if it is worthwhile or not. Seems like I remember hearing somewhere elm is stringy and hard to split. Is that true?*

User 2: *"Elms makes okay firewood, not the best but definitely worth the effort. Doesn't split at all hardly without a splitter, no problem with one. Keep it dry, soaks up water…and will rot quick when wet. Doesn't smell very good either."*

User 3: *"I used to burn a lot of Elm, it's not that bad. It splits best if you work around the outsides [on big chunks] first. Also splits better when it's bitter cold, doesn't seem as stringy then."*

User 4: *"As firewood it was okay, not as much heat value as oak or maple but for free you couldn't beat the price and most people wouldn't mess with it because they didn't know how to split the stuff."*

[A conversation between users of ForestryForum.com. Date: 08/11/05]

One farmer believes dead elm is a particularly poor firewood. This is in contrast to a woodland owner who looks forward to harvesting her elm trees, believing it to be an excellent firewood.

"Elm is terrible. Elm can be horrible, especially if you cut down a dead elm tree, it can be a real pig to burn. We've had some and it's been murder. It's like iron to split and it will not burn, it seems to have lost its nature, lost the carbon out of it for some reason."

[Farmer 2, 13/05/2014]

"These are all elm sucklings. It's ready for burning and it's just fantastic and easy. Those I have my eye on because it's all stored dead wood so you can go in and cut it down easily."

[Small Woodland Owner 5, 28/01/2014]

In *The Wood Fire Handbook*, Thurkettle (2012:44) classes elm as an excellent firewood, remarking: "It is an absolute puzzle to me why this wood is so ridiculed in poems pertaining to advice on the best woods to burn…I would have my woodshed full of it if I could find enough".

One firewood user commented on the inaccuracy of folklore knowledge, in reference to elder (*Sambucus nigra)*:
"There's a folk tradition that you shouldn't use elder on the fire but it's fine. It's actually a very hard wood. If you dry it properly, we've had elder logs on our fire and it doesn't spit or anything. The bark isn't that good, you want to take the bark off."

[Small Woodland Owner 3, 10/08/14]

Despite this interviewee's positive experience of burning elder, *The Firewood Poem* is critical, containing the lines:

Make a fire of Elder tree,
Death within your house will be;

The subject of whether it is right to burn 'wet', 'green' or unseasoned logs was raised a number of times by interviewees. This was often in relation to ash, as many believe ash is the best firewood, arguing it can be burnt immediately after felling.

"Obviously ash is the absolute premium of firewood. Everybody wants ash because you can burn it wet or dry."

[Forestry Consultant 2, 12/05/2014]

"There's no doubt about it, ash is the best wood. It looks better, it's clean, the bark doesn't come off, it doesn't go mouldy and dries a lot quicker than any of the other woods."

[Woodfuel Merchant 8, 27/02/2014]

Once again, *The Firewood Poem* is partly responsible for perpetuating this belief that ash can be burnt, even when wet:

But ash wet or ash dry
a king shall warm his slippers by.

The following extract from an internet discussion forum highlights how debates about the burning properties can become heated when people disagree. One user commented that under-seasoned ash can be burnt, which drew criticism from another user which he claimed represented a general lack of awareness of wood burning. They attribute this misunderstanding to "that old nursery rhyme", this presumably being *The Firewood Poem*. Once again, the issue surrounding the mis-selling of unseasoned firewood by 'opportunistic' merchants was raised.

User 1: *"Here we go again... Freshly cut ash can still have a moisture content of well over 30% - dry it off first before burning it. Wet wood is wet wood, wether it's Ash or not."*

User 2: *"Why the exasperated tone? I can't see that anyone has suggested that you should burn ash without drying it first."*

User 1: *"Mmmm...Comments on this thread seem to suggest that you can.- "choose ash because they make good firing whenever they are felled".*

User 2: *“You seem to be the only one who is reading a suggestion of wet wood burning into your quotes. Or am I missing something. I'm sure we all agree, only burn dry wood.”*

User 1: *“Sorry Gents - maybe I've misunderstood you. I'm glad you're fully aware that burning any type of wood when wet is wrong - unfortunately many people don't realise this. I often see Ash portrayed on internet forums as the best firewood to use "because you can burn it even when freshly cut" which we all know is nonsense. A lot of this misconception seems to stem from that old nursery rhyme that gets quoted from time to time. There's many a dodgy firewood dealer who convinces people new to wood burning, that Ash is fine to burn green "it says so in that rhyme" - it means they can turn round a freshly felled Ash tree into cash very quickly. I still prefer DRY Beech, Oak or Hawthorn.”*

[A conversation between users of GreenBuildingForum.co.uk. 12/02/2010]

Whilst the demand for hardwood is greater than softwood, many people appreciate that all species burn effectively once seasoned.

“In my view, woodfuel, it’s all hydrocarbons. I think if you season them all for two years, you’d be hard pushed to say that’s better than this.”

[Small Woodland Owner 6, 25/02/2014]

“Wood is wood is wood. It will all burn at the end of the day, that’s what it’s there for.”

[Forester 1, 12/03/2014]

There is an extensive knowledge-base about different techniques for cutting and seasoning wood which is being shared via the internet, reflecting the growing use of firewood. This knowledge, and in some cases ‘mis-knoweldge’, influences buying habits which affects the types of wood which merchants seek. The type of ‘wood knowledge’ that Mytting (2015) describes as having never been lost in Scandinavia, is in the process of being ‘re-learnt’ and shared in the UK.

6.5 Woodfuel, Nature Conservation and Cultural Severance

Many woodfuel merchants, and other woodland workers, expressed the ongoing need to educate the public because of the perception that they are destroying 'natural' woodland. Many class themselves as conservationists, encouraging species diversity by thinning and coppicing, whilst capitalising on the woodfuel markets. The following quotes highlight the negative public reaction, sometimes vitriol, that woodland workers receive.

"From the public's perspective, the most destructive thing is the cutting down of trees. I don't think most people understand or care about what's happening, it's about the visual impact that they experience on their visit to the site."

[Forest Manager 8, 07/07/2014]

"We're going to come in for a bit of abuse shortly because they're not going to like us working on these woodlands on top of the hills where they've got a high visual impact. When you're working away in there, you get folks walking by saying "you bloody heathens" and you say: "Hold on! This is proper management! This is what it's about!"

[Farmer 2, 13/05/2014]

"When you start managing a woodland in Britain, people throw their hands up in horror because most people have not seen a woodland managed. We think of woodlands as being relatively quiet places but prior to that they were very intensively managed. I think on the continent they've got a lot more woodlands that are managed and the population is more used to it. It's not in our psyche at the moment. I think people think we need more woodland but it's not really the psyche that we should be managing woodlands."

[Forest Manager 3, 24/10/2013]

Cultural severance is the disappearance of traditional management practices, like coppicing, which produce distinctive habitats. It also encapsulates the disassociation which takes place between people and the landscape as they become increasingly distant from its management. The negative public comments that woodland workers receive reflects this disassociation between people and woods in particular, with some people not appreciating that thinning a wood is beneficial to certain species. With more woodland management taking place, the firewood and woodchip markets are strengthening the links between communities, economies and land management.

The FC's willingness to reinstate coppicing on marginal land forms part of the re-linking of local economies with the surrounding landscape called for by Rotherham (2008). The

woodfuel markets provide an economic reason for more land to be managed, reversing the trend of cultural severance. A number of interviewees believe that burning wood makes people feel more connected to nature and may encourage the development of a wood culture in the UK.

"People burning wood on their fires I think is building a better understanding of forestry and a better understanding of woodland management in this country and I think that's something we want to try and promote as well. A lot of people hear a chainsaw and they automatically think the worst, they automatically think someone is cutting down a wood nearby and that's devastation, it's deforestation. People want to be able to associate firewood with well managed woodlands, with environmental gain and I think if we can get that message across with those 175,000 people starting to use firewood each year it's going to be a good thing for the industry."

[Forestry Consultant 1, 13/12/2013]

Many believe the woodfuel markets represent an opportunity for owners to engage more with their woods, provide themselves with income, and in doing so, have a positive impact on wildlife. There are a number of groups like the Small Woods Association which offer advice on achieving this, as well as the many community woodland groups across the UK, comprised of people keen to work, and volunteer, in woods (Figure 6.11).







Figure 6.11 One of the many community woodland groups carrying out management in woods across Northamptonshire. Ambrose-Oji *et al*., (2015) has previously explored the recent growth of such groups. By working with owners to produce wood products from their woods, such groups could help to link woods with a local economy and reverse the trend of cultural severance. Author's photograph. The 'Shambala Festival'. [Taken 28/08/2016].

One area of discussion often raised by foresters and merchants was the management of heathland sites, where owners want to limit the number of trees, particularly birch which regularly colonises heathland. Whilst birch was often described as an undesirable 'weed' species, some regard it as being under-utilised as a woodfuel. One manager, who works at a conservation site, believes that birch should be allowed to grow in some heathland areas, as a woodfuel crop, despite the impact it would have on the landscape's character. The manager criticised the conservation movement for being overly concerned with attempting to re-create a particular historical snap-shot of a landscape. Instead, management practices which could yield profits for conservation bodies are overlooked because they are not deemed part of this historical landscape. He believes birch could be allowed to grow on a proportion of heaths to produce woodfuel on 4-5 year rotations. Resembling short rotation

forestry practices, this would not have the same impact on the landscape as short rotation energy crops have, like Miscanthus.

"Birch is a natural species that belongs there and it hasn't got the same sort of impact in the way that people deride the short rotation coppice, it fits into the landscape".

[Forest Manager 4, 09/12/2013]

Despite peoples' intentions to recreate historical landscapes, the same forest manager believes they fail to appreciate how land was managed on a cycle for a variety of purposes. He made the point that, historically, trees would have been allowed to grow on heathland sites as neighbouring areas were kept cut as part of a rolling cycle of land management. This forestry manager strongly believed that the woodfuel markets are an excellent driver to bring land which has lost its economic function back into management.

"Quite often, thinking about other organisations that work with heathland, that is one of the problems. If you imagine birch comes in. Some say birch is the problem species, the weed species…I love it, I think it's amazing but if you were able to sacrifice maybe a third of a site to allow scrub to come up into there. I know the Forestry Commission are trialling bits of this of allowing an area to scrub up and then you're able to create a biomass potential. If we suggested that, Natural England would probably just have a dicky fit."

[Forest Manager 4, 09/12/2013]

A forest manager based at the 800 hectare heathland and wooded landscape of Sutton Park in Birmingham, described a successful scheme of heathland regeneration taking place alongside areas of birch growth which produces a landscape he described as having "higher nature conservation value". In recent years, the park has supplied woodchip to local merchants who have invested in equipment designed to produce woodchip for local power stations. Much of the park's woodchip has been sold to the nearby 2.6 meggawatt Eccleshall Biomass Power Station which supplies electricity to 2,600 homes (Eccleshall Biomass Ltd., 2016). Being a larger area, the managers of Sutton Park have greater flexibility than managers of smaller conservation sites, and therefore, it is ideally suited to rotating land use with heathland interspersed with predominantly birch woodland (see Figure 6.12). Sutton Park, therefore, represents a 'working' conservation site, made possible by producing woodfuel.



Figure 6.12 Heathland and birch woodland in the centre of Sutton Park, Birmingham. Areas of heath are periodically allowed to 'scrub up' as well as narrow corridors of birch as shown in the top and bottom left hand photographs. On-going birch thinning takes place as shown in the top right photograph with one left to decay. Whilst wood is sold as firewood, the largest market is for woodchip. Recent chipping had taken place as the bottom right photograph shows a pile waiting to be moved off-site. Author's photograph [Taken: 7/7/2014].

> *"We had a large fire here in 1976 which burnt vast areas so a lot of the birch trees we've got are all about 40 years' old so they're ideal for cutting down and generating fuel. The woodland team across the city have invested a lot of money into some of the bits of kit they need for grading and for getting chip down into suitable sizes to go off and directly into the power stations. The plan that we've got going forward will be to increase that because there's a market that's available and the by-product is that we generate higher nature conservation value off the back of that as opposed to only treating the woods for their nature conservation value when there is a monetary value."*

"The areas which we want to re-claim as heathland or make sure that we're not losing to scrub and woodland encroachment, we're in there with the woodland management. They're felling and also flailing large areas of birch and then any of that woodchip and timber that's generated from that has previously gone into power stations and then there's been a payment per tonne going back into the woodland management. The regeneration is heathland regeneration that we want as opposed to birch regeneration."

[Forest Manager 8, 07/07/2014]

The use of birch as a species for woodfuel was raised by multiple interviewees. Like the managers of Sutton Park, an FC land manager described the benefit of treating birch as a woodfuel crop on some sites. Rather than spending money to clear birch saplings, the FC is allowing the site to scrub up before harvesting it as woodfuel.

"There are some instances where we're struggling to keep open habitat open because it's costing us a fortune to stop the birch from growing. What we will do is do short rotation forestry. That just means scrub habitat."

[FC Land Manager, 26/06/2014]

One merchant believes birch is an ideal choice of species for dedicated 'woodfuel forests' because of the straightness of the stems, making it easier for large machines to harvest them.

"My thought for woodfuel is that little fellow there, the silver birch. I think that is the ideal woodfuel. It's the lady of the wood. Birch is a pioneer so it goes into open ground and it's fast growing, it self-seeds so you don't need to plant it which removes a whole stage of the game, it is a dense wood, far denser than say pine. And you can grow them up to standard size which makes it more manageable for bigger machinery. And it creates far more of a woodland habitat than an open field system with willow coppice"

[Woodfuel merchant 11, 16/03/2014]

6.6 Summary

This chapter has considered how the growth of the woodfuel markets is changing the culture of lowland forestry and woodland management. Whilst the markets for firewood and woodchip offer new business opportunities for foresters and woodland owners, there is reluctance about whether wood should be grown specifically for energy purposes. There has been considerable debate within the FC's Central England District about whether the move to use unfavourable land to produce firewood using coppicing should be pursued. For many, woodfuel is a waste product, and with no guarantees that the market will remain buoyant, focussing the management of some woods on its production is unwise. Conversely, the FC stands to lose little as the woods it is looking to convert to coppice currently yield no profit. The FC seeks to capitalise on the woodfuel market, whilst bringing neglected woods back into management which could benefit wildlife. More widely, the woodfuel markets are allowing owners to pay for the restoration of PAWS sites.

This chapter has explored how people believe woodlands should be managed, based on their conservation status, in the context of a growing demand for woodfuel. The view that FC has not used its own woods to source woodfuel was raised, with some merchants fearing that smaller, sometimes ancient woods will be harvested inappropriately. For some, commercial woodfuel production should take place in larger woods where large harvesters can be used. Nonetheless, the woodfuel markets are encouraging owners to manage previously neglected woods, thereby reducing the threat of cultural severance. A balance must therefore be found between harvesting from smaller woods to provide income and producing more woodfuel from commercial plantations.

Chapter 7

Conclusions and Discussion

7.1 Introduction

This chapter summarises the principal findings of the research by responding to the aim of the thesis: to understand the impact of the firewood and woodchip markets on the management of woods across the English Midlands, and the role and interactions of merchants with woodland owners and timber suppliers. The value of the research and the methods used are critiqued before areas of further research are suggested.

7.2 Woodland Management and Woodfuel

7.2.1 Re-linking Woodlands with the Economy

Previous research on the economics of woodland management have shown the sector to be in decline. Nicholls and Young (2005) highlight that the majority of forestry departments on estates had shrunk between the 1960s-2000s with low timber prices discouraging owners from continuing timber production. Equally, the increasing use of recycled paper meant there was less use for timber during the 1990s (Mason, 2007). According to Nicholls and Young (2005), many owners accepted that their woods had become loss-making enterprises and paid minimal amounts for their upkeep. Other owners neglected their woods, allowing them to become dark, cold and unfavourable places. In 2005, only 9% of estates made a profit from their woods (Nicholls and Young, 2005). Rotherham and Titterton (2013) highlight the risks of neglecting landscapes which have lost their economic function. Species which relied on the distinctive habitats created by management activities face population declines. Rotherham (2011) refers to this as ‘cultural severance’. With many woods being unprofitable and neglected, the UK’s woodland management sector was in a state of decline as recently as 10 years ago.

This research has demonstrated how the markets for firewood and woodchip have reinvigorated the sector and that there are reasons for optimism. Owners are reinstating management regimes in woods which had been considered uneconomic, or unprofitable for many years previously. This is the case for owners of estates with multiple woods and for small woodland owners. As a number of owners and woodland managers commented, the woodchip market in particular has created an outlet for softwood which they can harvest from PAWS. Not only does this provide an income for the owner by selling timber to woodfuel merchants, it also encourages owners to begin the restoration of PAWS, which

may have been delayed because it was viewed as a cost activity. The demand for firewood and woodchip have therefore reversed the economics of managing some woods; where management was considered a cost activity as recently as five to ten years ago, it has now become a profitable activity. The woodchip market is therefore being viewed particularly favourably by some owners as it has presented them with an opportunity to begin the profitable re-introduction of native species in coniferous plantations.

In smaller woods, the firewood market is prompting owners to begin management in areas which may have been neglected for a number of years. Many owners came to realise that the firewood market was growing and this encouraged them to carry out more thinnings, and in some cases, re-instate coppicing in part, or all of their wood. Whilst coppicing in smaller woods has generally been carried out with the objective of providing improved habitat for wildlife, owners now have a market for small diameter coppice poles with more material now being sold to merchants. Again, the current demand for woodfuel has reversed the economics of management in some small woods; owners are now being paid by woodfuel merchants who then carry out the harvesting operation. Equally, however, many small woodland owners are more inclined to carry out management because they are looking to source more firewood for their own use. As Lawrence *et al*. (2010) note, firewood has a social dimension, with owners sharing firewood with friends and family. With a growing number of people using wood burners, in part to reduce their domestic heating bills, more woodland owners are sourcing their own firewood as well as supplementing their friends' and relatives' supplies.

As highlighted in section 6.3, some owners are looking to harvest from their woods to provide woodchip for biomass boilers. In the case study described in section 6.3, the owner already operated a firewood business but is looking to increase the amount he harvests to provide the feedstock for a district heating scheme. In much the same way, many owners on larger estates have installed biomass boilers and now view their woods as sources of energy, rather than a drain on their finances. This is particularly the case with PAWS where owners are looking for opportunities to remove the non-native conifer plantations.

Quine *et al*. (2012) identify that one of the challenges facing the market for small diameter wood products, like firewood, is that the UK's wood-using industries developed around the harvesting and transport of the bulk availability of softwood. Equally, McCay *et al*. (2011) note the difficulty of managing small woods profitably, partly due to the low timber prices since the 1980s. However, with timber prices rising by over 120% in real terms over the past 10 years, the demand for woodfuel is such that it has become profitable for small harvesters and forwarders to extract timber from smaller woods. As the case study described above

shows, owners are establishing their own woodfuel supply chains, highlighting that the challenge of harvesting and moving small dimeter timber is being overcome when the will to do so is present.

Whilst making a profit from woodland management remains challenging, owners are finding that it is possible by selling woodfuel. As such, attitudes towards the profitability of owning a wood appear to have changed since 2005 when Nicholls and Young (2005) reported that only 9% of owners made an income from their woods. In the current research, over half of all owners expected their woods to be more profitable over the next five years, highlighting an optimistic outlook. Even small profits tip the balance heavily in favour of carrying out more management because owners appreciate the wildlife benefits it brings.

Having been neglected for much of the latter half of the 20th Century, many woods that had been traditionally coppiced had undergone 'cultural severance' as described by Rotherham and Titterton (2013) in their study of heathland sites. Prior to the collapse of the market for turf and peat, heaths were managed by local people whose livelihoods depended on products they derived from heathland. As such, distinctive habitats emerged from the management, and the landscape became a part of the locals' culture. The re-emergence of the woodfuel markets in the 21st Century is therefore an opportunity to re-connect woods with local economies. In the case of woodchip boilers, coppicing is being viewed favourably, which would produce the structural changes to woods which many owners would like to see.

The management of the historical birch heathland in Sutton Park, Birmingham, was explored in this research, and is presented as an opportunity for managers of similar conservation sites to raise income. This is especially relevant with the current financial situation of Local Councils, many of which are searching for ways to supplement their income following cuts to their budgets. As one forest manager said, the conservation movement has been overly-focussed on re-creating 'snap shots' of particular historical landscapes, and fail to appreciate that the land was historically managed to serve multiple economic purposes. In Sutton Park, the managers have instigated a system of land-rotation, where some areas of heathland are allowed to scrub up which is then harvested and sold as woodchip to local markets. Equally, firewood is being sold to visitors to the Park. Such examples of land being managed for an economic purpose, and in doing so, re-instigating some of the traditional management practices which produce a more diverse woodland structure, is precisely what Rotherham and Titterton (2013) call for. As Rotherham (2015) argues in a critical analysis of cultural severance across Europe, finding ways to re-connect landscapes with economies is the conservation movement's greatest challenge of the 21st Century. The markets for firewood and woodchip present owners with multiple opportunities to do this. Although profits are

small, they are often sufficient to encourage decision-making in favour of management over neglect. This is especially the case given many estate owners believed the annual losses from their woods was an acceptable price to pay for landscape conservation as recently as 2005 (Nicholls and Young, 2005).

7.2.2 Woodland Management for Woodfuel Production

As Tubby (2013) notes, the markets for firewood and woodchip could lead to changes in the silvicultural practices of woodland owners and managers. This thesis demonstrates that the rotation lengths applied in some woods are indeed being reduced. In turn, this will alter the structure, aesthetics and age dynamics of woodlands. As discussed above, private owners are reinstating management regimes in previously neglected woods. However, it has also been shown that the FC's Central England Division is changing its management policy, with a greater focus on woodfuel production, despite the mistrust of this change in direction by some. To do this, the FC is re-introducing coppicing in woods with poor soils and low timber yields. The FC stands to lose little if the woodfuel markets do contract because the land currently produces no income.

In the case of Salcey Forest, Northamptonshire, (discussed in Section 6.2), the is using a coppice-with-standards system for the benefit of wildlife and to produce wood products (FC, 2013). To do this, the current oak high forest conditions are being altered by felling groups of oak standards, some of which are over 150 years old. As the FC, (2013: 3) notes, "Given strong market demand for both oak saw timber and coppice-derived woodfuel the historical coppice-with-standards system has much to recommend it economically and meets many of the conservation management objectives for native woodland, such as promotion of coppicing plants and butterflies requiring open habitats". This is another area where cultural severance is being challenged.

Following the planting of oaks between 1820 and 1940, many areas have been neglected in Salcey Forest, leading to many stored coppice oak stems which are supressing the growth of any considerable hazel-ash-birch understorey. As such, the FC hopes that by felling groups of oak standards and re-introducing coppicing, not only will they be able to make a profit through increased firewood and woodchip sales, they will also encourage the growth of native broadleaf species currently being supressed; an example of re-linking a wooded landscape with the economy as called for by Rotherham and Titterton (2013). However, it goes further in that Salcey Forest is also being used by the FC to aid "public interpretation of native woodland management systems" (FC, 2013:1). Such an aspiration is part of the FC's wider move to foster a "woodland culture", as called for by the Independent Panel on Forestry (2012).

Similar changes in management were found to be taking place in woods owned by conservation bodies. That is, a movement towards greater variation in stand structure, the management of which is being encouraged by the small profits, or at least break-even finances, from the woodfuel markets. As Mason (2007) notes, interest in the use of CCF forestry practices has grown since the mid-1980s, particularly after growing concern about the loss of ancient woodland and the environmental impact of commercial forestry plantations. CCF practices appeal to the majority of owners, with many of them using a mixture of coppice, coppice-with-standards and selection systems in their woods. This is despite the majority of published literature surrounding the merits and application of CCF being focussed on coniferous rather than broadleaf woodland.

On some estates, owners are increasingly hesitant to clearfell because of the costs of replanting and protecting saplings from deer and rabbits. This is despite their timber stands reaching their maximum annual increment and a harvestable age. The FC grants are not sufficient to cover the cost of clearfelling and replanting so owners are now carrying out more thinning operations than clearfelling. In effect, such woods are now being managed under CCF principles. As coniferous plantations are successively thinned, it increases the opportunity for broadleaf pioneer species (like birch) to naturally regenerate beneath the coniferous canopy as well providing a continuous supply of woodfuel.

As the FAO (2009) suggests, the global demand for woodfuel could encourage the adoption of shorter rotations and greater use of small diameter logs. Coppicing is being used more widely and there are signs of a growing appreciation for Short Rotation Forestry (SRF) whereby smaller diameter stems of fast-growing species are harvested every 8-20 years. As McKay (2011) notes, SRF could potentially produce much greater volumes of woodfuel than thinning and coppicing existing woods. Whilst SRF is unlikely to be used by private owners in their own woods as the more intensive, homogenous stand structures do not suit most owners' objectives (Smith and Watson, 2011), the FC managers commented that the system they are looking to instigate in some woods is essentially SRF.

Whilst SRF was not found to be widely in use, there is a growing appreciation of its potential contribution to woodfuel production. At present, there is not sufficient demand to encourage the adoption of SRF, but this could change, especially with concern about the focus of the FC's *Woodfuel Strategy for England* on small woods, many of which are important conservation sites. As one woodfuel merchant believed, the country's smaller woods will not be able to continue meeting the growing demand for woodfuel and the FC has neglected to use its own land for energy production. As Molteno and Lawrence (2013) note, decisions need to be made as to which woods should be managed more intensively to produce more

woodfuel. Equally, decisions need to be made about where it might be undesirable to carry out more intensive management practices. SRF may become a more acceptable type of management, especially in newly created woods if more ecologically sensitive woods are at risk of being over-harvested. As numerous owners and merchants appreciate, SRF is well-suited to large-scale firewood production.

7.2.3 Management for Multiple Objectives

Whilst the majority of owners manage their woods for the benefit of wildlife, personal pleasure and recreation, there is growing interest in the use of their woods to make money. As Figure 4.4 shows, most owners who completed the online survey provided answers which were broadly equivalent to previous research about woodland owners' objectives. Nicholls *et al*. (2012), for example, highlight that most owners manage their woods for amenity rather than for financial reasons like profit or investment opportunities. As Nicholls and Young (2005) write, people rarely purchase a wood with a view to making money from it. However, some of the woodland owners interviewed in this study revealed that their management decisions have been influenced by the recent growth of the woodfuel markets and the opportunity to make a small profit from owning a woodland. As one owner commented, as she neared retirement and her income drops, the ability to sell firewood is much appreciated. If it were not for the ability to, at least break-even, and cover the costs of management, some owners would not have re-instigated a more structured management programme in their woods.

Whilst some owners did not specify that making money was an objective *per se*, it became apparent that many owners would welcome the opportunity to do so, by selling timber or woodfuel. During one interview, it was not until the owner was asked why they had started to manage their wood more intensively that they admitted it was to make money. Prior to this question, the owner had only talked about managing the wood for wildlife. Whilst financial considerations are not the primary drivers for small woodland owners, it is likely that some feel ashamed to admit that making money would be welcome. This issue was raised by a forestry consultant who said he often found owners unwilling to tell him that making money from their wood was something they would like.

One area often raised by interviewees was the benefit that woodfuel production has on meeting other management objectives. Timber production from softwood conifer plantations is improved, for example, by the greater number thinning operations taking place. By removing weaker stems as a stand of trees grow, the straighter stems have less competition and have more resources available to grow (Kerr and Haufe, 2011). The market for woodchip in particular has meant that many first and second thinning operations can now be

carried out at a profit or to break-even. As such, owners are more likely to carry out thinnings today than they were in the early 2000s when the woodfuel market had yet to become established and timber was commanding low prices. One woodland owner commented that, back in 2005, they realised that timber production alone would not be profitable. He calculated that the price of timber at roadside (which commands a higher price than standing timber) was not insufficient to make it worthwhile to manage his wood. The owner looked for other ways to add value to his wood and realised the firewood market was the best outlet for lower value timber. It was only after he established a firewood business that he began selling timber again.

Equally, the greater number of thinning operations, made possible by the woodfuel markets, opens up more gaps between trees, allowing owners to re-assess their management objectives. As one forester commented, the extra space between stems means owners can change their objectives, depending on how successful the growth of certain trees has been. The impact of disease, and wind damage, for example, may alter the objective of producing high quality timber trees. As one forester noted, the incentive to thin stands for woodfuel has removed the risk of "turning small rubbish trees into big rubbish trees". As Molteno and Lawrence (2013) note, there is much to recommend owners and managers combining timber and woodfuel production.

Something this thesis demonstrates is how the barriers to woodland management, including inadequate access, lack of markets, lack of economies of scale (see Quine *et al*., 2012), are being overcome by the woodfuel markets. With profits to be made through woodfuel, owners and managers are looking for solutions to previous problems preventing management. Often, these are infrastructural solutions, with improvements to woodland tracks and drainage systems being made.

7.2.4 Woodfuel and Wildlife

The majority of owners want to create diversity in their woods, for wildlife and for aesthetic reasons. The woodfuel markets have encouraged owners to thin and coppice greater areas of their woods, which is letting more light in, leading to the growth of understoreys. There has been much research about the relationship between the diversity of woodland structure and wildlife. Fuller and Warren (1993:25) write: "The conservation value of coppicing is unquestionable on sites with a long and continuing history of active management". Bird populations are highest in recently coppiced woods and will decline if an area of coppice woodland is neglected (Fuller and Green, 1997). The numbers of fritillary butterflies and moths are also greater in actively coppiced woods, as are the numbers of small mammals like dormice, shrews and bank voles (Fuller and Warren, 1993).

Buckley and Mills (2015) provide a comprehensive overview of the merits and drawbacks of coppicing. They review a range of studies about the impact of woodland abandonment and the conversion of coppice to high forest conditions on wildlife. Studies by Debusshe *et al*. (2001), Decocq *et al*. (2004), Kirby *et al*. (2005), Van Calster *et al*. (2007), Baeten *et al*. (2009), Amar *et al*. (2010), Ito *et al*. (2012) and Kopecky *et al*. (2013) show that abandonment is followed by declines in the diversity of species and a homogenisation in the field and shrub layers, with a greater abundance of shade-tolerant species. However, Buckley and Mills (2015) draw attention to the downside of coppicing, these notably involving the reduction in habitat for species that prefer older trees, such as leaf mining moths and web-building spiders. Stokland *et al*. (2012) highlight that the reduction of deadwood in actively coppiced sites does not benefit fungi, saproxylic invertebrates and lichens, as well as reducing the nesting opportunities for bats and birds.

However, most owners and managers are aware of the benefits of leaving deadwood across woodlands, with a number of them leaving deadwood and creating habitat piles. Some owners leave standing dead trees alone to provide crevices for bats and birds. The diverse woodlands desired by the majority of owners typically involves leaving behind a number of older standard trees, which provide a certain amount of habitat for 'mature tree' specialist species. Furthermore, the majority of owners (78%) were found to classify a proportion of their wood as minimum intervention, or non-intervention, areas (see Table 4.9). As such, of the woodlands which are now undergoing greater management, there is generally a mixture of active coppice, high forest and areas of non-intervention. It is likely this will be of benefit to wildlife given the historical lack of management during the latter half of the 20th Century.

One area where the benefits of greater woodfuel harvesting on wildlife and species diversity may not be so pronounced is where there is heavy deer and rabbit grazing. The impact of deer and rabbits on young saplings can be considerable and their numbers have been increasing in recent decades (Fuller and Gill, 2001). Whilst thinning a wood for woodfuel production may be viewed as a tool for conservation, without adequate control of deer and rabbit populations, the gains in species diversity described by Buckley and Mills (2015) may not be fully achieved. Equally, future crops of woodfuel may be threatened by deer browsing. As raised by some of the interviewees, there is a lack of public support for a widespread programme of deer culling. Controlling deer and rabbits is a topic not raised within the Independent Panel's report on Forestry (2012) which calls for a greater 'woodland culture'. Whilst it is recognised that deer increasingly threaten the ecology of the country's woods, the report does not offer any solutions. It is therefore suggested that the woodland culture, as called for by the Independent Panel and the FC, takes into consideration the wider relationship between woodland management, woodfuel production and deer control. It

has previously been highlighted that there are areas where the management of woodfuel production and pheasant shooting may be integrated (see Section 4.7). Whilst a change in culture would be needed, it would not be impossible for the FC to encourage a greater programme of deer control. Whether this could be done through grant funding, or by bringing together landowners and deer stalkers, are areas which could be explored.

7.2.5 Post-productivism

Wilson (2001:77) claims that most research about post-productivism "has largely failed to take into account the wealth of actor-oriented and behaviourally grounded research". He argues that the doctrine has been explored too rigidly with 'dimensions' and 'characteristics' rather than taking into account the actors involved. It is hoped this research has addressed this deficiency.

In many ways, the changes which have taken place to the UK's forestry sector fit well within the post-productive doctrine. As Mather *et al*. (2006) note, since the passing of the 1986 Agriculture Act, the environmental and social objectives of multi-purpose have become ingrained in forestry policy and changes to the grant system means timber production no longer has to be an owner's top management priority. Greater concern for the environment is a central tenet of post-productivism according to Almstedt (2003) and the UK's forestry policy certainly reflects this. This research confirms the findings of Nicholls *et al*. (2012) and Urquhart *et al*. (2009) in that the majority of woodland owners are most interested in wildlife and amenity with timber production relatively low on the list of owners' management objectives. Furthermore, it has been shown that companies selling woods are making concerted efforts to widen the ownership-base and introducing people with 'non-rural' backgrounds to woodland ownership. Such companies are splitting up woodlands, making them more difficult to manage commercially but encouraging more management to be carried out by owners themselves. Such a move does highlight that a change has occurred in woodland management, perhaps with less focus on material production. Lawrence *et al*. (2010) has previously noted the changing pattern of rural land ownership with a greater number of owners looking for the 'rural lifestyle' where timber production and income is not their priority. Another aspect of post-productivism is an increase in the 'multifunctional' use of landscapes as the rural economy diversifies (Woods, 2011). In the case of woodlands, Mather *et al*. (2006) highlight that this is the case with the average number of management objectives increasing following changes to forestry policy in the 1980s with less focus on timber production. As Mather *et al*. (2006) note, it is unlikely that the prominence of environmental objectives in woodland management is unlikely to wane in the foreseeable

future. It is for the reasons outlined above that it is tempting to claim that the UK has undergone a post-productive shift in the way it manages its woods.

However, it is too early to make such a claim. Whilst environmental objectives remain the over-arching objective for most owners, the woodfuel markets are encouraging more harvesting to take place. This is a policy being promoted by the FC within its *Woodfuel Strategy for England*. As Table 7.1 shows, the volume of timber being harvested from the UK's woods has been increasing over the past decade, contradicting what would be occurring if the sector had undergone a post-productivist shift. In many instances, woods that have not been managed for decades are being brought back into management, with owners carrying out restoration projects on PAWS for a profit. Furthermore, there is evidence that more management is taking place in smaller woodlands with more owners carrying out management themselves as well as there being an increase in the number of felling licenses being issued by the FC (see Figure 2.4 on page 27).

Year	Total softwood harvesting	Total hardwood harvesting
2006	8243	438
2007	8736	440
2008	8238	431
2009	8392	536
2010	9258	535
2011	10056	541
2012	10095	532
2013	10936	529
2014	11431	532
2015	10774	528

Table 7.1 UK wood production 2006-2015, in thousands of green tonnes from public and private woodlands. Source: FC (2016[d]).

Mather *et al*. (2006) explain that part of the increase in timber harvesting is due to historical planting and the long-term cycles used in forestry, with many trees reaching maturing, ready for harvest. This point was referred to by an FC Production Forecast Officer and highlighted by the recently completed National Forestry Inventory (see Figure 5.2, page 178). Mather *et al*. (2006:447) claim: "Productivist' forests were established in the past and are now maturing: the 'post-productivist' forests created more recently have very different characteristics". Whilst they are correct in asserting that environmental considerations are more important than timber production, it does not mean the forestry sector has entered a post-productivist era. Many of the 'productivist' forests referred to by Mather *et al*. (2006)

became neglected during the latter half of the 20th Century during the depression in timber prices and are now being managed because of the woodfuel markets. This research highlights how a change in market conditions can alter peoples' behaviour, with the demand for woodfuel encouraging owners to harvest more. In many cases, this is for environmental reasons – to remove non-native species – but also to produce an income.

Making money is another area of evidence which contradicts Mather *et al*. (2006) and their claim of a post-productivist shift in forestry. It has been highlighted that owners are more interested in making money from their woods than previous research has suggested. People are naturally reluctant to admit that they would like to make money from their wood. However, many owners are selling timber to woodfuel merchants with many charities also becoming more commercially minded in response to the woodfuel markets. Multiple woodland consultants mentioned that they are increasingly asked by owners how to make money from their wood.

Part of the problem with labelling the changes which have taken place to the UK's forestry sector as post-productivist is the name of the term itself. Wilson (2001) raises his concern with the name, and suggests that 'non-productivism' is a more suitable antithesis to 'productivism'. However, 'non-productivism' is certainly not applicable to UK forestry. Woods (2011) suggests that 'multifunctionality' is a better alternative to post-productivism. According to him, 'multifunctionality' recognises that rural areas have value over and above the goods they produce. Whilst this is true, the 'ecosystem services' model already takes these 'non-marketable' goods into account. Furthermore, Mather *et al*. (2006) criticise the use of 'multifunctionality' because they claim it fails to capture the shift in focus from material production which is a fundamental aspect of post-productivism. Furthermore, 'multifunctionality' does not reflect the changes which have occurred to UK forestry over the past century; by definition forests have been used for multiple purposes throughout human history.

Evans *et al*. (2002) criticise post-productivism for being overly dualistic by attempting to bring together the changes taking place in rural areas under one umbrella term. The same criticism can be made of Mather *et al*. (2006) when they describe the UK's forestry sector as being in a post-productivist era. Labelling the forestry sector as 'post-productivist' over-simplifies the complex relationships between the rural economy, policies and peoples' behaviour. As Evans *et al*. (2002:313) argue, efforts should focus on "understanding deeper processes underpinning agricultural change".

7.3 The Woodfuel Merchants

7.3.1 Professionalisation of the Sector

The growth in demand for woodchip and firewood has presented many business opportunities for woodfuel merchants. As this thesis has explored, there has been a 'professionalisation' of the sector, as merchants have sought to provide better customer service and improve the efficiency of harvesting and processing woodfuel. To keep pace with the demand for woodfuel, merchants have invested heavily in machinery for use across the supply chain. Merchants are increasingly using either large-scale harvesters, the sort of which were traditionally used by foresters harvesting timber, or smaller scale forwarders which minimise the impact to woodland soils. Woodfuel merchants' ability to purchase forest harvesters and forwarders is indicative of the larger profits now being realised following the growth of the woodfuel market. As one merchant described, in 2000 he would not have been able to afford the forwarder he subsequently purchased in 2011 because he would not have made enough money to cover the cost of the machine. Many merchants have invested in firewood processing machines which rapidly speeds up the rate at which they cut, split and bag firewood. Crucially, these processors mean merchants spend less time handling wood which presents them with more time to make deliveries. Many merchants have also invested in delivery vehicles with fitted cranes, enabling them to deliver firewood in bags rather than dumping loose loads on customer's lawns. These investments have increased the efficiency with which merchants can harvest and process woodfuel to meet customer demand. In an increasingly competitive market, merchants have sought alternative ways to add value to firewood and retain customers. Improving the method of delivery so that firewood is more presentable is one of the ways that merchants have added such value.

As the woodfuel market has grown, customers are asking for more information about the quality of woodfuel, in some cases purchasing their own moisture metres to test logs upon delivery. This trend has encouraged merchants to provide more information about the quality of firewood they sell, specifying the length of seasoning and, in some cases, the average length of logs. The increasingly automated firewood processors allow merchants to produce logs of a specific size which means they can cater to particular customer's needs or local preferences. As the use of firewood has grown, there has been some standardisation of its unit of sale, with the majority of merchants no longer delivering by the unspecified 'load'. There are minimal legal requirements covering the sale of firewood, and those that exist are roundly criticised by merchants because it wrongly specifies that it should be sold by weight. This, they argue, allows people to charge more for unseasoned, wet logs. The majority of merchants, therefore, sell by volume and explain in detail why this is the case on

their websites. Nonetheless, some customers remain confused by the sale of firewood by volume, as evidenced by the analysis of people's comments on internet discussion forums.

The 'professionalisation' of the sector therefore revolves around the greater use of machinery and improvements in customer service. Perkin (1989) argues that professionalisation is a natural trend across society, as activities become increasingly specialised and diverse. Palladino (1994) defines professional groups as having control over specific knowledge and skills which they can sell. In Brassley (2005), it is argued that British farming underwent a professionalisation during the 20th Century, whereby 10% of the top farmers have ended up producing 50% of the country's agricultural output. Brassley (2005) suggests that it is difficult to define what 'professional' knowledge is, but the possession of knowledge or a skill may be recognised by 'outsiders', or those who do not have that knowledge. Professional skills are, therefore, subjective and Brassley (2005) argues there has been a tendency to underestimate the skillset of manual labourers. In this respect, the professionalisation of the woodfuel sector reflects the wider professionalisation of agriculture during the last century, with an increasing use of specialist machinery, an increasing conscientiousness of marketing and increasing accreditations like HETAS (providing guarantees around the quality of woodfuel) and chainsaw licenses. As Brassley (2005) recognises, not all farmers have become 'professional' with some being categorised as 'lifestyle farmers', or as 'post-productivist' according to Wilson (2001). For such farmers, there is less focus on the commerciality and growing their farm as a business. This thesis presented a similar finding amongst woodfuel merchants, with a typology put forward in Section 5.7

7.3.2 Stratification of the Woodfuel Market

Whilst the growth of the woodfuel market has allowed for more entrepreneurial people to develop large businesses, with complex supply chains and rapid methods of woodfuel processing, there has remained a market for the more informal sale of firewood in particular. In the typology of woodfuel merchants presented in Table 5.2, it is the 'opportunists' and 'traditionalists' which operate the informal firewood market. Little regard is held for the HETAS woodfuel accreditation scheme which guarantees the moisture content of firewood and a variety of containers are used to make deliveries, from potato boxes to bins. The majority of firewood deliveries are made using builder's bags, which come in various sizes. Most merchants specify they deliver in $1m^3$ bags. However, it seems many have not measured the bags they use or are deliberately under-supplying. Many of the more entrepreneurial merchants go to great lengths to ensure they deliver the amount of firewood expected of them, and criticised those who do not. There is a collective sense that the

success of the firewood market depends on quality and good customer service, and the opportunistic merchants brings the sector into disrepute. Nonetheless, a good number of merchants believe they capitalised on the poor quality firewood and the inefficient methods of processing and delivery which used to be a feature of the market.

A distinguishing factor between the proposed categories of merchant are the periods at which they began selling woodfuel. The 'traditionalists' had often been selling firewood in the 1990s, when demand largely came from rural areas before the recent surge in wood burners installations. The 'opportunists' appear to have entered the market shortly after demand for firewood rose exponentially in the mid-2000s. This group used mostly manual labour to cut and split firewood and sold by 'the load'. Often, it was tree surgeons selling firewood as an aside to their business or others simply looking to make 'quick money', despite the labour-intensive nature of the work. The introduction of the RHI in 2011 appears to have made it possible for larger woodfuel businesses, the 'entrepreneurs', to develop, by focussing on woodchip as well as firewood. The need for standardisation in the woodchip market to guarantee the smooth running of biomass boilers has, to some extent, been applied to the firewood market by the entrepreneurs. Today, the woodfuel market consists mostly of local 'one or two-man' firewood businesses, an increasing number of farmers seeking to diversify their commercial activities, tree surgeons selling what used to be their waste material and larger, often forestry-based, companies which now deliver woodfuel nationally. As many of the 'entrepreneurial' merchants mentioned, it was contracts with RHI-using customers which led to the considerable rise in demand for woodchip. As such, it appears that Government policy has substantially driven the changes which have taken place in the woodfuel market.

7.3.3 Working in the Woods

Operating across at different scales of production, some merchants use large harvesters and can rapidly fell a large number of trees. Despite comments regarding the relative agility of such harvesters, they have limited use on steep terrain and they also leave deep compressions in the soil. The cost of running and transporting them also warrants a minimum volume of timber to be felled. As such, the large harvesters are unsuitable in many small, fragmented woods which the FC wishes to see being managed. This leaves a gap in the market for merchants who operate at smaller scales, using smaller pieces of machinery, normally felling trees with chainsaws. One merchant operating at such a scale resented the use of large harvesters and feared they are being increasingly used inappropriately in ecologically sensitive woods. He had already lost contracts with a Local Council which hired a merchant using a large harvester. The FC's *Woodfuel Strategy for England* (2007:15)

explicitly states that “sensitive management” will benefit a wood’s ecology. Some merchants are of the view that large harvesters pose a threat to the country’s small woods of high conservation value.

Amongst the merchants operating at smaller scales, there is concern that as the market continues to grow and other woodfuel businesses become larger, they will be increasingly out-competed for contracts. Small-scale merchants generally produce firewood, harvested from smaller woods. The concern is that businesses focussing on woodchip, which command larger economies of scale, will render small-scale firewood merchants redundant. This could increase the risk that smaller woods of high conservation may be harvested inappropriately if the value of timber continues to rise. Furthermore, the RHI was roundly criticised by many small-scale merchants because it only subsidises the use of woodchip in biomass boilers, not firewood in wood burners. According to firewood merchants, therefore, the RHI has created a false market for woodchip and this could threaten not only their businesses but the conservation of smaller woodlands.

7.3.4 Lack of Supply: reality or a perception?

This thesis explored where merchants source their timber and the ways in which they maintain sufficient rolling stock to meet demand. Many merchants find this to be a logistical challenge, and as the market has grown, more have built their own kilns in which to force dry firewood and increase their rate of turnover. The majority of merchants believe there is a risk that the demand for woodfuel will soon outstrip its supply, believing there to be a lack of tree cover in the UK. Many recounted stories to demonstrate the increasing difficulty of sourcing hardwood in particular, and their growing reliance on selling ‘mixed loads’ of hard and soft wood. Some have considerably increased the area from which they source timber and many now supplement their stocks by importing firewood from European countries. It was for these reasons that many argued the case for increasing the country’s area of woodland cover, as well as creating some woods designed specifically for woodfuel production, so-called ‘woodfuel forests’.

Interestingly, the majority of complaints about the increasing difficulty of sourcing timber came from merchants who focus on firewood sales. Whilst some woodchip merchants commented on the growing difficulty of sourcing timber, this was not as pronounced. Therefore, the comments from merchants alone, suggest that the recent changes to the market have resulted in fewer opportunities for firewood merchants, possibly due to woodland owners preferentially supplying woodchip merchants, seeking to capitalise on the growing number of RHI biomass boilers. Whilst it is likely an informal firewood market will remain, run by the ‘opportunists’, it appears that the firewood market as a whole will be

increasingly run by larger businesses which focus on woodchip. Such businesses can source timber and process firewood more efficiently than the smaller, 'traditional' firewood businesses run by one or two men.

An alternative view of the country's timber stocks was explored in this thesis, however. Based on their latest national survey of woods and forests, the FC confirm the prevailing view in the literature that woodlands are not being managed to their productive potential. McKay *et al*. (2003), for example, calculated that there are 4.2 million tonnes of unharvested timber available in the country's woods per year. Yeomans *et al*. (2008) believe there had been a considerable decline in the number of 'actively managed' woods over the past fifty years and Quine *et al*. (2012) note that 43% of woods have felling licenses, highlighting a potential lack of management. Following the completion of the National Forest Inventory, some within the FC are of the view that there is an over-supply of timber because the country's tree cover was found to be both greater and denser than previously thought, with an age structure such that most trees are nearing their maximum mean annual increments, and therefore ready for harvest. The view of these people is that a lack of management has been detrimental to the country's woodland wildlife as canopy closure has taken place.

There is, therefore, a discrepancy between the views of merchants that there is a lack of timber and the FC's view that there remain many under-managed woods across the country. The majority of conservation bodies endorse the FC's push to harvest more timber which they believe will open up canopies and benefit wildlife (see Wildlife and Countryside Link, 2009). Equally, merchants do appreciate the benefits of woodland management, with many of them classifying themselves as conservationists. However, based on their experiences of finding it increasingly difficult to source timber, many hold the view that there is a lack of supply. This could be a regional trend. The comments from those working for the FC were generally about England as a whole, and as Figure 5.4 (page 179) shows, there is considerably less hardwood timber in the East and West Midlands compared with South East and South-West England. The prevailing view remains that the country's woods are generally under-managed and the current rate of harvesting is significantly less than the annual increment in growth.

Many merchants have attempted to change their customers' buying preferences by encouraging them to use softwood firewood. This has been difficult given the commonly held view that hardwood makes better firewood than softwood. This is despite the fact that all wood, regardless of its species, has broadly the same energy content by unit weight (see Matthews and Mackie, 2006). To compensate for the different densities of wood, merchants sell hardwood at higher prices. However, hardwood remains in greater demand and

merchants remind customers that the wood burners they use are typically Scandinavian in origin, and therefore designed to burn softwood.

The thesis explored people's opinions about the burning properties of different woods and the relative ease of cutting and splitting different species. Due to many first time wood-burning customers not appreciating the benefits of using properly seasoned firewood, merchants also regard themselves as 'educators' of the practice, highlighting the risks and waste of energy associated with burning unseasoned wood. For some people, Lady Celia Congreve's *The Firewood Poem* (1930), has promoted a false perception that some species of wood (notably ash) can be burnt regardless of their moisture contents. Equally, some merchants blame others for perpetuating this claim and selling unseasoned wood. It has been demonstrated that amongst some communities of people involved with the sector, there exists a range of different methods, esoteric habits and advice for cutting and splitting wood. In the case of the Internet, where there exist many groups of woodland owners and wood burning people communicating via online forums and social media, there is a great deal of knowledge-sharing taking place about the practice. This could reflect a growing woodfuel, and potentially a growing 'woodland culture' in the UK, as more people become acquainted with burning wood.

7.4 Reconsidering the Methodology and Future Research

The use of semi-structured interviews proved to be an effective way of exploring the themes addressed in this research. As highlighted in Chapter 2, geographers have paid little attention to contemporary woodland management and no research has previously focussed on merchants and the development of the woodfuel market. Interviews have allowed for an in-depth study of merchant's perceptions and experiences of the market, as well as their practices and methods of operating which would not have been possible through the use of a survey alone. This research is therefore an example where interviews have proven to be an effective way to engage with a specific group of people. Importantly, the interview approach has highlighted the concern of many merchants that the supply of timber in the UK is under threat because of the scale of the woodfuel market. Regardless of whether this threat is real, perceptions are important because they guide people's behaviour. In the case of woodland owners, the interviews have led to new observations. For example, this thesis has suggested that financial considerations are more important for woodland owners than previous surveys have concluded. It was repeatedly the case during interviews that owners did not refer to the financial aspects of owning a woodland, but upon further questioning, admitted they would like to realise a profit, or at least, see their woods break-even. This is

not to claim that profit is a top management objective for owners but is an observation supported by the comments of a forester who said owners are reluctant to admit they would like to make money. Conservation bodies and woodland owners who use contractors are more likely to carry out management if they can yield an income from their wood.

The interviews which took place 'in the field' were an effective way of encouraging interviewees to contextualise their responses to questions than was the case during telephone and more formal 'sit-down' interviews. Often, interviewees would make passing comments which ultimately proved useful, and provided greater context about their involvement with the woodfuel market or reasons for carrying out specific management activities. This was also the case during interviews with people as they carried out their work, such as making delivery runs, or working in a wood where others often made contributions to discussions.

One of the drawbacks to interviews is the length of time it takes to transcribe them, with Bryman (2001) suggesting an hour-long interview takes six hours to transcribe. Whilst this process was made somewhat faster with the use of a foot pedal, which controls the re-winding and fast-forwarding of a recording, the transcription process was a time-consuming one. However, the act of transcribing did allow for the noting down of thoughts about how interviewees' comments could be categorised and a thorough understanding of the issues affecting the interviewees was made during the process.

The use of interviews, and qualitative research generally, have often been criticised for lacking in validity, or how representative the results are of reality and the wider population (see Anderson, 2011; Brinkman, 2014; and Silverman, 1997). To some extent, researchers that use interviews may be criticised for selecting quotes to present which support pre-conceived ideas and arguments. In this research, whilst an overall theme had been selected from the outset, it was the comments from interviews which ultimately guided the direction of the research and the particular issues addressed. *Nvivo* was a useful tool to code the interviewee's comments into categories, as highlighted in Figure 3.6 (page 76).

Whilst the online survey was an effective way of collecting data about woodland management and owners' objectives, the response rate was disappointing. This is despite the survey being distributed to over 1,000 members of the Small Woods Association and being marketed across various social media platforms and groups interested in woodland management. In future, whether such surveys could be made shorter or whether the use of 'prize draws for participation' are issues which could be explored.

There are multiple areas of potential future research. Given the UK's woodchip and firewood markets are still growing considerably, it will be interesting to see what changes take place

as the market matures. There are many factors which could affect the growth of both the firewood and woodchip markets. Being a commodity, timber prices are subject to wider macro-economic trends and cycles. The recent vote to leave the European Union, for example, could have a considerable impact on the importation of firewood from Europe. With a depreciation in the value of sterling, firewood merchants may be less inclined to purchase from abroad. If the winter of 2016/17 is particularly cold, with high demand for firewood, merchants who rely on European imports may be unable to maintain a continuous supply. Longer term, whatever trading relationship the UK has with the EU, this will have an impact on the import volumes of firewood. With reduced importation, merchants may be encouraged to seek more timber from UK woods. From the perspective of the FC and conservation bodies, this would be welcomed as it would encourage more owners to have their woods thinned.

With the woodchip market being driven by RHI subsidies, if a future Government elects to remove these, or reduce the payments for burning wood, the market could considerably contract. However, as more biomass boilers are installed and the market matures, it is likely the subsidies will fall (as is already the case) and the market will be sufficiently large to support itself. A complicating factor, though, is the potential impact that a future market for shale gas from 'fracking' might have on the woodfuel market. If this becomes mainstream in the UK, gas prices would likely fall and this would lessen the demand for biomass boilers, currently appreciated as being a cheaper alternative to heating large buildings.

A recent report from the Royal College of Physicians (see RCP, 2016) warns of the dangers to health following the increasing number of people using wood burners in their homes. The report highlights that particles from wood burning accounts for between 7%-9% of London's wintertime particle pollution (Fuller *et al*., 2014) and that particles travel into neighbouring homes, highlighting the danger of 'passive wood burning'. It is warned that the growing trend for wood burning threatens the air quality improvements that have been made by the widespread adoption of gas in domestic settings. Despite being considered a source of renewable energy, the RCP's report suggests people should burn less wood. With 40,000 premature deaths a year resulting from indoor air pollution (RCP, 2016), it is possible that a number of people will be deterred from using their wood burners, thus lowering the demand for firewood. It will be interesting to see to what extent the RCP's report, and future research about the health implications of inhaling particulates from wood burners, might have on the woodfuel market.

As highlighted in Chapter 2, the use of woodfuel, and biomass more generally, has been criticised by environmentalists for the destruction of large areas of the world's forests as well

as contributing to carbon emissions rather than curbing them. Bailis *et al*. (2015) estimate that woodfuel burning makes a contribution of 1.9%-2.3% to global carbon dioxide emissions. Bjørnstad and Skonhoft (2002) argue that the changing ways in which Scandinavian forests are being managed to produce woodfuel, notably shorter rotation lengths, are likely reducing the overall storage of carbon in forests. Others argue, however, that the substitution of fossil fuels for woodfuel will lead to overall reductions in carbon emissions (see Read *et al*., 2009). The underlying science of carbon release and storage from the global woodfuel sector is complex, and there is no unanimous agreement on whether it has an overall positive or negative impact on the atmosphere's climate budget. For the purposes of the UK's woodfuel sector, the most important consideration is the public's perception and attitudes towards wood burning and its impact on the climate and people's health. However, the popular science-based magazine, *New Scientist*, recently published an article which strongly criticised the global woodfuel market, entitled: *Revealed: The Renewable Energy Scam Making Global Warming Worse* (see New Scientist, 2016). With headlines such as these appearing in the media, the public's attitude towards wood burning could become increasingly negative.

The woodfuel market has the potential to considerably alter the ways in which the forestry and woodland management sectors operate. With coppicing appearing to become more popular with the growth of the woodfuel market, there is scope for research which explores its future commercial viability. With coppicing generally being considered a beneficial activity for wildlife, the extent to which it becomes further integrated into woodland management strategies as the woodfuel market matures will be interesting. The FC, for example, may choose to adopt coppicing more widely. Equally, silvicultural systems like SRF, which are not widely used, may play an increasingly important role in the provision of firewood and woodchip if the demand for home-grown woodfuel continues to grow. Future research could explore whether the fear of small-scale merchants that they will be forced out of the market by larger woodfuel companies is justified. There are also questions concerning the use of large harvesting equipment in smaller woods of high conservation value.

Other studies could explore the sociological aspects of the woodfuel market, such as the extent to which the typology of merchants presented in this thesis reflects the rest of the country, or indeed, the situation in other countries with more established woodfuel supply chains. Furthermore, there is scope for research about the use of firewood and woodchip in domestic situations, taking into account factors like gender and family traditions. Given the chopping and splitting of firewood has historically been carried out by men, it would be interesting to explore whether the modern woodfuel market has changed this. Whilst not addressed in this thesis, all of the merchants interviewed were men. In total, only 4 of the 45

people interviewed in the research were women. There is also much material available from the various Internet discussion groups mentioned in this thesis that would be worthy of further research.

There are multiple areas of research concerning contemporary woodland management and the supply chains of wood products that would be of interest to a variety of geographers. There are on-going ecological changes in woods in response to changing management practices for woodfuel production and biogeographers are suited to studying these alongside ecologists. Cultural and economic geographers are well placed to explore the social and economic dimensions of woodland management. In particular, they may find interest in the debate surrounding the applicability and usefulness of post-productivism, as discussed in this thesis.

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Appendix

Example of a full transcript

Background: The interviewee is a semi-retired architect in her mid- 50s. She lives in North Nottinghamshire in a large rural barn conversion. She owns a 32 hectare wood, in which an interview had been conducted a month before with the firewood merchant she sells timber to. She refers to this merchant throughout the interview. The interview took place in the owner's kitchen on the 28th January, 2014.

The interview began after a discussion about the research topic and both the researcher and interviewee had introduced themselves. The interviewee had laid an Ordnance Survey map covering the area surrounding her wood on her kitchen table. This helped her remember the changes which had taken place in the wood and to make specific comments about different sections of her wood.

Key: [R] – Researcher [I] - Interviewee

[R] Can you tell me how large your wood is?

[I] It's about 78 acres.

[R] How long have you owned it for?

[I] I've owned it since about 1995 or 1996.

[R] And how did you come to purchase it?

[I] I bought it from a plastic surgeon who bought it for the shooting and he moved away and he was selling it so I bought it from him. Before that it belonged to [previous owner's name] who was a big farmer around here. It originally stretched out down there [pointing on the OS map]. One weekend they went in and knocked down that and got into a lot of trouble for it. That's why all these oaks are dotted around. It used to be bigger.

[R] For more arable land I take it?

[I] Yeah.

[R] What sort of state was it in when you bought it?

[I] Well it is in a bit of a state! You've got to define "bit of a state" because it was pretty similar to what it is now really, in fact it was less of a mess because the shoot haven't really looked after it and their stuff is all over the place and messy. Their new gamekeeper is supposed to be clearing it up but they're always too busy.

[R] And what prompted you to buy the wood?

[I] I bought it for its amenity value. I didn't live here then, I lived in Farndon, just on the edge of Newark and I had my own architect's practice so I was too busy to do anything else. I had some spare cash, that was there for sale and actually I lived with a partner then and we bought it to enjoy and when we split up, I had it but, I say it was always for its amenity value, it was really for me only about its amenity value. I've had various people look at it, [name of forestry consultant], someone from the Forestry Commission came and looked at it, various people came and looked at it and gave me ideas and what they thought could happen but generally in the early years it was thinning it so that you just got the stems and I just didn't like that idea. On occasions I have talked to contractors but the ground is so wet, really it's uneconomic for anybody to come in. And on the whole I was quite happy with that. I've never really looked for it to provide an income. Until, well I'm sort of retiring a bit, at least trying to cut down on the work and I thought maybe it could. Do you know [name of a local woodland manager and land agent]?

[R] Yes, he's written a book and I've heard him talk at Royal Forestry Society meetings.

[I] So I looked on the Forestry Commission website and there was this grant. So I spoke to [name of a Forestry Commission Officer] at Market Rasen who was really helpful, incredibly helpful and sympathetic, not bombastic and he gave me [the name of the local woodland manager and land agent] and he suits me as an agent because he's quite willing to do what I want to do. So that's why I started coppicing and they always say "well you've got to coppice it or else it will…" but I don't quite believe that, I think it regenerates as quick as it…and whatever happens it would…so yes, I would never sell it as small acres because I think that would just destroy the wood. You know, everything I like about it, it would destroy and I've always said I've not had it for money, it's for amenity.

[R] When I was talking with [name of firewood merchant she uses], he talked about your plans of getting the wood back into management…

[I] …He's the second. So last season, not last September, the September before that (September 2012) was the first round of coppicing.

[R] Was that in just one compartment?

[I] It was half a hectare. You come into the middle of the wood here [points to map], there's a ride through there. The first hectare was up to about this bit there and he has done that bit there. It's probably about two thirds to a third but maybe that sort of proportion.

[R] And what were your reasons for starting to manage the wood?

[I] Partly monetary because I was not getting the income. Partly interest because it always was a coppiced wood wasn't it? Or no, not always but for a long time. The timber that is there is mainly coppiced ash. So really for that reason. I hated the first set of coppicing. It looked awful. We went in and it looked like the wood had been ravaged. He'd left it really untidy. [The new firewood merchant] has been a lot more workman like and it looks like a worked wood rather than a ravaged wood but I'm not that convinced about how much I like it.

[R] So is the plan to carry on with coppicing?

[I] I think so. Oh yes, I think so, yes with this ash dieback. Because I'm a cynic and I lived through the Dutch Elm Disease, I think it's coming to come and eventually, even if it's in a hundred years, eventually kill the wood so you might as well coppice it. I should be planting it some extra stuff in this quarter that we did because not all the ash took so there's cope to plant it with a wider variety of trees but I suppose what I'd really like would be to establish…this is worked out on like a thirty year coppice cycle to get that cycle going again successfully.

[R] Across the whole wood?

[I] Across the whole wood. So in thirty years you come back to this one and it's all grown up because that to me would be to perpetuate the wood. But the problem with it is that because the ground is so damp, the machinery churns it up.

[R] I remember seeing a ride that machinery could only get so far up because of the wet ground.

[I] Yes, that's right. It's terrible. Absolutely. I think it's because they did oil exploration there back about, it must have been back around 2001 or 2002 and I reckon they put explosives, they did put explosives down but when [her woodland manager and land agent] and I walked round before the first coppice it was in that very dry summer, not this summer? No, it was a very dry patch anyway and it was still very wet in certain patches and they were only ever patches in the rides, they were never patches in the wood. So I thought well they're not going to do their explosives in the middle of the wood so I wouldn't be surprised. And this soil has areas of stone in it, it's Keuper marl and I lived over there once and you only have to dig down like that and there was a patio already there for you. But the wetness of it…my best thing would be to get a horse logger in to do it. Because I think that would just. But I don't have the knowledge or the contacts or anything. Even if I was ten years younger, we had a horse, my daughter's horse who actually would pull. She'd have pulled those logs out easily, a big strong mare but I think that would do the least damage to the wood.

[R] And what sort of costs have been involved with bringing the wood back into management?

[I] Well there aren't any really because he [her firewood merchant] buys the wood off me at a price per tonne. So he stands all the costs, oh no, I stand [her woodland manager and land agent] costs! They're not very much. And then I get a grant on top of it.

[R] Is this one of the Woodland Improvement Grants from the Forestry Commission?

[I] It is from the Forestry Commission. I can't remember which grant it is. But yes. I run my own practice and am so busy so I don't have time and I'm not particularly good at anything else but I always felt there was such scope there to do all sorts of stuff. Because it's such a lovely place to be without wrecking it. Yes, Woodland Improvement Grant I think yes. So yes [whilst flicking through a folder containing her documents about her wood] there are costs with the wood, there were costs, yes woodland planning grant, I've been looking for this! Here's the grant stuff, we got it for three years because they're cutting it back I think.

[R] So it [the grant] seemed to start in 2011, based on this letter here?

[I] Yes, it would have done.

[R] So will it be finishing this year…

[I] No, there were three years. So it will be finishing…I've made one claim, I can make one claim this year and then once claim in 2015. Only because of the time it took to get it sorted. And then, I think they're stopping it so…

[R] Yes, the grant scheme is finishing. Whether it will morph into something else I don't know.

[I] Yes, well it always has in the past. It will become a bird grant or something like that. That's why [Forestry Commission Officer] is incredibly flexible you know. He just likes giving out money and seeing the wood brought back into management or just whatever you want to do with them he will help really. He's a Forestry Commission Officer at the Market Rasen Office.

[R] So at the moment is it just [name of firewood merchant] working in the wood?

[I] Yes.

[R] Have you sold any logs to others?

[I] I haven't done any of that. How it works, and this is how [her woodland manager and land agent] told me to organise it. It makes it very simple for me. Because I originally went

out to tender to two contracts, [name of one firewood merchant] and [name of another firewood merchant] to give me a price per tonne for the wood. One came back at £15, the other came back at £10 and then upped it a bit. So [the merchant who offered more] did the first one. So then, it's either done by weight tickets on the lorry then I get the money when they sell it and it's just simple maths. 80 tonnes, 80 times 15 is whatever. Usually it's about £1000.

[R] So that seems like a reasonable amount?

[I] Well it's interesting because always before I always had a good practice, it was very profitable, money was not an issue. Money is more of an issue now but it's more a balance of keeping…I haven't found a balance really. It's a balance of keeping the wood…I burn a lot of logs you can see. I get through them at a terrific rate and it does give me free heating. This fire is fantastic so I have someone who will cut it and go up and collect it so it's like a day out so that makes your job complicated because you can't really put an easy figure to it.

[R] So you'll be saving on your fuel bills then?

[I] I'm just using it for that [points to a wood burner in the corner] but in the office I've got an open fire but the fact is that I haven't got the time to go up to the wood, I'm reliant on other people so it's always been a bit tortuous to get the wood here. I've never worked that one either because it's too expensive, it's not worth buying it. I asked [her firewood merchant] for a price per tonne and it just wasn't worth me buying it really. It's worth a day out and a day's work which is quite enjoyable. So for me, the sort of economics of doing it because I would be lethal with a chainsaw! If I was good with a chainsaw it would be no problem. But I bought…[her firewood merchant] did a whole lot and then stopped, it got too wet or he got a new job and something better to do and he left quite a bit at the top and I bought that off him for about £120. So that means he's done the difficult bit of getting it on the ground and we can just chop it up and take it away so that's worked well. So all of those little things are like little bits of value, added value.

[R] So from the time from when you bought it until September 2012, had you done much management with it?

[I] Yes. We got, when I was with [her partner], we got that five years management grant. There was a big area of about an acre, you can see it in the middle, where there had been a lot of elms that had all come down and that was empty so we planted that. And we kept the rides cut back. We did some work on the pond down here, so we had a management grant then but you're not really doing very much for that, I mean the planting was good but to be honest it would have regenerated if we hadn't replanted it.

[R] And how much is roughly being extracted now?

[I] Well I think it was 80 tonnes this year. And I think it was more than that last year. I think it was more like 120 tonnes last year or maybe more than that. Here we are [looking through her documents], 117 tonnes, £15 a tonne.

[R] And the harvesting is set to continue?

[I] It was only going to ever be extracting it the rate that it is now to be for the thirty year cycle but it's very much determined by the wetness of the ground and access. To me, it's a little money for me personally for quite a lot of impact on the wood because of the machinery that's used and I'm not convinced about whether the damage it's doing outweighs the money that comes in and the value to the wood in the future. I'm a real cynic. There were a lot of stools that hadn't taken, there is quite a lot of deer damage and I'm not the sort of person…I'm sure I could manage it a load better, the whole wood for deer, culling the deer, getting the maximum amount of the wood, all sorts of things but I haven't, I've left it too late and anyway I always had architecture to do which was my job. But it seems to me it's a poor man's… it's not that profitable for [her firewood merchant] I think, judging from questions I heard him ask [her land agent]. You get these massive fuel log companies I suppose who produce it en masse and, of course, I have a man who's a ground worker who's done a lot of work here. He'll do anything and the basis was that he would sell logs as he wanted them if he cut enough of them for me to use in the fire. H wasn't really up for going out and getting a market. This year has been hopeless because it's not been cold enough to use wood so we haven't really done it so you get the impression its so ad hoc.

[I] Have you seen Hill Holt wood up on the A46? There's quite a high profile wood there. They've gone right to the other extreme of…if I say exploiting the wood, I don't mean exploiting the wood but they have people go in, they have charcoal burning days, things like that. But to me, I never wanted that sort of high level of people…I wanted it all really! I never wanted that sort of impact on the wood because I think there's so much hidden stuff. I mean there aren't that many birds, there are birds but there fungi and the insects, when you really look. When you look at the ash trees, the number of different types of ash trees there are there, there's an absolute fund of really quite low-profile stuff.

[R] So biodiversity and wildlife is key to you?

[I] Yes, absolutely it is and preserving that because it doesn't owe me anything really.

[R] In terms of managing the rides and getting into the woodland, well I think I entered the wood here and we walked around to here [pointing to map].

[I] Oh, did you only see that!? Oh Goodness, that's such a narrow bit of the wood. This end, that corner, I was wondering with my son and we were about in there, we were wondering off the rides and in this corner there were lots of oaks, standard oaks and we were just standing there and he said why do I let the ivy grow up, not the oaks but the ash and I said well it's more habitat blah blah blah and we were just on the ride and there was this thing on the ground that looked like a fence post, at the top it had too bits like that. We turned it over and it was stone and as we pulled it over you could see the imprint of the writing on the underside and it said this Carrington holt of oaks was planted by her Grace the Dutchess of Rutland I think it was in the year 1829 and I thought that's just magic. But we also found that hunting horn. When we were coppicing, I took my daughter's partner's niece, she was just 16, she was kicking around whilst I was talking to [her previous firewood merchant], she kicked that up and it was just…it's full of different things. This area here is an enormous area of beech, it looks like a traditional area of wood, just massive beech standards. The area of different colour here [pointing to the map] those are all elm sucklings so those I have my eye on for timber for here because it's all stored dead wood stored up right so you can go in and cut it down easily, its ready for burning and it's just fantastic and it's easy and I reckon there is a constant supply because as soon as they die down they sprout up again so I reckon that would be good. This is all the oak area. This bit down here is willow and wet and the stream comes round like that. We planted a lot of trees around the pond here, alder and aspen and things like that and some oak and beech. Those have taken quite well.

[R] Have you bought any machinery for managing your woodland?

[I] I bought a quality log splitter for the house, it's for the big logs that come.

[R] And why did you start producing your own logs?

[I] Money really because I was worried that my income had gone down. Money and interest. I'm not convinced about the coppicing. I'm not convinced and sure they are people with the skills.

[I] What is it about the coppicing you don't like?

[I] It's the act of coppicing and the result maybe…[her land agent] seems to know what he's talking about and as I say I'm a cynic and I bet people when they did it in the past and people did it all the time they were proper coppicers so they knew exactly how to do it, when to do it, how to get it out, well they would have got it out with the horses and not done the damage. So really, I would like to do it properly. That would be really good.

[R] Is it only logs that come out of your wood?

[I] They don't come out as logs, they come out as three metre long logs and go off on a 38 tonne articulated lorry. You must have seen them there?

[R] Yes, I saw a pile there which [her firewood merchant] had said were put too far away from the ride and they couldn't get them out.

[I] That's rubbish because it was stacked there last year and went away quite happily. The big stack of big timbers?

[R] Yeah, it was here.

[I] Yeah, yeah. It was stacked there last year and it went alright. I don't think [her firewood merchant] wants to pay for it, well I thought he'd sold it. [Her land agent] helped him get a good price for it because he was moaning that he couldn't get a decent price for it. [Her land agent] helped, he gives me £14 a tonne, he couldn't find anything above £40 or £45 a tonne and [her land agent] found him someone who would buy it at £55 a tonne. And the reason why I said, I heard [her firewood merchant] ask [her land agent] about how long it would normally take two men to cut the area that they did and I think [her land agent] said 100 hours. I worked out that they'll owe me a £1000 or thereabouts but it was about £100 a day for what they were doing but I can't remember the maths now which I didn't think was a lot really for that sort of skilled work. But then [her firewood merchant], they're both quite wacky, they both disappeared off for the summer. Well you can tell he is just by looking at him!

[R] Yes, he's definitely a free spirit!

[I] But the idea of having hazel, you know, would be lovely because that wood would be brilliant for growing hazel stakes, fencing stakes, fuel, it's a real multi-purpose wood for somebody who knows it can use it.

[R] Well [her firewood merchant] would obviously like the hazel!

[I] Do you know the [name of large woodfuel business]? They're big, long-term clients. Well [name of the business owner] knows everything there is to know about biomass. If you want to talk to him, I can give you his number and he would love to talk to you or at least I hope he would! He's been a client for 15 years. He's studied biomass because they produce willow on a very large scale. So I'm doing a scheme with him at the moment where we're putting in district heating and because they can then use their willow, they will actually sell their willow to the tenants. When you see how quickly that willow grows, it makes a nonsense of using anything else and you know they've got it on a big scale with a proper harvesting and proper

chips and they know all there is to know about chips in the same way I'd like to know somebody who knows about coppicing. They're very interesting.

[R] Coppicing is one way of using wood from a woodland to produce woodfuel but there's also…

[I] Clearfelling, that can't be good though can it, that can't be profitable, not for fuel? If you've got coppice wood, it's all growing up like that, if you are clearfelling it, it implies that they are standards and if they are standards and hardwood then they probably have got more value as timber. I once talked to people about taking the wood out of the wood for timber. This was 10 years ago. None of them said it was economic because it was so wet that it would be too difficult to get the machinery in and out, it would cost them too much. It would be too far off the road to make it worthwhile. Nobody was interested. But that wasn't for fuel, that was for timber because the log market has only really just come back hasn't it?

[R] Yeah, I've been trying to pin-point when the market for logs started to pick-up…

[I] …I would have said five thinking back because I remember they felled a wood close to here, the [name of estate] Estate and I thought aha! That was the sign the log market was coming back.

[R] Do you know what kinds of people [her firewood merchant] sells to?

[I] Logs, people who sell logs, large-scale log sellers. Yes. He was keeping some of it for himself I think for logging and selling on and his friend was taking some. You know, small-scale sort of back of the lorry sort of stuff.

[R] How did you come to agree the price with [her firewood merchant]? Did you put a tender out?

[I] No I just went to [her firewood merchant] this time, I got so fed up with [her old firewood merchant] and the mess that he'd left and [her new firewood merchant] actually offered £15 a tonne and [her land agent] said "no no, we'll give you £14" so to me £80 is neither here nor there but he felt it was stretching [her firewood merchant] a bit which was probably true based on what we were talking about. I guess the log market is well established because so many people have wood burning stoves but on the other hand there are the big suppliers who could do it so cheaply, they are so mechanised and they do it on such a big scale that it's really difficult for people like [her firewood merchant] to compete with them. They buy it off [her firewood merchant] and people who go in and coppice it for such a…although logs seem so expensive to me when you buy them in the little things, the bags?

[R] Yes, the big companies that are getting involved are interesting, and the economics are fascinating.

[I] Well the thing is, coppice seems to be…either the fast-growing conifers or coppicing is the only sustainable way to do it. The wood that they cut down there was not a particularly attractive wood, it was a very small parcel, I should think about a third of an acre and it was wispy ashy and I think they replanted that rather than coppiced it. There would be lots of scope, those invoices were from one of the men who worked for [her old firewood merchant]. There were two dead oaks with a lot of Burr oak in them and I asked him to cut those down whereas a lot of the dead wood is just left standing because of the Burr oak there but I can't get that out but it seems to be that Burr oak is absolutely beautiful, there should be a good market for something like that. If only there was an open, probably Amazon or EBay would be a good pace to sell it on, something like that but it's such lovely stuff I didn't want it to just rot. Well it is just rotting because it's still in there! Can't get it out.

[R] Have you considered putting in more stable rides?

[I] It would be very appropriate I think because it would make it easier to move around but I won't do anything that involves putting money because it's so big, you put an enormous amount of money in and it just swallows it up, well literally the rides just swallow it up! And it's just not...why…you're putting more money in then that you're taking out for the coppicing. Or, I don't want to go and clearfell it anyway. So no, in fact [her partner] and I put a load of old hard cord down, there's a ride from there down to there so actually that's not…but the rest no. And to be honest, that clay just swallows hard cord so you'd actually be never-ending, the big material, it would be good enough for walking but…we used to take the Land Rover over there and constantly get stuck, even with mud wheels because it's just impossible stuff. The quad is an idea, quad and a small trailer. It carries not very much but it does very very little damage. It's a really good way of taking things out but nobody does things on that sort of scale. For somebody, I reckon, this is ridiculous, for somebody, the trouble is that the income it could produce would not be competitive with other work that young people can get but if you approached it right there with low costs and could market it right there, there would be a load of stuff you could get from there. Or if you did it right across the board. That would be good but you can't compete with…and neither would it bring a proper return on the money that was put in, although it probably would. It cost me £55,000 in 1990-whatever so I think that was really cheap.

[R] Is firewood something you've started thinking about more since you started coppicing?

[I] Yeah, definitely. Because I didn't feel we'd done it quite right so I was trying o think of a way that we could do it better. Yeah, it has a lot. I've thought about it a lot more.

[R] In terms of species…you're leaving in the oak standards aren't you?

[I] Yes, all the oak. I thought there were some gaps, maybe in the bit that [her firewood merchant] did. Well it's too early to tell isn't it? They haven't sprouted yet but in this section some of the bits that just hadn't sprouted so I was going to plant about twenty trees but I haven't done that yet because I've just not had time. But yes, ideally and different species ideally.

[R] For biodiversity and wildlife?

[I] Yes but also because of the ash dieback as well. The ash will regenerate itself. You know, it's so, that soil is ideal for it. You can't stop it. So that can go on regenerating and these will be other things. There's quite a lot of sycamore as well. This, I was surprised, there's an area…it's very localised the sycamore but they're a big patch there and there's a big sycamore patch up here and I was quite anti the sycamore because I felt it was invasive but actually if the ash is going to go, the sycamore is probably quite a good species to take over. I don't know whether you can coppice it. I had a client who is a minor land owner. He gave me this book. When I first lived near him in the 70s, he was sort of laughed at because he was old-fashioned and wasn't tearing his hedges up and of course now, it's gone full circle but he used to talk to me a lot about his woods because he used to, they've got quite a lot of woodland on the estate and I remember him saying how they used to get the workmen, their farmworkers to work the woods in the off-season and now they haven't got the farm workers to do it. So the woods aren't getting worked but I find that fascinating.

[R] Prior to 2012, I take it you were using firewood which was being produced naturally through falling branches or bits of thinning?

[I] Yes, some of it was being chopped up where it was accessible where I could get to go up there but it was ad hoc. There was an old gamekeeper up there and he wasn't supposed to but he used to take out quite a lot of wood and he used to use it as a currency. Fallen wood was currency to him so anyone who wanted a favour from him would go and give him some. And I took a very relaxed view because I just thought so what? There's plenty there but he's too old now to do that. Actually, that's quite interesting because he is now too old to do that. There's quite a lot of fallen wood that nobody has touched because it's a bit too big for us say and he did use it, that was very much part of his local community, the wood. He was, they were quite poor, they lived in sort of like a pre-fab timber 1940s shed about half a mile from the wood which is now divided into two and he was gamekeeper but I think the wood would have given him quite a bit of extra income for, only on a small scale but he only lived on a small scale.

[R] You mentioned earlier you had a client who worked with biomass and you were looking to set up a district heating scheme. How do you think the woodfuel and biomass markets have changed in recent years?

[I] Well it's opened up, the market has opened up hasn't it? Coppiced ash is ideal for fuel because ash is such a good wood burning stuff. It splits easily and easy to cut down, coppices easily and it's there. It has opened up the market.

[R] Do you think managing a woodland for woodfuel and wildlife can go hand-in-hand?

[I] Well they are supposed to but I don't think they do. Why I don't I think they do. I don't they do there because what concerns me is the damage I think the machinery does to the undergrowth and a lot of the biodiversity for want of a better word to me in that wood is in the undergrowth, it's not birds, it's not flowers, it's not butterflies, it's the specialist wood insects that you can't see and I just have a feeling, so it might bring butterflies in but really I don't like the damage it does. The shoot like it don't they but they're shooters so they…I'm not sure whether that's good or bad. One of my clients runs the shoot and he didn't like the idea of them coppicing, it was the wrong time of year because the young birds are out and it disturbs them and I told this to [her land agent] and he is now managing another wood that they now shoot in and he says he had a conversation with the gamekeeper and they're all for it because of the habitat it produced. Suppose it's the open habitat there that they like, but it's not really open, it's full of brash and undergrowth so I do think the pheasants like that as I did mention how many were there in last year's coppiced bit. He's never made a big fuss about it.

[R] Would you say there have been any downsides to the greater management in your wood?

[I] I think it has done the damage to the undergrowth but let's face it, it's like an acre in a 78 acre wood, it's not the end of the world. And it's been interesting and in theory, I think it's a good way forward. I wouldn't class that as a failure, it's down to my own stupidity but it's no big deal. I suppose I quite like the idea of keeping [her firewood merchant] in a job because he's so wacky he ought to have a place! I didn't like using [her previous firewood merchant] because I felt it was neither one thing nor the other, he didn't do it very well, he wasn't particularly interested, you know it was just a commercial job in…he was putting little bits in a commercial cog that actually was geared up to do much bigger stuff and that doesn't appeal to me at all. So yes, a moderate success but there must be a whole load of other stuff, markets to access. It has no foundation does it? Like there are no ready sort of systems for markets for wood stuffs, they're all so dispersed. You know, because there is some ace wood there for bowl turning and wood turning, absolute magic stuff but putting it

on and marketing that is just too much effort. Not when I can draw something which would earn me a year's worth of that in one go! Markets change don't they and so in twenty years' time which is nothing in terms of that wood when I've nearly owned it twenty years and it's not really changed as far as I can see but big global changes might mean that local stuff is a lot more valuable. And in many ways I've thought don't stress because it might come into its own in the future and that would be the time when it would be most valuable. In some ways, I don't like squandering it on a mass market when you feel that the value is undervalued at £15 a tonne. I don't like seeing those trees go down for £15 a tonne.

[R] How do you go about learning about woodland management?

[I] Talking to people is number one simply because you get so many different views. And because I've got a particular view, I need all those widespread views so talking to people and over the years remembering. The Royal Forestry Society stuff I read a lot but it's…yeah I like the RFS stuff. And I read quite a bit about horse logging, the internet you can research about horse logging and see exactly where it is and what the position is, so the internet a lot. Then just picking stuff up, telly a bit. It gives you a perspective, but that book a lot for the practical bit. Ash is good for firewood! I found it fascinating taking the logs out of the wood and how to use them to get the best out of a fire here because actually I use a lot of very wet wood because it burns slowly and it might not, you can up the flame, give it some draught and get a really good long burn out of a log like that whereas if you have the dry stuff it's woof and it's gone.

[R] You use wet wood…

[I] …Yes, wet ash, wet anything, wet elm we've used, wet willow.

[R] Wow!

[I] Yes, because we cut a willow down so we've got quite a lot of, it doesn't have to be that old and it depends on what you put in with it, the balance, you've got so many things to play with because you've got the air draught, and you've got a mixture of woods and the sizes so you can just really control.

[R] And you've never had any issues with it?

[I] It hasn't been in long enough but I didn't line the flue so. But I'm really really pleased. This year, for the first year at how efficient it is and what heat it chucks out because this is a jolly cold house. You walk into this room where it's not centrally heated and it's a lovely heat, it's a weird heat. I don't know what it is.

[End of interview]

The Firewood Poem

Beechwood fires are bright and clear
If the logs are kept a year,
Chestnut's only good they say,
If for logs 'tis laid away.
Make a fire of Elder tree,
Death within your house will be;
But ash new or ash old,
Is fit for a queen with crown of gold

Birch and fir logs burn too fast
Blaze up bright and do not last,
it is by the Irish said
Hawthorn bakes the sweetest bread.
Elm wood burns like churchyard mould,
E'en the very flames are cold
But ash green or ash brown
Is fit for a queen with golden crown

Poplar gives a bitter smoke,
Fills your eyes and makes you choke,
Apple wood will scent your room
Pear wood smells like flowers in bloom
Oaken logs, if dry and old
keep away the winter's cold
But ash wet or ash dry
a king shall warm his slippers by.

By Lady Celia Congreave. First published in *The Times* in 1930.