PUBLIC BENEFITS FROM PRIVATE FORESTS AND WOODLAND IN ENGLAND: INVESTIGATING THE OPPORTUNITIES FOR PUBLIC GOOD ENHANCEMENT

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ABSTRACT

Public goods such as environmental conservation, amenity and carbon sequestration are increasingly emphasised in forest policy agendas. However, many public benefits in woodlands have occurred incidentally, rather than on the basis of socio-economic logic and often at locations relatively inaccessible to major centres of population. In fact, data reveal a concentration of privately owned woodland in densely populated areas, especially in central and southern England, and that woodland is often factored into residential location decisions and lifestyle behaviours. However, the provision of public goods is likely to be contingent on the value systems of private forest and woodland owners and their flexibility of response to measures promoted under the devolved forest strategies.

A combination of qualitative and quantitative research methods were employed to construct a robust typology of private woodland owners with respect to their willingness and ability to deliver public good benefits in three study areas in England: the Lake District, Cornwall and the High Weald AONB. Building on an exploratory scoping study, Q Methodology interviews were conducted with 10 woodland owners in each study area, followed by a self-completion survey, administered using Dillman's Total Design Method. Data from 600 woodland owners was subjected to a Factor and Cluster Analysis, with the emergent model validated using Discriminant Analysis.

Six discrete private woodland owner types were revealed: Individualists, Multifunctional Owners, Private Consumers, Conservationists, Investors and Amenity Owners. Important distinctions between owner groups are associated with the likely provision of particular benefits and disbenefits, and the classification suggests that a move from a production versus consumption/protection framework to one that includes intersecting goals may be more appropriate. Policy implications are discussed to facilitate use of the typology in targeting particular woodland owner groups with more nuanced policy mechanisms, including incentive schemes, market mechanisms and advisory services.

DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Gloucestershire and is original except where indicated by specific reference in the text. No part of the thesis has been submitted as part of any other academic award. The thesis has not been presented to any other education institution in the United Kingdom or overseas. This thesis is a product of my own work and is not the result of anything done in collaboration.

Any views expressed in the thesis are those of the author and in no way represent those of the University. I agree that this Thesis may be available for reference and photocopying, at the discretion of the University.

Publications and Conferences

Relevant academic and professional conferences were regularly attended at which papers were presented and work peer-reviewed. Papers based entirely on the thesis material have been prepared for publication and to date one has been published in a refereed journal.

Urquhart, J., Courtney, P. & Slee, B. (2010). 'Private ownership and public good provision in English woodlands.' *Small-Scale Forestry*, 9, 1, pp. 1-20.

Urquhart, J. (2009). *Public benefits from private forests and woodland in England: classifying private woodland owners,* Research Summary paper, Social and Economic Research Group, Forest Research, Forestry Commission.

Urquhart, J. (2009). *Public good delivery in private woodlands in England: An empirically-based typology of small-scale private forest owner.* Contributed paper presented at the New and Emerging Rural Researchers Session at the Royal Geographical Society – Institute of British Geographers Annual Conference, Manchester, 26-28 August 2009.

Urquhart, J. (2009). *Public good delivery in private woodlands in England.* Seminar presentation at Forest Research, Alice Holt Research Station, Farnham, 16 July 2009.

Urquhart, J. (2009). *Public good delivery in private woodlands in England: An empirically-based typology of small-scale private forest owners.* Proceedings from IUFRO Small-scale Forestry Symposium, West Virginia, USA, 8-11 June 2009.

Urquhart, J. (2008). *Applying Q Methodology to understand private woodland owners' perspectives on public good provision in English woodlands.* Proceeding from the 12th Biennial Conference of the International Association for the Study of Commons (IASC), Cheltenham, 15 July 2008.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of variance
ANT	Actor Network Theory
AONB	Area of Outstanding Natural Beauty
ASNW	Ancient semi-natural woodland
BAP	Biodiversity Action Plan
CAP	Common Agricultural Policy
CBA	Cost-benefit Analysis
CLA	County Land and Business Association
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
EU ETS	European Union Emission Trading Scheme
EWGS	English Woodland Grant Scheme
FC	Forestry Commission
FGS	Forestry Grant Scheme
FSC	Forest Stewardship Council
FWPS	Farm Woodland Premium Scheme
FWS	Farm Woodland Scheme
HLS	Environmental Stewardship Higher Level Scheme
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
KMO	Kaiser-Meyer-Olkin measure of sampling adequacy
LETS	Local Employment and Trading Systems
LFA	Less Favoured Area
LNR	Local Nature Reserve
MC	Marginal cost
MSA	Measure of sampling adequacy
NFU	National Farmers' Union
NGO	Non-governmental organisation
NIPF	Non-Industrial Private Forest
NIWT	National Inventory of Woodlands and Trees
NNR	National Nature Reserve
NPV	Net present value
OS	Ordnance Survey
PCA	Principal components analysis
PM_{10}	Particulates of less than 10μm
RDPE	Rural Development Programme for England
RFS	Royal Forestry Society
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SNCI	Sites of Nature Conservation Importance
SO_2	Sulphur dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SWA	Small Woods Association
tC	Tonne of Carbon
TDM	Tailored Design Method
TEEB	The Economics of Ecosystems and Biodiversity
TEV	Total Economic Value
TPO	Tree Preservation Order
UKWAS	UK Woodland Assurance Scheme
UNFCCC	United Nations Framework Convention on Climate Change
WAG	Woodland Assessment Grant
WCG	Woodland Creation Grant
WGS	Woodland Grant Scheme

WIG	Woodland Improvement Grant
WMG	Woodland Management Grant
WPG	Woodland Planning Grant
WRG	Woodland Regeneration Grant
WTO	World Trade Organisation
WTP	Willingness to pay

CHAPTER ONE
INTRODUCTION AND BACKGROUND

A society grows great when old men plant trees
whose shade they know they shall never sit in.
- Greek Proverb

1.1 INTRODUCTION

This thesis examines the scope for enhancing the public benefits derived from private woodland and forest ownership in England. Public goods such as environmental conservation, amenity and carbon sequestration are increasingly emphasised in forest policy agendas. However, many public benefits have occurred incidentally, rather than on the basis of socio-economic logic or evidence. According to the CJC Consulting (2003) report to Defra and the Treasury, the major elements of public good benefit from forestry relate to biodiversity, landscape, informal recreation and carbon sequestration[1]. The report's findings summarise a long tradition of economic work into public benefits (e.g. Willis et al., 2003), which tend to gross up benefits into headline figures (c. £1 billion per annum for Britain), often without full consideration of the large spatial variations in benefit for some public goods, or the extent to which differences in ownership and management system impede or enhance public benefits. The case for public support for all forestry and woodland has increasingly been articulated by policy makers in terms of public benefit outputs, but much of this public benefit has been provided in public sector forests, often at locations relatively inaccessible from major centres of population.

Recent data provided by the National Inventory for Woodland and Trees (FC 2003) reveal a considerable concentration of privately owned woodland in densely populated areas, especially in central and southern England where private forest ownership accounts for over 80% of forest cover and where the marginal benefit from public good investment might be very high. Work conducted for the Forestry Commission (2004, p. 250) reveals the extent to which forest and woodland, whether private or public, is valued by local populations and factored into their residential locational decisions and lifestyle behaviours. However, the pattern of farm and forestry ownership is changing, with urban wealth increasingly being used for amenity-driven purchases of rural land. Private woodland owners are an increasingly diverse group of landowners, including farmers, estate owners, forestry businesses and a range of "new" owners. These new owners are often more socially and environmentally-motivated than the more traditional woodland owners. While much private woodland appears to be geographically located in areas where their public good value might be very high, the ability to provide those benefits will be contingent on the willingness or ability of private woodland owners to provide them.

[1] The definition of public goods is returned to in more detail in Chapter Three.

By definition, public or non-market goods are goods that are freely available for all to benefit from. In terms of woodland, they are the benefits that are provided that cannot be traded on markets, such as biodiversity, landscape and amenity. However, while the value of these benefits to society is often high (Willis et al. 2003), private landowners cannot capture financial benefit from their investment in the provision of these public goods. Thus, on a strictly economic basis, unless the owner can internalise the cost or be compensated for the provision of public good benefits, their inability to capture any private profit from their provision may be a disincentive to such investment. Yet some owners may not be motivated by purely economic goals and will not act according to economic logic. Their social or environmental objectives may predispose them to provide certain public benefits, such as nature conservation, at a loss. Thus, the enhanced delivery of public benefits from private woodland will almost inevitably be contingent on the value systems of private forest and woodland owners and their flexibility of response to measures promoted under the devolved forest strategies. Indeed, the heterogeneous mix of owner types presents a challenge for policy makers: essentially, how can policy objectives be delivered through such a diverse forest estate? In this regard, it is, therefore, important to understand the ownership and management motivations of these woodland owners as "knowledge of forest owners' values, attitudes and ownership objectives is ... of crucial importance in understanding and predicting forestry behaviour in private woodlands" (Dhubhain et al., 2006).

1.2 THE INITIAL SCOPING STUDY

A scoping study for this PhD was carried out in the form of a Masters project in 2006 and has been published in the peer-reviewed journal *Small-scale Forestry* (Urquhart et al., 2010). The study aimed to explore the knowledge base of private forest and woodland owners with respect to woodland management and public benefit issues. It was observed that private woodland ownership has changed over the past 20 years, with an increase in new, more socially-oriented owners who may be more motivated by environmental or amenity objectives than financial return. However, there was little substantive evidence relating to the knowledge base of private woodland owners and, in particular, their ability and willingness to deliver public benefits. This lack of evidence in the literature meant that a scoping study was required, firstly, to contribute to theory development surrounding public good provision in private woodlands. Therefore, a Grounded Theory methodology was adopted, using semi-structured interviews, to address this theoretical gap. Grounded theory methodology is most frequently used where there is little or no substantive previous theory development or empirical research in the field of interest (Punch, 2005; Kvist et al., 2006). The main strength of the approach is that theory emerges during primary research through a concurrent process of data collection and analysis. In the Masters study, the grounded theory approach allowed the research to evolve without preconceived presumptions about the attitudes and behaviour of the woodland owner participants.

Secondly, the study gathered evidence about private woodland owners and their management systems to enable an informed approach and the targeting of appropriate questions in order to develop a robust, statistically validated, typology. The findings of the study indicated that private woodland

owners have a diverse range of objectives, motivations and management regimes which influence the potential for public good delivery. Five distinct owner types were identified with respect to their background characteristics: community woodland owner; farmer woodland owner; traditional woodland owner; resident new woodland owner and absentee new woodland owner. The study suggested that some private woodland owners, such as those less motivated by economic return, may be better placed than others to deliver certain public benefits; that conflicts can arise between the provision of recreation and nature conservation, especially in smaller woodlands; and that many private woodland owners are sceptical about becoming involved in grant schemes which may help foster public good provision in the private sector. Three main hypotheses were derived from the grounded theory study which inform the present study: 1) Ownership objectives influence the ability of private woodlands to deliver public good benefits; 2) Public good provision is spatially variable in terms of the scale and location of woodlands; and 3) Market mechanisms have the potential to present a more effective means of stimulating sustainable woodland management than government subsidies.

The findings of this exploratory scoping study are discussed in relation to other studies in the literature review in Chapter Two. The qualitative and inductive nature of this initial study contributed to the development of the mixed methods methodology presented in this thesis, and provided the springboard for the development of a robust woodland owner typology.

1.3 AIM AND OBJECTIVES

The main aim of this thesis is to assess the scope for enhancing the public benefits derived from private woodland and forests in England. In order to fulfil this aim, there are four central objectives:

- To review the knowledge and information systems of different types of forest and woodland owners, especially in relation to their engagement with, and understanding of, public benefit issues;
- To use statistical methods to generate a typology of woodland owners in England with respect to their willingness and ability to deliver public benefits from their forests and woodlands;
- To review the various categories of public benefits arising from private forestry and identify their spatial variability through a regional or case study approach; and
- To recommend policy interventions that will help to enhance the capacity for public benefit provision from non-public forests and woodland in England.

This thesis focuses on a key component of the countryside that is being 'recommoditised' as a consumption good rather than a provider of primary products. It provides a salient example of the challenges faced in ensuring that forestry-related public goods are provided by different types of private sector owner.

The study represents a unique contribution to the academic and policy literature in two main ways. Firstly, in an academic context, the empirical study will inform the literature on multifunctionality and

post-productivist, consumption-driven land use, especially with regard to the changing nature of woodland ownership. Secondly, this study aims to directly inform public policy by making a unique contribution to the evidence base. More specifically, it should be useful in establishing programmes and initiatives for public good provision that are tailored to the needs and constraints of different types of private owners.

1.4 THESIS STRUCTURE

The remainder of this chapter provides a historical background to forestry in Britain, describing the uses and management of woodland over the centuries. Present-day forest policy is discussed in its national, regional and global context, along with the UK government approach to achieving the objectives set out in the national forest strategies. The chapter also gives an overview of forest and woodland ownership in England and outlines the potential for enhancing public good provision in private sector woodland.

Chapter Two considers the theoretical underpinnings of the research. An overview of rural discourses together with the broader philosophical setting is presented. Stances such as utilitarianism, ecological modernisation, post-productivism and environmental pragmatism are considered.

A critical review of the literature relevant to this study is presented in Chapter Three. Existing classifications of private woodland owners are examined in light of their applicability to the UK context, especially in terms of their implications for the policy agenda. A review of studies that have assessed the demand for private woodland use is given, followed by a consideration of the spatial variability of public benefit provision in the private woodland sector. Finally, the literature review and theoretical basis for this study are drawn together in a conceptual model, identifying the conceptual hypotheses for research.

The methodological background is then outlined in Chapter Four, along with a description of the methods used, namely Q Methodology and a postal survey of private woodland owners. The sampling strategy, data collection and analysis techniques are presented, along with a discussion of advantages, limitations and ethical implications.

Chapter Five presents the results of the Q Methodology study. These results were used as a springboard, and external form of validation for the postal survey, the results of which are given in Chapter Six. A full discussion of the results, including their policy implications, is presented in Chapter Seven, along with the main conclusions and some suggestions for future research.

1.4.1 Definition of woodland, forest and forestry

In order to avoid confusion, definitions for the terms woodland, forest and forestry are given here. The Forestry Commission defines **woodland** in the UK as land under stands of trees with a canopy cover

of at least 20% (25% in Northern Ireland), or having the potential to achieve this, including integral open space and felled areas awaiting restocking (FC, 2009a). There is no formal definition for **forest** in the UK but the term is often used for large areas (especially conifers) or for old Royal hunting preserves such as the New Forest or the Forest of Dean (FC, 2009a). **Forestry** is defined by the Royal Forestry Society as "the science and practice of managing forests and woodlands" (RFS, 2009a). While forestry has generally been considered in terms of managing forests and woodlands for timber, it also encompasses more general woodland management which may be for other purposes. This is often termed **multi-purpose forestry**, where forests are managed for a wide range of objectives, including timber, recreation, nature conservation and pollution control.

1.5 A BRIEF HISTORY OF FORESTS AND WOODLANDS IN BRITAIN

This section outlines the changing nature of forests and woodlands in Britain since the melting of the glaciers and ice sheets in Western Europe at the end of the last Ice Age 10,000 years ago. It charts the colonisation of Britain by the first pioneer trees, to the huge tracts of wildwood that dominated the British landscape by 2500 BC. It then outlines the influence of humans on forests, and how human activity has shaped British woodlands through the Middle Ages, the Napoleonic Wars, the Industrial Revolution and in post-war years.

1.5.1 The early development of 'wildwood'

Around 10,000 years ago the glaciers and ice sheets of the last Ice Age melted in Western Europe and trees returned to Britain to colonise the tundra and moorland. The first pioneer tree species were aspen, birch and sallow, followed by pine and hazel. Pine was followed by oak and alder, then elm and lime arrived, and finally ash, holly, hornbeam, beech and maple (Rackham, 2001). By about 4,500 years ago the 'wildwood' (woods before human intervention) was fully developed. Pollen records from this time compiled by Birks and his colleagues in 1975 indicate that the extreme north of Scotland was still largely tundra at this time, the north-west Highlands had birch forests, while the forested parts of the eastern Highlands consisted of pine. Oak and hazel woodlands were mostly found in the rest of Scotland, northern England, most of Wales and the south-west of England. South Wales and Cornwall consisted of hazel and elm, while the rest of England had mainly lime.

Human influence on the wildwood and the gradual clearance for man's activities began about 6,000 years ago during Mesolithic times, although the small clearings around people's homes combined with the low population meant that they made relatively little impact upon their surroundings. Mesolithic people did, however, begin the creation of heathland for pasture for edible wild animals (Rackham, 2001). Human interference on a large scale did not begin until just after 4,000 BC when Neolithic man began to clear the wildwood to cultivate the land. In some areas, such as the East Anglian Brecklands where the population was relatively dense, the wildwood disappeared for good (Rackham, 2001). This clearance of wildwood continued through the Bronze and Iron Ages with at least half of England cleared of wildwood by 500 BC. Throughout this time demand for wood products was important, but

woodlands needed to be managed in order to produce the small timber and poles needed (timber from wildwood was too large and impractical to use). Early Neolithic people had already discovered the benefits of coppicing for the production of useable underwood for fencing, vehicles, equipment and fuel (Rackham, 2001).

When the Romans arrived in Britain in 43 AD they found a land with almost as much agricultural land as today. Most of the wildwood had been cleared by this time and the Romans continued the management of woodlands by coppicing in order to provide the timber and wood required for their civilisation and military workings. The Romans also introduced sweet chestnut into Britain in coppice woodlands.

After the Romans, Britain went into economic decline and the industrial uses of woodland were no longer required. However, management of woodlands still continued in order to provide people with fuel and other products. The Anglo Saxons needed small timber and poles grown in carefully managed coppice rotations in order to build their characteristic wattle-and-daub buildings. During this time woodlands were mainly in private ownership under a feudal system and were highly valued, although, as documented in the Domesday survey of 1086, woodland cover in England was at most 15%. In the following 200 years the population doubled and the rate of destruction of woodland for agriculture increased to around 20 acres per day (Rackham, 2001). The remaining woodland was used as coppice-wood or wood pasture.

1.5.2 The medieval wood

Throughout the Middle Ages coppice-with-standards and wood pasture continued to be the normal management systems for woodlands. The underwood produced an annual crop and the standards yielded timber on a less regular basis. Rotations in coppice woods were short, often 8 years, but sometimes as short as 4 years. The most common use of wood was for fuel and fencing, with timber, mainly oak, used for building.

During this time, the extent and structure of woodlands was generally constant, although the length of coppice rotations increased. Woodlands provided income and capital and, for at least 600 years, the real price of trees remained steady (Rackham, 2001). As Rackham states: "the economic value of woods, plus the capital cost of destroying them, tended to preserve woodland against other land-uses from 1350 to 1850" (Rackham, 2001, p. 83).

As well as their management of woodlands for wood products, woodlands in Britain have also been managed for game since Saxon times, although the Royal hunting forests were not established until the medieval period. Throughout this time, the term 'forest' referred to a place of deer, not necessarily a place of trees (Rackham, 2001). The establishment of the Royal forests gave the king the right to prevent landowners from clearing and cultivating their land. This control continued after the Forest

Laws were revoked in 1507 through the deer parks and small estates that replaced the hunting forests. The main game hunted at this time was deer, wild boar, rabbits, foxes, hares, pheasants and partridges.

1.5.3 Woods and wars

The main industry for woods throughout the Middle Ages and beyond was charcoal for iron-smelting. From the mid-16th Century to the mid-19th Century, much timber was required for shipbuilding, leather-tanning and charcoal for the Napoleonic Wars. In fact, as many timber-built ships were launched in Britain between 1800 and 1860 as in the whole of history before 1800 (Rackham, 2001). Ships were built almost entirely of oak, except for the masts, which were constructed from imported timber, often pine. Oak bark was used for leather tanning. Between 1780 and 1850 tanning was a huge industry serving the military's demand for saddles and was a much greater consumer of oak trees than the shipyards (Rackham, 2001). Charcoal was also required in the making of gunpowder.

The Industrial Revolution brought dramatic changes to the British countryside and although woodlands were still managed to produce pit props, many were cleared for agriculture to feed the growing population. By the end of the 1800s woodlands and their management fell into decline, with a lack of coppicing and felling. This was due to a decline in the demand for timber, with other materials replacing it, such as iron and steel. Coal also replaced wood as a fuel, and with the advent of the railways cheap coal could also be taken into the countryside. By 1900 Britain had less than 5% woodland cover (FC, 2006a), partly due to the progressive exploitation of the previous centuries and partly as a result of a falling demand for wood products during the Industrial Revolution.

1.6 20TH CENTURY FOREST POLICY AND BEYOND

In this section, an overview of Britain's forest policy since 1900 is given, from the policies of the early 20th century that aimed to develop and maintain a strategic reserve of timber, to an increasing emphasis on multi-purpose forestry objectives within the international policy framework which has existed since the 1990s. The move towards multi-functional or post-productivist forestry has influenced the development of the devolved Forest Strategies in the UK in which the social, economic and environmental benefits of forests and woodlands are explicitly recognised. Further, with the government's commitment to reducing the UK's carbon dioxide emissions, the role of forests in mitigating climate change is also acknowledged. An overview of the role of government in regulating forestry is given below, outlining the development of forestry standards, certification and grant incentives.

1.6.1 Early 20th Century forest policy in Britain

Until the end of the First World War, Britain relied heavily on overseas timber supplies. However, the German naval blockade during the war cut off Britain from most of its timber imports and the felling of much of its remaining natural woodland stock to supply the huge demand for wood for trench building

caused serious shortages in timber (Campbell and Fairley, 1991), as well as a realisation of Britain's vulnerability in times of war. In the wake of a post-war inquiry, the Forestry Act came into force in 1919 and the newly-founded Forestry Commission was given the task of increasing Britain's cover of woodland and creating a strategic reserve of timber. Due to the agricultural depression, the Commission was able to buy up large tracts of poorer quality agricultural land cheaply and by September 1929 about 240,000 ha of woodland were being managed in 152 forests and about 56,000 ha had been planted. A further 22,000 ha had been planted in the private sector with the aid of government grants. The main market for timber at this time was pit props. By the outbreak of the Second World War in 1939, 200,000 ha of plantations had been established, consisting mostly of fast-growing exotic conifers such as Sitka spruce (Richards, 2003). Since these plantations were still in their infancy, they could only contribute in a small way to the increased demand for home-grown timber during, and shortly after, the war. The remaining mature woodlands, mostly in private ownership, therefore bore the brunt of that demand. In the decades after WW2 it was the common belief that worldwide availability of timber would tighten and Britain's pre-war policy of expanding domestic timber reserves was again pursued (Richards, 2003). This post-war expansion was shared between the state (in the form of the Forestry Commission) and the private sector. However, in the 30 years from 1945, there was an unprecedented destruction of ancient woodland in contrast to the slow decline of the previous 1,000 years (Rackham, 2001). Much ancient woodland was replaced with conifer plantations under the forest policy at that time or it was grubbed up for agricultural use, due to the need to feed the nation after the shortages of the Second World War.

1.6.2 Late 20th Century repositioning of forestry

The policy of creating a strategic timber reserve continued until the late 1950s. In 1957 the Zuckerman report was published, reviewing forestry and agriculture on marginal lands. The report concluded that the objectives of the Forestry Commission were out of date and that with the advent of nuclear warfare, the need for a strategic timber reserve had diminished. The report recommended that foresters should actively seek uses for their wood products, and what followed was a large and rapid expansion of the wood processing industry. Grants, tax concessions and technical support were provided to private owners by the Forestry Commission in order to encourage new woodland planting and growth in the timber industry. This was accompanied by the continued modernisation of sawmilling and industries such as wood-based panels, pulp and paper. Output and income from the forest estate almost doubled during the 1950s-1970s as mechanisation and investment in forestry rapidly increased. In 1950 the Forestry Commission employed 13,220 people and by the end of the decade nearly 243,000 ha of private forest were planted under the Dedication Scheme which comprised a grant-aided commitment to production forestry. Silvicultural systems were employed that provided the raw materials for the growing market, such as short rotations on fertile soils, heavy thinning and the use of fertilisers and monocultures.

A cost-benefit analysis in 1972 by the Treasury began to question the economic logic of investment in

intensive forest regimes. The main findings of the report suggested that the rate of return on new planting and restocking was generally low and that even planting in favourable locations was only likely to achieve an internal rate of return of 3%. Furthermore, the cost of creating jobs through forestry investment was extremely high in areas of low rates of return and secondary benefits, such as the environment, were limited. While there were significant recreational benefits, these were confined to the accessible areas of forests. While there was much criticism over the 1972 cost-benefit analysis, especially in relation to the Treasury's use of a test discount rate of 10%, a further cost-benefit analysis by the National Audit Office in 1986 concurred with the findings of the 1972 study. They recalculated the rate of return on forestry from timber alone as between 0.5–5%, depending on the location. Recreation benefits were estimated at £10 million per year. Thus, a change in direction in national forestry policy appeared to be on the horizon.

1.6.3 A change in direction

In the 1970s there was a growing awareness of access and recreational needs, together with that of the conservation and amenity benefits of woodland. In the early 1980s recession hit timber users and the Forestry Commission was forced to develop an export market, much of which was to Scandinavia. A period of modest forest privatisation in the 1980s and early 1990s followed, when the Forestry Commission sold part of their estate to private owners. At the same time, there was a growing awareness of the need for forests and woodlands to provide not only timber, but other socio-economic benefits such as rural employment and non-market goods such as recreation, biodiversity and pollution control. There was also a growing realisation that management practices within woodlands and forests needed to be sustainable in order to ensure their long-term future.

Following the end of tax allowances for new planting in 1988 a new approach to encouraging woodland creation and management began. Central to this were the new policy perspectives on the importance of the environmental and social benefits of woodland. As part of the Rural Development Programme for England (RDPE) grants for woodland management and creation under the Farm Woodland Premium Scheme (FWPS) and the Woodland Grant Scheme (WGS) were offered. These grants aimed to encourage the effective and appropriate management of woodlands, in particular ancient semi-natural woodlands, improve the economy in rural areas and provide an alternative land use to agriculture. The Farm Woodland Scheme (FWS) was introduced in 1988 to replace the tax allowances on investment in new woodlands. The FWS, and the subsequent Farm Woodland Premium Scheme (FWPS) introduced in 1992, aimed at encouraging farmers to plant woodlands on productive agricultural land in order to improve landscapes, create new habitats and increase biodiversity. Farmers received payments to cover their loss due to foregone agricultural production. Up until the end of the scheme in 2005, over 43,500 ha of agricultural land was approved for planting, 91% of which was broadleaves (FC, 2006b). Between 2000-2005 the Woodland Grant Scheme supported the creation of 28,262 ha of new woodland in England (with approximately 28 million new trees planted) and 257,921 ha of existing woodland were brought into approved management schemes (Defra, 2006a).

In 2005 the English Woodland Grant Scheme (EWGS) was announced, with the purpose of developing the co-ordinated delivery of public benefits from England's woodlands. The EWGS operates under the RDPE, supported by funding from the European Union and the Treasury. It is administered by the Forestry Commission. Funding is managed regionally, with some grants targeted at priorities in the Regional Forestry Framework action plans. The main objectives of the EWGS are[2]:

- to sustain and increase the public benefits derived from existing woodlands in England
- to invest in the creation of new woodlands in England to deliver additional public benefits.

In order to meet these objectives, the scheme consists of six grants for the creation and stewardship of woodlands, outlined as follows.

1.6.3.1 Woodland Planning Grant (WPG)

The Woodland Planning Grant (WPG) contributes to the cost of producing management plans for existing woodlands that meet the planning requirements of the UK Woodland Assurance Scheme.

1.6.3.2 Woodland Assessment Grant (WAG)

The Woodland Assessment Grant (WAG) contributes to the cost of undertaking specified assessments if the Forestry Commission considers that further information is required before decisions about work in the woodland can be made. Eligible assessments might include: ecological assessment; landscape design plan; historic and cultural assessment; or determining stakeholder interests.

1.6.3.3 Woodland Regeneration Grant (WRG)

The Woodland Regeneration Grant (WRG) contributes to the cost of making changes to the composition of woodland within the normal cycle of felling and woodland regeneration. Regeneration of woodland, either by planting or natural seeding, offers an opportunity to change the woodland to improve its capacity for sustainable management and delivery of benefits to the public.

1.6.3.4 Woodland Improvement Grant (WIG)

The Woodland Improvement Grant (WIG) funds capital investment in woodlands over an agreed period, to create, enhance and sustain an increase in the quantity and quality of public benefits delivered. It is aligned with Defra's Agri-environment Environmental Stewardship Higher Level Scheme (HLS).

There are 4 national funds available under the WIG:

- BAP WIG - to help deliver the UK Biodiversity Action Plan (BAP) for priority woodland habitats and species, e.g. restoring Ancient Woodland Sites.

[2] Information on EWGS grants is available at http://www.forestry.gov.uk/ewgs

- Red Squirrel WIG - contribution for conservation work in red squirrel reserves and buffer zones.
- SSSI WIG - contribution towards bringing Sites of Special Scientific Interest (SSSI) sites from 'unfavourable' condition to 'favourable' condition.
- Access WIG - contribution towards the provision and improvement of public access facilities where there is the need.

1.6.3.5 Woodland Management Grant (WMG)

The Woodland Management Grant (WMG) aims to encourage low key, sustainable woodland practice. It is designed to protect the delivery of existing benefits to the public and improve the capacity of the woodland to increase these.

1.6.3.6 Woodland Creation Grant (WCG)

The Woodland Creation Grant (WCG) supports the establishment of new woodlands that meet national and regional priorities. The grant is available on a competitive and regional basis, using scoring systems that select applications based on best fit with the public benefit priorities. Compensation for lost agricultural income can be claimed if woodland is created on agricultural land.

The aim of this grant is to generate the greatest benefits by creating woodlands:

- Near to where people live, particularly within the urban fringe.
- For access, recreation and sport.
- Appropriately designed for wildlife, particularly where they can act as protective buffers and link important woodland habitats and other associated natural areas.
- Designed to enhance the landscape.
- To restore former industrial land.

In addition to grants for the creation and stewardship of woodlands, the Community Woodland Supplement, introduced in 1991, has assisted specifically in the establishment of new woodland near to settlements for informal recreation. The criteria for the supplement was that woodland must be within 5 miles of a village or town and that there must be unfulfilled demand for access to woodland in the area. There are now 12 community forests in and around major urban areas in England. A National Forest was also created in 1990 in the Midlands. The site was chosen for its symbolic location at the centre of the UK and covers an area of 200 square miles. Since 1991, when woodland cover was only 6% in the area, over 7 million trees have been planted resulting in nearly 18% woodland cover by 2005[3].

Managing land for game hunting has also had a strong influence on the landscape and woodland

[3] http://www.nationalforest.org/forest/

management activities in many areas (for example, the New Forest in Hampshire, created as Royal hunting ground almost 900 years ago). Many smaller copses and spinneys[4] that exist today are the result of game management. Managing woodlands and farmland for game still has a market value – the sporting value of shooting, and, to a lesser extent, the sale of the meat. The economic value of hunting also provides an incentive for the preservation and management of both game and their habitats.

1.6.4 An International Agenda

Following the Rio Summit of 1992, Britain signed up to a number of international agreements resulting from the Ministerial Conferences on the Protection of Forests in Europe, including the Statement of Forest Principles, in which "Forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual human needs of present and future generations" (Principle 2b). The Guidelines for the Sustainable Management of Forests in Europe, agreed in Helsinki in 1993, included the recognition that "forest polices ... should strongly encourage practices in state and private forests which facilitate multiple functions and sustainable management, including the conservation and appropriate enhancement of biodiversity. Forest owners who provide multiple-use benefits to the community should be encouraged and supported by society or other beneficiaries, as appropriate, when such provision involves them in excessive costs" (Resolution 1.2). The Guidelines also recommend that "Forest management should provide, to the extent that it is economically and environmentally sound to do so, optimal combinations of goods and services to nations and to local populations. Multiple-use forestry should be promoted to achieve an appropriate balance between the various needs of society" (Resolution 1.5).

Following on from the Third Ministerial Conference on the Protection of Forests in Europe in Lisbon in 1998, at which the Guidelines for the Protection of Forests in Europe were agreed, Britain has developed criteria and indicators to help assess and monitor the success of its commitment to sustainable forest management. These initiatives include the UK Forestry Standard and Guidelines (FC, 2004), UK indicators of sustainable forestry and a new framework of regulatory instruments and advice. In June 1999 the UK Woodland Assurance Scheme (UKWAS) was launched, a voluntary scheme set up by a range of government, private and NGO stakeholders in UK forestry in response to the growing demand by consumers and retailers for independent assurance that the wood products they buy come from well managed forests. Forest owners can voluntarily sign up to UKWAS (for a charge) in order for their activities to be independently inspected for adherence to the UKWAS Standard. Those owners who meet the standard may use the Forest Stewardship Council (FSC) trademarks on their products.

[4] A copse that shelters game.

In line with its international obligations, the UK government has set out its objectives for sustainable forest management in the devolved national Forest Strategies (FS, 2006; FC, 2006c; Defra, 2007a; FC, 2009b), which outline the social, environmental and economic objectives of sustainable forest management for England, Scotland, Wales and Northern Ireland. These strategies aim to deliver social and environmental benefits (public benefits) from forests and woodlands alongside economic benefits (e.g. timber production). The *Strategy for England's Trees, Woods and Forests* (Defra, 2007a) has five main aims:

- provide, in England, a resource of trees, woodlands and forests in places where they can contribute most in terms of environmental, economic and social benefits now and for future generations;
- ensure that existing and newly-planted trees, woods and forests are resilient to the impacts of climate change and also contribute to the way in which biodiversity and natural resources adjust to a changing climate;
- protect and enhance the environmental resources of water, soil, air, biodiversity and landscapes (both woodland and non-woodland), and the cultural and amenity values of trees and woodland;
- increase the contribution that trees, woods and forests make to the quality of life for those living in, working in or visiting England;
- improve the competitiveness of woodland businesses and promote the development of new or improved markets for sustainable woodland products and ecosystem services where this will deliver identifiable public benefits, nationally or locally, including the reduction of carbon emissions.

As well as a change of emphasis in forest policy, the role of woodland and forests is also increasingly identified in wider policy agendas. For example, there is clearly growing recognition of the role that forests and woodlands can play in mitigating climate change. The use of woody biomass for the generation of electricity, heat and liquid fuels is included in the government's Energy White Paper (2003) and was highlighted as a mitigation tool for climate change in the Stern Review (2006). There is also recognition of the role of woodland in improving quality of life and rural economies, as outlined in the Rural White Paper (2000, p. 103) which states: "Trees, woods and forests will have a more prominent place in the countryside," with more accessible woodlands for people to visit and an increase in semi-natural and native woodlands.

1.7 THE BRITISH FOREST ESTATE SINCE 1900

By the end of the 20th Century, Britain had expanded its woodland cover to 12%, with 9% woodland cover in England (Defra, 2007a). Over half of woodland in England is broadleaved, a further 25% is conifer and the remainder is mixed (12.3%) and open space within woodlands (6.5%) (FC, 2001). The main broadleaved species is oak, accounting for 25% of all broadleaved species.

While England has 9% woodland cover, there is much variation in cover regionally. For example, Humberside has less than 3% cover, while Surrey has 22% (Smith, 2002). Indeed, the South-east has been the most wooded region of England since the late 1800s. Of note is the variation in woodland cover in the north of England. Northumberland, for example, has increased its woodland cover from less than 4% to over 15% since 1895. Other counties, such as Lincolnshire, have hardly changed.

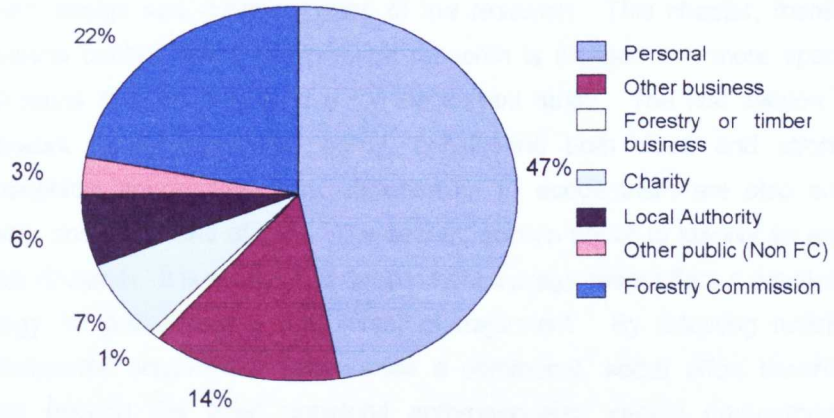


Figure 1.1: Woodland and forest ownership type by area (FC 2001)

According to the 1995-99 National Inventory of Woodland and Trees, the Forestry Commission owns or leases 22% of woodland over 2 ha in England (Figure 1.1) (FC, 2006d). The remaining 78% of woodland is made up of private, business, forestry or timber business, charity, local authority, other public or community owners. 62% of all woodland in England is in personal or private business ownership, accounting for just over 680,000 ha. It is this group of woodland owners that this study seeks to explore. Since private ownership of woodland is increasing and policy goals are evolving, it is important to understand the nature, and attitudes, of these owners in relation to public good provision. Evidence suggests that these private woodland owners are not a homogeneous group. They consist increasingly of a diverse mix of traditional or farm woodland owners, together with a wide range of new, socially-oriented owners who may have little previous experience of woodland management. With such a wide range of woodland owners, it is likely that there will not be one policy approach that will be effective in delivering the strategic aims for England's woodlands. Therefore, this study attempts to shed some light on the diverse and complex range of attitudes and motivations of private woodland owners, insofar as they are likely to mediate the provision of public goods. This will inform public policy and assist in the development of programmes and incentives that will better deliver public benefits from England's woodlands and forests. The next two chapters consider this evidence in more detail, starting with its theoretical underpinning.

CHAPTER TWO

PHILOSOPHICAL CHALLENGES OF FOREST RESEARCH: TOWARDS A CONCEPTUAL FRAMEWORK

2.1 INTRODUCTION

As with any research it is important to consider the ontological and epistemological framework within which the research is embedded. The theoretical underpinnings will have fundamental impacts on the context, design and implementation of the research. This chapter, therefore, considers the broad theoretical context within which forest research is situated and more specifically the relevance and implications that this might have for the current study. The first section outlines the philosophical framework for environmental policy, considering both weak and strong sustainability debates. Philosophical approaches from utilitarianism to ecocentrism are also considered, along with the benefits and limitations of both. The second section seeks to identify an appropriate theoretical basis for this research. It is shown that environmental pragmatism offers a practical, workable environmental strategy for policy-making and forest management. By adopting holistic, pluralistic approaches environmental pragmatism emphasises a communal, social effort towards problem-solving. This moves beyond the often unhelpful anthropocentric versus non-anthropocentric debate that is sometimes evident in environmental policy making.

The third section moves on to examine the changes in rural space and conceptualisation of 'the rural' over the past century. The debate between social constructionism and realism is discussed, outlining possible approaches towards pragmatic rural research. Discourses on productivism and post-productivism are then discussed, along with the associated multifunctional discourses, especially in relation to British forestry.

2.2 THE PHILOSOPHICAL CHALLENGES OF FOREST RESEARCH

Delivering multi-purpose forestry objectives presents a number of challenges for forest policy-makers and managers, not least in achieving sustainability goals which are often diffuse and nebulous. Monitoring and assessing these objectives involves not just an analysis of the commercial productivity of forests, but also an assessment of whether the environmental and social objectives are being adequately delivered. Policy evaluation techniques such as Quality of Life Assessments can help to identify what matters to people so that the consequences of management options on quality of life can be better understood (CA, 2006). However, an integrated approach to the forest resource necessarily involves finding a balance between the provision of non-marketable public goods (environmental and social benefits) and private goods (e.g. timber production). This involves comparing the value of a good with a market value (e.g. timber) to goods with no market value (e.g. biodiversity, recreation), which presents problems in terms of policy. If a marketable value can be attributed to those public

goods, they can be compared and valued alongside marketable goods. In terms of sustainable forest management, the woodland resource does not simply consist of the value of timber within it. In theory, value (whether financial or otherwise) can be estimated for the public goods therein, such as biodiversity, recreation, landscape, carbon sequestration, pollution absorption and so on.

However, estimating non-market values for public goods is not straightforward and is not without its problems. Although environmental economic techniques have been widely used to explore social/policy choices and to evaluate policies, they may fail to bring to light 'intrinsic values'[5] or miss out other social or symbolic values that cannot be readily converted into economic terminology. Thus, identifying the full set of values related to an environmental issue is messy, tangled and complex. To try to make sense of the range of approaches to natural resource management, it is appropriate to consider the philosophical challenges and theoretical underpinnings of environmental issues and policy.

The philosophical framework will have fundamental impacts on the context, design and implementation of the research and can potentially impact on findings and policy recommendations. The ethical position of the research will also help determine how the study is framed and will have implications for data collection, analysis and findings. The following three sub-sections consider three philosophical debates which are relevant to this study: weak and strong sustainability, utilitarianism and ecocentrism.

2.2.1 Weak and strong sustainability

Ontological positions have consequences for environmentalism and are reflected in differing approaches to understanding sustainable development. There are a number of definitions of sustainable development, all reflecting alternative environmental ideologies. These range from technocentrism, centred on the belief that technology can overcome any environmental problems, to ecocentrism, which supports a steady-state[6] or reduced scale economy together with preservation of resources (Turner et al., 1994). Obviously, environmental ideologies are not bipolar, and there is a range of stances in-between. Technocentric positions are often considered very weakly sustainable, while ecocentric approaches, such as deep ecology, represent the application of very strong sustainability principles (Turner, 1993).

However, the definition of what constitutes weak and strong sustainability is itself wrought with difficulties. One way of defining weak and strong sustainability is concerned with approaches to natural capital, which has been at the centre of much academic debate for many years (Beckermann, 1995; Jacobs, 1995; Faucheux et al., 1997; Ayres et al., 2001). Central to the debate is the issue of what aspects of natural capital are critical to human society and, therefore, un-substitutable with other

[5] Intrinsic value is the value of an environmental asset which exists independent of its utility to humans (Norton 2002; pg. 39).
[6] Zero economic growth and zero population growth (Turner 1993).

forms of capital (Chiesura and De Groot, 2003). Often critical natural capital is defined as those important and irreplaceable life-support functions of the planet, such as the ozone layer. Very strong sustainability argues that such natural capital is essential to the wellbeing of people both now and in the future (Norton, 2002) and, therefore, requires protection (Daly and Cobb, 1990) and cannot be traded off or substituted (Spash, 1997). Some argue that wider socio-cultural functions (such as recreation, health, amenity, education, heritage etc.) are also important for the quality and sustainability of human life (Chiesura and De Groot, 2003). Initiatives, such as The Economics of Ecosystems and Biodiversity (TEEB), launched in 2007, aim to promote a better understanding of the true economic value of ecosystem services and to identify economic tools that take proper account of this value (EC, 2008).

Perhaps the most often quoted and widely known definition of sustainable development is the Brundtland definition: "Humanity has the ability to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their needs" (WCED, 1987). This definition of sustainability stresses the importance of inter-generational equity and intra-generational equity. However, the emphasis is on the transfer of aggregate capital stock (social, economic, natural) under the 'constant capital' rule (Turner et al., 1994). In this approach, representing very weak sustainability, natural capital can be substituted by human-made capital, provided that the aggregate capital stock is not diminished. As can be seen from the contrasting 'very weak' and 'very strong' sustainability discourses, the issue is fraught with difficulties and choices have to be made. Utilitarianism and ecocentrism are two opposing ideologies to consider in this respect.

2.2.2 Utilitarianism

Environmental policy research, within which this study is situated, has traditionally been influenced by ethical traditions such as utilitarianism. Utilitarian thinking in the writings of Jeremy Bentham and John Stuart Mill in the 19th century was especially influential for economics, public policy and government regulation (Hillier, 1998; Des Jardins, 2001). The fundamental principle of utilitarianism is 'the greatest good for the greatest number of people.' It focuses on the right or wrong of the consequences of actions. Thus, a utilitarian would justify breaking a fundamental tenet if the consequence was to bring a greater good or increased economic or social welfare (Perman et al., 2003).

There are two versions of utilitarianism, distinguished by how the term 'good' is described. Hedonistic utilitarianism focuses on pleasure as the only 'good' valued for its own sake (Des Jardins, 2001). Preference utilitarianism, on the other hand, defines 'good' as happiness that results from the satisfaction of our desires (Des Jardins, 2001). The latter is closely associated with welfare economic theory and thus has potential application in environmental policy-making.

However, there are challenges for adopting a utilitarian perspective when dealing with environmental

goods and natural capital. It is difficult to measure problems that are qualitative by nature. For example, because 'good' is difficult to quantify, utilitarians tend to substitute it with something that can be measured (Des Jardins, 2001). For example, in the context of rainforest destruction we can calculate the loss of biodiversity, the reduction in carbon sequestration, reduction in amenity, but how do we measure the value of the irreplaceable life support functions of the forest? Are some things simply ethically wrong and, thus, do not require any form of quantification to prove that they are wrong? What if the destruction of an ancient semi-natural woodland with a rare species would result in a net increase in beneficial social consequences? Does the net benefit to society outweigh the intrinsic value of one species? These are difficult questions which must be addressed when making environmental policy decisions and are certainly pertinent when allocating resources for the delivery of public benefits in woodlands.

Utilitarian philosophy and welfare economics take the view that our only obligation to future generations is to avoid actions that will make them poorer than we are (Norton, 2002). Thus, they have a relatively weak approach to sustainability. Utilitarian writers, such as Solow, believe that there are no limits to the substitution of human-made wealth for natural resources (Norton, 2002). Solow states that, because we cannot know the wants or needs or future generations, we are not in a position to make assumptions about what is appropriate to bequeath. Ignorance regarding future generations is used to justify the 'constant capital' approach. Solow denies that decisions to protect special places or species are bound up in sustainability. He regards these as gifts, free decisions based on the preferences of today's generation and not an obligation under sustainability (Norton, 2002). Other writers such as Barry (1989), Passmore (1974) and Golding (1981) share this view.

2.2.3 Ecocentrism and other ideologies

Many environmentalists, however, disagree with Solow's 'ignorance argument' and also disagree with the principles of utilitarianism. They assert that there is moral responsibility for assigning value to natural capital and ensuring that it is perpetuated (Norton, 2002). Such an approach asserts that there are certain absolute rights and duties that we have to abide by, despite the consequences or lack of utility to humankind. Ecocentrism asserts that nature has intrinsic value and should be protected for its own sake. Such a deontological environmental position recognises the inherent, inviolable value of the environment (such as Naess's (1973) 'deep ecological' perspective). As such, our use of the environment should be sustainable, respecting and preserving the life support functions that the earth provides to humanity. In his *Sand County Almanac,* written in 1949, Leopold (1987) argues that humans are 'plain citizens', not masters dominating over the rest of the natural world. Deep ecologists adhere to the concept of biocentric equality in which humans are accorded the same rights and values as the rest of the natural world.

However, classifications of ecocentric and technocentric ethics, such as O'Riordan's (1981), do not address the intermediate positions in-between weak and strong sustainabilty (Sylvan, 1985; Sylvan,

1985; Pepper, 1986). O'Riordan (1981) contrasts the ecocentric view of reverence, humility, responsibility and care with the technocentric view that humans can control nature to suit their purposes using modern technology. However, it is likely that individuals will have elements of both frames of reference, which will depend upon the issue in question and their socio-economic and cultural setting. For example, those in technological careers are still able to appreciate the beauty of nature and those who adhere to a strict ecocentric approach may still appreciate the comforts of civilised life (O'Riordan, 1981). Martell (1994) argues that you can be humanist and have a sound environmental ethic.

Merchant (1992) maps the middle ground in terms of ethics and ideologies. She contrasts egocentrism with ecocentrism, with homocentrism in the middle. Egocentric ethics allows individuals to use natural resources to improve their own standard of living and asserts that humans are separate from nature, and that nature is valued according to its use or worth to humankind. Homocentrism is based on utilitarian philosophy and Marxism and although it prioritises human values, its humanism does not lead to a destructive view of nature associated with the aggressive and competitive individualism of egocentrism. Homocentrism includes social ecology and eco-socialism, including much of the 'communalist' element of O'Riordan's classification (O'Riordan, 1981; Pepper, 1986; Merchant, 1992).

Benson (2000) uses the term 'light green' and 'dark green' instead of 'shallow' and 'deep' ecology. 'Light greens' believe that independent moral status is confined to humans and that the environment should be conserved for human use, whereas 'dark greens' extend moral status to all living and non-living things, as in Naess's deep ecology (Benson, 2000). There are, of course, innumerable shades of 'green' in-between, reflecting the diversity and complexity of human perception and values.

In general, environmental policy has taken a welfare economic approach which is utilitarian, instrumentalist, consequentialist and individualistic (Spash, 1997; Norton, 2002; Perman et al., 2003). However, there is considerable disagreement about the policy implications of such an approach (Perman et al., 2003). The work of Rawls (1971) has significantly influenced the consideration of ethical issues in policy. Rawls adopts ideas more in line with Kantian deontology than utilitarianism, with assertions that welfare maximization could violate fundamental freedoms and rights that should be protected (Perman et al., 2003). Norton (2002) argues that applying very strong sustainability approaches is difficult to achieve on pragmatic terms. He suggests that we need to understand the value that is placed on environments. This involves defining a classification of potential harms to future generations that would leave them worse off than if those impacts had been avoided (Norton, 2002). If this can be defined independently of the effects on productivity, then we can quantify our "non-economic" obligations to the future. In other words, we can demonstrate those things that are considered "priceless" (Norton, 2002).

Sagoff (2004; 2008) further asserts that the solution to environmental problems does not lie in

computing costs and benefits to find efficient policies. He suggests it lies in deliberative political dialogue that is sensitive to moral and aesthetic reasons for supporting environmental protection, as well as understanding the consequences of protection on economic growth and well-being.

In conclusion, this section has shown that environmental issues are complex and highly contested, not least in terms of how they are conceptualised and operationalised within environmental policy. The following section considers the philosophical tradition of environmental pragmatism which, for the purposes of conceptualising this study, may offer an approach that is more realistic, sensible, down-to-earth and willing to compromise (Des Jardins, 2001).

2.3 ENVIRONMENTAL PRAGMATISM: A PRACTICAL ENVIRONMENTAL APPROACH

The philosophical tradition of pragmatism was developed by American philosophers Charles Peirce, William James and John Dewey in the 19th and early 20th centuries (Hillier, 1998; Des Jardins, 2001). They were sceptical of the monistic theories in epistemology and ethics, and embraced a moral pluralism encompassing context-dependent practical accounts of truth and value. Forsyth (2003) outlined the three key tenets of pragmatism: the rejection of essentialist concepts of truth; the perception of no epistemological difference between facts, values, morality and science; and a belief that social networks or solidarities determine scientific inquiry.

Pragmatism was a reaction against the prevailing ideology of the time which was based on Hagel's absolutist metaphysics and abstract truth. In contrast, the pragmatists did not believe that there is one truth out there waiting to be discovered, but that truth is 'what works'. Finding solutions, it was argued, is a communal, social effort, not simply the reductionist approach of uncovering absolute truth. The pragmatism of Peirce, James and Dewey was deeply embedded in the individual experience of life. In this sense, knowledge is only meaningful when it is coupled with action and practical application. James objected to intellectualism because it seeks conceptual clarity and reality in the sense that experienced life is ignored. He believed concepts are a means to a practical end, not the means to purest knowledge (Robert, 2000).

Contemporary environmental pragmatism is influenced by the thinking of these early pragmatists. It has emerged in an effort to move environmental ethics out of its perceived state of paralysis and to make environmental philosophy relevant to environmental policy (Robert, 2000). Although a relatively young philosophy, environmental ethics has developed under a very narrow predisposition of what constitutes moral environmental policy. Light and Katz (1996) state that this "consensus" within environmental ethics asserts that "an adequate and workable environmental ethics must embrace non-anthropocentrism, holism, moral monism, and, perhaps, a commitment to some form of intrinsic value" (pg. 2). Such a narrow view reduces environmental philosophy to debates revolving around dualistic stances such as individualism/holism, anthropocentrism/nonanthropocentrism, instrumental/intrinsic value, monism/pluralism. Light and Katz believe that "the intramural debates of environmental

philosophers, although interesting, provocative and complex, seem to have no real impact on the deliberations of environmental scientists, activists and policy-makers" (pg. 1). This preoccupation with asserting a particular environmental ethic can paralyse attempts at finding practical solutions to environmental problems (Norton, 1996). Light (1996) argues for tolerance amongst theorists, so that issues of philosophical disagreement can be put to one side and left for private dispute. The construction of political and normative theories, asserts Light (1996), should, therefore, be guided by the overarching commitment to solving environmental problems, although this is deeply problematic in a world of contested values. Thompson (1996) agrees that moral philosophy is paralysed by foundational ethic theories (such as utilitarianism and egalitarianism). He prefers the use of a combination of James' idea of pragmatic necessity and Dewey's notions of the reconstruction of community. Sagoff (1988) calls for such an environmental pragmatism: "[W]e have to get along without certainty; we have to solve practical, not theoretical, problems; and we must adjust the ends we pursue to the means available to accomplish them. Otherwise, method becomes an obstacle to morality, dogma the foe of deliberation, and the ideal society we aspire to in theory will become a formidable enemy of the good society we can achieve in fact" (pg. 14).

Environmental pragmatists are not, however, consistent in their ideology. Indeed, such a suggestion is in direct contrast with the pluralism of the pragmatic approach. Even Peirce, Dewey and James, although all pragmatists, understood the nature of truth and knowledge differently (Smith, 1978). Despite its emphasis on *experience*, there is often an assumption that environmental pragmatism precludes metaphysics (Parker, 1996; Robert, 2000). However, some pragmatists, such as Robert (2000), are concerned that an approach that ignores metaphysics is "too philosophically weak" (pg. 196). Robert believes that environmental pragmatism would be strengthened by making James' metaphysical commitments "explicit, elaborated and embraced." Parker (1996) agrees and particularly stresses "the question of a metaphysical grounding for environmental ethics, an area of environmental philosophy where pragmatism may have the most to offer" (pg. 21). For Parker, pragmatism revises traditional ideas in epistemology, metaphysics and value theory by stressing that humans (and other organisms) are embedded in a particular environment, and that knowledge and value are a result of their interactions and transactions with the world (Parker, 1996). Similarly, the neo-pragmatist Rorty (1989a; 1989b), argues that scientific explanations reflect social and political networks rather than underlying reality. Recent approaches to studying the environment and human relationships with the environment such as actor-network theory (ANT) and structure/agency represent pragmatic attempts to move beyond the paralysis of epistemological and ontological divide.

Parker (1996) further asserts that pragmatic epistemology is a radical form of empiricism, critical of the notions of absolutes and metaphysics. Pragmatic metaphysics emphasises those qualities of the world that are understood by active experience of the world. Pragmatic value theory focuses on what is good for a particular organism in its environment. A pragmatic ethics, asserts Parker, is an understanding of these values in all their multiplicity, complexity and indeterminacy. He states: "There is an irreducible

pluralism in the world we encounter. There is the idea (supported by contemporary physics) that *indeterminacy* and *chance* are real features of the world. *Change, development,* and *novelty* are everywhere the rule. The pragmatists also attend to certain common – perhaps even universal – *structures* and *relations* that appear throughout our experience. Pragmatism, then, sees *reality* as process and development, and sees *beings* as relationally defined centers of meaning rather than as singular entities that simply stand alongside one another in the world. It emphasizes not substantial beings, but interrelations, connectedness, transactions and entanglements as constitutive of reality" (Parker, 1996, p. 25).

Thus, pragmatists are concerned with knowledge as understood by individuals' lived experiences. These experiences are shaped by their interactions and interrelationships with other individuals and with their environment. This focus on experience as the primary source of understanding knowledge was termed by James as "radical empiricism" (Parker, 1996, p. 25).

Environmental pragmatism, therefore, offers an alternative to the restrictive foundational environmental theories. It calls for moral pluralism and a putting aside of ideological differences and philosophical debates in order to look for collective, workable solutions (Reitan, 1998). In contrast to reductionist absolutism, environmental pragmatists take a holistic and pluralist approach, further asserting that humans cannot be separated from nature, but are a biological part of nature (Rosenthal and Buchholz, 1996). For pragmatists, the environment is not 'out there', but is part of each of us. In this sense, non-anthropocentric versus anthropocentric debates within environmental ethics are meaningless as we cannot draw the line between human well-being and the well-being of the environment in which humans are situated (Rosenthal and Buchholz, 1996). Our goal should be to stop the destructive activities that are threatening our planet and our own existence. Gunter (1996) states: "We are undoing the very fabric of which we are woven: the biosphere, the web of climate and water and living things in which our elaborate disquisitions are the merest, faintest ripples. We are wrecking the ozone layer, the tropical rain forests, even the rain. That is, on top of all the other problems that could be mentioned, we are beginning to destabilize world climate ... Our philosophy ought, on 'pragmatic' grounds, to bring us to stop doing this" (pg. 277).

Adopting a pragmatic approach has clear implications and potential for the development of environmental policy. For example, as shown earlier in this chapter, the sustainable development debate can be hindered by weak/strong sustainability arguments focussed on anthropocentric versus non-anthropocentric approaches to sustainability. As pragmatism has shown, such a debate is meaningless when humans are understood as part of and not separate from nature. Latour (2004) reiterates this concept by proposing an end to the dichotomy between nature and society, and replacing it with a collective community of humans and non-humans building on the experiences of the sciences as they are actually practiced. Latour pefers to look at the tangled interrelationships between human and non-human entities and understands these as networks or hybrid collectives (as in

Haraway's "cyborgs" (1991)). Approaches such as hybrid geography and ANT (van der Ploeg and Saccomandi, 1995; Murdoch and Morgan, 1996; Marsden, 1998a; Murdoch, 2000; Whatmore, 2002; Morris, 2004) have emerged in response to the need for more holistic, pluralist solutions to environmental problems and policy-making (Castle, 1996).

In the context of the present study, environmental pragmatism offers a practical ontological perspective upon which to frame the research and overcomes the limitations imposed by the paradigms discussed earlier in this chapter. Contemporary forest policy emphasises sustainable forest management, with the delivery of multi-purpose objectives. The provision of often conflicting social and environmental objectives can present problems for managers and policy-makers. A pragmatic approach to sustainable forest management can enable the focus to be shifted onto seeking workable, practical ways of delivering the desired outcomes (sustainability of forests and woodlands), instead of being trapped into debates about theoretical stances towards sustainability. In this regard, it is important to first consider the changing attitudes towards the environment and rural space in the UK more specifically. This will have implications for forest policy and woodland ownership and, thus, provide the backdrop for this thesis. Therefore, the following section considers approaches to the conceptualisation of rural space and its specific application to private forestry. The concepts of post-productivism and multifunctionality are discussed in light of their applicability and usefulness in furthering the theoretical base for public good provision in private woodlands.

2.4 RURAL LAND USE: PRODUCTION, CONSUMPTION AND PROTECTION

Chapter One outlined the changes in UK forestry over the past century, with a focus on creating a strategic reserve of timber after World War I, to an integration of the productivist paradigm with wider social and environmental objectives in later years. However, in order to understand the changing role of forestry, it is necessary to consider rural change more broadly and how this has been conceptualised within rural research. The following four sub-sections consider this theoretical position of rural space by, firstly, conceptualising rurality, especially in terms of the debate between constructionism and realism. The following sub-section examines how rural space has been restructured over the past century, leading to debates on productivism, post-productivism and multifunctionality, which are considered in the third sub-section. The final sub-section discusses other approaches to conceptualising rural space, such as ecological modernisation and actor network theory, and critically assesses these in the context of the present study.

2.4.1 Conceptualising rurality: constructionism and rurality

Firstly, the terms rural or rurality are difficult to define. They are contested concepts in that, while they have generated much discussion and dialogue in rural geography, there is little hope of reaching a consensus on what actually constitutes *rural* (Ilbery, 1998). As Halfacree (1993, p. 34) asserts, the "quest for any single, all-embracing definition of 'the rural' is neither desirable or feasible." Definitions

range from traditional land use functions (with agriculture being a distinctly rural occupation) (Cloke and Milbourne, 1992), to rurality as a social construct depending on individuals' perceptions and experience of rurality in their everyday life (Shucksmith, 1994). Halfacree (1993) identifies four approaches to defining rural: descriptive, sociocultural, rural as a locality and rural as social representation. The *descriptive* approach assumes that the rural can be defined as a discrete entity in a particular spatial and social space. An example of this is Defra's classification of local authority areas, which is based on population density (Defra, 2005). The *sociocultural* approach asserts that a low population density, characteristic of rural areas, affects the behaviour and attitudes of individuals (Halfacree, 1993). *Rural as a locality* is dependent on identifying particular characteristics of a locality which makes it rural, such as extensive tracts of countryside. However, these indicators may well vary from place to place due to the particular character of each area. *Rural as social representation* relates to the understanding of rurality as a social construction. It focuses on how 'the rural' is perceived and how individuals understand rurality in their everyday life. This approach to defining rurality is becoming increasingly important as the consumptive and protectionist attitudes towards rural space increase. For example, purchases of woodland in England are often related to these consumptive or protectionist attitudes, with owners buying their own 'little piece of countryside' for the 'warm glow' of owning a wood for personal amenity or nature conservation.

While there are many ways of defining and approaching discourses on rurality, the distinction between rural and urban environments is often blurred and contested, especially in terms of social and cultural networks. The modern distinction between the 'urban' and the 'rural' traces its roots back to the Industrial Revolution. At a time of mass urbanisation, the countryside began to be seen as a place of 'escape' for city-dwellers. A new value was placed on wild landscapes, which had previously been seen as dangerous and unpleasant places (Silvertown and Sarre, 1990). The writings of the Romantics had a strong influence on the way that natural landscapes were perceived, with an intrinsic value and moral consideration extended to the non-human world. However, some theorists argue that categorising space into a dichotomous 'urban' or 'rural' divide is counterproductive and simply a social construction (Latour, 2004).

Dunlap (1996) and Dickens (1996) observe that the debate about realist versus social constructionist approaches to studying environmental issues has received much attention in environmental sociology. While realists (Benton, 1994; Dunlap and Catton, 1994; Martell, 1994; Murphy, 1994; Dickens, 1996) agree that sociology has a part to play in understanding the real, objective environmental problems faced by society, they object to social constructionist approaches, claiming that social constructionists do not acknowledge 'reality' and the individual existence of nature, the environment and environmental problems (Bumingham and Cooper, 1999). This, say the realists, can lead to the denial of the existence of real environmental problems. While realists do not deny that there is a constructionist dimension to human understanding of the environment, they object to strong social constructionism which denies that "there are features of the world which exist independent of discourse and social

construction" (Dickens, 1996, p. 74). In this regard, realists argue that social constructionism is ethically wrong: "... the realists argue that it is simply unacceptable not to acknowledge the independent objective reality of nature and to ignore the moral imperative of attempting to protect the natural environment" (Burningham and Cooper, 1999). Crist (2004, p. 8) further argues that: "Openly or implicitly, the natural world is portrayed as mute, intrinsically meaningless, ontologically indeterminate, epistemologically unavailable, and aesthetically indistinct." She goes on to assert that constructionism fails to acknowledge that humans can receive meaning *from* the world through a "*cultivation of receptivity* – opening oneself, listening, watching, being within, letting be, or merging into" (p. 12, original emphasis). In order to do so, one has to accept the 'reality' of nature and that "knowledge is a boon from nature not a human project about or projection onto it" (Crist, 2004, p. 12).

However, the apparent dichotomy between constructionism and realism can be misleading. The problem is often that both sides of the social constructionism/realism debate misconstrue the others' position and they are, perhaps, not as far apart as might seem, since "most theoretical paradigms incorporate elements of both" (Smith, 2001, p. 109). On the one side, realists recognise that, as in Dickens (1996, p. 71), "all knowledge must in some sense be a social construction. No knowledge has fallen out of the sky with a label attached pronouncing 'absolute truth'." On the other side, social constructionists, in most instances, acknowledge some version of 'reality', but assert that constructionism deals with the relationship between social activities and that reality.

Macnaghten and Urry (1998) contend that approaches to understanding environmental problems and human relationships with the environment must move beyond realism and constructivism by realising "the significance of embedded social practices" (p. 2). Similarly, Woodgate and Redclift (1998) purport that "we must move beyond the position where nature is viewed as *either* the material conditions of our existence, *or* as no more than a set of culturally generated symbols. We must begin to accept nature as both" (p. 7). Asserting that nature exists as a separate 'reality' somewhere out there, waiting to be discovered, investigated, understood, and explained perpetuates the Cartesian nature/society divide. Murdoch (2001) criticises Burningham and Cooper (1999) for drawing a line between 'nature' and 'society' and questions whether "a truly ecological sociology [would] necessarily need to revisit the distinction between the social and the natural so that the boundary between the two domains were, in some sense, dissolved?" (p. 112). The idea, according to Meyer (1999), that "humans and non-human nature are necessarily connected and hence interdependent" (p. 3), suggests that we need to reject the separation of natural and social entities into two distinct ontological categories (Murdoch, 2001). Murdoch (2001) argues that approaches such as Actor Network Theory (ANT) can overcome the difficulties bound up in dualistic thinking and force sociology to confront a new 'hybrid' world in which the natural and social distinctions are redundant (Callon, 1986; Law, 1992; Latour, 1993). As an ecological theory, ANT contends that social and natural entities come into being as a result of complex interrelations (or networks) between both human and non-human actors. ANT extends agency to non-humans, treating natural and social actors 'symmetrically'. It focuses on collectives and complex

ecologies, thus, according to Murdoch (2001), it is well suited to studying environmental problems.

Fall (2004) uses the example of protected areas to illustrate that the creation of boundaries in order to protect nature can often lead to practical management conflicts between various actors. Misunderstandings arise between natural scientists working for 'nature conservation' and social scientists seeking 'sustainable development' within the same area. Other authors, such as Crist (2004), purport that such a distinction between nature and society is necessary in order to fully recognise environmental problems. Such scholars believe that a shift towards a truly ecological form of sociology is not possible or, indeed, desirable. The arguments put forward by critics of ANT (Bloor, 1999; Hacking, 1999) revolve around human exemptionalism. Soper (1995) argues that although humans are part of nature, they are also separate from it. She contends that although ecologists stress the interdependence of humans and the environment, this does not imply that humans are the same as the environment. When ecologists appeal to the human race to care for the environment they are imposing responsibilities on them "of a kind it is meaningless to ascribe to the rest of nature" (Soper, 1995, p. 40). By removing the distinction between nature and society, Bloor believes we may compromise our ability to explain our actions towards nature: "Only by sustaining the distinction between subject and object, and by driving a wedge between nature itself and descriptions of it provided by the knowing subject, can we highlight the problematic character of those descriptions" (Bloor, 1999, p. 94). Murdoch (2001) and other supporters of ANT (such as Michael, 1996; Barry, 1999) argue that a middle ground, or co-constructionist approach, may provide a pragmatic way forward. Murdoch (2001) suggests that it might "be prudent to assume that, while humans are enmeshed within networks of heterogenous relations, they retain distinctive qualities as members of such networks" (pp. 126-127). Indeed, according to Soper (1995), it is this distinction that infers moral responsibility upon humans: "Unless human beings are differentiated from other organic and inorganic forms of being, they can be made no more liable for the effects of their occupancy of the ecosystem than can any other species, and it would make no more sense to call upon them to desist from destroying nature than to call upon cats to stop killing birds" (p. 160). Approaches such as ANT explore the networks and interactions where society and nature meet, which uncovers "both the ecological consequences of human actions and the full implications of ecological action" (Murdoch, 2001, p. 128). This 'relational ethics' may enable the integration of "an awareness of heterogenous relationships with a recognition of human exemptionalism" (p. 128).

The philosophical debates outlined in this chapter have implications for studying public good delivery in private forests in which the physical nature of and spatial setting of a woodland, along with the motivations and objectives of its owner, will determine a woodland's capacity for providing public benefits. For example, are an owner's motivations for ownership and management to some degree shaped by the physical characteristics of the wood itself? Or is the wood shaped by the objectives of the owner? Or perhaps the real situation is a blend of both? Also, as has been highlighted, the objectives of forest policy will be a reflection of the wider political paradigm which has shifted from a

predominantly productivist agenda to an emphasis on multifunctional forestry, incorporating broader social and environmental values. As has been suggested, issues concerning environmental management, including sustainable forest management, are often contested and complex.

However, in order to further conceptualise this research, it is important to consider the literature on rural land use classifications and rural restructuring in the context of sustainable forest management. In this regard, the debate in relation to the concepts of 'post-productivism' and 'multifunctionality' is critically examined, along with the implications of this for forest research.

2.4.2 Classifying rural land

Marsden (2003) characterises the diversity of the British countryside by identifying four ideal types: preserved, contested, paternalistic and clientelist. The *preserved* countryside is most evident in the English lowlands, but not exclusively. The attitude of the population is generally preservationist, with strong anti-development interests. The most vocal sector of society is middle-class incomers and any rural change is highly contested as a threat to the perceived rural idyll. The *contested* countryside generally consists of the rural space outside the core commuter catchments. Farmers and landowners are still politically dominant, but increasing numbers of incomers are trying to impose the position of the preserved countryside. Thus, there is a conflict between the old, traditional sector in society and the new, more urban groups. The *paternalistic* countryside consists of large private estates and farms, which are seeking diversification on their holdings (perhaps increasing opportunities for tourism or leisure). Such residents take a custodial view of their land. In the *clientelist* countryside, located in remote upland rural Britain, farming can only be sustained by state subsidy (often hill sheep farming).

While such classifications of 'the rural' may be an interesting academic exercise, the reality is often not quite so clear-cut. Often there may be elements of several or all of Marsden's ideal types present in one geographic space, but it is clear that rural areas are dynamic and in a state of change. Such change can be understood by exploring the shift in emphasis from production, the focus of post-war agricultural policy, to demands on the countryside which can be understood as more consumption and protection related. The rural economy is no longer dominated (in employment terms) by farmers and landowners. In-migration is creating a more diverse employment structure, with less employed in agriculture and more commuting to urban centres (or homeworking) for careers in secondary or tertiary industries. Much local employment in some areas is also made up of tourism-related jobs.

2.4.3 Rural restructuring, post-productivism and multifunctionality

Despite the ongoing debate about how to construct our understanding of the environment and human relationships with it, some writers believe that rural areas do have particular features, both physically and socially, that distinguish them from urban areas. Clout (1993) identifies these features as relatively low population densities, open country and extensive land uses, lack of access to major urban centres,

loose networks of infrastructure, and a relatively low number of workers in secondary and tertiary industries as opposed to primary industries (such as agriculture). However, the rural social landscape is not homogenous, and the distinction between urban and rural is increasingly blurred as the movement of wealthy urban dwellers into the countryside (Ilbery, 1998, pp. 3-4), or the in-migration of poor Eastern European workers, may conflict with some of the more traditional features of rural areas.

With these migratory changes, there has, in developed European countries, been an increase in 'hobby farming' and amenity purchases of woodland. According to Cloke et al (1998) and Halfacree and Boyle (1998), hobby farms and small woodland plots are often bought as a lifestyle choice in search of a perceived rural idyll. These are small-scale farms and woodlands, managed non-commercially with most of the farmer's income derived from other sources.

The post-war emphasis in rural areas was on production and a rapid efficiency drive in agriculture was pursued, with farming becoming increasingly industrialised and mechanised. At this time there was little interest in theoretical debate in rural geography, with most research being of an empirical nature, especially in agricultural economics (Ilbery, 1998). However, with the restructuring of rural space a new political economy has emerged. Marsden (1998a) identifies two main features of this new political economy. Firstly, an urban to rural shift in population and economic activity. This counter-urbanisation (Champion, 1989) has caused a redefinition of the relationship between urban and rural, with the growth of commuters and retirees as rural residents and an increase in tourism. Also, distant agricultural and food markets are often dominated by powerful manufacturing and retailing sectors which help shape the rural land-based farm sector. Within forestry, cheap imports of timber and the closure of saw mills has impacted upon the private forester. Thus, decisions made by land managers, such as farmers or foresters, are often based upon the economic pressures that determine their management goals and the political contingencies that determine their management opportunities (Robbins, 2004). For example, a woodland owner will make different decisions when timber prices are low and extraction costs are high than when the reverse is true. The changing political and economic conditions can, therefore, alter the context for the decision-making of land managers, which will in turn affect their use of the resource. This new political economy thus frames rural restructuring (Marsden, 1998a) and recent changes within agriculture and rural land ownership. Such observations have clear implications for understanding the changing nature of woodland and forest ownership in the UK. Issues such as the drop in timber prices over the past 15 years and the political emphasis on multifunctionality within forests and woodlands impact on and influence the decisions of woodland owners.

As previously stated, it is widely agreed that agriculture, and rural space more generally, in Western Europe has undergone a complex restructuring since the mid-1980s (Kristensen et al., 2004). The stimulus for this change was the drive for sustainability as a result of the Rio Earth Summit in 1992, the changes in the Common Agricultural Policy (CAP) that began to decouple subsidies from production,

the high cost of maintaining agricultural subsidies, public pressure, the WTO negotiations and an increase in environmental regulation in EU policy (Bowler and Ilbery, 1999). This new farming context has been conceptualised by a number of writers (Bowler, 1992; Marsden et al., 1993; Shucksmith, 1993; Marsden, 1995; Ilbery and Bowler, 1998; Marsden, 1998b; Mather, 2001; Mather et al., 2006) who suggest that agricultural and rural space is in a transition from productivism to post-productivism. Farmers and other primary producers (such as foresters) are seeking new ways of making a living (Ilbery, 1998), such as converting farm buildings into holiday accommodation. Cloke and Milbourne (1992, p. 360) describe this diversification of land use: "[There] is no longer one single rural space, but rather a multiplicity of social spaces that overlap the same geographical area." As Ilbery (1998) asserts: "The period of progressive productivism has given way to what has been termed a 'post-productivist' countryside" (p. 14). Productivism characterises the post-war emphasis on production in the land-based sector. This is contrasted with a shift in emphasis where the countryside is increasingly seen as a place of consumption and protection as well as production (Slee, 2005; Holmes, 2006).

The triggers for the evolution of post-productivism differ for agriculture and forestry. The major driver for the transition to post-productivism in farming was the cost of agricultural support, as well as overproduction and surpluses. Within forestry, however, the main issue was a fall in timber prices between 1991-2006 resulting in many non-industrial private forest owners harvesting well below their sustainable increment (Slee et al., 2006) as well as social injustice (e.g. tax incentives for the wealthy), and the increase in woodland planting on agricultural land under the Farm Woodland Scheme. At the same time, forests were becoming emblematic of environmental issues globally (Mather et al., 2006). This led to the development of new UK Forest Strategies and a new Woodland Grant Scheme (WGS) which replaced the Forestry Grant Scheme (FGS). Under the FGS timber production had to be the primary objective whereas under the new WGS this was no longer mandatory and wider issues such as biodiversity and recreation were of increasing importance. Post-productivist characterisations in the literature by Mather et al. (2006) suggest that forestry is associated with more positive indications of post-productivism than agriculture, but both forestry and agriculture are associated with more positive then negative indications (Table 2.1).

Table 2.1: Categorisation of trends in relation to characterisations of post-productivism

		Agriculture	Forestry
Ilbery & Bowler (1998)	1. Reduction of farm output	+	---
	2. Withdrawal of state subsidies	---	---
	3. Production of food within an increasingly competitive international market	+	++
	4. From intensification to extensification	+	+
	5. From concentration to dispersion	?	++
	6. From specialization to diversification	+?	++?
Wilson (2001)	7. Ideology	+	++
	8. Actors	+?	++?
	9. Food regimes	+	+
	10. Agricultural production	+	++
	11. Agricultural policies	++	+++
	12. Farming techniques	?	+
	13. Environmental impacts	+	+++
Evans et al. (2002)	14. Dispersion of production patterns	?	++
	15. Growth of on-farm diversification and off-farm employment (pluriactivity)	+?	+?
	16. Extensification and the promotion of sustainable farming through agri-environmental policy	+	+++
	17. Shift from quantity to quality in food production	+	+
	18. Environmental regulation and restructuring of government support for agriculture	++	+++

+ = Indication in accordance with post-productivism as conceptualized (+ = weak; ++ = medium; +++ = strong).
- = contra-indication to post-productivism as conceptualized (- = weak; -- = medium; --- = strong).
? = not relevant or no information
Note: 'forestry', 'forest' and 'wood' should be substituted as appropriate for 'agriculture', 'farm' and 'food'.
Source: Mather (2006)

A study by Slee et al. (2003) concluded that 90% of the total economic impact of forestry on rural development in two case study areas arises from indirect effects unrelated to production (e.g. through tourism and local residence associated with quality of life). The high prices often paid for rural land and woodland are also reflective of amenity-based consumptive values rather than productive values, which has implications for developing policy mechanisms to enhance public benefit. While such owners may be able to internalise some of the costs for public benefit provision through their own consumptive activities (such as maintaining rides for personal access which also provides biodiversity benefits) their non-profit-making motivations may limit the amount of public good enhancement they can achieve without state support.

Ilbery and Bowler (1998) contend that this move from productivism to post-productivism is represented by a shift away from intensification, specialisation and concentration towards extensification, diversification and dispersal. Others, however, are not so sure about the adoption of the term post-

productivism (Morris and Evans, 1999; Evans et al., 2002). Wilson (2001; 2006) suggests that while notions of productivism and post-productivism have been useful in highlighting the existing spatial differences in contested agricultural landscapes, the term is limited in value due to its implied temporal linearity and binary assumptions (Argent, 2002; Wilson and Rigg, 2003). Other critics, such as Evans et al. (2002) go even further, dismissing post-productivism as a 'distraction' and a 'myth'. Indeed, these authors argue that "political emphasis on the need for farmers to be able to compete in a liberalized global market seems to place greater emphasis worldwide on the continuation of productivist principles" (p. 316). They assert that post-productivism takes academics down a 'false blind alley' and that "more progress in agricultural (and rural) geography could be achieved by abandoning post-productivism" (p. 326). While the term has, perhaps, been too readily adopted without substantive evidence, Mather et al. (2006) assert that the full potential of post-productivism in relation to an understanding of land-use change has not yet been realised. While criticisms against post-productivism usually take the form of pointing out that productivism has not died (Evans et al., 2002) and that many farmers still follow productivist objectives (Burton and Wilson, 2006), its supporters state that post-productivism is characterised not by the lack of a productivist element, but by a change in the relative emphasis from commodity to non-commodity outputs (Mather et al., 2006). They state that post-productivism is not a complete switch from material production to service provision, but a shift in emphasis. As Goodin (2001) states: "post-productivists are not opposed, or even indifferent, to economic output ... they have simply 'gotten over' being utterly fixated on it, as productivists have been" (p. 15). In terms of woodland ownership, perhaps Goodin's statement is too simplistic. It may be that since the new 'lifestyle' owners are not dependent upon their woodland for their income, their emphasis will inevitably not be primarily on production. Although they are likely to welcome any economic benefit they can gain from their woodland, this may be motivated by a desire for the woodland to pay for itself in terms of management for wildlife or other public good benefits, rather than to manage it as a profit-making activity.

Wilson (2001) suggests that the notion of a 'multifunctional agricultural regime' may better encapsulate the diversity, nonlinearity and spatial heterogenity that can be observed in rural society. While Mather et al. (2006) prefer the term 'post-productivism', their justifications are fairly weak. Firstly, they state that Wilson's (2001) term 'multi-functional agricultural regime' relates to agriculture alone. Multifunctionality, however, can refer to any form of land use. Secondly, they assert that multifunctionality is irretrievably associated with trade negotiations. However, the term has gained widespread acceptance in terms of land use and so the association with trade negotiations is largely irrelevant. Thirdly, Mather et al. (2006) state that, although the term has recently become popular, the concept to which it relates was a characteristic of much pre-modern agriculture and forestry. Indeed, the concept does characterise multiple land uses, which were in existence before mechanisation. However, this is hardly a strong justification for abandoning the term. The authors also assert, as does Hytönen (1995) that the term is ambiguous and abstract, and does not convey the shift in emphasis from material production which is the essential characteristic of post-productivism. However, as Slee

(2005) suggests, rural land use is likely to be a hybrid with productivist, non-productivist and post-productivist elements. The combination is likely to vary between geographical areas and between differing ownership objectives. Ilbery and Bowler (1998) concur, suggesting that there is likely to be a co-existence of productivist and post-productivist systems. If this is the case, then the term multifunctionality may aptly describe the modern-day objectives for land use. Despite the on-going debate, it is likely that both 'multifunctionality' and 'post-productivism' are useful terms to describe the paradigm shift in rural land-use policy, and forest management more specifically, that has emerged over the past 20 years. Indeed, these terms will be discussed further in Chapter Seven in light of the findings of this study. However, in an effort to avoid the multifunctional/post-productivist dilemma, some authors, such as Evans et al (2002) suggest that land use change can better be understood by using extant theoretical perspectives, including ecological modernisation theory. Morris and Evans (1999) assert that such approaches provide a potential corrective to the dualism of post-productivism. The following section illustrates how ecological modernisation and structure/agency perspectives add to the theoretical debate.

2.4.4 Ecological modernisation and structure/agency perspectives

Ecological modernisation retains the centrality of production, but recognises that while economic activity causes harm to the environment, it can also present solutions. The theory of ecological modernisation arose in the early 1980s when Joseph Huber began to promote the idea that environmental problems can be addressed through superindustrialisation and more sophisticated technological innovations (Murphy, 2000). In order to achieve this, Huber believed that government intervention should be limited, and that free market economics should drive such innovation. However, Hajer (1995) clarified this to suggest that the state should explicitly intervene in the market to achieve both economic growth and environmental protection. This could be achieved, it was argued, through environmental standards, environmental taxes, strategic environment assessments, technological innovation and macro-economic restructuring. Jänicke and Simonis (Janicke, 1985; Janicke et al., 1988; Janicke et al., 1989) further purported that a restructuring of national economies was required in order to 'shift the emphasis of the macro-economy away from energy and resource intensive industries towards service and knowledge intensive industries' (Gouldson and Murphy, 1997). Mol (1995) concluded that there needed to be an 'economization of ecology' with the incorporation of economic concepts, mechanisms and principles into environmental policy, such as the economic valuation of non-market environmental goods and services.

There are, however, limitations to the application of ecological modernisation theory. Giddens (1998) asserts that the underlying assumption of ecological modernisation is that technological innovation can reduce or negate environmental harm. There is no apparent acceptance of risk or the acknowledgement that increased technology and economic growth may cause further environmental damage. Christoff (1996) further highlights that ecological modernisation fails to consider the intrinsic values in nature "... [In ecological modernisation] the environment is reduced to a series of concerns

about resource inputs, waste and pollutant emissions. As cultural needs and non-anthropocentric values (such as are reflected in the Western interest in the preservation of wilderness) cannot be reduced to monetary terms, they tend to be marginalised or excluded from consideration" (p. 485). Despite these very real limitations, ecological modernization does provide a way of thinking about how to move beyond the conflictual relationship between economics and the environment (Murphy, 2000).

Other researchers argue that the shift in emphasis towards "post-productivism" or "multi-functionality" calls for a new theoretical understanding which is more integrated and holistic, combining social and environmental values with those of production. Marsden (1998a, p. 16) suggests that "rural space becomes a highly elastic phenomenon, constructed out of combinations and layers of social, political and economic relations, traversing different physical spaces at any one time". However, as Burton and Wilson (2006) assert, often these new conceptual frameworks of rural space focus mainly on exogenous factors of agricultural change (for example, policy changes, the political economy framework, farmers' economic adjustments to external forces). Agency-related endogenous characteristics, such as attitudes, perceptions, behaviour and identities, are often overlooked. In this context, Burton and Wilson (2006, p. 96) argue that "... most research on post-productivism has taken a top-down political economy-oriented approach, and, as a consequence, many of the traditional features of post-productivist enquiry have focused on specific actor groups (e.g. policy makers) or larger structural entities (e.g. 'the state') to the neglect of individuals and their action." Wilson (2001) further notes that "the dominant political economy discourse has ... inevitably led to a heavy emphasis on the importance of the state and policies, a strong focus on the importance of macro-economic factors in actor decision-making... As a result, the farming community has often been viewed as responding almost entirely to *outside* forces, with little acknowledgement of possible changes from *within*" (pp. 85-86, original emphasis).

Burton and Wilson (2006) apply Giddens' theory of structuration to the investigation of the extent to which farmers' self-concepts and attitudes towards post-productivist approaches are compatible with current structural changes in agriculture. Giddens' theory of structuration attempts to overcome problems of macro/micro and actor/structure that exist in traditional structuralist interpretative frameworks by focusing on social practices rather than individual experience. Burton and Wilson (2006) conclude that a structure-agency territorialisation could provide an appropriate method for conceptualising multifunctionality within rural space. They suggest that it could help to deconstruct the traditional productivist/post-productivist model of agricultural change and provide a more theoretically sound concept of 'multifunctionality' (Burton and Wilson, 2006).

Many of these approaches to conceptualising rural space seek pragmatic ways of understanding complex and contested issues and informed the development of a conceptual framework on which to base this study. However, as has been identified, there are two main limitations that must be addressed and overcome. Firstly, the conflict between different ideologies such as social

constructionism/realism and post-productivism/multifunctionality is bound up in moral monism[7], which insists that one paradigm has preference or moral status over another. Such an assertion leads to paralysis and continued theoretical conflict (Light and Katz, 1996). Secondly, the debate between different ways of conceptualising rural space is concerned largely with theoretical, as opposed to practical, problems. Thus, it fails to identify practical, workable solutions that can be applied to real problems; in this case that of deriving public benefits from private forestry. In light of these potential limitations, this study sought to develop a conceptual framework that was pragamatic, integrated and practical.

A descriptive model of rural occupance, developed by Holmes (2006) provides some useful evidence of a practical framework for theorising rural space. Holmes identified seven distinctive modes of rural occupance according to the relative precedence given to production, consumption and protection values (Figure 2.1). While Holmes' study relates specifically to rural change in Australia, six of these modes (excluding indigenous) are generic and broadly describe the social landscape in most developed Western nations: productivist agricultural; rural amenity; small farm (or pluriactive); peri-metropolitan; marginalized agricultural and conservation. Figure 2.1 illustrates that these modes of rural occupance can range from an emphasis on one land use (production, consumption or protection) to a combination of several or all land uses.

[7] Moral monism is the view that all ethical questions have a single correct answer.

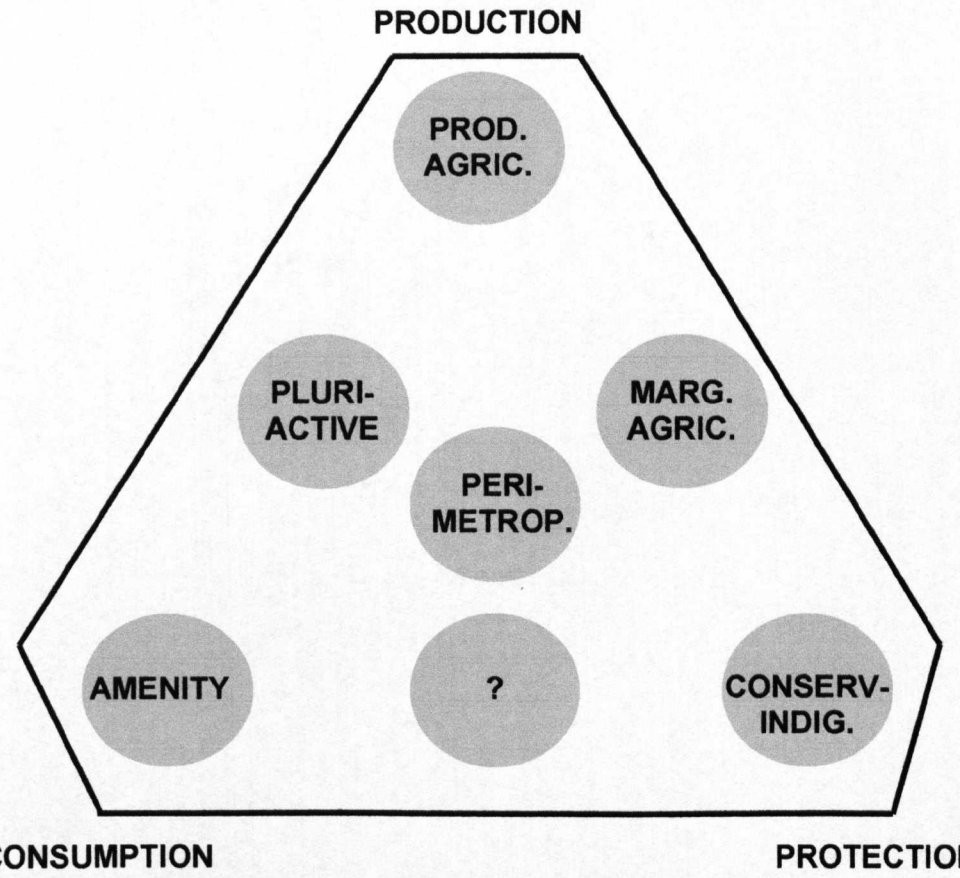


Figure 2.1: Occupance modes in rural Australia, positioned according to the relative weights given to production, consumption and protection values. The depicted modes are: productivist agricultural; marginalized agricultural; pluriactive; peri-metropolitian; amenity; and conservation-indigenous (Holmes, 2006).

Productivist agricultural occupance is dominated by production values. This mode is generally found in regions with high-grade agricultural land. There is usually a need to maintain competitiveness and efficiency, which often leads to intensification in farming practices. *Rural amenity* occupance is dominated by consumption values. With dispersed residential lifestyles and an increased awareness of the importance of green space for health and quality of life, there is a growing demand for amenity countryside. *Small farm or pluriactive rural* occupance consists of a mix of production and consumption values. With a reduction in farm incomes, there is a need for pluriactivity, with income sources from both on-farm and off-farm sources. *Peri-metropolitan* occupance is characterised by the countryside around major centres of urban population, where there is intense competition between production, consumption and protection values. While there is a demand for recreational provision in the surrounding green space, there are also pressures on the countryside in terms of waste disposal, resource extraction and water supply/quality. *Marginalized agricultural* occupance can potentially integrate the production and protection values. This mode is generally found on marginal land of low productive value (e.g. hill farms), which may also have high conservation and biodiversity value. In contrast, the *conservation* occupance mode focuses mainly on protection values and is generally found

in areas unsuitable for farming, such as the uplands, coastal environments and marshes. Holmes (2006) suggests there may be a seventh mode, *commodified nature,* depicted by '?' in Figure 2.1, where there is a strong interplay between consumption and protection values.

While this model relates to rural space generally, there are clear parallels with forest land and the model can be adapted to reflect the differing social landscapes within forestry in Britain (Figure 2.2).

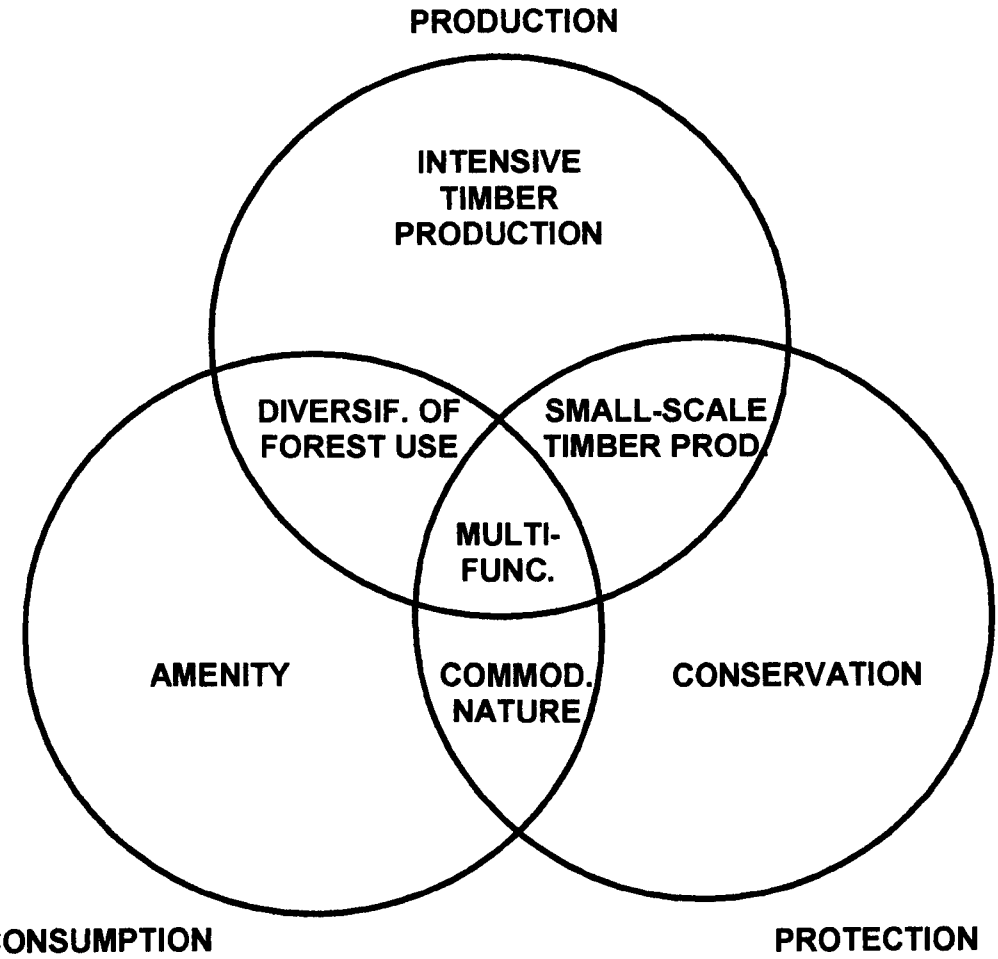


***Figure 2.2: Occupance modes in British forestry, positioned according to the relative weights given to production, consumption and protection values. The depicted modes are: intensive timber production; small-scale timber production; diversification of forest use; multifunctionality; amenity; commodified nature and conservation, adapted from Holmes* (2006).**

Table 2.2 describes the varying "modes of forest occupance" that may be found in the English forest sector. Sustainable forest management strategies seek to find the balance between providing the economic (production), social (consumption) and environmental (protection) benefits of woodlands together.

Table 2.2: Modes of forest occupance in Britain

Mode	Description
Production	Intensive timber production, such as conifer plantation
Protection	Managed for nature conservation
Consumption	Managed for amenity purposes
Diversification of forest use	Formal recreational provision (e.g. mountain bike tracks) alongside timber production
Small-scale timber production	Incorporates both nature conservation and timber production, e.g. coppicing
Commodified nature	Amenity and conservation provided together
Multifunctional	Timber production occurs alongside recreation and nature conservation

However, as Holmes (2006) explains, there can be conflicts between preserving 'pristine nature' (conservation value) and the 'rural idyll' (consumption value). An understanding of the complexity of modes of rural occupance in terms of forest and woodland use provides the framework within which to study how woodland owners construct their perceptions and attitudes. These external influences on woodland owners can impact upon their normative assumptions and values. Therefore, in order to construct a broadly representative typology it is necessary to ensure that woodland owners located in all of these modes of occupance are included. Chapter Four outlines how the descriptive model is used to select appropriate study areas for this research. The model is further discussed and developed in Chapter Seven in light of the study findings.

To summarise, this chapter has outlined the philosophical challenges of the study by examining the sustainability debates in terms of contrasting weak and strong sustainability. It has considered the approach of different sustainability discourses to the issue of natural capital and the substitution of natural capital for man-made capital. The review has shown that while environmental policy has typically employed utilitarian perspectives, the increasing emphasis on multipurpose forestry calls for more integrated and holistic approaches to policy-making and research. Environmental pragmatism has been presented as a potentially appropriate philosophical base for delivering and monitoring the sustainability agenda within private forestry. Environmental pragmatism offers a practical ontological perspective upon which to frame the research. The provision of often conflicting social, environmental and economic objectives within forestry can present problems for policy-makers. A pragmatic approach can enable the focus to be shifted towards seeking workable, practical ways of delivering the desired outcomes (i.e. the enhanced delivery of public good benefits).

This chapter has also reviewed the theoretical issues underpinning debates about rural land use, contrasting the realist and social constructionist approaches to understanding rurality. Alternative approaches, such as actor network theory and ecological modernisation have been considered with

regard to attempting to bridge the nature/society divide. Within rural debates, and forestry more specifically, there is conflict over whether the term post-productivism can be used to describe the changing policy focus from productivity in the rural land-based sector, to the integration of more social and environmental objectives. Some authors prefer the term multifunctionality, but the debate is by no means settled. A descriptive model, developed by Holmes (2006), has been presented as a potentially useful tool for conceptualising forest management in relation to this study.

The following chapter defines more precisely what is meant by the term 'public goods' and identifies which public goods are associated with forestry. It then goes on to assess the potential demand and spatial variability and public good provision in private woodlands. A critical evaluation of existing private forest owner classifications is also presented, identifying the gaps in the literature with respect to the development of a typology of private woodland owners in England.

CHAPTER THREE

PUBLIC GOOD PROVISION AND MANAGEMENT IN PRIVATE FORESTRY: A LITERATURE REVIEW

3.1 INTRODUCTION

This chapter examines the academic and policy literature on public good provision in private woodlands. Firstly, the term 'public goods' is defined and the economic context for this study is reviewed. The demand for private woodland use is assessed by presenting an overview of studies that have valued public good benefits economically. The demand level for woodland use is also assessed with reference to visitor demand surveys, the variability in the market price for woodland and the extent of designated woodland conservation sites, with a critical assessment of their applicability and relevance to this study. The spatial variability of public benefit provision in woodlands is then examined, assessing the relevance of scale and location in terms of how this might enable or hinder public good provision.

The next section reviews some international classifications of private woodland owners and considers their applicability in the UK context. This is followed by a critique of the suitability of the extant terminology relating to woodland owner classifications in terms of policy formulation and delivery. The final section synthesises the literature review in the context of the aim and objectives set out in Chapter One. A critical assessment of the review's implications for this study and identification of research questions is presented in the form of a conceptual model. While the review identified some general research questions and concepts, these need to be transformed into research issues to be investigated. Thus, the conceptual model aims to organise the theoretical concepts emerging from the literature review and the preceding scoping study (Urquhart, 2006; Urquhart et al., 2010), together with the relationships between those concepts, in order to operationalise the research and provide the framework for investigation.

3.2 THEORETICAL BASE FOR PUBLIC GOOD PROVISION

As Section 2.2 outlines, environmental resource management is complex and contested, with conflicts often occurring between natural and socio-economic factors. As with environmental pragmatism, environmental economics seeks ways to overcome these conflicts and recognises that the environment is not separate from the economy (Turner et al., 1994) but is interrelated (Figure 3.1). The economic system cannot operate without natural resources and ecological systems, thus environmental economics views the economy as an open system which must extract resources, process them and dispose of waste products into the environment (Turner et al., 1994). The environment, on the other hand, is considered a closed system, which, although it does not require the economy in order to function, is inherently linked to economic well-being. For example, too much

waste production in the wrong place leads to contamination and pollution, which in turn has a negative effect on human welfare and compromises the effective functioning of the economy in the long-term. Thus, the principal aim of environmental economics is to use economic tools to help protect the environment, which, in theory, can often be more effective than a moral argument (Turner et al., 1994).

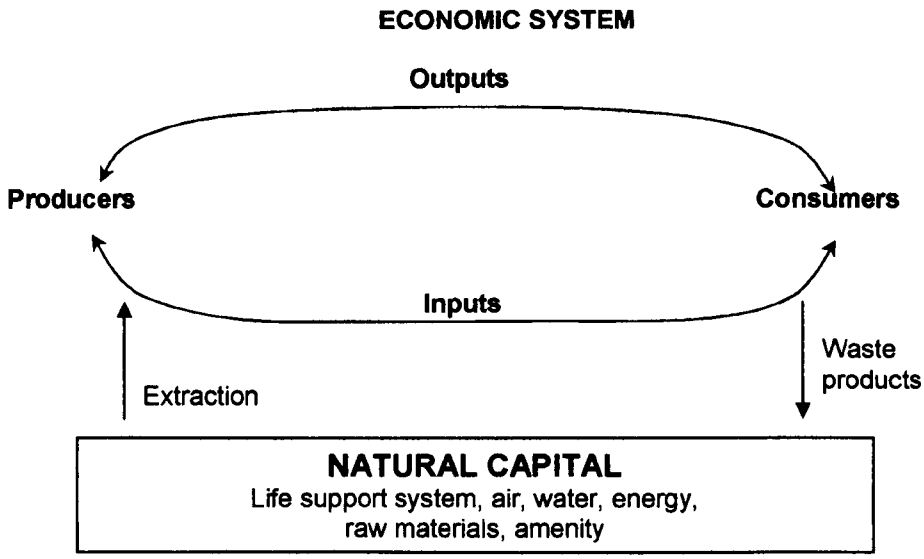


Figure 3.1: Open economic system and closed environmental system (adapted from Turner et al. 1994).

Pigou (1932) distinguished between the private costs of production and consumption and the full social costs, and stated that these needed to be included in any comprehensive cost-benefit analysis (CBA). Much of the early work on market failure related to the negative effects of production on welfare, either of consumers or other producers. It was argued that uncompensated losses to human welfare due to, for example, the negative effects of the emission of waste substances should be factored into the economic framework. These so-called spill-over effects or externalities do not necessarily relate to the environment, although environment-related externalities have become more and more the focus of attention in cost benefit analyses and the study of market failure. Thus, a cost-benefit analysis for a coal-fired power station should include an evaluation of the external costs of atmospheric pollution as well as the profit from the electricity produced. The pollutants from the power station will have economic consequences that can be quantified – such as carbon dioxide emissions, crop losses due to sulphur dioxide emissions, visual impacts and medical costs for resulting health problems. Thus, the total economic value (TEV) includes a valuation of both use and non-use values of financial and social costs and benefits. However, it is important to remember that TEV is related to the valuation of people's preferences (anthropocentric and instrumental value) and not to the intrinsic value of natural capital, which it is impossible to measure using these techniques (Turner et al., 1994).

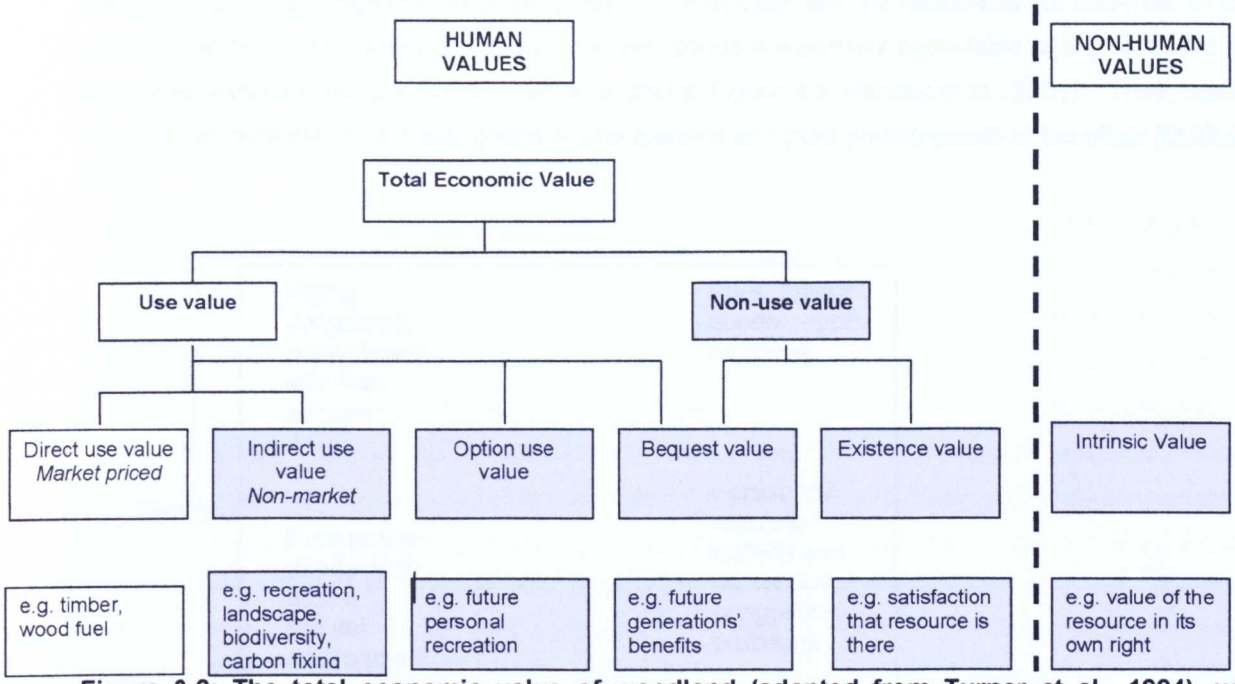


Figure 3.2: The total economic value of woodland (adapted from Turner et al., 1994), with "public goods" depicted by shaded boxes.

As can be seen in Figure 3.2, the TEV of any woodland consists of a combination of use values and non-use values (bequest and existence values). Use value can be 'direct' (i.e. timber production) or 'indirect' (i.e. functional values in terms of recreation, carbon sequestration etc.). Option values relate to the option of protecting the resource for future use, and can either be direct or indirect. Non-use values include existence values, the value of preserving the resource as part of the wider ecosystem, and bequest values; the value associated with passing on the resource to future generations. The term 'public good' refers to indirect use values and non-use values, as indicated by the shaded boxes in Figure 3.2. In other words, those values that do not have a direct use value.

3.2.1 Public goods

In economics, a public good is something that is impossible to produce for private profit because private sector providers are unable to acquire profit from their provision. The defining characteristic is that the good can be consumed by more than one individual. Thus, public goods are non-rivalrous - once produced, everyone can benefit from them without others' enjoyment being diminished. In the context of woodland, one person's enjoyment of visiting the woodland does not necessarily diminish another's enjoyment. Public goods are also non-excludable, meaning that it is difficult to prevent access to them. Thus, in the case of open access woodland, all are free to visit the woodland if they choose.

However, the above definition of public goods essentially relates to 'pure' public goods, which are fully non-rivalrous and non-excludable. At the other end of the spectrum, pure private goods are fully rival

and fully excludable. Such polarization of the provision of public goods is rare, although almost all market goods have a high degree of excludability. Goods can also be excludable but non-rival, or they can be rival but non-excludable. Often, however, goods are partially excludable and/or rival and can be located variously along a spectrum as illustrated in Figure 3.3 (Mantau et al., 2001). Thus, there is a continuum between pure public goods at one extreme and pure private goods at the other (McGuire, 1987).

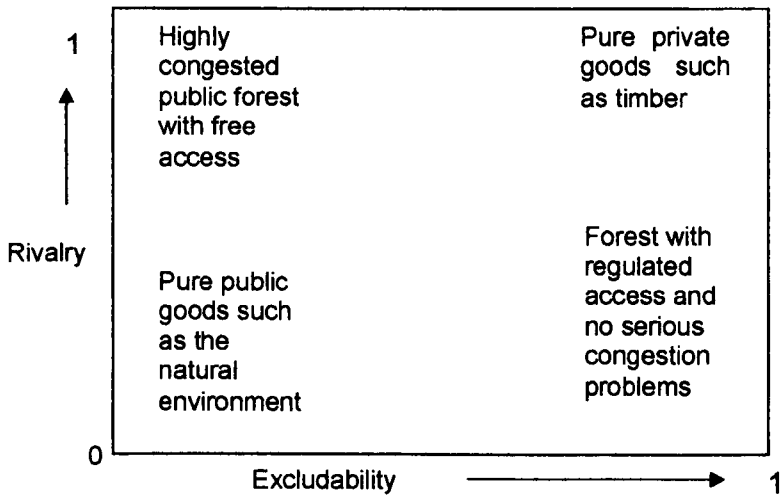


Figure 3.3: Example of impure public goods within forestry (adapted from Mantau et al. 2001).

The extent to which a public good remains a public good depends on the distribution of property rights (Slee, 2006). For example, legislation granting public right of access to woodlands in Scotland under the Land Reform Act 2003 turned a notionally private good unambiguously into a public good. Access to woodlands in England is more limited, based on the 1949 National Parks and Access to the Countryside Act (woodlands and forest remain outside the legislation of the Countryside and Rights of Way (CROW) Act 2000), except for the special case of dedication. In this regard, Church and Ravenscroft (2008) suggest that woodland owners' sense of ownership and perceived property rights are central in determining their decisions regarding access. These attitudes are formed against the backdrop of historical conflict over recreational access to land in England. According to Shoard (1999), allowing or denying access is connected to a strong sense of ownership and identity with the land. Sime et al (1993) concluded that maintaining rights of ownership and control is important to owners and will influence their decisions regarding public good provision and their response to public policy incentives.

The issue of property rights is also of fundamental importance in understanding both the nature of, and solutions to, environmental economic problems. In the case of some environmental products, such as clean water or clean air, the possession of this right by the state puts it in a position to make the polluter pay. If the private owner of land has the rights to the water, including the right to pollute it, the strict neoclassical solution is to reward the provider for the good he provides to wider society. This

latter course of action is termed the 'provider paid principle', in contrast to the 'polluter pays principle', and applies where a negative impact is being inflicted on the owner of a property right. In terms of private woodland ownership, should the owner be compensated for providing public good benefits in his or her woodland? The question is complex, especially in situations where socially-oriented or lifestyle owners will provide some of these benefits anyway (such as biodiversity or landscape).

In the past, most studies used to inform policy took a rather narrow view of the economics of forestry, placing the emphasis mainly on the productivity and profitability of timber (Kula, 1986). More recently, studies have developed a broader framework for the evaluation of the economics of forestry, recognising that a range of economic benefits exist, not just timber production (Pearce, 1991; Price, 1997; Willis et al., 2003; CJC Consulting, 2004). These studies suggest that an inclusion of non-timber values can increase the economic rates of return from forestry (Dickie and Rayment, 2001) and not just increase intrinsic values. For example, Whiteman (1991) showed that including recreational values changed the net present value of restocking land in the New Forest with oak from -£5,112 per hectare to +£2,907 per hectare. If nature conservation, carbon sequestration and water catchment values are added the internal rate of return (IRR) increases from -0.1% to +18.25% (Dickie and Rayment, 2001). Thus, it can be argued that, in lowland Britain at least, the ecological, aesthetic and recreational benefits of woodlands and forests can outweigh their commercial value for timber (Pitt, 1992; Innes, 1993; Matthews, 1994; Selman, 1997; Brainard et al., 2001). However, since public goods produce external benefits, the forest manager does not reap the return directly. Unless the forest manager can be compensated for, or internalise, the benefits derived from public good provision, in order to make the management pay for itself, he/she is unlikely to manage the woodland with public good provision in mind.

In order to deliver effective sustainable forest policies, a robust assessment of the value of non-market, or public, goods is required. Putting a value on public goods allows them to be compared with economic outputs from forestry (such as timber). It also allows an assessment of what outputs should be prioritised for state support.

Thus, while there are acknowledged limitations to the use of economic techniques to evaluate the value of public goods, the assessment of these non-marketable goods has enabled their inclusion as components of forest policy. Indeed, a fuller consideration of the wider economic benefits of forestry (including the social and environmental benefits) has strongly influenced global forest policy development over the past 10-15 years. In the context of this study, environmental economic approaches provide a pragmatic framework for assessing the non-market benefits from forests and woodlands. An evaluation of public preferences for public benefits in woodlands enables those benefits to be valued and gives credence to the allocation of public funds to support such provision. The following section reviews a number of studies that have incorporated these economic evaluation techniques to value the social and environmental benefits of woodlands.

3.3 DEMAND LEVEL FOR PUBLIC GOOD PROVISION

As outlined in Section 3.3.1, the demand level for public good provision in woodlands can be estimated by an assessment of the values attributed to public goods; these values act as a proxy for demand. However, while it might be interesting to ascertain the potential for enhanced public good delivery in private woodlands and forests, the exercise is purely academic if there is no demand for such provision. Thus, as well as estimating values attributed to relevant public goods, this section also explores the evidence for public benefit demand in woodland by: (1) examining surveys on visitor numbers and attitudes towards woodlands and forest use; (2) examining wildlife designations relating to woodland and forests; and (3) investigating the variation in market price for woodland plots.

3.3.1 The potential value of public goods

According to a major study by Willis et al. (2003) the total value of the social and environmental benefits of forestry in Britain is estimated at about £1 billion per year. The aggregate capitalised value is estimated at £29.2 billion. This total aggregate value of woodland is largely dominated by recreational and biodiversity values (Table 3.1), accounting for over 75% of the social and environmental value.

Table 3.1: Annual and capitalised social and environmental benefits of forests in Britain (£ millions, 2002 prices) (Willis et al., 2003).

Environmental benefit	*Annual value*	*Capitalised value*
Recreation	392.65	11,218
Landscape	150.22	4,292
Biodiversity	386.00	11,029
Carbon sequestration[1]	93.66	2,676
Air pollution absorption	0.39	11
Total	1,022.92	29,226

[1] These figures are approximations since carbon sequestration and future climate change impacts obviously vary and are extremely difficult to predict. They are calculated using the value of £6.67 per tC, which is very low when compared with Government's recommended central value for the social cost of carbon of £51 per tCO_2e for non-traded prices and £21 per tCO_2e for traded prices (2009 prices).

In a survey on public opinion of forestry in 2009 in England, around 98% of the respondents supported the use of public money for forestry in order to provide at least one public benefit (FC, 2009d). When asked what is important about forests and woodland, respondents indicated that they are important places for wildlife and places where people can relax and de-stress (FC, 2009d). Four fifths of respondents agreed that woodlands can help mitigate climate change by storing carbon, and 85% felt that more trees should be planted to help tackle climate change. Ten per cent of respondents reported using wood as a fuel in their home.

Through a review of relevant literature, this section attempts to assess the potential public good values of the four principal public benefits of forests (recreation, biodiversity, landscape and carbon sequestration) identified by Willis et al. (2003) as having the highest social and environmental benefit.

Other benefits are also worth considering, such as health, quality of life, pollution absorption, water quality and cultural heritage.

3.3.1.1 The public good value of biodiversity

According to Willis et al. (2003) the annual biodiversity value of woodlands in Britain is estimated at £386 million, which accounts for 38% of the total estimated public good values. The study also estimated the marginal benefits of biodiversity as being 35p per household per year for enhanced biodiversity in each 12,000 ha (1%) of commercial Sitka spruce forest, 84p per household per year for a 12,000 ha increase in lowland broadleaved forest, and £1.13 per household per year for a 12,000 ha increase in ancient semi-natural woodland.

Hanley et al (2002) (who adopted the findings of Garrod & Willis 1997 as the basis for their estimates) published the most comprehensive and inclusive assessment of non-use value of forest biodiversity in UK. The study showed a preference for improving biodiversity values in lowland ancient semi-natural broadleaved forest (see Table 3.2). According to the NIWT (FC, 2003a), much of this woodland is in private ownership. It is, therefore, appropriate in this case to investigate the extent to which woodland owners are willing to provide or enhance the biodiversity benefits within their woodlands.

Table 3.2: Relative biodiversity preferences for different types of forest, and actual mean WTP (£ per household per year) (Hanley et al., 2002).

Biodiversity forest type	Relative preference for existing area	Relative preference for an increase* of 12,000 ha	Absolute WTP values (£ per household per year) for an increase of 12,000 ha
Upland Conifer Forest (control)	1.00	1.00	0.35
Lowland Conifer Forest	1.21	1.15	0.33
Lowland Ancient Semi-Natural Broadleaved Forest	2.11	2.31	1.13
Lowland New Broadleaved Native Forest	1.95	4.23	0.84
Upland Native Broadleaved Forest	2.32	3.31	0.90
Upland New Native Broadleaved Forest	1.95	3.15	0.61

** Ancient lowland and upland native broadleaved woodland – to protect and regenerate these woodland types. In columns 2 and 3 the base value is the individual mean for upland conifer, with other types of forest scaled to that token unit, for existing area and increase in area, respectively.*

3.3.1.2 The public good value of recreation

The total annual value of recreation in woodlands and forests is estimated at £393m, with over 90% of this recreational value attributable to woodland located in England (Willis et al., 2003). The marginal values for woodland recreation are estimated at £1.66 for each recreational visit (90p for local visits, £1.80 for visits from a greater distance) (Willis et al., 2003). A series of travel cost models, covering 15

forests, by the Forestry Commission in the 1980s found a consumer surplus[8] of £2 per person per visit (1988 prices), although this ranged from £1.34 to £3.31 per person per visit depending on the location and characteristics of the forest (Willis, 1991). The figure used by H.M. Treasury is £1.60 per visit. Similarly, a survey by Scarpa (2003) found the mean maximum willingness to pay (WTP) for a woodland visit ranged from £1.66 to £2.75. Dog walkers' have a low consumers' surplus on marginal walks (4p to 30p), most likely due to their frequency of visits (Willis and Garrod, 1991). The marginal benefits of woodland recreation are understandably higher when substitute recreational experiences are limited (CJC Consulting, 2003).

As well as estimations of non-market benefits in woodlands, estimations of the market benefits of forest-related tourism suggest woodlands bring real economic value to a region. Indeed, forest-related tourism expenditure associated with tourism day visits is estimated to be around £2.3 billion, over 3% of total tourism expenditure in the UK. For England the figure is £2.05 billion, which amounts to 3.4% of tourism expenditure (Hill et al., 2003). In a study of six countryside areas, an average of 13% of total tourism expenditure incurred by surveyed visitors was considered to be "forest-associated expenditure" (see Table 3.3). In other words, the additionality of forestry and woodland to rural tourism ranged from 11% to 17%.

Table 3.3: Proportion of tourism expenditure in the countryside that is "forest-associated" (Hill et al., 2003).

	%
New Forest	15
Lake District	12
Borders	11
Wye Valley	17
Snowdonia	12
Mean	**13**

Slee et al. (2004) have subsequently argued that such values, termed shadow or halo effects, can be enormously significant in local economies. In their study in mid-Bedfordshire, Slee et al. (2004) found that the impacts of residential and tourism effects accounted for over 95% of the estimated total forest-related income injection into the local economy. However, the authors also note that methodologies to assess forestry's contribution to the rural economy need to adapt to the particular socio-economic contexts of different areas. Furthermore, the various values associated with forestry are interrelated and changes in one value invariably affect another (e.g. the effects on water quality of new planting).

This section has shown that woodland recreation has significant value in terms of informal recreation and tourism. The location of privately-owned woodland near to centres of population may in turn provide opportunities for enhanced recreational benefit. It also potentially represents areas with high landscape value, as outlined in the following section.

[8] Consumer surplus – the difference (or the net gain) between the price actually paid when purchasing a good or service and the price the consumer would have been willing to pay for the same good or service.

3.3.1.3 The public good value of landscape

As the Forestry Commission (2004) acknowledges, woodlands are a highly visible and valued component of many landscapes. However, the valuation of landscapes is complex and there is only limited economic evidence of the benefits or disbenefits of changes in woodland concentration or design on the landscape. Garrod (2003) estimated that an average household was willing to pay £227 per year for views of urban fringe broadleaved woodland on car journeys. Views of woodland in other landscape settings were either small or statistically insignificant. The study showed that typical respondents preferred small woodlands comprising randomly spaced broadleaves of varying heights with areas of open space. Garrod also estimated the capitalised value of forest landscape at £7,980 per house. Anderson & Cordell (1988) estimated that local trees added 4% to house prices and Morales (1980) estimated this at 6%. A hedonic pricing model by Garrod and Willis (1992) revealed a significant positive relationship between broadleaved woodland and house prices and a significant negative relationship between mature spruce conifers and house prices, of +£43 and -£181 respectively, for each 1% change in the relative proportions of these types of woodland.

Willis et al. (2003) estimated a value of £269 per annum per household for those residences with a woodland landscape view on the urban fringe. CJC Consulting (2005) conclude that the landscape value (in terms of public good) of woodlands is higher in urbanised areas. This is presumably because more people in these areas are able to enjoy the woodland landscape than in remote areas. Garrod (2003) also showed that a preference for forested over non-forested landscapes was only found for broadleaved woodland (and not coniferous) in a peri-urban setting. However, it is also recognised that a small amount of additional trees and woods can help to conserve highly valued rural upland landscapes.

Table 3.4: Aggregate capitalised value of woodland landscape in England (Willis et al., 2003)

Number of households with woodland view	183,324
Value of woodland view for houses (£, millions)	1,408
Number of households seeing woodland on journey	329,444
Value of woodland view on journeys per household (£, millions)	2,133
Total value of views of urban fringe woodland (£, millions)	3,540

Thus, the demand for broadleaved woodland close to where people live in terms of landscape benefits appears to be significant.

3.3.1.4 The public good value of carbon sequestration

Two main approaches have been used in existing studies to estimate the value of carbon, namely the cost-benefit analysis (CBA) approach and the marginal cost (MC) approach. Each has a number of

uncertainties associated with it, which can be grouped into two main categories: scientific uncertainties and uncertainties associated with economic valuation (Clarkson and Deyes, 2002). Scientific uncertainties include uncertainties in present measurement and prediction of future emissions, estimating the climate impact associated with increased levels of atmospheric carbon and identifying the physical impacts resulting from climate change (Clarkson and Deyes, 2002). The economic valuation uncertainties include how to estimate values for non-market impacts, predicting how the impacts will change in the future and determining the rate at which future impacts should be discounted to today's prices (Clarkson and Deyes, 2002). Thus, we see a range of carbon values estimated in the literature from £2.66 to £140 per tonne of carbon sequestered (tC).

A model by Fankhauser (1994; 1995) in the early 1990s provided well-documented estimates for the value of carbon sequestration. Fankhauser estimated a value of $20.3 per tC in 1991, increasing to $22.8, $25.3 and $27.8 over the next 3 decades to 2021. The Intergovernmental Panel on Climate Change's (IPCC) Working Group III estimated a range of $5 to $125 per tC as a social cost (IPCC, 1996). Pearce (2003) argued that the base case of social marginal cost of carbon ranges from £2.66 to £6 per tC, while Willis et al. (2003) use the value £6.67 per tC.

The UK government's approach to carbon valuation underwent a major review, concluding in July 2009 (DECC, 2009). The new approach is based on the cost of mitigation, moving away from a valuation based on the damages associated with impacts. The carbon valuation is set at a level in line with the UK government's targets in the short and long term. Previously the valuation of carbon was based upon an estimate (from the Stern review) of the damages associated with the climate impacts of emissions, termed the shadow price of carbon (Defra, 2007b). The current central value for carbon is £21 per tCO_2e (traded prices[9]) and £51 per tCO_2e (non-traded prices[10]) with lower values of £12 and £25 and upper values of £25 and £76, respectively (Defra, 2007b).

Brainard et al. (2003) estimated the net present value (NPV) for carbon sequestered by woodland in England as being over £772 million, with most of this value occurring in private broadleaved woodland (see Table 3.5).

[9] For appraising policies that affect emissions in sectors covered by the European Union Emission Trading System (EU ETS).
[10] For appraising polices that affect emissions in sectors not covered by the EU ETS.

Table 3.5: NPV estimates (£millions) for carbon sequestered by woodland in England (price per tC = £6.67, with annual increments of 6.67p to year 2002-2031) Brainard et al (2003).

	NPV (£ million), discount rate = 3.5%
Forestry Commission	
Beech	9.50
Oak	11.57
Sitka Spruce	21.07
Other Broadleaf	15.30
Other Conifer	54.72
FC Totals	115.21
Private woodland	
Broadleaf	523.94
Conifer	133.17
Private woodland Totals	657.11
All England Woodland	772.32

The total annual value of carbon sequestration in Britain includes estimates of £94 million per year at £6.67 per tC, to £983 million per year at £70 per tC (Willis et al., 2003). At the higher level the value for carbon sequestration is clearly much higher than that of either biodiversity (£386 million) and recreation (£393 million) in Willis et al.'s (2003) study. However, it is important to note that these limited analyses are restricted to the value of carbon associated with sequestration in living biomass, soils and wood products and are most appropriate to studies of the benefits of woodland creation. They do not consider the carbon benefits that accrue from wood replacing fossil fuels directly in the form of woodfuel or, indirectly, by replacing materials such as concrete and steel that have high CO_2 emissions associated with their production. It is these substitution benefits that are likely to contribute most to arguments in favour of woodland management for carbon objectives.

In light of this, woodlands can affect the carbon balance in three main ways: locking up carbon in standing timber; the substitution of fossil fuel with wood fuel and substitution of wood for more carbon-intensive materials such as concrete and steel. If wood is used as a substitute material for concrete or steel in building, it can have a positive impact on the carbon balance. The use of wood in other wood products, such as furniture, also locks up carbon for the duration of the product's lifetime, although this role is of far less significance than the potential savings of wood and wood products in direct and indirect fossil fuel substitution. In the long term, carbon substitution benefits arising from woodland management have the potential to far exceed those resulting from management of standing carbon stocks (Broadmeadow and Matthews, 2003). Further, the likely increase in energy requirements from wood fuel (due, for example, to the rise in the price of fossil fuels over the longer term) and the government's commitment to increasing the renewable energy sector, present a potentially growing market for low grade timber from English woodlands. The government's *Woodfuel Strategy for England* (FC, 2007a) estimates that in England 2 Mt of woodfuel (equivalent to a carbon saving of 400,000 tonnes of carbon) could be provided annually, 50% from the estimated unharvested available material

in English woodlands. The rest will be from arboricultural arisings, harvesting residues and recovered wood. The strategy states that many woodlands are currently undermanaged, with an estimated additional 4 Mt of biomass potentially available. If barriers to management were removed an additional 1 million dry tonnes of woodfuel could be sourced from England woodlands, which would satisfy much of the immediate need for woody biomass (UK Government, 2006).

The UN Framework Convention on Climate Change (UNFCCC) currently does not anticipate forestry being included in climate change mitigation measures. However, with global deforestation potentially accounting for more global warming emissions than the transport sector (Stern, 2006) this could soon change. Reforestation schemes and sustainable forest management could provide an alternative. By inclusion in the European Emissions Trading Scheme (EU ETS) forest industries can get recognition and benefit from their role in mitigating climate change.

3.3.1.5 Other public good values

As well as biodiversity, recreation, landscape and carbon sequestration, a range of other public goods are provided by forests and woodlands, such as pollution absorption, water supply and quality and protection of archaeological artefacts (Willis et al., 2003). There is also increasing evidence to support the view that woodlands and forests can improve quality of life, health and well-being (DETR, 2000; CABE, 2003). In England, it has been estimated that the net pollution (particulates (PM_{10}) and SO_2) absorbed by trees reduces deaths by 5 per year, and reduces hospital admissions by 4 per year. This amounts to a benefit of £583,570 per year (Powe and Willis, 2004). According to Willis et al. (2003), £124,998 is saved each year for each death avoided by 1 year due to PM_{10} and SO_2 absorbed by trees, and £602 for an 11 day hospital stay avoided due to reduced respiratory illness. Recent arguments about woodlands as providers of opportunities for enhanced health through the provision of 'green gyms' are recognised, but calculation of economic values of such benefits are highly location-specific and are influenced to varying degrees by the substitution effects of other recreational sites or areas of public open space. It is, therefore, likely that the health improvement value from pollution absorption estimated by Powe and Willis (2004) underestimates the total contribution of woodland to the health agenda, since it does not include the considerable health benefits incurred through informal recreation in woodlands.

England's semi-natural ancient woodlands also have much cultural heritage (Bannister, 2007). Many ancient woodland sites contain features related to past woodland management, such as wood banks and saw pits, as well as archaeological features such as Bronze Age burial sites or Roman houses. Any management of these woodlands needs to be sensitive to the historic features present.

Woodlands can also improve soil, water and flood control as well as reducing pollution from agriculture (CJC Consulting, 2005). However, there is a cost of 13p to £1.24 per m^3 where water is lost to abstraction for potable uses, although for most areas where no abstraction occurs the marginal cost is

zero. The external cost of woodland on water quality has largely been 'internalised' within forestry through the application of guidelines on woodland planting and conditions attached to forest certification. For example, woodland planting is encouraged along rivers and streams to act as a buffer against run-off from agricultural land (FC, 2003b).

There is a strong case for intervention in forestry when it aids regeneration and urban development with potential positive benefits to quality of life and impacts on attractiveness to businesses and their retention in an area (CJC Consulting, 2005). Community forests provide a good example of the role of woodland in regeneration. Other forest and woodland initiatives such as the South West Woodland Renaissance Partnership have also been shown to stimulate local economic activity. However, the use of forestry in rural development is not always ideal because of the long time-scale, uneven labour profile and the effects of long-term dependence on subsidies (CJC Consulting, 2005). However, CJC Consulting (2005) suggest that there is a much stronger case for forestry when it stimulates innovation in rural business development. A good example of this is the woodland cycling initiative in the south-west of England, which is a consortium of private and public woodland owners attempting to develop the market in the South West for off-road cycling in order to create revenue for private owners and businesses.

In summary, the above review indicates that (1) biodiversity values are likely to be highest in lowland ancient semi-natural broadleaved forests; (2) recreation values are likely to be highest in lowland broadleaved woodlands near to urban areas where other recreational opportunity is limited; (3) landscape values are likely to be highest close to urban areas; and (4) carbon values are likely to be highest in lowland ancient semi-natural broadleaved forests. The majority (over 90% in some cases) of this woodland is privately owned and, thus, provides a strong justification for investigating the opportunities for enhancing public benefit in private woodlands.

Having established that potential values of public benefits of woodland are substantial, and highly variable according to location, species and type of benefit, the following section goes on to present an overview of studies undertaken on visitor numbers to woodland and preferences for different types of woodland. Such an assessment will help to further inform the understanding of demand for public good benefit from woodland.

3.3.2 The demand for woodland recreational use

It is clear that there has been long term recreational value in the overall woodland resource and that there is growing interest in recreation on near-natural forest or wildwoods (Worrell et al., 2002; Garforth and Dudley, 2003). In the biennial Public Opinion of Forestry Survey in England (FC, 2009d), 77% of respondents stated that they had visited a woodland in the last few years, a higher proportion than in previous surveys (2007: 76%; 2005: 65%; 2003: 66%). The TNS Travel and Tourism (2004) omnibus survey estimated that there were 222 million visitors to woodlands in England

in 2004, 21% of which were to Forestry Commission woods, 33% to local authority woods, 23% to private woods and 7% to woods owned by voluntary or NGO organisations. This estimate is much higher than that of Benson and Willis (1992), who estimated that there were 28 million visits to FC woods in Britain in 1992, 77% of which were in England.

Distance and access to woodland appears to be a major factor in determining visitor rates to a woodland site (Ode and Fry, 2005). Benson and Willis (1992) assert that the location of woodlands is a major determinant of the value of recreation in those areas. For example, the marginal benefits of woodland recreation are higher where substitute recreational experiences are limited. A study by Coles and Bussey (2000) found proximity of woodlands to be a key factor in determining where visitors choose to go. Most visits were within 5 minutes walk of home, although over 25% of respondents were prepared to walk up to 10 to 30 minutes from home (Coles and Bussey, 2000). Similarly, Harrison et al. (1995) found that, ideally, green spaces should be within 280 metres of the user's home in order for them to visit on foot. In the Coles & Bussey study, 75% of the user population lived within 275 metres of a woodland.

A study undertaken by Ward Thompson et al. (2005) investigated how and why people use local woodlands. Their findings revealed that freedom from litter and proximity to woodlands is important for regular woodland users. Coles and Bussey (2000) further recommend that woodlands should be a minimum of 2 ha to maximise social value and have an open structure, and while tree species was not seen as an important factor, most users preferred mixed woods. Some studies, however, suggest a strong public preference for broadleaves over conifers (Garrod and Willis, 1993; Hanley and Ruffell, 1993).

The respondents in Ward Thompson et al.'s (2005) study felt that the woodlands near to where they lived needed to be tidied up, the signage maintained and good footpaths provided. Woodland visitors evidently want a mix between very wild woodland and a woodland park; partly managed but also with a natural feel. The two issues that prevented more frequent woodland use were safety and forest abuse and the presence of rangers or wardens was believed to be a deterrent to vandalism while encouraging a feeling of safety. Woodlands with very mature, mixed-species trees and a fairly open layout were the most popular for visitors. Open woodlands give a positive image, whereas dense, gloomy woodlands can create negative images with many places that might hide an attacker, or limit the view ahead and induce fear of crime (Burgess, 1995). A study for the Forestry Commission in 2001 showed that over three-quarters of the respondents would like to see toilet facilities at woodland sites (Heggie, 2001). The majority also wished to see sign-posted walks suitable for all abilities, a car park, nature trails and a picnic area.

The TNS survey indicated that walking (62%) is the most popular activity in woodlands, followed by cycling (8%) and horse riding (2%). A Forestry Commission survey indicated that 30-40% of all visitors

to woodlands and forests are dog walkers (Christie et al., 2005), who may visit the woodland several times a day, but only for a short duration. These users are likely to prefer nearby woodlands which are easily accessed.

The Pubic Opinion of Forestry Survey (FC, 2007b) indicated that 71% of respondents would like to see more woodland in their part of the country. Thus, the demand for woodland recreational use appears to be for well-managed mixed or broadleaved woodland near to where people live. Since much private woodland is broadleaved and located near to centres of population, this suggests that such woodland is ideally placed to deliver these amenity benefits.

3.3.3 Nature designations

Many nature designations include woodland sites. Designations include Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs), National Nature Reserves (NNRs), Local Nature Reserves (LNRs), Biodiversity Action Plans (BAPs), Tree Preservation Orders (TPOs), Biosphere Reserves and ancient woodland. These designations reflect the qualities that are particularly valued by visitors and residents, in particular biodiversity values, and in turn help indicate the factors that contribute to demand.

Site of Special Scientific Interest (SSSI): SSSI designation gives sites some legal protection to ensure that sites are well managed. The owner of the land has certain responsibilities alongside the local authority and other public bodies. There are over 4,000 SSSIs in England, with over 500 of these comprising woodland or forest.

Special Protection Areas (SPAs): SPAs are strictly protected sites under the EC Birds Directive. They are classified for rare and vulnerable birds listed in Annex I of the Birds Directive and for migratory species. In the UK the Joint Nature Conservation Committee (JNCC) is responsible for selecting and monitoring SPAs.

Special Areas of Conservation (SACs): SACs are sites strictly protected under the EC Habitats Directive which requires the establishment of a network of important conservation sites that will make a significant contribution to conserving the 189 habitats and 788 species identified in Annexes I and II of the Directive. 78 of these habitats occur in the UK, and 43 of the species are native to the UK. There are 237 SACs, SCIs or cSACs in England.

National Nature Reserve (NNR): NNRs are sites designated for wildlife conservation. The sites are designated because of their importance for a particular habitat. NNRs are either owned or managed by English Nature, a Wildlife Trust, the Woodland Trust or a local authority. There are 61 woodland NNRs in England.

Local Nature Reserve (LNR): LNRs are established by local authorities under the National Parks and Access to the Countryside Act (1949) on land in which the authority has a legal interest. There are over 1,050 LNRs in England, covering almost 40,000 ha (EN, 2007). There are about 240 woodland LNR sites in England.

Biodiversity Action Plan (BAPs): The UK's Biodiversity Action Plan is the government's response to the Convention on Biological Diversity (CBD) signed in 1992 and provides a framework for the protection of vulnerable species and habitats. There are 45 Habitat Action Plans (HAPs) which include woodland habitats.

Tree Preservation Orders (TPOs): TPOs can apply to single trees, a group of trees or woodland. They are issued by the planning authority to protect trees with amenity or environmental value.

Biosphere Reserve: Biosphere reserves are internationally designated by UNESCO under the Man and Biosphere Programme. There are only nine in the UK, four of which have woodland as part of the site. All Biosphere Reserve are also NNRs and SSSIs (or partly). In Wales the Dyfi reserve consists of salt marshes and esturarine systems, with the remnants of native oak woodland along the Dyfi valley. In England Moor House in Upper Teesdale consists of an upland blanket peat bog, heather moors, acidic grasslands and deciduous woodland. In Scotland Cairnsmore of Fleet and Silver Flowe comprises a unique bog formation and montane acid grasslands, wet heath and broadleaf forest. Taynish, also in Scotland, consists of native mixed woodland, with wet and dry heath, grassland and coastal ecosystems.

Ancient Woodlands: Ancient woodland is land that has had continuous woodland cover since at least 1600 AD and it may be either (1) Ancient semi-natural woodland (ASNW) – ancient woodland sites that have retained the native tree and shrub cover, although it may have been managed by coppicing and felling and allowed to regenerate naturally; or (2) Planted ancient woodland sites (PAWS) – ancient woodland sites where the original native trees have been felled and replaced by planting, often conifer species.

The ancient woodland inventory in England identifies over 22,000 ancient woodland sites in England (AWI, 2002). This account for 309,000 ha of woodland, less than 20% of the total wooded area (WT, 2000a). More than 8 out of 10 ancient woodlands in Britain are less than 20 ha, and nearly 50% are less than 5 hectares (WT, 2009).

Ancient woodland is not a statutory designation and so gives no legal protection to the woodlands. While some ancient woods are designated, as SSSIs for example, 85% of all ancient woodlands (including 5 of the 12 largest woods in England) have no designation (WT, 2009).

In summary, the designations reflect valued woodlands, often in terms of their importance as a habitat for rare or threatened ground flora, insects or birds. Some woodlands are designated as they are a rare habitat in themselves; for example, ancient upland oak woodlands or Caledonian pine forests. Thus, the nature conservation designations cited here can be used as a proxy for biodiversity public good value demand.

3.3.4 The price of woodland

The recent demand for rural land, including woodland, has driven more woodland plots onto the market. Whereas woodland used to be available mainly as large commercial conifer plantations, now smaller plots of broadleaved or mixed woodland are frequently available, fetching prices from £30,000 to £80,000 for 10 acres (Woodlandowner.org, 2007). The variation in price is dictated by the location, with woodland close to centres of population or of high amenity fetching a premium. The Forest Market Report produced by Tilhill and Savills (2008) reported that woodland prices in the south of England were recorded in the £8-12,000 per hectare range. More remote woodlands or those with lower amenity value typically sold for £2-5,000 per hectare. In the current uncertain economic climate, land and woodland is seen as a safe haven, with tax breaks on commercial woodland and a growing biomass market (Tilhill and Savills, 2008).

To summarise, section 3.3 has explored the demand level for public good provision in woodlands and forests. The estimates of the social and environmental values of woodland suggest that these benefits contribute significantly to the total economic value of our woodland resource. Studies investigating preferences for different woodland types, nature designation of woodland sites and increasing market prices for woodland plots, suggest that there is increasing demand for public good provision in woodland. However, such demand is likely to have spatial variability, both in terms of scale and geographical location. The following section, therefore, considers the spatiality of public good provision and assesses how this relates to private forestry.

3.4 SPATIAL VARIABILITY OF PUBLIC BENEFIT PROVISION IN PRIVATE WOODLANDS

As Chapter One suggested, woodlands are increasingly being called upon to deliver multiple benefits, including public benefits such as biodiversity, recreation, landscape and carbon sequestration. However, much of the public benefit has been provided in public sector forests, often at locations relatively inaccessible from major centres of population. Also, many of these public benefits have occurred incidentally, rather than on the basis of socio-economic logic or evidence. As has been shown, data provided by the National Inventory for Woodland and Trees (FC, 2003a) reveal a significant concentration of privately owned woodland in densely populated areas, especially in central and southern England where private forest ownership accounts for over 80% of forest cover and where the marginal benefit from public good investment may be very high. Much private forestry is in lowland areas close to urban areas, whereas Forestry Commission woodland tends to be in more remote, often upland, rural areas where the conditions are more suitable for fast-growing coniferous timber-

producing species.

Furthermore, recent studies reveal the extent to which the general public value woodland as part of the open space close to their homes (O'Brien, 2004; Slee et al., 2004; Ward Thompson et al., 2005). Table 3.6 suggests that the recreational value for woodland near to centres of population is much greater than for that in more rural areas with low population density. In this study, Willis and Garrod (1991) found a range in recreational value from £2 in a sparsely populated area in Argyll, to £445 in highly populated Cheshire.

Table 3.6: Estimates in the variations of value on recreation across the UK (Willis and Garrod, 1991).

	Value per ha per year
Cheshire	£445
New Forest	£425
Forest of Dean	£245
Brecon	£42
Thetford	£14
Newton Stewart	£4
Lorne (Argyll)	£2

In a study commissioned by the Woodland Trust (2004), it was estimated that 10% of England's population has access to 2ha+ accessible woodlands within 500m of their homes and 55% have access to 20ha+ accessible woods within 4km. The study calculated that if all existing woods were opened (most of which are in private ownership) a further 26% of the population would have 2ha+ woodland within 500m and a further 28% would have access to a 20ha+ woodland within 4km. However, there is a need to consider the marginal costs and benefits of making different woodlands accessible.

The review of the literature also revealed a preference for broadleaved woodland for public benefit provision, especially for recreation, biodiversity and landscape. The private forestry estate in Britain is considerably older than that of the Forestry Commission and contains more broadleaves, with only 37% of private forestry being exclusively coniferous, compared to 75% of Forestry Commission forest (Slee, 2006). Thus, as well as being locationally well placed to deliver public benefits, private forestry also consists of proportionally more of the preferred woodland type for public benefit than does public woodland.

As the previous section suggested, private woodland owners may be well placed to deliver public good benefits from their woodlands. The challenge is to identify which public goods different types of woodland owner would be willing (and able) to deliver and to overcome the potential or actual reticence of private woodland owners to engage with grant schemes or other informative policy mechanisms. In

this regard, the following section aims to review and assess the academic literature on private woodland owner classifications. It outlines the types of private woodland owner that have been previously identified, albeit in a non-UK setting. It also critiques these classifications in terms of their applicability in the context of the English private woodland owner.

3.5 EXISTING CLASSIFICATIONS OF PRIVATE WOODLAND OWNERS

In Europe, private forest ownership has historic roots, with large areas of forestland traditionally owned by royal families and aristocrats. These forests were often managed for both game hunting and timber. However, in spite of a remnant of aristocratic ownership, a large proportion of the forest estate, in the form of small parcels, is now in private ownership. This structural change in woodland ownership parallels that of the emergence of hobby farming in the agricultural sector. As well as farm forest owners, a new type of forest owner has emerged, motivated less by economic gain and more by socially-motivated objectives, such as nature conservation and personal enjoyment (Hogl et al., 2005). This hetereogenous mix of owner types presents a challenge for policy makers: essentially, how can policy objectives be delivered through such a diverse forest estate? In order to address the problem, a number of researchers have attempted to classify private woodland owners, although these have generally been in non-UK settings, such as mainland Europe or the United States, where forest ownership structure may differ.

Some studies on private forest owners link owner characteristics (such as values, attitudes, management objectives) to particular behavioural patterns (Hogl et al., 2005) such as harvesting behaviour (Kuuluvainen et al., 1996), reforestation methods (Karpinnen, 2005), participation with subsidy schemes (Madsen, 2003) or owner ability to follow principles of ecosystem management (Creighton et al., 2002; Jacobsen, 2002). However, reference to the substantial body of agricultural literature suggests that categorising landowners into discrete groups is fraught with difficulties, with many individuals holding a range of attitudes that may overlap several groups. The behaviour of landowners is multi-faceted and influenced by a range of external and internal factors (CCRI, 2009). In many studies, farmers are often considered as responding primarily to external factors, such as rules (e.g. policy), resources (farmland) and other exogenous forces (e.g. the wider political economy of farming) (Marsden et al., 1993; CCRI, 2009). While these factors are important, other researchers suggest that internal forces, such as attitudes, values and identity, are especially important with regard to environmental behaviour (Potter and Gasson, 1988; Morris and Potter, 1995). Thus, the response of landowners in relation to participation in agri-environmental schemes, for instance, is influenced by a wide range of factors. As such, farmer typologies have been criticised as being artificial and not able to fully explain the individual behaviour patterns of a diverse farming population. Each farmer will base the decision on whether to participate on a range of financial, practical, emotional, social and cultural factors (Hill et al., 1992). Burton (2004), therefore, questions the validity of typologies based on attitudes alone, as they are not always a reliable predictor of behaviour. He argues that models (such as Morris and Potter's 1995) that assume that only changes in attitude are needed to change farmers'

practices are weak. Indeed, research has shown that there are often inconsistencies between what people say and believe and how they actually behave with regard to the environment (Carr and Tait, 1991; Lichtenberg and Zimmerman, 1999; CCRI, 2009). In order to overcome this, Fish et al (2003) suggest that uptake of agri-environmental schemes is not necessarily associated with owner types, but with styles of participation or non-participation, with farmers potentially taking different approaches to different parts of the farm.

These insights from the extensive agricultural literature are useful in informing the development of a classification of private woodland owners. Most of the typologies of private woodland owners classify owners into two main groups: production-oriented and consumption/protection-oriented (Dhubhain et al., 2006). Production-oriented owners are generally motivated by the production of wood or non-wood goods and services, usually with the objective of generating economic activity. Consumption/protection-oriented owners, on the other hand, are motivated by the consumption of wood or non-wood goods and services. These owners are often classified into further sub-types, including wood consumption; non-wood consumption, such as recreation; protection, such as the provision of wildlife habitats; and passive or disinterested attitudes. Table 3.7 presents a summary of the literature review relating to ownership typologies. These studies and the ownership types identified are further discussed in the following section.

Table 3.7: Private forest owner types as identified in the literature.

Study	Country	Production goals	Multiple objectives	Consumption/Protection goals		
				Wood consumption	Non-wood consumption/ protection	Passive
(Kurtz and Lewis, 1981)	United States	*Timber agriculturist*-timber production and financial return.			*Forest environmentalist*-aesthetic values, wildlife and privacy.	
(Marty et al., 1988)	United States	*Timber agriculturist*-timber production for profit.	*Utilitarians*-equal priority to variety of uses. *Timber conservationists*-sustained timber production and concern for wildlife.		*Forest recreationists*-value recreation and enjoyment of forest.	
(Kuuluvainen et al., 1996)	Finland	*Investor*-forest as asset, source of income and security. *Self-employed owner*-employment and labour income.	*Multiobjective owner*-values both economic and amenity benefits.		*Recreationist*-values recreation.	
(Loenstedt, 1997)	Sweden	*Formal economic goals*-aim to achieve positive cash flow. *Production goals*-increase standing volume and increment of forests.		*Informal economic goals*-profits from hunting and firewood.	*Environmental goals*-aesthetic appreciation of forest.	
(Karpinnen, 1998)	Finland	*Investor*-regard their forest as a source of economic security 13% *Self-employed*-	*Multi-objective*-values equally monetary benefits and amenity 26%		*Recreationist*-emphasis amenity and recreation values 31%	

		employment from forest.				
(Volz and Bieling, 1998)	Germany	*Homo oeconomicus*-calculatory, optimizing.	*The traditionalist*-influenced by handed-over values. *The responsible owner*-acts to hand over forest to children.		*The idealist*-likes to see forest grow, forest work and independence.	*The resigning owner*-distrusts policy. Forest of no real value to owner, only work and worry.
(Becker et al., 2000)	Germany	*Economically oriented*-financially motivated, property and investment.	*Universally interested*-evenly motivated.		*The ecological type*-motivated by recreation, natural experiences, nature conservation.	
(Kline et al., 2000)	United States	*Timber producer*-stress timber production and land investment.	*Multi-objective*-emphasise economic benefits, non-timber benefits and personal gratification equally.		*Recreationist*-value recreation and enjoyment of green space.	*Passive*-underline owner gratification – enjoyment of owning the forest most important.
(Von Mutz et al., 2002)	Germany	*Economically oriented owners*-source of income for consumption and security.			*Leisure-oriented*-outdoor recreation, hunting, nature conservation.	
(Bieling, 2004)	Germany	*Economically interested*-wood sales, financial security.	*Conceptually interested*-values personal experience, own wood supply, recreation, inheritance value.			*Disinterested*-no objectives important except to keep forest in family ownership.
(Boon et al., 2004)	Denmark	*Classic forest owner*-greatest emphasis on income generation 52%	*Multi-objective*-motivated by financial, environmental and other values 18%		*Hobby owner*-forest used for hobby activities; value aesthetic and biodiversity 30%	*Indifferent farmer*-generally indifferent towards benefits of being forest owner.
(Hugosson and Ingemarson, 2004)	Sweden	*Production motivations*-wood production and harvesting.			*Conservationist*-emphasise protection function of forest.	

		Economic efficiency goals-economic objectives.				
(Mizaraite and Mizaras, 2005)	Lithuania	*Businessman*-earn income from sales of wood and non-wood products 29%	*Multi-objective*-hold multiple objectives 31%	*Consumer*-main motivation is the extraction of wood and non-wood products for personal use 22%	*Ecologist*-value nature conservation 18%	
(Wiersum et al., 2005)	Europe		*Multi-functional*-attach equal priority to economy, nature and landscape 17%	*Individualist*-own forest mostly to provide products for own use 16%	*Environmentalist*-place priority on nature and landscape 30%	*Indifferent*-a low level of motivation concerning all forest functions 37%
(Urquhart, 2006)	England	*Traditional woodland owner*-emphasis on income generation from timber management and investment.			*Community woodland owner*-places priority on public amenity. *Resident new woodland owner*-priority is wildlife conservation and personal enjoyment.	*Farmer*-indifference to woodland. *Non-resident new woodland owner*-owner gratification; enjoyment of owner woodland most important.
(Serbruyns and Luyssaert, 2006)	Belgium	*Materialistic Profit-seeking*			*Satisfied recreational Disatisfied recreational*	
(Van Herzele and Van Gossum, 2006)	Belgium	*Economist*-emphasis on timber or wood production.			*Recreationist*-importance of recreation and nature values.	*Passive*-low level of involvement.

3.5.1 Production-oriented owners

Table 3.7 outlines a range of studies undertaken to identify different private woodland and forest owner types. As stated above, these can broadly be classified into owners with production-oriented motivations and those with consumption/protection-oriented motivations. However, within each of these classifications there is a range of owner types. For instance, Kurtz and Lewis (1981), in a study of forest owners in the eastern United States and Marty et al. (1988) in Missouri, labelled production-oriented owners as *timber agriculturists.* These owners were concerned with growing and harvesting timber in order to maximise the financial return from the wood crop. Similarly, Kline et al. (2000) classified American forest owners with an emphasis on timber production as *timber producers.* In studies in Europe, production-oriented owners were classified as *investors,* with emphasis on the forest as an asset and source of security, or as *self-employed owners,* who rely on the forest for their income (Kuuluvainen et al., 1996; Karpinnen, 1998). Similarly, Mizaraite and Mizaras (2005) labelled owners who earn an income from the sale of wood and non-wood products from their forests as *businessmen.* In Germany, owners who stressed wood sales and financial security as important were classified as *economically oriented* (Becker et al., 2000; Von Mutz et al., 2002) or *economically interested* (Bieling, 2004). Owners who placed an emphasis on timber production in a study in Denmark were labelled *classic forest owners* (Boon et al., 2004) and similar forest owners were considered *traditional woodland owners* in a scoping study in England (Urquhart, 2006).

Some classifications have distinguished between production goals and economic goals. For instance, Lönnstedt (1997) identified three discrete types of production-oriented owners in Sweden. Firstly, woodland owners with *formal economic goals* stressed the importance of achieving a positive cash flow. Such owners would reinvest profits into their woodland through investment in equipment, forestry roads and expansion. A second group of owners was also identified, distinguished by their *informal economic goals.* These owners were also interested in making a profit from their woodland, but their income was derived from less formal activities, such as hunting or firewood. A third type of owner was identified with *production goals.* These owners were concerned with increasing the standing volume and increment level from their forests. A more recent study in Sweden by Hugosson and Ingemarson (2004) also differentiated between production and economic goals. Owners with *production motivations* emphasised wood production and harvesting, while those with *economic efficiency goals* managed their forests in order to achieve economic objectives.

3.5.2 Owners with multiple objectives

The distinction between owner objectives is not clear-cut. Often, owners may have a range of objectives and motivations, so placing them into one owner type is problematic. Owners may have distinct production-oriented objectives, as outlined in the previous section, but they may well also value the amenity or nature conservation benefits of their woodland. Boon et al. (2004) described owners in Denmark who are motivated by economic concerns as well as environmental or amenity values as *multi-objective owners.* Kuuluvainen et al. (1996) and

Karpinnen (1998) used the same term to describe owners in Finland who valued both the economic and amenity benefits from their woodland, as did Kline et al. (2000) in a study in the United States and Mizaraite and Mizaras (2005) in Lithuania. In a study of forest owners in Europe, Wiersum et al. (2005) used the term *multi-functional forest owners* to describe owners who attach equal importance to the economic benefits, nature conservation and landscape values of their forests. In the United States, Marty et al. (1988) classified such owners as *utilitarians* and in a studies in Germany they were considered *universally motivated* (Becker et al., 2000) or *conceptually interested* (Bieling, 2004). Marty et al. (1988) also used the term *timber conservationists* to describe owners who pursue sustained timber production objectives but also have a concern for wildlife. A key message here is that the willingness and ability of private woodland owners to deliver public benefits is likely to be multi-dimensional and which in turn has implications for methodological design in this study.

3.5.3 Consumption/protection-oriented owners

In contrast to production-oriented owners, consumption/protection-oriented owners are motivated by amenity, nature conservation or other non-financial objectives. These objectives can be broadly divided into three classes: consumption of wood; non-wood consumption; or protection and passive.

Owners concerned with the consumption of wood and non-wood products for their own private use have been termed *consumers* by Mizaraite and Mizaras (2005) in a study in Lithuania and *Individualists* by Wiersum et al. (2005) in a study in Europe. Such owners may rely fairly heavily on the wood products they obtain from their woodland for their own personal use, such as firewood, stakes, poles or fence posts.

A number of typologies have identified owners with non-wood consumption or protection objectives, such as nature conservation, recreation, landscape and protecting the woodland resource for future generations. Those woodland owners who value the recreational benefits from their woodland can be understood as having consumption-oriented motivations. Both Kuuluvainen et al. (1996) and Karpinnen (1998) in Finland described owners who emphasise amenity and the recreational benefit of their woodlands as *recreationists.* These woodland owners stressed the importance of the non-timber aspects of their forest ownership, including recreation, aesthetics and berry-picking. The term *recreationists* was also used in a study of American forest owners by Kline et al. (2000) who valued the recreational benefits of their forest as well as the importance of preserving the resource for future generations. Similarly, in an American study, Marty et al. (1988) described owners who value recreation and enjoyment of their forest as *forest recreationists.* English woodland owners who value the amenity benefit of their woodland were described as *community woodland owners* by Urquhart (2006).

Protection-oriented woodland owners are classified as those owners who prioritise nature conservation or other protective values in their forest. Lithuanian woodland owners who are motivated by nature conservation objectives are described as *ecologists* by Mizaraite and

Mizaras (2005). In a study in Sweden, Hugosson and Ingermarson (2004) classify owners who emphasis the protection function of their forest as *conservationists,* while Wiersum et al. (2005) use the term *environmentalists* for owners who emphasise the importance of nature and landscape.

In many instances, forest owners value both the amenity benefits and the nature conservation value of their forests. In this instance, a range of terms is used to describe such owners. For instance, in Denmark, Boon et al. (2004) used the term *hobby owner* for owners who considered their woodland a hobby and who valued the aesthetic and biodiversity benefits. In Germany, von Mutz et al. (2002) preferred the term *leisure-oriented owner* for owners who saw their forest as a place for recreation, hunting or nature conservation and Becker et al. (2000) described the owner motivated by recreation and nature conservation as *the ecological type.*

The third type of consumption/protection-oriented owner, the passive owner, has an indifferent attitude towards their woodland. In a study in Germany, Volz and Bieling (1998) described the *resigned owner* as perceiving their forest as having no real value, but simply creating work and worry for the owner. In England, Urquhart (2006) identified *farm woodland owners* as being indifferent to their woodland, considering it a nuisance. Similarly, Boon et al. (2004) in Denmark described *indifferent farmers* as being generally indifferent towards the benefits of being a forest owner. In a study of European forest owners, Wiersum et al. (2005) classified a group of owners as *indifferent,* having low levels of motivation towards their forest. In the United States, Kline et al. (2000) identified *passive* forest owners who had no main objectives, but felt that owning the forest was the most important aspect of their ownership.

Within typologies of woodland owners, often the distinction is made between 'agricultural forest owner' and 'non-agricultural forest owner' (Kurtz and Lewis, 1981; Jones et al., 1995; Loenstedt, 1997; Karpinnen, 1998). The following section discusses this trend in the context of its applicability to British forestry and outlines the potential problems with such a classification.

3.5.4 Agricultural forest owner versus non-agricultural forest owner

In many typologies in Europe and the United States the 'agricultural forest owner' represents the traditional land owner with a farming background, whose forest may or may not provide a large proportion of his/her income. In these classifications, the 'agricultural' or traditional forest owner views the forest as part of his/her farm or work and may take a business-like, or at least a production-centred, approach. He or she would normally harvest more timber if it was economically feasible to do so. In the literature, the agriculturally active local resident forest owner represents the central reference point (Schraml and Memmler, 2005), against which all other owner types are measured. It is often implied that 'absentee owners' or 'non-farming forest owners' have little connection to their land and they lack the specifically developed ethos which the 'agricultural forest owner' has (Schraml and Memmler, 2005).

Those who do not have a farming background are often classed as 'non-agricultural forest owners'. Terms such as 'non-resident forest owner' and 'non-industrial private forest' (NIPF) owner (Harrison et al., 2002) are also used to distinguish the 'non-agricultural forest owner' from the 'agricultural forest owner'. The 'non-agricultural' forest owners are likely to rely on other sources of income, rather than their forest (Kvarda, 2004), although they will not exclude extracting a profit from their woodland where possible in order to balance out the costs. They are also more likely to live in more urban areas, and may live some distance from their woodland. The 'non-agricultural' owner may view their woodland from a more socially-oriented perspective, with concern for their own personal enjoyment, utilization of timber for their own needs and preserving the resource for future generations (Kvarda, 2004). Their management activities may be constrained by a lack of time, experience or access to machinery (Kvarda, 2004).

In the context of the United Kingdom, the distinction between agricultural and non-agricultural forest owner is, at best, less helpful. In contrast to the assumption that the agricultural forest owner has privileged status and knowledge in terms of an understanding and connection to the land, farm woodland owners in the United Kingdom often consider their woodlands as unproductive and of little value (Urquhart, 2006). The concept of the 'farm-forester' in Europe, where the farm woodland provides income and wood products for the farmer, is negligible in the United Kingdom. Management of existing farm woodlands or afforestation of agricultural land has often been motivated by the financial reward offered under government grant schemes or subsidies, such as the Farm Woodland Premium Scheme. In many instances, though, farm woodlands are often neglected and sometimes derelict (RFS, 2009b).

Some typologies attempt to further classify the 'non-agricultural forest owner'. For instance, four 'non-agricultural forest owner' types were identified in a study by Boon and Meilby (2005) in Denmark: production-oriented owner; classic, large owner; environmental/recreational owner and the older, small-farm forest owner. The authors indicate that the first two owner types are financially motivated and are concerned with timber production, while the last two are more concerned with environmental and recreational aspects of management. The authors suggest that policy needs to be sensitive to the motivations of all owner types. Production-oriented woodland owners may be more motivated to manage in a particular way if such management is shown to increase yield or financial return. The environmental-focused owner, on the other hand, may be influenced by management approaches that emphasise nature conservation (either through passive or active management). Other studies have used the term 'urban forest owner' for 'non-agricultural forest owner' (e.g. Schraml and Hardter (2002) and Hardter (2004)), differentiating the 'urban forest owner' according to source of main income and place of residence.

However, such terminology presents problems for policy formulation and forest owner typologies have often been criticised for their lack of information in terms of forest policy or suggestions for practice (Suda et al., 2001). By differentiating forest owners according to their

agricultural practices or farming background, the classification is limited to 'farmers' and 'the rest'. The difficulty in such a terminology is that it describes what the owner is not (i.e. not a farmer), not what he/she is. This is not only imprecise and ambiguous but has limited use for policy formulation. Such a classification also becomes redundant when most studies cite over 50% of forest owners as 'non-farming' (for example, in Sime et al's (1993) study in England, about half of the sample were non-farmers).

Such dichotomous classifications present the 'agricultural forest owner' as preferable in terms of delivering forest policy with emphasis on their forest management experience and knowledge. However, this can marginalise the non-agricultural small-scale private forest owner (Schraml and Memmler, 2005). Other factors besides timber production can explain ownership objectives, such as personal enjoyment and consumption, participation in interest groups, nature conservation, environmental awareness or protection of a resource for future generations. These non-marketable forestry objectives, which are often public goods, are increasingly the emphasis of forest policy. Thus, the personal motivations of some private woodland owners may well be in line with forest policy objectives and enable the 'non-agricultural forest owner' to deliver public good benefits from their woodland holding, perhaps even better than the traditional farm-forester. In this regard, any classification of private woodland owners needs to consider owners' attitudes towards, and ability to deliver, such public goods, which themselves may be multi-dimensional and not easy to predict.

While there may be great opportunities for the delivery of public good benefits from private woodlands, there appears to be a barrier between effective policy delivery and the 'non-agricultural forest owner' in England. For example, a study undertaken in 2002 to investigate the attitudes and perceptions of private woodland owners to public access revealed that the availability of grants related to the provision of public access was unlikely to attract much interest from woodland owners. The study suggested that there would be more positive attitudes towards grant aid that related to the broader motivations for improving woodland management (Church et al., 2005). While most of the woodland owners in the study had benign attitudes towards public access, with 80% already having public access in their woodlands, they were more interested in boosting the commercial potential of their woodlands through appropriate incentives.

An earlier study in England by Sime et al (1993) concluded that a sense of ownership and perceived property rights were more important to woodland owners than were grant incentives. The authors indicated that many private woodland owners have a strong sense of attachment to their woodland and want to maintain control of the management. These findings are supported by Church and Ravenscroft (2008) and by the scoping study which preceded this thesis (Urquhart, 2006; Urquhart et al., 2010). Some of the respondents in the scoping study indicated a strong sense of perceived property rights, with statements such as, "It's our land and we want to keep it that way" and "I don't like being controlled by the system" (Urquhart, 2006).

This review indicates that new terminology and a better understanding of the motivations of this group of owners are, thus, required. 'Non-agricultural forest owners' are not a homogenous group, and by classifying them as such ignores their unique and diverse problems, and also their potential to deliver desired public good benefits. Understanding their motivations and objectives, therefore, needs to be based not only on the owner's occupation (i.e. farmer or non-farmer) or their proximity to the woodlands, but, crucially, on their objectives for woodland ownership and management (e.g. nature conservation, personal enjoyment). The non-agricultural forest owner in the United Kingdom represents a diverse group of owners who are potentially well placed to deliver public good benefits. Further understanding is also required about the motivations and objectives of farm woodland owners. Farm woodlands account for 55% of private woodland area in England, but much farm woodland in England is currently under-utilized in terms of public good benefits. Thus, an understanding of what motivates farm woodland owners, along with private woodland owners more broadly, is required in order to design more effective policy instruments to encourage and enhance public good provision in private woodlands.

In order to develop policy instruments to facilitate the enhanced delivery of public goods, it is important to understand the heterogeneous nature of private sector forestry and the owner types that exist, including a deeper understanding of both agricultural and non-agricultural forest owners. No robust classification of private woodland owners has yet been undertaken in the United Kingdom, which represents an important gap in the literature. This study aims to address this gap by providing such a typology and uncovering the objectives and motivations of different woodland owner types. By doing so it will help to identify which owner types are best placed, willing and able to deliver enhanced public good benefits and how policy might best capitalise on, and enhance, this opportunity.

As this review has shown, woodland owners are diverse and have a range of motivations for woodland management. While they may be locationally well-placed to deliver public goods, some ownership objectives relating to privacy and personal amenity may preclude them from delivering some forms of public goods. It is, therefore, crucial to explore the interface between public good provision and private woodland ownership and a number of research questions arise from this review that can be usefully addressed in this study. These are:

- What are the motivations for private woodland ownership?
- What sort of management activities, if any, do private woodland owners carry out in their woodlands and how do these impact on public good delivery?
- What is the experience and knowledge base of private woodland owners?
- What are private woodland owners' attitudes towards the delivery of public goods?
- What are the barriers to effective woodland management for enhancing public goods in private woodland?

Such questions form part of the conceptual framework for this study. In order for the identified concepts (philosophical, theoretical, evidence-based and policy-based) to be operationalised, it is first necessary to develop a conceptual model. The conceptual model presented in the following section will bring together the main concepts and issues identified in the literature and synthesise them into operational concepts for informing the data collection and analytical methods to be employed in this study.

3.6 THE CONCEPTUAL MODEL

Conceptual models provide conceptual and methodological tools for formulating hypotheses and theories. The aim of a conceptual model is to organise a set of concepts in a logical way, identifying the relationships between those concepts. It is constructed to enable reasoning within a logical framework of the processes and concepts revealed by a literature review. In essence, the conceptual model is a "mental map" that presents complex and interrelated ideas and concepts in an organised form. However, as Frankfort-Nachmais and Nachmais (1996) explain, a concept is "an abstraction – a symbol – a representation of an object or one of its properties, or of a behavioral phenomenon" (pg. 26). They further suggest that "concepts do not actually exist as empirical phenomenon – they are *symbols* of phenomena, not the phenomena themselves" (pg. 27). Thus, according to Frankfort-Nachmais and Nachmais, concepts are shorthand for describing the empirical world which serve a number of functions in social science research.

There are four main aspects to this. Firstly, concepts are the foundation for communication through which "the perceptual world is given an order and coherence that could not be perceived before conceptualization" (Denzin, 1989, pg. 38). Thus, in short, concepts enable abstract perceptions to be articulated and empirically researched. Bulmer (1984), on the other hand, perceives concepts to be "categories for the organisation of ideas and observations" (pg. 43).

Secondly, concepts can introduce perspective to theorisation of a phenomenon. Denzin (1989) suggests that "the concept ... acts as a sensitizer of experience and perception, opening new realms of observation, closing others" (pg. 38). Conceptualising the research can, therefore, help to focus the study on potentially important lines of enquiry. Wilson (1999, p. 250) notes that the conceptual model "may suggest relationships that might be fruitful to explore or test."

Thirdly, the use of concepts allows scientists to classify and generalise. It enables researchers to unpick the tangled and interwoven realm of social phenomena and delineate the essential attributes for empirical study. And fourthly, concepts can serve as components of theories and, thus, of explanations and predictions. In this way, the use of concepts can enable the prediction of attributes for similar phenomena.

Once the set of concepts have been identified, these need to be organised in a conceptual model in order to identify how they are linked to each other (Miles and Huberman, 1994). The conceptual model can then be used to generate issues for investigation and, in essence, operationalise the research. A summary of the conceptual model for this study is presented in Figure 3.4. The full conceptual model can be found in Appendix 1. The model attempts to illustrate the processes that have led to the development of, and changes within, British forestry, from the perspective of policy, and of changing public attitudes towards the environment. The model also reflects the development of theoretical concepts and the philosophical debates within the research arena relating to rural restructuring and conceptualisation. The conceptual issues for investigation in this study are essentially derived from the proposition that private woodlands and ownership in England may provide opportunities for enhanced public good provision.

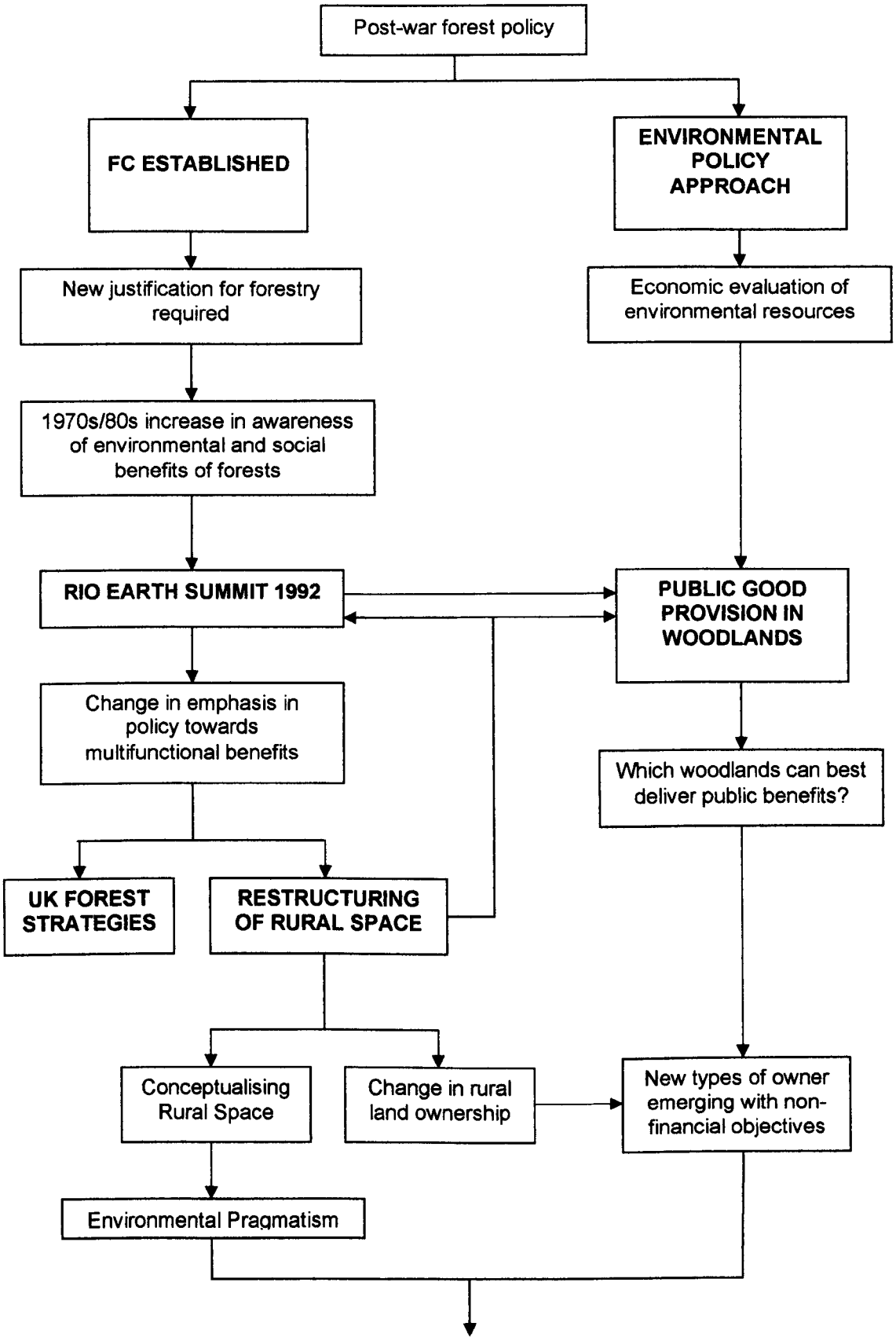
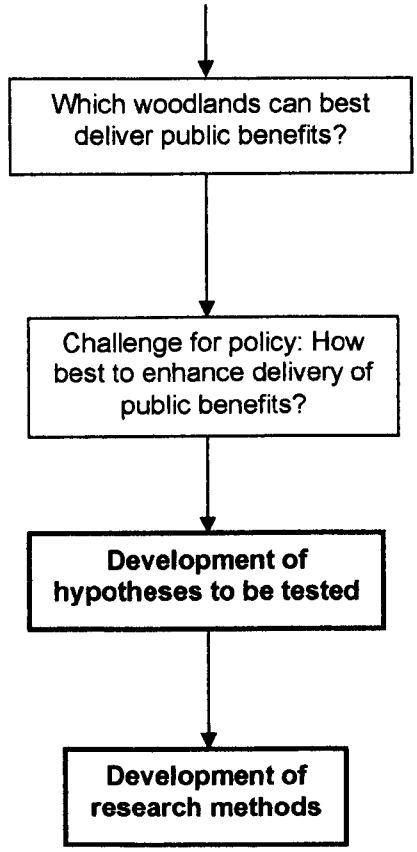


Figure 3.4: Summary of conceptual model (see Appendix 1 for full conceptual model)


Which woodlands can best deliver public benefits?
Challenge for policy: How best to enhance delivery of public benefits?
Development of hypotheses to be tested
Development of research methods

3.7 RESEARCH ISSUES

The conceptual model and the findings from the scoping Masters study identified a series of issues worthy of research that addressed the aim and objectives of this study, set out in Chapter One.

- Ownership objectives influence public good provision. Thus, non-financially motivated (non-timber producing) woodland owners are more likely to provide public goods than financially motivated owners.

- Woodland owners have a strong sense of perceived property rights. Thus, any incentive schemes which are framed as a "payment for service" are likely to be more effective than as "rules for participation".

- Multiple public good benefits are delivered together. Thus, there will be conflict between some benefits, such as recreation and biodiversity.

- Private woodland owners are diverse with varying objectives and motivations. Thus, a range of measures will be required to encourage public good provision, including state incentive schemes, market mechanisms and advisory services.

- Management of woodlands for wood products and enhanced public good provision are positively correlated. Thus, an increase in demand for wood products will encourage sustainable forest management and enhance public good provision.

3.8 METHODOLOGICAL DEVELOPMENT AND OPERATIONALISATION

An examination of the philosophical underpinnings of forest policy and forest research reveals an entanglement of complex and contested discourses, which is often paralysing in terms of finding practical solutions to problems. Typically, forest policy has taken a utilitarian perspective. However, in situations of market failure (as with public benefit delivery in woodlands and forests) there is often the need for a more pragmatic, integrated approach to research that informs public policy. Sustainable forest management involves contributions from a number of disciplines and environmental pragmatism offers a useful framework for facilitating the development of a theoretical basis which can encompass multiple discourses and moral agendas, seeking to find practical solutions. The environmental pragmatist framework can put aside the divergent values and seek convergence on a practical level, recognising that humans are embedded in the environment and that knowledge and value are the result of interactions with the world. Thus, in the context of an environmental pragmatic approach, methodologies must seek to uncover the experiences of individuals, find practical solutions and present the solutions in a way that is relevant to policymakers.

The literature review presented in this chapter has demonstrated that a change has occurred in

both forest policy and woodland ownership over the past 20 years. Within UK forest strategies, there has been an increasing emphasis on the multi-functionality of forests and woodlands, with the delivery of social and environmental benefits alongside economic benefits firmly on the agenda. This shift has occurred in parallel to the changing pattern of woodland ownership. With a fall in timber prices and homegrown timber accounting for only a quarter of the UK sawnwood market and half of the UK woodbased panel and paper markets (FC, 2005), new woodland purchases are more likely to be for amenity or conservation objectives, rather than for timber production.

This chapter has outlined the economic framework for this study by examining the concept of total economic value (TEV) and public goods as they relate to forestry. The benefits and limitations of such an approach have also been considered. The social and environmental benefits of forestry in Great Britain have been estimated at around £1 billion per year (Willis et al., 2003), with over 75% of these benefits relating to biodiversity and recreation. Studies that have investigated recreational demand for woodland use reveal that people value woodlands close to where they live and that they prefer mixed or broadleaved well-managed woodlands.

Following a review of the evidence, the chapter has also asserted that the spatial location of private woodlands, in the lowlands close to centres of population, may present opportunities for public good delivery. Proportionately more private woodlands than Forestry Commission woodland consist of broadleaves rather than conifers, further predisposing private woodlands towards public good provision.

Existing classifications of woodland and forest owners have also been considered and it is noted that a lack of woodland owner typologies or classifications exist in the United Kingdom, with very few relating specifically to the English context. The main work to draw on in this regard is that by Church and Ravenscroft (2008) and Sime et al. (1993) who investigated attitudes of woodland owners to recreational access. While European and American typologies group private woodland owners typically into production-oriented and consumption/protection-oriented, their proclivity to categorise woodland owners as 'agricultural' or 'non-agricultural' has limitations in a UK setting.

Finally, the literature review and theoretical base have been developed into a conceptual model in order to provide an operational framework for the study. A range of issues are identified with respect to private woodland owners' willingness and ability to deliver public good benefits. These will be used to help frame specific questions for primary data collection.

The following chapter draws together the epistemological and ontological underpinnings of this study (outlined in Chapter Two) with the literature review to provide a concise methodological framework. Within this framework appropriate research methods are developed in order to investigate the issues proposed in this chapter. In essence, these methods aim to reveal and

investigate the issue of public good provision in private woodland in a systematic and rigorous way so as to help provide sound empirical evidence to inform the policy process.

CHAPTER FOUR
RESEARCH METHODOLOGY

4.1 INTRODUCTION

In order to investigate the issues identified in Chapter Three, a tailored programme of research was required to collect, analyse and interpret the relevant observations. It was essential that the research method was aligned with the theoretical and conceptual underpinnings of the study and be applied in a robust and replicable manner. Thus, the choice of study areas, data collection mode, sampling frame and sample selection was vital, as was the design of the survey instruments and analytical methods.

The literature review and subsequent conceptualisation suggested that a integrated, pragmatic approach was required, involving both quantitative and qualitative techniques. The selection of the appropriate methods for data collection was, therefore, based on these overarching criteria, along with the availability of a suitable sampling frame, and the time and resources available.

This chapter describes in detail the methodological approach taken in this study. It first explains the rationale for the selection of the study areas. Each of the survey instruments are then discussed in relation to data collection and sampling procedures; problems with data collection; and the analytical techniques employed. The chapter also presents the results of a pilot study that was conducted in order to test the survey instruments for reliability and validity.

4.2 STUDY AREAS

After consultation with the Forestry Commission, it was agreed that three study areas would be selected in England. England was the preferred region of study by the co-sponsors of the research for the following reasons. Firstly, England has a higher concentration of privately-owned woodland close to urban centres than do either Scotland or Wales. Secondly, forest and woodland type, and therefore management, varies significantly between England, Scotland and Wales. Therefore, each country is likely to require separate investigation. Thirdly, the Forestry Commission is a devolved government agency, with each national office strategically managing its forest resource independently. Thus, a study focusing on one country within the UK will have greater policy relevance for the corresponding national Forestry Commission body than a study encompassing UK forest ownership more widely. In the literature review in Section 3.3.1 it was suggested that woodlands near to urban areas have a higher public good value, especially for recreation and landscape values. With a high proportion of woodland in England, especially in the south, situated in the lowlands close to centres of population, there may be significant opportunities for public good enhancement. The exclusion of Wales and Scotland does not, however, imply that public good provision in forests and woodlands in these countries is of any less importance or value, but the time and financial constraints of this study did not allow for a full and independent consideration of these areas.

4.2.1 Study area selection

It was important to include study areas that would encompass a range of different woodland owner types and different woodland settings. Thus, an adaptation of Holmes' (2006) descriptive model, as outlined in Chapter 2, reflecting the differing social landscapes within forestry in Britain (see Figure 2.2) was used to ensure a broad range of woodlands and owners. In this regard, the three study areas (Figure 4.1) were carefully selected to encompass production, consumption and protection values in terms of the public goods they might deliver: the Lake District National Park, the High Weald Area of Outstanding Natural Beauty and the county of Cornwall.

Within this it was also necessary to consider how landscape designations such as National Parks and AONBs influence the operating environment the private woodland owners inhabit. The particular focus of those designations will impact upon the management activities of woodland owners so it was deemed appropriate to include areas under such designations as part of this study. For example, National Parks have two statutory purposes under the 1949 National Parks and Access to the Countryside Act and the 1995 Environment Act:

- To conserve and enhance the natural beauty, wildlife and cultural heritage
- To promote opportunities for the understanding and enjoyment of the special qualities of the National Park by the public

There is also a duty to foster economic and social well-being of communities within National Parks. However, where conflicts exist between promoting public enjoyment and conservation, the Sandford Principle states that conservation will take precedence if those conflicts cannot be resolved. The *National Park Management Plan 2004* for the Lake District sets out its objectives, including recreational opportunities which are in keeping with the quiet enjoyment of the National Park. It also sets out nature conservation objectives, such as conserving native broadleaved woodland and populations of species of European and national importance, such as the red squirrel. Private woodland owners within the National Park may be presented with particular opportunities or constraints in light of these objectives. For instance, they may have access to funding for particular management activities, such as providing access for all-ability visitors or for conserving particularly important habitats. However, they may also face restrictions on their harvesting activities, which may potentially impact upon the landscape value (such as when clear felling). Thus, in conceptual terms, the Lake District National Park can broadly be considered as an area of 'commodified nature' (which was an additional classification suggested by Holmes), incorporating both *consumption* and *protection* values.

The second study area was the High Weald Area of Outstanding Natural Beauty (AONB). Although the designation of AONBs under the 1949 National Parks and Access to the Countryside Act is similar to that of National Parks, the latter have the additional remit of providing recreational opportunities, while AONBs have the primary purpose of conserving and

enhancing natural beauty. The *High Weald Area of Outstanding Natural Beauty Management Plan 2004,* which was revised in 2009, outlines a number of objectives for management of the AONB which have potential implications for private woodland owners. "Traditional" land management practices are to be encouraged, supporting the re-instatement of techniques such as coppicing. In order to support sustainable forms of economic development and conservation management, the development of a market for wood, especially wood fuel, is encouraged. This may present opportunities for private woodland owners to enable them to actively manage their woodland in response to market demand. In light of this, the AONB is designated as an area of *protection* in this study, with an increasing emphasis on *small-scale timber production* within the area, such as coppicing, to improve the diversity of habitats for wildlife.

The third study area, Cornwall, is an area that is attempting to improve the rural economy through *production*, such as that promoted under a number of schemes, including 'Working Woodlands'. However, this is generally not intensive management but involves a *diversification of forest use* to improve the woodland owners' income. While the emphasis is on productive management, the goal is to achieve *multifunctional* benefits from the woodlands.

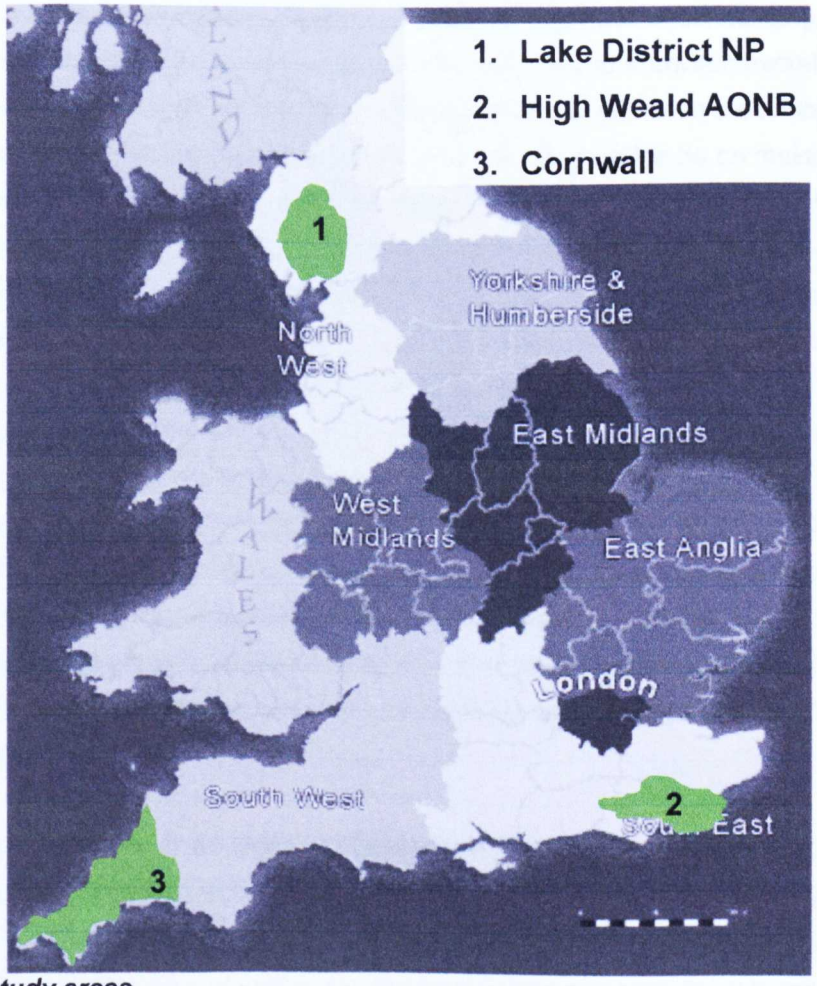


Figure 4.1: Study areas.

The three study areas were selected to ensure that each of the seven rural occupance modes was included in the study. While each area may be dominated by a particular social landscape, this does not preclude the others. For example, all three areas may have elements from several modes of occupance but in varying proportions. The case studies were also chosen because each has centres of urban populations to varying degrees of influence and accessibility and the surrounding countryside of these urban environments is likely to be under pressure to deliver multifunctional benefits. The High Weald is located in highly-populated south-east England, where pressure for recreational space is great. The Lake District, while sparsely-populated, receives many recreationists and tourists each year. Cornwall was chosen for its remote setting in the south-west of England, where, although tourism and recreation are popular, this is often driven more by the coastal landscape than forests. It was anticipated that the three areas might provide different configurations of private woodland owner types. A full description of each of the study areas is presented in Appendix 2.

4.3 MIXING METHODS IN FOREST RESEARCH

As discussed in Chapter Two, forest policy has changed focus from strategic production, towards a multifunctional welfarist policy, with the provision of social and environmental benefits, as well as timber. Likewise, forest research has been dominated by positivist approaches, requiring mainly quantitative methods of inquiry. However, with the increasing emphasis on multi-purpose forestry, there is a need for a greater understanding of the social processes of forestry, linking them holistically to the economic and environmental outputs from woodlands. Although this change in priority within forest policy has seen a development in new methods of inquiry for forest research, the emphasis has continued to be on mainly quantitative approaches, such as attempting to place an economic value on the environmental and social benefits of forests. Environmental economic approaches such as Travel Cost Methods, Hedonic Pricing and Contingent Valuation techniques have been used extensively in order to value non-market goods (environmental and social benefits) alongside marketable goods (e.g. timber) (Willis and Benson, 1989; Benson and Willis, 1991; Scarpa, 2003; Willis et al., 2003). While this is appropriate, the delivery of multi-purpose forestry objectives is also likely to be influenced by the nature of forest ownership and management regimes, including the motivations and perceptions of private woodland owners and users. As section 3.5.2 inferred, the motivations of private woodland owners are diverse and they may well have a range of objectives for managing their woodland. Investigating ownership attitudes is, therefore, likely to demand more qualitative and participatory approaches (Mather, 2001) which are more in line with interpretivism than positivism (for example, O'Brien and Claridge (2002), O'Brien (2004) and Church et al. (2005)).

As revealed by the review of evidence in Chapter Two, the conceptualisation of rural space has been fraught with dichotomous arguments that can be, at best, restricting and, at worse, paralysing in the search for practical solutions to real issues. In response, this study takes an integrated and pragmatic approach which aims to enable the divergent values of potentially opposing paradigms to be set aside in order to seek practical, workable solutions to the issue in question.

A mixed-method research strategy is adopted, employing both qualitative and quantitative techniques, which seeks to overcome some of the limitations of traditional positivist approaches, while remaining of practical relevance to policy-makers. In this respect, aspects of qualitative and quantitative paradigms are mixed at a number of stages throughout the research design, involving both inductive and deductive approaches. While the ultimate aim is to facilitate a robust statistical analysis and quantitative enquiry in order to develop a typology of woodland owners, the inclusion of a qualitative, participatory element allows for a more nuanced understanding of the diversity of woodland ownership and the demand level for public benefit provision.

The use of a combination of both qualitative and quantitative research methods within one study is sometimes contested. While some researchers, termed "purists" (Creswell, 1994), assert that qualitative and quantitative research are based on distinct paradigms (Filstead, 1979) and should not be mixed, others, termed "pragmatists" (Rossman and Wilson, 1985) suggest that each are appropriate to different kinds of research with the methods adopted on the basis of their applicability to the research problem. Indeed, triangulation[11] of methods can improve the validity of the research as results from one aspect of the study can be corroborated by congruent results from another part of the study (Webb et al., 1966; Denzin, 1970; Decrop, 1999; Ammenwerth et al., 2003). As Bryman (1988) asserts: "When quantitative and qualitative research are jointly pursued, much more complete accounts of social reality can ensue." However, Silverman (2000) cautions against multiple methods, stating that multiple sources do not always give a more complete picture. According to Creswell (1994), there are a number of reasons for combining quantitative and qualitative methods:

- seeking convergence of results;
- complementary – overlapping and differing facets of a phenomenon may emerge;
- developmentally – first method is used sequentially to inform the second method;
- initiation –fresh perspectives emerge;
- expansion – mixed methods add scope and breadth to a study.

In this case, the principal reasons for combining quantitative and qualitative approaches are developmentally, to use one method to inform the second method and to seek a convergence of the results by using a different method to look at the same issue. This also provides opportunity for results from different elements of the study to be externally validated.

In addition, the use of mixed methods also encourages the researcher to consider the pros and cons of both paradigms, enabling more effective theoretical development. As Brannen (1992)

[11] The application and combination of several research methods in the study of the same phenomenon.

asserts: "in particular it can help to clarify the formulation of the research problem and the most appropriate ways in which problems, or aspects of problems, may be theorised or studied. With a single method the researcher is not forced to consider these issues in quite the same way. By employing multiple methods, however, the researcher has to confront the tensions between different theoretical perspectives while at the same time considering the relationship between the data sets produced by the different methods" (pp. 32-33). In line with the environmental pragmatic approach taken in this study, it was appropriate to make the most efficient use of both quantitative and qualitative paradigms in answering the research questions. Firstly, exploratory interviews were used in a scoping study and the findings were published in the peer-reviewed journal *Small-scale Forestry.* Since there was little substantive evidence relating to the knowledge base of private woodland owners and, in particular, their ability and willingness to deliver public benefits, a Grounded Theory methodology was adopted. This approach allowed theories to emerge out of the data without pre-conceived assumptions. The findings suggested that private woodland owners have a diverse range of objectives, motivations and management regimes which influence the potential for public good delivery. It was shown that some private woodland owners, such as those less motivated by economic return, may be better placed than others to deliver certain public benefits; that conflicts can arise between the provision of recreation and nature conservation, especially in smaller woodlands; and that many private woodland owners are sceptical about becoming involved in grant schemes which may help foster public good provision in the private sector. Following on from this scoping study, two research methods were adopted to provide a research protocol that combined both quantitative and qualitative methods. These are outlined in Table 4.1.

Table 4.1: Mixed methods adopted in study.

Method	Type of method
Exploratory interviews	Unstructured interviews, Grounded Theory (Urquhart, 2006; Urquhart et al., 2010)
Q Methodology	'Qualiquantological' method (Stenner & Stainton Rogers 2004)
Self-completion questionnaire survey	Quantitative method – informed by Q Methodology

The two methods used in the present study to develop the typology of woodland owners were applied in the form of sequential triangulation. In other words, the earlier scoping study was used to inform the design of the Q methodology element of the study. This in turn was used to develop the questions for the subsequent self-completion survey. The following section provides a detailed outline of the two research methods employed in this study.

4.4 Q METHODOLOGY – METHODOLOGICAL BACKGROUND

As discussed in Chapter Two, rural land use policy and perspectives have changed significantly, with an increase in the importance of environmental conservation, amenity and

recreation (CRER, 2002). In this shifting policy context, it is important to understand how land owners perceive their role in providing these benefits and how they will respond to policy changes. Indeed, the motivations of land managers may be influenced by changing external factors, such as policy instruments, and it is important to understand these normative assumptions and values when looking at how individuals might respond to new policies (Davies and Hodge, 2007). As suggested by Davies and Hodge (2007), "policy assumptions and instruments that are at odds with the underlying motivations of agents may actually reduce achievement of policy objectives" (p. 1). Barry and Proops (1999) agree: "until we know the 'discourses' people use about the environment, it will be very hard to judge what, and whether, environmental policies will be socially acceptable, and therefore capable, of being implemented" (pg. 338). But how do rural researchers uncover these perceptions while remaining relevant to the policy-making process? One answer, as Section 4.3 of this chapter outlined, is that there has been a methodological shift in rural research with a move towards more participatory and qualitative methods (for example, Lyon, 2005; Dougill et al., 2006). Q Methodology offers a technique that "can be seen to be a bridge between the positivist and post-positivist schools of policy analysis as it features replicability and empirical rigour that is demanded by the former, yet is focused on the subjective, self-referential opinions of participants that are required by the latter" (Ellis et al., 2007, p. 523).

In light of this methodological shift, the present study adopted Q methodology, a technique that has until recently had limited use in rural research (Previte et al., 2007). Q methodology was devised by British physicist and psychologist William Stephenson in the 1930s and is described in his book *The study of behaviour: Q technique and its methodology* (Stephenson, 1953). Up until recently it has mostly been used in the US in the fields of communication, political science and health science. The aim of Q methodology is to study people's own perspectives, meanings and opinions (Previte et al., 2007). Goldman (1999) refers to Q methodology as the "science of subjectivity" (pg. 589) and McKeown and Thomas (1988) describe it as "a method for the scientific study of human subjectivity" (pg. 12). Brown (1986) outlines the approach taken in Q methodology: "Only subjective opinions are at issue in Q, and although they are typically unprovable, they can nevertheless be shown to have structure and form, and it is the task of Q-technique to make this form manifest for the purposes of observation and study" (pg. 58). Billard (1999) suggests that there has been a shift away from describing Q methodology as "a scientific focus on subjectivity towards a discursive and critical approach" (pg. 357). As Previte et al (2007) note, it is in its role as a participatory tool that Q methodology has application as an instrument for rural research: "It provides an opportunity to shift our focus from a particular individual narrative to an analysis of the range of viewpoints that is shared or favoured by a particular group of participants" (pg. 136).

In this regard, there have been a limited number of studies in rural research that have adopted Q methodology. For instance, Nijnik and Mather (2008) explored public preferences for woodland in rural landscapes. Davies and Hodge (2007) explored the perceptual framework of

arable farmers in the Eastern region of the UK with particular reference to environmental management and policy. Q methodology allowed the researchers to identify five distinct perspectives on notions of agricultural stewardship. Other studies adopting Q methodology include studies of farmers' views of farming (Fairweather and Keating, 1994; Walter, 1997), environmental conflicts (Adams and Proops, 2001), turlough[12] users and non-users views of converging EU agendas of Natura 2000 and CAP (Visser et al., 2007), the LETS (Local Employment and Trading Systems) scheme in the UK (Barry and Proops, 1999) and the role of social enterprise in regenerating rural studies (Zografos, 2007).

4.4.1 The Q Method

In brief, the main approach to Q methodology involves the development of a pool of qualitative statements which participants are asked to sort onto a ranked grid indicating their level of agreement or disagreement with the statement. The sorted responses are statistically analysed using factor analysis in order to reveal the underlying discourses.

There are five key stages to conducting a Q methodology study:

- Discourse identification
- 'Concourse' identification
- Selecting the Q sample
- The Q sort
- Analysis

The first stage involves identifying a particular discourse for study. A discourse refers to a shared set of perceptions, beliefs or opinions (Previte et al., 2007). In the context of this study, the discourse under investigation was the attitudes of private woodland owners towards the delivery of public benefits in their woodlands.

The second stage involves identifying a 'concourse' or a set of statements relating to the discourse. These statements should be "broadly representative of the opinion domain at issue" (Watts and Stenner, 2005, pg. 75). The statements can be either naturalistic or ready-made (McKeown and Thomas, 1988). Naturalistic statements are those emerging from the respondents, either in written or oral form. Generally the researcher would conduct interviews with participants in order to construct the concourse. In their study of discourses about the views of turlough users and non-users in Ireland, Visser et al. (2007) used interviews with turlough stakeholders to develop their concourse. Alternatively, ready-made statements can be compiled from existing sources, including other academic studies, related literature, newspaper articles and so on. For example, Swaffield and Fairweather (2000) used a set of photographs to represent different aspects of a discourse about forest sector development. Obviously, naturalistic statements are more likely to be familiar and understood by respondents as they are

[12] A low-lying area on limestone in Ireland which becomes flooded in wet weather.

constructed by the respondents themselves. In practice, a hybrid sample of statements is often used, including both naturalistic and ready-made statements. In this case, statements were constructed from the semi-structured interviews of the preceding exploratory scoping study (Urquhart, 2006; Urquhart et al., 2010) and constructed with reference to other studies relating to woodland ownership and perceptions about the countryside more widely.

The third stage of Q involves reducing the concourse of statements down to a manageable number, or a Q sample. Developing the Q set assists the researcher in refining or setting the research question which needs to be clear before data collection starts (Previte et al., 2007). The Q sample is the set of statements that participants will be asked to sort in the following stage. Therefore, the statements need to be clear and unambiguous and must reflect the complexity of the issue whilst allowing individual experience to be represented (Previte et al., 2007). The concourse is usually about three times the size of the Q sample (Stainton Rogers, 1995, pg. 185). Since the Q sample usually ranges from between 30 and 60 statements (Thomas and Watson, 2002, pg. 142), the initial concourse requires between 90 and 180 statements.

There are various techniques to ensure that the Q sample is sufficiently encompassing whilst avoiding unnecessary duplication. With an unstructured approach statements presumed to be relevant are chosen without specific effort to ensure all possible sub-issues are included. The risk of this approach is that some issues or sub-issues may be under- or over-sampled (McKeown and Thomas, 1988). Barry and Proops (1999) employed a structured approach to selecting their Q sample in their study of discourses about LETS in the UK. Following Dryzek and Berejikian (1993) the researchers employed a 4x4, 16-cell 'concourse matrix' to sample the available statements. This allowed the statements to be filtered, resulting in a representative range of statements.

The fourth stage is to ask participants to sort the statements onto a ranked grid (see Table 4.2). Statements are written on small cards and sorted in the form of a quasi-normal distribution or forced-free distribution on the grid. This means that while the respondent is free to place each statement where they wish, they are confined by the boundaries of the grid. Clear instructions to each participant must be given by the researcher. Typically respondents are asked to sort the statements according to how strongly they agree (+6) or disagree (-6) with each statement in the Q set. In general, studies use an 11- or 13-point scale with ranking ranging from +6 or +5 for statements the respondent most agrees with to -6 or -5 for statements they most disagree with. Statements ranked 0 or close towards the middle of the grid are those items that the respondent feels less strongly or ambivalent about.

Table 4.2: Q sort ranking grid.

-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6
Most disagree												**Most agree**

-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6

In order to facilitate the sorting process, respondents are initially asked to sort the statements into three piles: one for statements they agree with; one for statements they disagree with; and one for those they are unsure of or have no opinion about. They then work through each pile, determining which of the statements they agree (or disagree) most strongly with, placing them onto the grid. Finally, the participant is asked to check their Q sort and swap around any statements if they wish. The resulting Q sort is noted by the researcher and usually a short interview is recorded, asking the respondent to explain their decisions. In this study, the interview was used to record background information on the woodland and owner, such as length of ownership, size of woodland, grants received and activities carried out. The interview also enabled the researcher to gain an overall impression of owner's perspective, so that the researcher could ensure that the respondent's Q sort corresponded with their stated attitudes and behaviour.

The final stage of the process is the analysis of the data. The responses are subjected to factor analysis to identify patterns across the individuals. This contrasts with traditional 'R' methodology which is concerned with identifying patterns across variables. Each emergent factor represents a point of view and the association of each respondent with each point of view is indicated by his/her loading on that factor. Individuals who have high loadings on the same factor will, thus, have a similar outlook or perspective on the issue. Each statement in the Q sample is also scored for each factor. This can help the researcher to understand and interpret the results by indicating which statements are particularly significant for each factor (or discourse).

4.4.2 Limitations of Q Methodology

Some critics of Q methodology stress that the magnitude of the sorting task is beyond the cognitive ability of most people to perform adequately (Bolland, 1985). However, this limitation can usually be addressed by clear instructions from the researcher on how to conduct the Q

sort. Another criticism is that the inverted quasi-normal distribution can violate the principles of operant subjectivity. In other words, the respondent is not entirely free to place the statements where he or she chooses. If, for example, a respondent feels equally strongly about three statements and there are only two spaces in the +6 column, he or she is forced to place one of the statements under +5. While this may have some limitations, it does encourage the participants to carefully think about each statement and they are free to place the statements wherever they wish in the distribution format. The quasi-normal distribution is, therefore, merely a device for encouraging the participants to consider the items systematically (McKeown and Thomas, 1988).

While the approach is time-consuming for the researcher, it has the benefit of not requiring a large sample of participants. However, the relatively small sample means that inferences about the wider population cannot be made, since the distribution of the sample is non-random. While the method can reveal certain perspectives or discourses, it cannot, therefore, be used to ascertain the proportion of the wider population that hold those views. This requires a structured survey using random sampling techniques which, in this case, was undertaken subequently. However, it can assist in environmental policy-making by identifying the perceptions of people on a particular issue, and it can reveal the differences between groups. Such an understanding can, therefore, prove very useful in determining which policies are likely to gain support and from whom.

4.4.3 Research Design

In this study Q Methodology drew on the subjective viewpoints of participants to construct a typology of woodland owners, as a prelude to a subsequent self-completion questionnaire survey. Since quantitative approaches can be restrictive in situations where the perceptual world of the participants is the focus of the research (Marshall & Rossman 1999), Q Methodology was used to develop the subsequent self-completion questionnaire survey by informing the structure of the robust attitudinal statements. The results from both the Q methodology and the survey were also used to verify each other and to create a robust typology of private woodland owners.

4.4.3.1 Sampling procedure

The initial concourse of statements was constructed from interviews conducted with private woodland owners in the preceding scoping study (Urquhart, 2006). These statements were supplemented by statements compiled from other sources, including the academic literature, Forestry Commission reports and researcher knowledge.

The concourse consisted of 124 statements (see Appendix 3), which were reduced to 100 statements to avoid repetition. Since it is recommended that there should be approximately three times as many statements in the concourse as in the Q sample (Stainton Rogers, 1995,

pg. 1854), a set of 36 statements was found to be the most appropriate.

The statements were chosen according to the design presented in Table 4.3, as suggested by (McKeown and Thomas, 1988, pg. 14).

Table 4.3: Concourse matrix for Q set sampling.

Main Effects	Components		N
A. Direction	a. Financially-oriented	b. Socially-oriented	2
B. Dimensions	c. Moral	d. Pragmatic	2
C. Issues	e. Behaviour	f. Motivation	4
	g. Consequences	h. Attitude	

All possible combinations in the concourse matrix were considered (for example, *ace, acf, acg, ach,* etc.) resulting in a total of 16 combinations (Table 4.4). Thus, each statement was placed in the concourse matrix according to its particular direction, dimension and the issues it contained. For example, the statement "Wildlife conservation should only be considered once you have reached financial objectives" was classed as *ade*, since it is a financially-oriented statement which takes a pragmatic stance affecting the woodland owner's behaviour. 36 statements for the Q sample were selected from the concourse (see Table 5.4 on page 102).

Table 4.4: Number of statements selected from each statement type.

Statement type	Number selected
ace, acf, acg, ach	1
ade, adf, adg, adh	2
bce, bcf, bcg, bch, bde, bdf, bdg, bdh	3

This sampling procedure ensured that both financially-oriented and socially-oriented perspectives were covered, together with the more normative assumptions that woodland owners make. The concourse contained many more socially-oriented statements than financially-oriented statements. Thus, the resulting Q sample contained more socially-oriented statements, as shown in Table 4.4.

A list of private woodland owners in the three study areas was obtained from the Forestry Commission, Cumbria Woodlands and the High Weald AONB. A non-random sample of owners was contacted by letter seeking their participation in the survey. A cover letter from the Forestry Commission (or Cumbria Woodlands where appropriate) was enclosed, indicating that the study had their support and endorsement.

4.4.3.2 Pilot study

Before piloting, the Q sample was examined by a small number of other researchers familiar

with Q methodology and staff at the Forestry Commission to ensure that the statements were clear, concise, unambiguous, representative and not repetitive. After some minor alterations to the statements, the Q sort process was piloted with 5 woodland owners. A few amendments were made to a number of questions as a result of the pilot in order to improve clarity and remove any ambiguities.

4.4.3.3 Data collection

A total of 30 participants were recruited for the Q methodology study. Each participant was asked to sort the 36 statements onto a ranked grid. Short interviews were also conducted with each of the 30 participants to provide a richer and deeper context to their Q sort. It was deemed that the supporting qualitative interviews would also provide a form of external validation to the self-completion survey and provide demographic information.

4.4.4 Problems with data collection

There was a generally positive reaction to the process of Q sorting. Most participants were intrigued by the sorting grid and enjoyed the process and all of the Q sorts were conducted in a positive atmosphere. There was a range of comments about the process and the statements, although there were no recurring comments on the quantity or quality of particular statements or the sorting process itself. Inevitably, some participants found the sorting process easier than others. For example, several participants misplaced statements that included the word "not", such as "Applying for a woodland grant is not worth the effort". If a participant felt that grant schemes were worth applying for, they disagreed with this statement and would have to place it towards the -4 side of the grid. This was counter-intuitive, as if they thought applying for grants was worth the effort, they were inclined to place the statement towards the +4 end of the grid. Such mistakes were avoided by the researcher paying particular attention to how the participant was sorting the statements and questioned placements if they contradicted earlier attitudes that the participant had revealed in the qualitative interview. This proved to be a further benefit of supplementing the Q sort with an interview.

One other problem occurred as one of the participants was blind and was, thus, unable to read the statements for himself. In this instance, the researcher had to read out each statement and place them on the grid as instructed by the participant. This placed a greater burden upon the participant, as he had to remember a number of statements and sort them mentally without the visual aid of seeing the statements laid out before him.

4.4.5 Analytical Method

Fundamentally, Q Methodology involves the correlation and factoring of persons as opposed to traits or tests (as in R-method) (McKeown and Thomas, 1988). However, Q is not simply an inverted R-method due to issues of differing units of measurement for variables. According to Brown (1980, pg. 15) "correlation and factor work assumes linearity, and it is this linearity that is missing ... when the measuring units differ." In order to overcome this, Q is premised on a

common unit of measurement, "self-significance" (McKeown and Thomas, 1988). Thus, the statements in a Q sort are ranked according to their importance to the individual. The ranking process, such as A>B or A<B, are linear and can be measured, allowing correlation and factor analysis to be possible (McKeown and Thomas, 1988).

Data analysis in Q methodology is a three-step process: correlation, factor analysis and the computation of factor scores (McKeown and Thomas, 1988). The analysis of the Q sorts was carried out using the PQMethod software (downloaded free from the internet). The software is tailored to the requirements of Q studies and allows the data (Q sorts) to be entered as they are collected as 'piles' of statement numbers (Schmolck, 2002). Intercorrelations among Q sorts are computed and then subject to factor analysis using the centroid method or principal components analysis (PCA). Significant factors are expressed as a 'best estimate' Q sort. Thus, the analysis produces an 'ideal type' Q sort for each factor. Individuals who have high loadings on the same factor have a similar perspective on the issue in question.

4.5 QUESTIONNAIRE SURVEY – METHODOLOGICAL BACKGROUND

As one of the main aims of this study was to develop a robust, statistically-defendable typology of private woodland owners, it was necessary to conduct a questionnaire survey which could be analysed statistically using appropriate techniques and allowed inferences to be made about the population of private woodland owners in England with confidence. In order to combine, necessarily, both quantitative and qualitative research methods this was carried out in conjunction with the Q methodology study. In this way, quantitative and qualitative methods were used both developmentally, in that the findings of the Q methodology study informed the questionnaire survey, and convergence of the results from the two methods was sought, as detailed in Section 4.3.

In order to maximise response rates and to reduce survey error, Dillman's Tailored Design Method (TDM) (Dillman, 2007) was adopted. TDM is based on the principles of social exchange theory regarding why people do or do not respond to surveys. Social exchange theory purports that human social interactions are based on an exchange process in which people seek to maximize the benefits and reduce the costs of relationships. The actions of individuals are motivated by the return these actions are expected to bring from others (Blau, 1964; Dillman, 1978). People assess the potential benefits and risks/costs of social relationships and when the costs outweigh the benefits they end the relationship. Similarly, responding to a survey is a social interaction in which the respondent must perceive the potential benefits of responding as outweighing the costs. When they perceive the costs (time and effort) of responding to a survey as outweighing the potential benefits (usefulness of the survey and their involvement) they do not respond. The actions of people can be predicted according to three elements: rewards, cost and trust. Rewards are what one expects to get, costs are what one gives up or spends and trust is the expectation that the rewards will outweigh the costs. TDM is designed according to these principles and seeks to develop respondent trust, the provision of rewards and the reduction of costs in order to reduce survey

error. According to Dillman (2007), response rates of 70% can be achieved consistently by following the principles of the TDM.

The use of samples in surveying is typically used to estimate the distribution of characteristics in a given population. The use of other survey methods, such as focus groups, interviews or content analysis are limited in that the results do not infer the distribution of characteristics of the wider population, but of the participating individuals (Dillman, 2007). However, surveys undertaken with random sampling allow for a precise estimate of a population's characteristics to be determined if care is taken to reduce survey error. There are four possible sources of survey error: (1) sampling error occurs where the estimate is limited by the number of people surveyed; (2) coverage error occurs when some elements, or sub-sets, of the population are not included in the sample frame; (3) measurement error occurs when the respondent's answer is inaccurate or imprecise, and is usually due to poor questionnaire construction; and (4) non-response error occurs when a significant number of people do not respond to the survey and they have different characteristics to those that do respond (Dillman, 2007).

TDM is aimed at reducing survey error by employing a systematic approach to ensure that the sample frame contains a list of the population that is as representative as possible. It is unlikely that a complete list of the total population can be obtained, but every effort must be made to ensure that it is as comprehensive as possible. Following this, multiple contacts with respondents must be undertaken in order to ensure a satisfactory response rate (Heberlein and Baumgartner, 1978; Dillman, 1991). The following section outlines the research design for the self-completion element of this study, which is based on the TDM.

4.5.1 Research Design

This section outlines the research design in terms of questionnaire construction and the approach to contacting survey participants. Typically, TDM involves a series of five carefully timed contacts, including a respondent-friendly questionnaire. Each stage is designed to emphasise the benefits of responding to the survey and reducing the costs through building trust between the surveyor and the respondent. The following three sections explain how TDM was implemented in this survey.

4.5.1.1 Mailings

In order to maximize the response rate it is necessary to have multiple contacts with the respondents. As recommended by Dillman (2007), this survey involved a sequence of five contacts:

- Brief pre-notice letter
- Questionnaire and cover letter
- Thank you postcard
- Replacement questionnaire 2-4 weeks later
- Final contact by telephone or special delivery mail 1 week later

The pre-notice letter (Appendix 4) was mailed to the sample a few days before the questionnaire. The letter was brief (one page) and informed the respondent that the questionnaire would be arriving shortly. Since they were sponsoring the research and endorsing the survey, the majority of the pre-notice letters were sent from a Forestry Commission Area Manager on Forestry Commission headed paper. However, 27 respondents were sent a letter from Cumbria Woodlands, as this organisation had supplied these names and addresses. The introductory letter from the list supplier also helped to overcome any potential problems with data protection. Furthermore, government sponsorship has been shown to improve response rates (Heberlein and Baumgartner, 1978; Cialdini, 1984) and provides an element of authority and legitimacy (Dillman, 2007). The questionnaire (Appendix 5) was sent several days later, accompanied by a covering letter (Appendix 6). The cover letter outlined the reasons why the survey was being carried out and the importance of the respondent's response. The letter was personally addressed in order to create a feeling of trust. Reply envelopes were enclosed to make it easier for the respondent to return the questionnaire (Armstrong and Luske, 1987) and a small token of appreciation (not a "payment for your time") in the form of two first class stamps was also enclosed to instil trust. The respondent was asked to use one on the reply envelope and to keep the other as a thank you for their participation. The enclosure of real stamps indicated a sense of trust in the respondent that they would reply using one of the stamps and not simply keep it. The inclusion of token incentives, especially monetary ones, has been shown to consistently improve response rates by a number of researchers (James and Bolstein, 1990; James and Bolstein, 1992; Church, 1993).

A few days after the questionnaire mailing, a postcard (Appendix 7) was sent thanking respondents for their anticipated prompt return of the questionnaire (Dillman et al., 1974). After 2-4 weeks a replacement questionnaire and cover letter (Appendix 8) was sent to participants who had not yet responded. The letter explained that many other woodland owners had already responded. According to Cialdini (1984) and Groves et al. (1992), knowing others like them have completed the questionnaire can often influence people to respond. The point was made that the opportunities to respond and influence forest policy were scarce and a deadline for response was also given in order to instil a sense of urgency in participants.

The final contact was made one week after the replacement questionnaire was sent. This "special" contact was made either by telephone (if a telephone number was available) or by special delivery mail. The letter explained that this was the last opportunity for the participant to respond.

4.5.1.2 Questionnaire Design

The main objective of questionnaire design and construction is to reduce non-response error and measurement error (Dillman, 2007). Confusing and unclear questionnaires are likely to cause non-response and ambiguous or badly worded questions can cause inaccurate

responses. Two main elements were considered when designing the questionnaire: (1) the wording of questions; and (2) the layout and structure of the questionnaire. Both of these elements required careful design in order to construct a clear and easy-to-understand survey.

Carefully worded questions can also reduce the social costs of responding to a questionnaire. The questions were, therefore, worded so as to suggest that the researcher was dependent on the respondent to help provide a valuable input to the study (Dillman, 2007). The use of subordinating language and complex questions were avoided as these can produce feelings of inadequacy and deter the respondent from answering (Dillman, 2007).

In general, closed-ended questions were used. For example:

► How did you acquire your woodland? Mark ☒ ALL that apply.

☐ I bought it ☐ I planted it

☐ I inherited it ☐ Other (please specify) .....

A number of open-ended questions were used where appropriate. For example:

► How long have you owned your woodland?

_____ Years

The questions were constructed so as to avoid vagueness and ambiguity and any potentially objectionable questions were softened by the inclusion of a counteractive or introductory question. For example:

Question 7: People own woodland for many different reasons. How important are the following reasons to you?

Statements from the Q methodology study (Table 4.5) that had proved to be key in defining the factors or that aroused interest or discussion with the woodland owners were also included, reworded as necessary to fit the needs of the questionnaire format.

Table 4.5: Statements from Q methodology study utilised in postal survey

Owners should be rewarded for the benefits to society their woodlands provide (Q17)
I would manage my woodland better if it was financially advantageous (Q17)
Woodland owners should have the right to manage their woodland as they wish (Q14)
I do not manage my woodland primarily to make money (Q17)
I do not have enough time to manage my woodland properly (Q14)
I bought my woodland was an investment (Q17)
Grant schemes help owners to manage their woods (Q17)

The format of the questionnaire was based on a tried and tested approach developed in previous studies by McLeay et al. (1996), Davies (2001) and Tsourgiannis (2007) to develop typologies of farmers' marketing strategies using factor and cluster analysis. The method involved the use of a 5-point Likert scale for each response which allowed for consistency in the data for the factor and cluster analysis.

The questionnaire was presented in an 8-page booklet format, printed on A4 pages, folded in half and stapled along the spine (Appendix 5). The front page contained a heading, brief instructions and the first, easy-to-answer, questions. The back cover did not contain any questions, apart from an open-ended question asking for additional comments.

The questionnaire was divided into six sections, which were entitled:

- General questions about your woodland
- Woodland management and attitudes
- Constraints on woodland management
- Public benefits from your woodland
- Sources of information
- General questions about you

The sections were devised to be easily understood and show a clear progression from one topic to another. The two general sections about the woodland (section 1) and the owner (section 6) were to provide descriptive statistics to describe and determine the characteristics of any woodland owner types that might emerge from the study. In order to construct the typology it was necessary to ask questions about attitudes and behaviour, as well as potential constraints on management activities that might affect an owner's ability to deliver public benefits. A section was also included to determine which public benefits are already being delivered in woodlands and where owners go to find out about woodland management. The Q Methodology provided an initial typology of woodland owners, so it was important to investigate how similar or not the findings of this were to those of the self-completion survey. Some of the questions were directly informed from the Q Methodology statements (see Table 4.5), while others were constructed in order to build on the findings and experience of the Q Methodology study.

4.5.1.3 Pre-testing

In order to iron out any ambiguities or errors, the questionnaire was thoroughly pre-tested in line with Dillman's (2007) three-stage recommendations before the survey went 'live'. Firstly, the questionnaire was sent to a number of knowledgeable colleagues, including experienced academic surveyors and Forestry Commission statisticians. Eight people made comments and suggestions, many of which were incorporated into the questionnaire. Secondly, the questionnaire was tested on 5 woodland owners. Respondents were asked to comment on their understanding of the questions and how long it took to complete the questionnaire. Completion time took between 10-25 minutes. Thirdly, a pilot study with a small sample of 60

respondents was conducted. Half of the sample were subjected to all the mailing treatments (except the final contact) and half were sent the survey and cover letter only (see Table 4.6).

Table 4.6: Mailing treatments for pilot survey.

Date	Treatment	No. sent	Response
25.3.08	1st mailing: Pre-notice letter	30	
27.3.08	2nd mailing:		
	Questionnaire – no incentive	30	14
	Questionnaire + incentive	30	8
4.4.08	3rd mailing: Thank you postcard	21	7
16.4.08	4th mailing: Replacement questionnaire	14	3

The response rate for the two treatments in the pilot survey suggested that the application of multiple mailings would increase the response rate (Table 4.7). Although the pilot was only sent to a relatively small sample of 60, the response rate for the treatment applying all four mailings was 60%, whereas the questionnaire-only treatment had a response rate of 47%. In this instance, the multiple contact approach increased the response rate by 13%.

Table 4.7: Response rate for pilot survey.

	All mailings	Questionnaire only
No. sent	30	30
No. responses	18	14
Response rate	60%	47%

The pilot testing also highlighted a number of questions in the survey that required amending. For instance, in response to Question 2: "How did you acquire your woodland? Mark ☒ ONE box", a number of participants indicated that they could not tick just one box because they had acquired their woodland through several means (e.g. they may have brought some and also planted some). Thus, the question was amended to say, "Mark ☒ ALL that apply."

There was a 3.3% non-response to the variable "Restricted accessibility limits what sort of management can be carried out" in Question 14. This statement was rephrased to make it clearer: "Access into my woodland is restricted and so limits management activities."

There was also a 3.3% non-response to the variable "Non-wood activities in woodland" in Question 15. This variable was removed as respondents could state any specific non-wood activities that provide funding for management in the "Other" option.

In addition, there was some non-response to the variable "Public safety" in Question 20. In order to avoid any ambiguity, this variable was replaced with two variables: "Injury to public (e.g. falling branch)" and "Crime (attacks on public)".

The data from the pilot survey was thoroughly examined to check for any inconsistencies or unusual responses. Frequency histograms were run for all the variables checking that the frequencies for each looked plausible. This also highlighted some variables where responses were highly loaded on one response category, suggesting variables that could be collapsed for further analysis. For example, many of the respondents indicated that they do not harvest any wood products from their woodland, so it seemed appropriate to collapse these responses to a simple "Yes" or "No", as opposed to providing a scale from "Very large amount" to "None".

Chi-squared tests were also run on a number of the variables in order to get a feel for the spread of the data. For example, the variable gender was cross-tabulated with the variables relating to how the woodland was acquired, age, owner type, how long the woodland had been owned, area of woodland and length of time spent working in the woodland per week. Although none of the results were statistically significant due to the small sample, it allowed a general overview of the data to be gained. Further chi-square tests were carried out on a number of variables to ensure that relationships appeared plausible and realistic.

4.5.2 Sampling strategy

4.5.2.1 Sample selection

Since the study was restricted to the three study areas. the population under scrutiny consisted of all private woodland owners in these study areas . The sampling frame was the list from which the sample was drawn and included as many individuals as possible from the population.

A sampling frame from each study area was compiled from a range of sources, including the Forestry Commission's Woodland Grant Scheme and felling licence applicant database (post 2003), Cumbria Woodlands, the High Weald AONB, the Small Woodland Owners' Group and a number of personal contacts. After tidying up the lists, the sampling frame consisted of 251 individuals in the High Weald, 202 in Cornwall and 393 in the Lake District. While every endeavour was made to ensure the sampling frame was as comprehensive as possible there was inevitably some coverage error. Not every individual private woodland owner in each study area could necessarily be identified. Gaining access to lists of owners is problematic, due to concerns over data protection. Furthermore, disengaged woodland owners are difficult to identify due to the fact that they have no affiliation with any agency or body. However, in order to include a proportion of disengaged woodland owners, a number of owners were contacted through snowballing. The responses of these owners were examined to identify whether there was any difference when compared to the rest of the sample.

A sample of 200 individuals in each study area was considered to be sufficient so as to reflect the potential variations in the population and to be able to make comparisons within and between each area, Furthermore, the Forestry Commission placed restrictions on the sample size in order to minimise respondent fatigue (where response rates are reduced over time due

to respondents being requested to participate in numerous surveys). In order to minimize sampling error, stratified random sampling was employed to select a sample for the survey. Since the sampling frame consisted of lists of individuals from a number of sources it was important to include individuals from each source, as these may represent a sub-set of the population. A systemic approach was taken, removing every fifth individual from the list of owners in the High Weald, almost every second individual on the Lake District list and removing two names randomly from the Cornwall list.

4.5.2.2 Data collection

The data collection for the survey was carried out in May-June 2008, as follows:

1st Mailing: 12th May 2008
2nd Mailing: 15th May 2008
3rd Mailing: 22nd May 2008
4th Mailing: 9th June 2008
5th Contact: 23rd June 2008

4.5.3 Problems with the survey questionnaire

Since the Forestry Commission lists are several years old, some of the contact details were incorrect. Where individuals informed the researcher, these were corrected and if the owner was no longer in possession of woodland their name was removed from the mailing list. Some respondents indicated that the woodland they were involved with was not in private, but public ownership. These surveys were not included in the analysis and were removed from the mailing list. A total of 56 owners fell into this category. In order to maintain a sample of 600 private woodland owners, surveys were sent to 54 more individuals from the respective case study area.

4.6 ETHICAL ISSUES

There were not any major ethical issues associated with this research, although there were certain restrictions imposed by the Forestry Commission regarding sample size for the self-completion survey in order to reduce the response burden on participants. The response burden relates to the concern over individuals being contacted regularly for surveys. This can lead to survey fatigue and a reluctance to participate, so it was deemed necessary to reduce the number of individuals contacted each year. In this case, the agreed maximum number of woodland owners to be contacted was 600. This limitation was overcome by employing Dillman's TDM in order to maximise the response rate.

There were also issues relating to data protection. In order to overcome this, the pre-notice letter was sent from the Forestry Commission in order to confirm that the study was supported by the Forestry Commission.

4.7 RESPONSE RATE AND WAVE ANALYSIS

The total response rate for the postal survey was 81% (488 replies), 71% (426 surveys) of which were useable surveys. The response rates for each mailing are outlined in Table 4.8.

Table 4.8: Response rate for postal survey.

Mailing	Cornwall % (*n aggregate*)	Weald % (*n aggregate*)	Lake District % (*n aggregate*)	Total % (*n aggregate*)
Mailing 2:				
All responses	34% (68)	33% (65)	36% (71)	34% (204)
Useable	32% (64)	29% (58)	33% (65)	31% (187)
Mailing 3:				
All responses	64% (128)	62% (124)	71% (141)	66% (393)
Useable	57% (113)	58% (115)	61% (121)	58% (349)
Mailing 4:				
All responses	73% (145)	75% (150)	81% (161)	76% (456)
Useable	63% (125)	70% (140)	69% (138)	67% (403)
Mailing 5:				
All responses	77% (153)	81% (162)	87% (173)	**81% (488)**
Useable	66% (132)	75% (150)	72% (144)	**71% (426)**

Note: Mailing 1 was notification letter, so no response expected.

Table 4.8 shows that the application of multiple mailings increased the overall response rate of useable surveys from 31% (after mailing 2, the questionnaire survey and covering letter) to 71%, which is in line with Dillman's (2007) claim that responses of 70% should be achievable using the TDM. The response rate also met the sampling size requirements of the study as outlined in Section 4.5.2.2.

A comparison between early and late respondents was carried out to identify whether there was any significant difference between those who responded early and those who responded late (Desselle, 2002). The analysis was conducted by comparing demographic variables and a number of motivational variables between the first 50 respondents and the last 50 respondents. However, it was not possible to compare the characteristics of the sample with that of the wider population because no adequate data exists on the population.

The demographic variables were analysed using chi-square statistics and the results suggested that there was no significant difference between early and late respondents (see Table 4.9).

Table 4.9: Early and Late Respondent Analysis: Independent Variables

Variable	Pearson Chi-Square value	Asymp. Sig. (2-tailed)
Q1: Area of woodland	3.096	.797
Q4: Years of ownership	4.341	.631
Q5:Owner type	7.480	.279
Q6: Distance from wood	3.082	.544
Q11: Carry out work myself	6.579	.160
Q23: Gender	1.755	.416
Q24: Age	5.676	.339
Q25: Employment status	4.827	.305

The motivational variables were tested by comparing means through an analysis of variance (ANOVA). The results also suggested no significant difference between early and late respondents (Table 4.10). The motivational variables were measured in the survey using a 5-point Likert scale, with a median value of 3.

Table 4.10: Early and Late Respondent Analysis: Motivational Variables

	First 50 Mean (SD)	Last 50 Mean (SD)	F	Sig.
Wildlife	1.40 (0.639)	1.67 (0.996)	2.508	.117
Investment	3.82 (1.137)	3.74 (1.242)	0.097	.756
Timber	3.48 (1.374)	3.23 (1.462)	0.767	.383
Recreation	3.82 (1.320)	3.62 (1.593)	0.437	.510

4.8 DATA ANALYSIS

The central aim of this study, as previously outlined, was to classify private woodland owners according to their willingness and ability to deliver public good benefits in their woodlands. Since no previous study had been conducted in England regarding the ownership and management objectives of private woodland owners, it was, thus, necessary to collect primary data on the objectives and strategic management attitudes of individual woodland owners.

The identification of management strategies and the development of a woodland owner typology was carried out in a three-step process, adapting and further developing the methodology by McLeay et al. (1996), Davies (2001) and Tsourgiannis (2007) who employed it in the context of developing typologies of farmers. This approach is particularly suitable for studies where no previous data on underlying attitudes or perceptions exist.

- Factor analysis was conducted in the initial stage of the analysis in order to reduce the number of variables to those that provided the best explanation for the range of

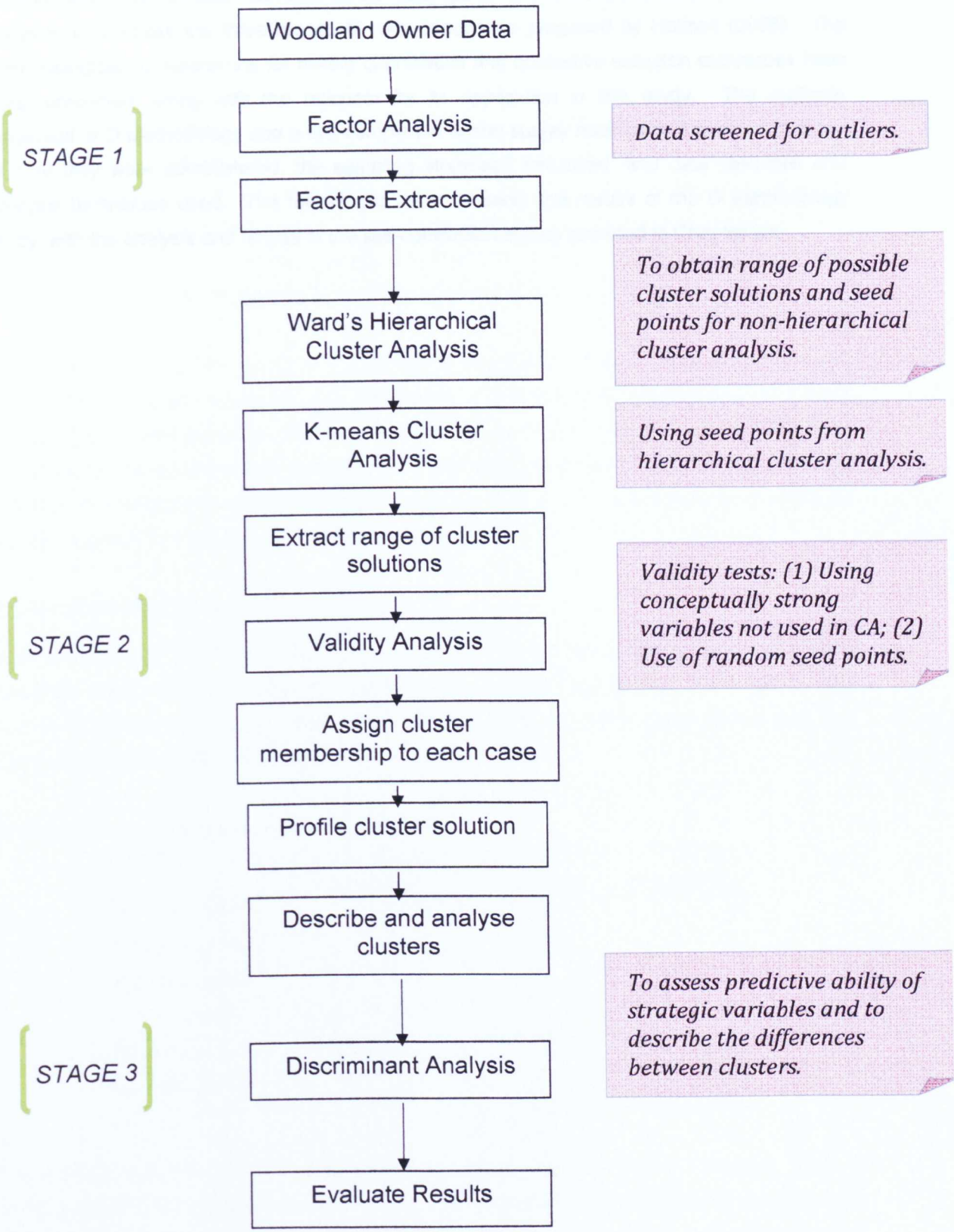
perceptions and motivations of owners (Tabachnick and Fidell, 2001; Hair et al., 2006).

- The second phase of analysis involved subjecting the factor scores to hierarchic and non-hierarchic cluster analysis in order to classify private woodland owners with similar objectives and behavioural patterns into distinct groups (Tacq, 1997; Tabachnick and Fidell, 2001; Hair et al., 2006). Cluster analysis is a widely used multivariate statistical technique used to group individuals into clusters so that individuals in the same cluster are more similar to one another than they are to individuals in another cluster (Lorr, 1983; Tacq, 1997; Hair et al., 2006).

- Finally, the validity of the independent variables from the factor analysis to predict cluster membership was assessed using a discriminant analysis. Discriminant analysis is a multivariate technique that can be used to predict group membership from a set of variables or to describe the differences between groups (Klecka, 1980; Tabachnick and Fidell, 2001; Hair et al., 2006; Warner, 2008). It is the appropriate statistical technique to use for testing the hypothesis that the group means for a set of individual variables for two or more groups are equal (Hair et al., 2006, p. 274). The results of the discriminant analysis, along with the factor and cluster analyses, were used to describe the emergent owner types.

The various stages of the statistical analysis that were carried out are shown in Figure 4.2.

Figure 4.2: Stages in Analytical Approach



4.8 CONCLUSION

To summarise, this chapter has outlined the rationale for the selection of the three case study areas to encompass the three modes of rural occupance proposed by Holmes (2006). The methodological considerations for mixing quantitative and qualitative research techniques have been presented, along with the rationale for its application in this study. The methods employed, a Q Methodology and a self-completion postal survey have been presented in terms of how they were administered, the sampling strategies employed, and data collection and analysis techniques used. The following chapter presents the results of the Q Methodology study, with the analysis and results of the self-completion survey provided in Chapter Six.

CHAPTER FIVE

ANALYSIS AND RESULTS: Q METHODOLOGY

5.1 INTRODUCTION

The design and sampling strategy for the Q Methodology study was outlined in Chapter 4. Thirty woodland owners in the study areas participated between January and March 2008. The researcher visited each of the participants in their homes, with interviews lasting between 30 minutes and one and a half hours. This chapter presents the analysis and results of the Q Methodology study. The analysis, using the freeware software PQMethod, extracted four factors from the Q sorts representing different private woodland owner categories.

Each of the factors represents a group of woodland owners with similar attitudes towards public good provision in their woodlands. The interpretation of the data was used to characterise each of the factors, with particular reference to financial and time constraints or opportunities, attitudes towards grant provision and attitudes towards public access. These results were used to inform the design of the subsequent self-completion questionnaire survey and to contribute to the development of a typology of private woodland owners.

5.2 DESCRIPTIVE STATISTICS

The response rate from letters requesting participation in the Q Methodology study was 46% in the High Weald AONB, 62% in the Lake District and 53% in Cornwall (Table 5.1). Ten woodland owners were visited in the High Weald AONB, 11 in the Lake District and 9 in Cornwall, making a total of 30 participants.

Table 5.1: Response rate for Q methodology.

	HIGH WEALD	LAKES	CORNWALL
No. letters sent	28	21	32
Positive replies	13	13	17
Negative replies	2	2	5
Non-response	13	6	10
Response rate %	46%	62%	53%
No. interviewed	10	11	9

The descriptive statistics for the participants in each study area are given in Table 5.2. While it is not possible to make inferences about the wider population due to the relatively small sample size, a number of issues relating to the sample are worthy of consideration. Of particular note is the difference in mean holding size between the areas, with the High Weald AONB having a much smaller mean holding size (23 ha) than either the Lake District (100 ha) or Cornwall (92 ha).

Table 5.2: Details of participants in Q study.

OWNER	HA	YRS	ACQ	EXP	GRANT	AGE	FACTOR
Lake District							
17	6	40	Bought with farm	N	WGS	70+	3
11	81	40	Inherited with farm	Y	WIG	20s	1
16	6	80	Inherited with farm	Y	ESA	40s	2
15	202	18	Inherited estate	Y	WGS	40s	1
14	11	40	Caravan site	N	Applied	40s	1
13	20	143	Inherited with estate	Y	No	70+	-
12	41	70	Bought with estate	Y	WIG	40s	1
19	7	97	Inherited with farm	Y	WIG/HLS	50s	1 and 4
18	93	57	Inherited with farm	Y	WGS	50s	1
20	607	400	Inherited estate	Y	WGS	40s	1
10	30	200	Inherited estate (absent)	Y	WGS	30s	1 and 3
Total:	**1104**						
Mean:	**100**	108					
Median:	**30**	70					
High Weald							
4	1	6	Bought with farm	N	FWPS	50s	3
5	1	7	Bought with farm	N	WGS	50s	4
3	8	7	Hobby (absent)	N	WGS	50s	1
1	8	2.5	Hobby (absent)	Y	No	40s	1
2	8	2.5	Hobby (absent)	N	No	40s	1
9	1	12	To protect house	N	WGS	50s	3
8	5	6	Inherited with farm	Y	FWPS/WGS	40s	2
7	15	7	Bought with house	N	No	50s	3
6	162	25	Bought with farm	Y	ELS	60s	4
22	25	27	Business	Y	WGS	50s	1
Total:	**234**						
Mean:	**23**	10					
Median:	**8**	7					
Cornwall							
21	61	66	Timber business (absent)	Y	WGS/EU	50s	1
23	16	30	Bought with farm (absent)	Y	WGS	60s	3
30	500	500	Inherited with estate	Y	WGS/WIG	40s	4
29	37	200	Inherited with estate	Y	No	30s	2
28	86	25	Planted on farm	N	WGS	60s	1
27	32	15	Bought with estate	Y	WGS	30s	1 and -2
26	8	100	Inherited with farm	Y	WGS	50s	3
25	24	20	Inherited with farm	Y	ELS/WGS	40s	1
24	66	45	Inherited with farm	Y	WGS/SWF	40s	1
Total:	**830**						
Mean:	**92**	111					
Median:	**37**	45					

Ha = hectares; Yrs = years owned; Acq = how acquired; Exp = prior woodland/land management experience; Grant = existing/previous grants; Factor = factors with high loadings.

The woodland in the sample in the Lake District and Cornwall was mainly on farms or estates, with much being inherited, indicated by the duration of ownership. Most of the participants in Cornwall (89%) and the Lake District (82%) indicated that they had some previous woodland management or land management experience, while only 40% of owners in the Weald had prior experience. This suggests that there is a higher proportion of "new" owners in the High Weald than in the Lake District or Cornwall, a number of which do not live close to their woodland. This is also reflected in the length of ownership indicated by the participants. The average length of ownership of woodland in the High Weald was 10 years, while in Cornwall it was 111 years and in the Lake District 108 years. These figures should be treated with caution, though, since some owners who had inherited their woodland indicated length of ownership in terms of how long the woodland had been in their family.

Most of the woodland owners in the study were (or had been) in a woodland grant scheme, although slightly fewer High Weald participants were involved. Of the sample, 9 were women, with 6 of these being in the High Weald.

From these descriptive statistics it appears that woodland owners in the High Weald may differ markedly from those in the Lake District and Cornwall. This assumption is tested further on a larger sample in the questionnaire survey in order to ascertain whether there are any statistical differences between the three study areas.

5.3 THE FACTOR ANALYSIS

PQMethod software was used to analyse the Q sorts. A centroid method analysis was initially performed, followed by both a varimax and judgmental, manual rotation using PQROT software. In order to determine whether or not a factor is significant, the eigenvalue criterion was employed. This method indicates a factor's significance by estimating the sum of its squared factor loadings. By convention, factors with eigenvalues greater than 1.00 are considered significant (McKeown and Thomas, 1988). As a result, four factors were kept for rotation, accounting for 52% of the variance (30%, 7%, 9% and 6% respectively). The four factors extracted provide four distinct interpretations of private woodland owners' willingness and ability to deliver public good benefits, revealed through the Q analysis procedure.

Several rotations were undertaken in order to establish which would enable the most meaningful interpretation of the data. Following standard Q procedure, the factor arrays, distinguishing and consensus statements and qualitative data from the interviews were used to determine which rotation provided the best distribution of explained variance between the four factors. This allowed meaningful interpretation of the results and provided factor arrays and distinguishing statements with which to describe each factor. These related well to the descriptive statistics and qualitative data from the interviews.

Factor loadings of the varimax/manual rotation of the four-factor solution of the study's 30 sorts are shown in Table 5.3.

Table 5.3: Factor loadings for Q sorts (significant loadings are denoted in bold; italics denotes defining sorts).

Q SORT	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
1	***0.54***	0.27	-0.23	0.01
2	***0.82***	-0.05	-0.09	0.01
3	***0.67***	0.07	0.26	0.09
4	0.42	-0.22	***0.70***	0.02
5	0.38	-0.26	0.08	***0.43***
6	0.14	0.31	0.25	***0.54***
7	0.36	-0.12	***0.51***	0.32
8	-0.01	***0.56***	0.08	0.13
9	0.39	0.11	***0.66***	-0.19
10	**0.61**	0.08	**0.44**	-0.02
11	***0.55***	0.27	-0.15	0.40
12	***0.66***	0.08	-0.02	0.23
13	0.27	-0.01	0.13	-0.27
14	***0.74***	-0.14	0.25	-0.05
15	***0.67***	-0.02	-0.01	-0.19
16	0.20	***-0.69***	-0.04	-0.05
17	0.36	0.08	***0.50***	-0.10
18	***0.67***	-0.16	0.15	0.31
19	**0.47**	0.14	-0.09	**-0.44**
20	***0.45***	0.26	0.09	0.11
21	***0.80***	-0.00	-0.07	0.14
22	***0.83***	-0.17	-0.24	0.14
23	-0.18	0.16	***0.66***	0.08
24	***-0.63***	0.06	0.01	0.25
25	***0.74***	-0.04	0.20	0.35
26	0.34	0.19	***0.49***	0.17
27	**0.69**	**-0.45**	0.02	-0.04
28	***0.78***	-0.07	-0.13	-0.04
29	0.22	***0.60***	0.05	0.03
30	0.42	-0.12	-0.04	***0.58***

Factor loadings are, in effect, correlation coefficients and indicate the extent to which a Q sort is similar or dissimilar to the 'ideal' Q sort for each factor. As a rule or thumb, correlations are generally considered to be statistically significant at 2.5 times the standard error. The standard error for a factor loading is given by the expression: $SE = 1/\sqrt{N}$, where N is the number of statements in the Q sample. Since this study contained 36 statements, the standard error of the factor loadings shown in Table 5.3 is $SE = 1/\sqrt{36} = 0.167$. Thus, loadings in excess of 2.5(SE) = ±0.42 are statistically significant at the .01 level and are indicated by bold text in Table 5.3. There is one "null" case (i.e. a Q sort that does not significantly load on any of the factors), which relates to Participant 13. This could be due to the fact that this participant, while previously owning over 400 hectares of woodland, had sold most of it to the Forestry Commission and the Woodland Trust, retaining just 15-20 hectares for private use. This participant had lost interest in his woodland, possibly explaining why he did not correlate significantly with any of the factors.

In order to construct the factor array, defining sorts were identified using the automatic flagging facility in PQROT, as well as manual flagging (to remove flags from the "null" case and flags on cases which loaded highly on more than one factor (cases 10 and 27). These defining sorts are denoted in italics in Table 5.3). The resulting factor arrays are shown in Table 5.4.

Table 5.4: Factor arrays.

No.	Statement	Factor			
		1	2	3	4
1	Woodlands should be utilised more as a sustainable fuel source	3	3	-1	3
2	Forest owners have a greater responsibility to produce timber than to conserve the rural environment	-2	-1	-3	-3
3	Woodland owners should be rewarded for the wider benefits to society their woods provide	1	3	-4	1
4	Enough is already being done to protect and enhance the rural environment	-3	0	-2	-4
5	Sport shooting is a strong motivation for me to manage my woodland	-3	-1	-2	1
6	Multi-functional forestry – delivering social, environmental and economic benefits together – is not possible	-4	-2	0	0
7	The possibility of being sued makes me unwilling to risk public access	-2	2	0	2
8	I believe that woodlands should be left alone to let nature take its course	-4	-1	-1	-2
9	Market forces are more effective at stimulating woodland management than public sector schemes and regulations	0	-2	-3	1
10	If there was decent money to be made out of woodlands I would manage my woodland better	0	2	-2	2
11	Applying for a woodland grant is not worth the effort	-2	1	-1	-4
12	Most woodlands are under-utilized in terms of harvesting wood or wood products	3	1	1	2
13	Woodlands are important because they help to mitigate climate change by absorbing carbon	2	3	1	0
14	Woodland owners should protect unique or rare habitats on their land regardless of what incentives are available	2	-4	3	2
15	Woodland owners should have the right to manage their woodlands as they wish	-1	4	1	-1
16	My main reason for owning a woodland is to maintain it as a wildlife reserve	-1	0	4	-2
17	Woodlands are an important element in the landscape	4	2	3	3
18	I do not manage my woodland to make money	-1	1	2	1
19	The more a wood is used by local people the more it is valued	1	1	-1	-2
20	Woodland owners have a duty to maintain the woodland resource for the next generation, whatever impact this has on profits	2	-2	2	4
21	Through owning a woodland I have become more environmentally-aware	0	-3	0	0
22	Woodlands provide an escape from every-day life by allowing people to get closer to nature	1	-3	1	0
23	Woodlands have intrinsic value and should be valued for themselves and not just for what humans can get out of them	2	1	3	-1
24	The local community benefits from my woodland	1	-1	0	-3
25	There is not much point in owning your own woodland if it is opened up for public access	-3	0	1	-1
26	There are conflicts between managing a woodland for wildlife and allowing public access	0	2	2	3
27	The size of a woodland dictates what sort of public benefits can be provided	0	0	0	-1
28	There should be more access routes into woodland to help people visit the countryside	-1	-4	-2	-3
29	I get a lot of personal enjoyment from my woodland	4	0	4	1
30	Public safety is an important consideration for woodland management	1	-1	-3	-1
31	Owners should learn as much as possible about their woodland in order to manage it properly	3	-3	2	1
32	I do not have enough time to manage my woodland properly	-1	4	-1	-2
33	I bought my woodland as an investment	-2	-2	-4	-1
34	Information and advice for woodland owners needs to be more readily available	-1	1	1	0
35	Decisions about woodland are made by outsiders who work in offices over land they do not know	0	0	0	-1
36	Woodland grant schemes really help woodland owners carry out management activities in their woods	1	-1	-1	4

Three statements (2, 17, 35) were shown to be 'consensus statements' in that they do not distinguish between any pair of factors (non-significant at $p>0.01$) with statements 17 and 35 also being non-significant at $p>0.05$ (Table 5.5). All factor arrays indicate disagreement with the statement "Forest owners have a greater responsibility to produce timber than to conserve the rural environment", indicating that all participants perceive conserving the rural environment to be more important than timber production. Conversely, all factor arrays indicate agreement with the statement "Woodlands are an important element in the landscape", while most participants were ambivalent about the statement "Decisions about woodland are made by outsiders who work in offices over land they do not know." Since these statements do not distinguish between any pairs of factors, they are not considered in the following analysis of each factor.

Table 5.5: Consensus statements.

No.	Statement	1	2	3	4
2	Forest owners have a greater responsibility to produce timber than to conserve the rural environment	-2	-1	-3	-3
17	Woodlands are an important element in the landscape	4	2	3	3
35	Decisions about woodland are made by outsiders who work in offices over land they do not know	0	0	0	-1

The following section describes the four factors by discussing the salient statements for each. These were the statements assigned +4 or +3 (most agree with) and -4 or -3 (most disagree with) in the idealised Q sort for each factor. Also, statements that distinguish each factor from the others (at $p<0.01$) are also discussed, together with evidence from the interviews. Of the 30 participants, 17 loaded heavily on Factor 1; 4 on Factor 2; 7 on Factor 3; and 4 on Factor 4. Each factor is identified with a name according to its dominant characteristics and represents the views of groups of similarly-minded woodland owners. The four groups are as follows (with the number in brackets showing the number of owners who are uniquely associated with each of the factors – i.e. for whom it was their only significant factor loading): F1: Multifunctional owner (15); F2: Individualist (3); F3: Hobby conservationist (6) and F4: Custodian (3).

5.4 FACTOR 1 (F1): THE MULTIFUNCTIONAL OWNER

Multifunctional Owners were characterised by a strong belief that multifunctional forestry is possible. They were happy to combine the management of their woodlands for wildlife, public access and the production of some wood products and gained a lot of personal enjoyment from their woodlands. Seventeen of the participants in this study loaded significantly on this factor, fourteen of which were defining sorts (Table 5.3). Eleven statements (22, 24, 36, 30, 10, 26, 18, 7, 25, 8, 6) distinguished this factor from the other factors at a significance level of $p<0.01$; and a further three statements (29, 28, 11) also distinguished this factor from the other factors at a significance level of $p<0.05$ (Table 5.6).

Table 5.6: Salient statements for Factor 1 (+4, +3, -3, -4)

No.	Statement	Factor score
29*	I get a lot of personal enjoyment from my woodland	4
17	Woodlands are an important element in the landscape	4
1	Woodlands should be utilized more as a sustainable fuel source	3
12	Most woodlands are under-utilized in terms of harvesting wood or wood products	3
31	Owners should learn as much as possible about their woodland in order to manage it properly	3
22**	Woodlands provide an escape from every-day life by allowing people to get closer to nature	1
24**	The local community benefits from my woodland	1
36**	Woodland grant schemes really help woodland owners carry out management activities in their woods	1
30**	Public safety is an important consideration for woodland management	1
10**	If there was decent money to be made out of woodlands I would manage my woodland better	0
26**	There are conflicts between managing a woodland for wildlife and allowing public access	0
28*	There should be more access routes into woodland to help people visit the countryside	-1
18**	I do not manage my woodland to make money	-1
11*	Applying for a woodland grant is not worth the effort	-2
7**	The possibility of being sued makes me unwilling to risk public access	-2
25**	There is not much point in owning your own woodland if it is opened up for public access	-3
5	Sport shooting is a strong motivation for me to manage my woodland	-3
4	Enough is already being done to protect and enhance the rural environment	-3
8**	I believe that woodlands should be left alone to let nature take its course	-4
6**	Multi-functional forestry – delivery social, environmental and economic benefits together – is not possible	-4

** Denotes distinguishing statements at p<0.05; ** denotes distinguishing statements at p<0.01; consensus statements are in light font.*

The Multifunctional Owner strongly supported the notion of multi-purpose forestry (4). This was reflected in the relatively equal consideration that this owner gave to the social, environmental and economic benefits that arise from woodlands. This owner type got a lot of personal enjoyment from his or her woodland (4), as did the Hobby Conservationist (4). In this regard, the Multifunctional Owner can be considered as one who very much enjoys their work in the woodland.

While making money from their woodland was not a priority, the Multifunctional Owner took a pragmatic approach to funding woodland management, and would take grants or sell wood products if this helped to pay for the management costs. Out of all the owner types they agreed least with the statement "I do not manage my woodland to make money" (-1), reflecting their pragmatic stance. They agreed strongly with the statements "Woodlands should be utilised more as a sustainable fuel source" (3) and "Most woodlands are under-utilized in terms of harvesting wood or wood products" (3), suggesting that they may be encouraged to manage their woodland if there was a market for wood products.

What distinguished this owner type was their entrepreneurial approach to woodland management. For example, Participant 14 was in the process of setting up a tree nursery in order to provide local employment and get people interested in woodland management. Participant 28 was planning to develop his newly planted woodland site into an eco-park, with eco-pods for sustainable tourism. Others were keen to provide an educational resource, either through traditional wood crafts (such as basket weaving, hurdle making, or walking sticks) or providing visitor interpretation to educate people about the wildlife, woodland and management activities.

Table 5.7: Factor array for statements relating to public access.

No.	Statement	F1	F2	F3	F4
7	The possibility of being sued makes me unwilling to risk public access	-2	2	0	2
24	The local community benefits from my woodland	1	-1	0	-3
19	The more a wood is used by local people the more it is valued	1	1	-1	-2
22	Woodlands provide an escape from every-day life by allowing people to get closer to nature	1	-3	1	0
25	There is not much point in owning your own woodland if it is opened up for public access	-3	0	1	-1
26	There are conflicts between managing a woodland for wildlife and allowing public access	0	2	2	3
28	There should be more access routes into woodland to help people visit the countryside	-1	-4	-2	-3
30	Public safety is an important consideration for woodland management	1	-1	-3	-1

Out of all the owner types identified, the Multifunctional Owner was the least against public access (Table 5.7). This was the only owner type that disagreed with the statement "The possibility of being sued makes me unwilling to risk public access" (-2), while all the other owner types either agreed (F2 = 2; F4 = 2) or had no opinion (F3 = 0). They also strongly disagreed that there is not much point in owning woodland if it is opened up for public access (-3), with the other owner types feeling less strongly about this statement (F2 = 0; F3 = 1; F4 = -1). The Multifunctional Owner did not have a strong opinion on whether or not there are conflicts between wildlife and people (0), reflecting their desire to manage for multiple objectives. The other 3 owner types all felt there are conflicts (F2 = 2; F3 = 2; F4 = 3). This owner type was also the only one that agreed that public safety is an important consideration for woodland management (1). This was most likely because this was the only type of owner that either allowed, or was not strongly opposed to, public access, so public safety must be a consideration. For those owners who did not encourage or allow access, public safety would not be an issue. One Multifunctional Owner (Participant 24) indicated that he would be happy to allow more access, but because his woodland was remote and not near an urban centre, this was not practical. He felt that he was penalised in terms of grant provision because of his inability to provide public access.

5.5 FACTOR 2 (F2): THE INDIVIDUALIST

Individualists were characterised by a strong belief that woodland owners should have the right to manage their woodland as they wish. They were not motivated by wildlife conservation, providing access, preserving the resource for the next generation or their own personal enjoyment of the woodland. Three of the participants in this study loaded significantly on this factor, with one significant negative loading (Table 5.3). Six statements (15, 32, 20, 31, 21, 14) distinguished this factor from the other factors at a significance level of $p<0.01$; and a further five statements (11, 29, 4, 6, 22) also distinguished this factor from the other factors at a significance level of $p<0.05$ (Table 5.8).

Table 5.8: Salient statements for Factor 2 (+4, +3, -3, -4)

No.	Statement	Factor score
15**	Woodland owners should have the right to manage their woodlands as they wish	4
32**	I do not have enough time to manage my woodland properly	4
1	Woodlands should be utilized more as a sustainable fuel source	3
3	Woodland owners should be rewarded for the wider benefits to society their woods provide	3
13	Woodlands are important because they help to mitigate climate change by absorbing carbon	3
11*	Applying for a woodland grant is not worth the effort	1
29*	I get a lot of personal enjoyment from my woodland	0
4*	Enough is already being done to protect and enhance the rural environment	0
6*	Multi-functional forestry – delivery social, environmental and economic benefits together – is not possible	-2
20**	Woodland owners have a duty to maintain the woodland resource for the next generation, whatever impact this has on profits	-2
31**	Owners should learn as much as possible about their woodland in order to manage it property	-3
22*	Woodlands provide an escape from every-day life by allowing people to get closer to nature	-3
21**	Through owning a woodland I have become more environmentally-aware	-3
14**	Woodland owners should protect unique or rare habitats on their land regardless of what incentives are available	-4
28	There should be more access routes into woodland to help people visit the countryside	-4

** Denotes distinguishing statements at p<0.05; ** denotes distinguishing statements at p<0.01*

Of the four owner types, the Individualists agreed the most strongly that woodland owners should have the right to manage their woodlands as they wish (4), with the other owner types having no strong opinion on this statement (F1 = -1; F3 = 1; F4 = -1). They also disagreed strongly with the statement "Woodland owners should protect unique or rare habitats on their land regardless of what incentives are available" (-4), whereas the other owner types all agreed with this statement (F1= 2; F3 = 3; F4 = 2).

Individualists were also not keen on allowing more access in their woodland, strongly disagreeing with the statement "There should be more access routes into woodland to help people visit the countryside" (-4) and they did not recognise the importance of woodland in helping people get close to nature (-3). The other owner types did not have a strong view on

this statement (F1 = 1; F3 = 1; F4 = 0), but they did not disagree with it to the extent of the Individualist. Despite their reluctance to allow public access, this owner believed that woodland owners should be rewarded for the wider benefits to society their woods provide (3). The Hobby Conservationist strongly disagreed with this statement (-4), while the Multifunctional Owner and the Custodian were fairly ambivalent (1). This reflected the Individualists' strong attitude towards property rights, which was not shared by the other owner types. Woodland belonging to one owner, which loaded heavily on this factor, was located in an area with a substantial number of mine shafts, presenting a real public safety issue. For this reason, these owners were not able to allow public access. Their main management objectives were to prevent people entering the woodlands in order to protect themselves from being sued as a result of an accident. Contrary to most woodland owners, they were encouraging rhododendron growth and a dense understorey as it provided a fairly impenetrable barrier to intruders. Such woodlands have clear constraints on the type of public benefits they can provide.

The Individualist was constrained by both a lack of time (4) and money (see Table 5.9 which outlines the responses to statements relating to finance and time available for management).

Table 5.9: Factor array for statements relating to financial issues and time management (consensus statement in light font).

No.	Statement	F1	F2	F3	F4
1	Woodland should be utilized more as a sustainable fuel source	3	3	-1	3
2	Forest owners have a greater responsibility to produce timber than to conserve the rural environment	-2	-1	-3	-3
3	Owners should be rewarded for the wider benefits to society their woods provide	1	3	-4	1
9	Market forces are more effective at stimulating woodland management than public sector schemes and regulations	0	-2	-3	1
10	If there was decent money to be made out of woodlands I would manage my woodland better	0	2	-2	2
11	Applying for a woodland grant is not worth the effort	-2	1	-1	-4
18	I do not manage my woodland to make money	-1	1	2	1
32	I do not have enough time to manage my woodland properly	-1	4	-1	-2
33	I bought my woodland as an investment	-2	-2	-4	-1
36	Woodland grant schemes really help woodland owners carry out management activities in their woods	1	-1	-1	4

Of all the owner types, the Individualist appeared to be the most constrained by time, agreeing strongly with the statement "I do not have enough time to manage my woodland properly" (4), while the other owner types disagreed (F1 = -1; F3 = -1; F4 = -2). This suggested that Individualists were likely to have other commitments on their time, perhaps in terms of managing a wider farm.

Individualists stated that they would manage their woodland better if they had the money (2), as did the Custodian, while the Hobby Conservationist disagreed with this statement (-2) and the Multifunctional Owner had no opinion (0). While Individualists did not agree that market forces are more effective at stimulating woodland management than government incentives (-2), they

did believe that woodlands should be utilised more as a sustainable fuel source (3). Of all the owner types, they most strongly agreed that woodlands help to mitigate climate change (3) (F1 = 2; F3 =1; F4 =0). One owner who loaded heavily on this factor (Participant 8) indicated that the reason for planting woodland on unproductive land on their farm was to provide an alternative form of income (in the form of grant payments for new planting).

5.6 FACTOR 3 (F3): THE HOBBY CONSERVATIONIST

The main thrust for this owner type was maintaining woodlands as a nature reserve and the protection of rare habitats. Seven of the participants in this study loaded significantly on this factor, six of which were also defining sorts (Table 5.10). Four statements (16, 1, 10, 3) distinguished this factor from the other factors at a significance level of $p<0.01$; and a further seven statements (29, 23, 18, 15, 7, 24, 11) also distinguished this factor from the other factors at a significance level of $p<0.05$ (Table 5.10).

Table 5.10: Salient statements for Factor 3 (+4, +3, -3, -4)

No.	Statement	Factor score
16**	My main reason for owning a woodland is to maintain it as a wildlife reserve	4
29*	I get a lot of personal enjoyment from my woodland	4
23*	Woodlands have intrinsic value and should be valued for themselves and not just for what humans can get out of them	3
17*	Woodlands are an important element in the landscape	3
14	Woodland owners should protect unique or rare habitats on their land regardless of what incentives are available	3
15*	Woodland owners should have the right to manage their woodlands as they wish	1
7*	The possibility of being sued makes me unwilling to risk public access	0
24*	The local community benefits from my woodland	0
11*	Applying for a woodland grant is not worth the effort	-1
1**	Woodland should be utilized more as a sustainable fuel source	-1
10**	If there was decent money to be made out of woodlands I would manage my woodland better	-2
30	Public safety is an important consideration for woodland management	-3
9	Market forces are more effective at stimulating woodland management than public sector schemes and regulations	-3
2	Forest owners have a greater responsibility to produce timber than to conserve the rural environment	-3
33	I bought my woodland as an investment	-4
3**	Woodland owners should be rewarded for the wider benefits to society their woods provide	-4

** Denotes distinguishing statements at p<0.05; ** denotes distinguishing statements at p<0.01; consensus statements are in light font*

The Hobby Conservationists indicated that maintaining their woodland as a wildlife reserve is the main reason for their ownership of woodland (4). This contrasted with the other three owner types, which indicated either ambivalence (0) towards this statement (the Individualist), or some degree of disagreement or less agreement (Multifunctional Owner = -1, Custodian = -2).

Out of all the owner types, the Hobby Conservationist was the least motivated by, or concerned about, money. This was reflected in the factor arrays for the statements relating to financial

issues (Table 5.9). This suggested that the Hobby Conservationist was not constrained by money and was, most likely, managing woodland as a hobby. This was the only owner type that disagreed with the statement "If there was decent money to be made out of woodlands I would manage my woodland better" (-2), with both the Individualists and the Custodians agreeing with this statement (2) and the Multifunctional Owners remaining ambivalent (0). The qualitative interviews revealed that these owners believed they are already managing their woodlands adequately, so did not perceive that money could enhance their management. Furthermore, the Hobby Conservationists strongly disagreed that they bought their woodland as an investment (-4), while the other owner types disagreed with this statement to a lesser extent (-2 for the Multifunctional Owner and the Individualist; and -1 for the Custodian). Hobby Conservationists did not express a strong opinion on whether woodlands should be utilised more as a sustainable fuel source (-1), whereas all three other owner types agreed strongly with this statement (3). This may be because other factors perceived potential income benefits from utilising their woodlands as a fuel source. This lack of concern for financial return was also reflected in the Hobby Conservationists' strong disagreement that woodland owners should be rewarded for the wider benefits to society that their woods provide (-4), while the Individualists agreed with this statement (3) and the Multifunctional Owners and Custodians agreed, but to a lesser extent. One Hobby Conservationist (Participant 9) perceived owning a woodland to be altruistic, and that owners should not expect to be rewarded.

Also, the Hobby Conservationists may not have felt they needed to be rewarded for the benefits their woodlands provide because they got a lot of personal enjoyment from managing their woodland (4), as did the Multifunctional Owner (4), while the Individualist (0) and the Custodian (1) did not have a strong opinion on this statement. A lack of time was also not a problem, as the Hobby Conservationist was likely to be able to afford to pay for contractors to carry out the work or may be retired and have sufficient time to do the work themselves.

This owner type, although not in strong opposition to public access, did not encourage it. These owners believed that there may be a conflict between protecting wildlife and allowing public access (2). The scores for statements relating to access were towards the centre (2 to -2), since access is not a motivation for their management, therefore, they did not perceive statements relating to access as relevant to them.

The qualitative interviews revealed that four out of the seven participants that loaded heavily on this factor are "new" woodland owners. In order words, they had no previous experience of woodland ownership or land management.

5.7 FACTOR 4 (F4): THE CUSTODIAN

The main objective for this owner type was maintaining and protecting the woodland resource for the next generation. For Custodians time was not an issue, but money was and they relied heavily on grants to carry out the management work in their woodlands. Four of the participants

in this study loaded significantly on this factor, three of which were also defining sorts (Table 5.11). Three statements (36, 5, 11) distinguished this factor from the other factors at a significance level of $p<0.01$; and a further four statements (29, 20, 13, 23) also distinguished this factor from the other factors at a significance level of $p<0.05$ (Table 5.11).

Table 5.11: Salient statements for Factor 4 (+4, +3, -3, -4)

No.	Statement	Factor score
36**	Woodland grant schemes really help woodland owners carry out management activities in their woods	4
20*	Woodland owners have a duty to maintain the woodland resource for the next generation, whatever impact this has on profits	4
1	Woodland should be utilized more as a sustainable fuel source	3
17	Woodlands are an important element in the landscape	3
26	There are conflicts between managing a woodland for wildlife and allowing public access	3
29*	I get a lot of personal enjoyment from my woodland	1
5**	Sport shooting is a strong motivation for me to manage my woodland	1
13*	Woodlands are important because they help to mitigate climate change by absorbing carbon	0
23*	Woodlands have intrinsic value and should be valued for themselves and not just for what humans can get out of them	-1
2	Forest owners have a greater responsibility to produce timber than to conserve the rural environment	-3
24	The local community benefits from my woodland	-3
28	There should be more access routes into woodland to help people visit the countryside	-3
11**	Applying for a woodland grant is not worth the effort	-4

** Denotes distinguishing statements at p<0.05; ** denotes distinguishing statements at p<0.01; consensus statements are in light font)*

This owner type strongly agreed that woodland owners have a duty to maintain the woodland resource for the next generation, whatever impact this has on profits (4). Although the Multifunctional Owner and Hobby Conservationist agreed with this statement (2), they did not rank it as high as the Custodian. The Individualist was the only factor which disagreed with this statement (-2).

The participants that loaded significantly on this factor were either farmers (3 participants) or traditional estates (1 participant). They may have estate workers or family labour and so, of all the factors, were the least constrained by time (-2). They were, however, limited by money in terms of what management could be carried out. They agreed with the Individualists that they would manage their woodlands better if there was decent money to be made from them (2), in stark contrast to the Hobby Conservationists who did not agree with this statement (-2). The Custodian appeared to be the most supportive of government incentives and grant schemes, disagreeing very strongly with the statement that "Applying for a woodland grant is not worth the effort" (-4) and agreeing very strongly that "Woodland grant schemes really help woodland owners carry out management activities in their woods" (4), whereas the other owner types felt less strongly about both statements (Multifunctional Owner = -2 and 1; Individualist = 1 and -1; Hobby Conservationist = -1 and -1, respectively). However, even though Custodians did not think that woodland owners have a greater duty to produce timber than to conserve the rural

environment (-3), they did believe that woodlands should be utilised more as a sustainable fuel source (3).

The Custodian Owner was against more public access in woodlands, as can be seen by the factor array for the statements relating to access and public use of woodlands (Table 5.7). Custodians are wary of allowing public access due to the possibility of being sued. They did not believe that there should be more access routes into woodland (-3), neither did they think that the local community benefits from their woodland (-3) or that the more the woodland is used by local people the more it is valued (-2). This reluctance to allow access could stem from their belief that wildlife and public access and not compatible (3), even though they indicated that they do not own their woodland to maintain it as a wildlife reserve (-2). Alongside this, some of the Custodian Owners were likely to manage their woodlands for sport shooting, so there may be conflicts with access. This owner type was the only one whereby sport shooting was perceived as an important motivation for management (1). All of the other owner types disagreed that they managed primarily for shooting (F1 = -3; F2 = -1; F3 = -2).

5.8 FACTOR DIFFERENTIATION

The analysis of the data collected using a Q Methodological approach identified four significant factors. Each factor represents a group of individuals who sorted the 36 statements in a way that statistically distinguishes them from the other factors. An interpretation of the factor arrays and distinguishing statements suggests four classifications of woodland owners: the Multifunctional Owner, the Individualist, the Hobby Conservationist and the Custodian.

Interpreting the factor arrays according to responses to financially-oriented and socially-oriented statements, as outlined in the concourse matrix for the Q set (Table 5.4), allows further differentiation of the four emergent factors.

5.8.1 Financial constraints and opportunities

The factor arrays for statements relating to financial issues are shown in Table 5.9. The scores indicate that the Hobby Conservationists were the least motivated, or constrained, by money. They were not interested in making a profit from their woodlands or harvesting wood products, including wood fuel. Any grant funding they received would most likely be used to improve wildlife habitats.

Custodian owners were the most supportive of grant incentives. Grant money really helped them to carry out management of the woodlands. However, they would, along with the Individualist and Multifunctional owners, like to see the development of a sustainable wood fuel market.

1. *Woodland should be utilised more as a sustainable fuel source (3, 3, -1, 3)*

The Individualists differed in their views on market forces though. They did not believe that market forces are more effective at stimulating woodland management and agreed more with the Hobby Conservationists on this point.

> ***9. Market forces are more effective at stimulating woodland management than public sector schemes and regulations (0, -2, -3, 1)***

> ***3. Woodland owners should be rewarded for the wider benefits to society their woods provide (1, 3, -4, 1)***

While Individualists believed that woodland owners should be rewarded for the wider benefits to society their woods provide, they did not find that the grant system supports them in the way they need. This may be because they were also temporarily constrained by time and did not have the time to fill out the application forms. Or, as the qualitative interviews suggested, they did not want to be told how to manage their woodlands. They felt strongly that they should be able to manage their woodlands as they wish, and perceived involvement in grant schemes as a constraint on their freedom and rights.

The Multifunctional Owners were keen to finance their woodland management through both grant schemes and through the sale of wood products, especially wood fuel. However, one Multifunctional Owner (Participant 1) suggested that, instead of owners receiving grants as a "gift" from government, owners should be seen as providing a service (public benefits) and so should be rewarded for this service.

5.8.2 Time constraints and opportunities

The Individualists were the most constrained by time. This may be because this owner type was not particularly motivated to manage their woodland for social or environmental benefits and so may have felt that their time was better spent on more financially rewarding activities. They indicated that they would manage their woodlands better if it was profitable to do so.

> ***32. I do not have enough time to manage my woodland properly (-1, 4, -1, -2)***

The Custodian owners were the least constrained by time, most likely because they may have estate or farm workers who can undertake the management tasks.

5.8.3 Attitudes towards public access

Individualists, Hobby Conservationists and Custodians were all wary of increasing public access in their woodlands. There were concerns that increased visitor numbers would disturb wildlife. Public safety and the possibility of being sued was also a disincentive to allowing access. Multifunctional Owners, on the other hand, did not perceive any conflict between people and wildlife. They appreciated the social, emotional and health benefits that access to woodlands

can have on people and communities. Some of these owners actively encouraged access, either through informal permissive paths, or more formally, managing their woodland as a visitor attraction, with entrance fees contributing towards management costs.

5.9 CONCLUSION

This phase of the research has identified four woodland owner types according to their attitudes towards public good provision. In terms of differences between the study areas, although the descriptive statistics suggest that woodland ownership in the High Weald AONB differs from that in Cornwall and the Lake District (with reference to woodland size, length of ownership and how the woodland was acquired) the analysis of the Q sorts does not concur in terms of attitudes and motivations for management.

The analysis of the Q sorts suggests that, in terms of owner motivations and objectives, the Lake District is most unlike the other two case study areas, with 73% of participants loading heavily on Factor 1 (the Multifunctional Owner), with only 40% and 56% of High Weald and Cornwall owners, respectively, loading heavily on this factor (Table 5.12). Of the three study areas the High Weald AONB has the highest proportion of Custodian owners (20%) and Hobby Conservationists (30%). All study areas have a similar proportion (about a tenth) of Individualists.

Table 5.12: Number of participants loaded on each factor in study areas (percentage of participants in brackets).

Area	Multi-functional	Individualist	Hobby Conservationist	Custodian
Lake District	8 (73%)	1 (9%)	2 (18%)	1 (9%)
Cornwall	5 (56%)	1 (11%)	2 (22%)	1 (11%)
High Weald	4 (40%)	1 (10%)	3 (30%)	2 (20%)

The findings from this Q analysis were used to inform the design of a postal survey in the second phase of the research (as outlined in Chapter 4). The analysis and results of this survey are presented in the following chapter.

CHAPTER SIX

ANALYSIS AND RESULTS: POSTAL SURVEY

6.1 INTRODUCTION

The findings from the Q Methodology study, detailed in the previous chapter, were used to inform the self-completion postal survey reported here. As a central aim of the research was to develop a statistically robust ownership typology it was necessary to gather primary data from a random sample that would, as far as possible, be representative of the population from which it was drawn. The analysis was carried out according to the methodology outlined in Chapter Four. Firstly, factor analysis was performed to identify the underlying strategic variables. These variables were then subjected to cluster analysis using both hierarchic and non-hierarchic techniques in order to identify different owner groups. Discriminant analysis was then applied to assess the predictive ability of the strategic variables and to aid in identifying the differences between the groups. Finally, the clusters or groups were profiled using bivariate techniques to characterise and describe each group.

This chapter, firstly, presents a descriptive analysis of the sample, outlining the differences and similarities between the study areas. It then outlines the analytical procedures and results from each of the three stages of analysis. Each stage involved preparing and thoroughly examining the data to ensure that the sample was suitable for subsequent multivariate analysis. This chapter, therefore, outlines how issues such as multicollinearity, linearity, missing data, outliers and normality were routinely addressed as part of the analytical process. The analysis and results of each of the multivariate techniques adopted are presented in sequence, identifying six discrete woodland owner types. Finally, a descriptive summary of each owner type is presented and profiled against the descriptive and demographic data gathered in the survey. Table 6.1 gives a brief summary of the emergent owner types, along with their distinctive characteristics.

Table 6.1: Summary of six woodland owner groups and distinctive characteristics

	Size of woodland	Length of ownership	Characteristics
Individualist	Small (3-10 ha)	<5yrs	Most likely found in the Weald or Lakes, with mixed, ASNW or broadleaf woodland. Woodland usually is bought and owners tend to live adjacent to their woodland. Ownership motivations include privacy, personal enjoyment, scenery and wildlife,. Not motivated by investment, climate control, timber, shooting, recreation or education. Least likely to apply for state support.
Multifunctional Owner	Small (3-10ha) or very large (over 51 ha)	<5yrs >31 yrs	Most likely found in the Weald or Cornwall and generally have mixed woodlands that have either been bought or planted. Motivated by multiple objectives, including amenity, conservation and financial return (timber and/or wood fuel) as well as personal enjoyment. Pragmatic and often entrepreneurial. Very likely to apply for grants.

Private Consumer	Small (3-10ha) or very small (<2ha)	<10yrs	Most likely found in the Weald and often have ASNW that has been bought. Extracts wood products (wood logs/poles etc.) for own use. Also manages for wildlife and gets a lot of personal enjoyment from woodland. Not very likely to apply for grants.
Conservationist	Small (3-10ha) or very small (<2ha)	<5yrs	Most likely found in Cornwall and usually ASNW or broadleaf woodland. Main motivation is to conserve woodland for wildlife and gets a lot of personal enjoyment from doing so. Least motivated by financial return. Unlikely to encourage public access due to risk of disturbance to wildlife. Fairly likely to apply for a grant, but mainly for environmental enhancement, not amenity.
Investor	Small (3-10ha) or very large (over 51 ha)	6-10yrs >31yrs	Most likely found in the Lakes and generally mixed or broadleaf woodland which has been bought or inherited. Some live a short distance (2-10 miles) from their woodland. Financially-oriented and likely to carry out timber production or other profit-making activity. Likely to apply for a grant, especially owners with large woodlands.
Amenity Owner	Small (3-10ha) or very large (over 51 ha)	6-10yrs >31yrs	Equally likely to be found in all study areas and woodland may be mixed, ASNW or broadleaf. Some owners may live some distance (over 40 miles) from the woodland. Favours public access and amenity. Very likely to apply for a grant.

6.2 DESCRIPTIVE RESULTS FROM PRIVATE WOODLAND OWNER SURVEY

This section focuses on the general descriptive characteristics of the survey sample, providing a broad overview of the sample and painting a picture of private woodland owners sampled in this study. The following section begins by examining the size and type of woodland owned privately in the study areas. It then describes the nature of the woodland owners themselves in terms of their stated owner type, age, employment status and details about how they acquired their woodland.

6.2.1 Overview of the woodlands

Woodland owners in this study owned over 16,000 ha of woodland, with 6,600 ha in the High Weald, 6,530 ha in the Lake District and 2,971 ha in Cornwall. Ancient semi-natural woodlands accounted for a third of the woodland in the study (Table 6.2), with a further third being mixed woodland. The remainder was mostly broadleaves, with a small proportion (0.8%) of purely coniferous woodland or other woodland type (1.8%). This pattern broadly reflects the Forestry Commission's statistics regarding ownership of woodland and forests in England, with just over 75% of non-Forestry Commission woodland being broadleaved, whereas only 25% of Forestry Commission woodlands are broadleaves, consisting mostly of conifer plantations (FC, 2001).

Another factor revealed in Table 6.2 was the differing composition of woodland in each of the three study areas. Over half of the woodland in the High Weald was ancient semi-natural woodland (ASNW) (56.8%), whereas the Lake District had the largest proportion of mixed

woodland (43.4%) and Cornwall had a relatively high proportion of broadleaves (50.8%).

Table 6:2: Woodland types in study areas

	Study area (%)			
	Weald	**Lakes**	**Cornwall**	**Total**
ASNW	56.8	28.7	13.3	33.6
Broadleaves	14.4	25.6	50.8	29.8
Conifer	-	1.6	0.8	0.8
Mixed	28.1	43.4	31.3	34.1
Other	0.7	0.8	3.9	1.8
Total	100.0	100.0	100.0	100.0

$\kappa^2 = 81.858$; $p<.0001$

The data in Table 6.3 shows that over half (59.2%) of the woodland owners in this study had woodlands of 10 hectares or smaller with only 14.5% of owners having woodlands over 50 hectares. A cross-tabulation of woodland type by size of woodland suggests that the broadleaved woodland and ASNW in this study consisted primarily of small woodlands of 10 ha or smaller. The majority of large woodlands (over 50 ha) were made up of mixed woodland. Of particular note is that the High Weald had a smaller proportion (12.9%) of very small woodland (<2 ha) than either the Lake District (23.0%) or Cornwall (24.4%). The very large woodlands (>50 ha) were more often found in either the High Weald or the Lake District.

Table 6.3: Type of woodland by woodland size.

	Type of woodland (%)				Study area (%)		
Area	**ASNW**	**Broad-leaves**	**Mixed**	**Total**	**Weald**	**Lakes**	**Cornwall**
<2ha	13.6	33.6	14.4	20.0	12.9	23.0	24.4
3-10ha	39.4	46.6	32.6	39.2	36.7	38.1	43.9
11-20ha	16.7	6.0	14.4	12.6	17.3	7.1	12.2
21-30ha	12.1	4.3	6.1	7.6	11.5	6.3	4.9
31-40ha	1.5	2.6	3.0	2.4	2.2	1.6	4.9
41-50ha	5.3	1.7	3.8	3.7	4.3	4.0	2.4
>50ha	11.4	5.2	25.8	14.5	15.1	19.8	7.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

$\kappa^2 = 52.451$, $p<.0001$ $\kappa^2 = 26.300$; $p<.0001$

Note: Only ASNW, broadleaves and mixed woodlands are included in this table, as conifer and other woodland only accounts for 0.8% and 1.8% of the sample, respectively.

A cross-tabulation of woodland size by stated owner type (Table 6.4) indicates that, as might be expected, the majority of the larger woodlands in the study (over 50 ha) were located on estates, while most of the smaller woodlands were owned by individuals (less than 2 ha) or by families or farmers (3-10 ha). Table 6.5 indicates that the estate woodlands in the sample consisted mainly of mixed woodlands, while individually-owned woodlands and farm woodlands were mainly ASNW but with a high proportion of broadleaved or mixed woodlands. Family-owned woodlands were mainly broadleaved or mixed.

Table 6.4: Size of woodland by owner type

Size of woodland	Owner Type (%)				
	Farm	Individual	Family	Estate	Total
<2ha	19.0	27.8	17.0	3.8	20.0
3-10ha	48.8	43.1	46.8	13.2	41.1
11-20ha	12.4	15.3	12.8	7.5	12.9
21-30ha	9.1	5.6	12.8	5.7	7.7
31-40ha	3.3	0.7	4.3	5.7	2.7
41-50ha	1.7	2.8	-	9.4	3.0
>50ha	5.8	4.9	6.4	54.7	12.6
Total	100.0	100.0	100.0	100.0	100.0

Table 6.5: Type of woodland by owner type

Woodland type	Owner Type (%)				
	Farm	Individual	Family	Estate	Total
ASNW	38.2	38.7	24.4	22.6	34.4
Broadleaved	31.7	35.9	40.0	11.3	31.4
Mixed	30.1	25.4	35.6	66.0	34.2
Total	100.0	100.0	100.0	100.0	100.0

$\kappa^2 = 33.122$; $p < .0001$

6.2.2 The woodland owners

As the data in Table 6.6 indicates, 37.2% of the participants stated that they were individual woodland owners, with a further 31.6% stating they were farmers. A further 13.7% of the woodlands were on estates, and 11.9% were owned collectively by families. A small proportion of the woodlands were owned by trusts (2.0%), charities (2.3%) or other bodies (1.3%). It is evident from the data that the High Weald contained the highest proportion of individual woodland owners (47.5%), followed by the Lake District (33.6%). Cornwall was dominated by farm owners (40.6%) and the Lake District had the highest proportion of estates (21.1%).

Table 6.6: Woodland owner type in study areas

Owner type	Study area (%)			
	Weald	Lakes	Cornwall	Total
Farm	26.6	28.1	40.6	31.6
Individual	47.5	33.6	29.7	37.2
Family	9.4	10.9	15.6	11.9
Estate	9.4	21.1	10.9	13.7
Trust	3.6	1.6	0.8	2.0
Charity	2.9	2.3	1.6	2.3
Other	0.7	2.3	0.8	1.3
Total	100.0	100.0	100.0	100.0

$\kappa^2 = 26.373$; $p = .010$

Table 6.7 indicates that most woodlands in this study had been owned for 10 years or less (47.7%), with 27.2% of the woodlands being owned for less than 5 years. Only 14.6% of the sample had owned woodland for more than 31 years. When compared to the owner type, it is clear that estate woodlands had been in the same ownership for longer than individually-owned woodlands. Table 6.7 indicates that 28.8% of estate woodlands had been owned for over 31 years, while only 5.0% of individually-owned woodlands had been owned for this length of time. In contrast, 39.7% of individual-owned woodlands had been owned for less than 5 years, in comparison to 13.5% of estate woodlands for the same time period. Table 6.7 also indicates that the Lake District had the lowest proportion of newly-acquired woodland, with only 13.9% of the respondents in this study area indicating that they had owned their woodland for less than 5 years, compared to 29.2% in the High Weald and 35.8% in Cornwall. The Lake District also had the highest proportion of long-time woodland owners, with 22.1% claiming to have owned their woodland for over 31 years, compared with 10.2% in the High Weald and 12.5% in Cornwall. The majority of woodland owners in the Cornwall study area had owned their woodland for 10 years or less (63.3%), compared with 47.4% in the High Weald and 30.3% in the Lake District, implying that Cornwall has the highest proportion of new woodland owners out of the study areas.

Table 6.7: Number of years woodland owned by owner type

Yrs owned	Type of owner (%)					Study area (%)		
	Farmer	Individual	Family	Estate	Total	Weald	Lakes	Cornwall
<5yrs	21.4	39.7	19.6	13.5	27.2	29.2	13.9	35.8
6-10yrs	22.2	21.3	17.4	17.3	20.5	18.2	16.4	27.5
11-15yrs	13.7	16.3	10.9	13.5	14.3	19.7	16.4	5.8
16-20yrs	8.5	8.5	8.7	19.2	10.1	9.5	13.1	9.2
21-25yrs	11.1	7.1	2.2	3.8	7.3	6.6	10.7	5.0
26-30yrs	8.5	2.1	13.0	3.8	5.9	6.6	7.4	4.2
>31yrs	14.5	5.0	28.3	28.8	14.6	10.2	22.1	12.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
$\kappa^2 = 56.728$; $p < .0001$					$\kappa^2 = 36.923$; $p < .0001$			

An analysis of demographic variables showed that 83% of the sample respondents was male, with no significant difference in terms of gender between the study areas ($\kappa^2 = 0.614$; sig. = .736). Just 0.3% of the sample population was under 30 years old, with the majority being aged between 50-59 (29.9%) and 60-69 years old (28.4%). Only 15.0% of the sample was aged 70 or over. In total, 73.3% of the sample was over 50 years old. A further 18.8% was aged between 40-49 years and 7.6% was 30-39 years old. No significant difference was found between the age of men and women in the sample population ($\kappa^2 = 6.751$; sig. = .240) or between the age of respondents in the study areas ($\kappa^2 = 7.298$; sig. = .697).

Table 6.8: Employment status of sample population

Employment status	Study area (%)			
	Weald	Lakes	Cornwall	Total
Full time	25.5	24.8	18.3	23.0
Part time	3.6	5.4	11.9	6.9
Self - employed	38.0	39.5	43.7	40.3
Not working	0.7	1.6	0.8	1.0
Retired	29.9	28.7	24.6	27.8
Other	2.2	-	.8	1.0
Total	100.0	100.0	100.0	100.0

$\kappa^2 = 13.923$; $p = .177$

Of the sample, 40.3% indicated that they were self-employed (Table 6.8), a large proportion (27.8%) was retired, and a further 23.0% was in full-time employment. There was no significant difference in terms of employment status between the study areas. Table 6.9 indicates that the majority of the woodland owners surveyed (60.4%) lived adjacent to their woodlands, with a further 11.4% living within 1 mile. Just 8.4% of the sample stated that they lived over 40 miles from their woodland and can be termed 'absent' owners (Urquhart, 2006). Furthermore, 40.3% of owners who lived adjacent to their woodlands were farmers, and 31.1% were individual owners. Farmers had the highest proportion of woodlands adjacent to where they live (76.8%), followed by family-owned woods (61.7%), estates (58.5%) and individually-owned woods (50.7%). Over half (57.6%) of the woodlands that were over 40 miles from their owners were individually-owned. The High Weald had a higher proportion of woodland owners living some distance from their woodland. Of all the owners living over 40 miles, 45.5% were in the High Weald, and 56.5% of owners living between 10-40 miles from their woodland were also in the High Weald. Cornwall had the highest proportion of owners living close to their woodlands with 42.2% of those living less than 1 mile away being in Cornwall. This implies that absentee owners are most likely to be found in the High Weald. With its high proportion of new woodland owners and those living adjacent to their woodlands, Cornwall may represent an area where woodland is often purchased for amenity or emotional reasons.

Table 6.9: Proximity of woodland to owner residence

Proximity to woodland	Owner type (%)					Study area (%)		
	Farm	Individual	Family	Estate	Total	Weald	Lakes	Cornwall
Adjacent	76.8	50.7	61.7	58.5	60.4	54.7	60.2	66.9
Within 1 mile	12.0	10.3	10.6	13.2	11.4	7.9	11.7	15.0
Within 2-10 miles	8.8	18.5	10.6	13.2	14.0	17.3	18.0	6.3
10-40 miles	0.8	7.5	6.4	11.3	5.8	9.4	3.1	4.7
Over 40 miles	1.6	13.0	10.6	3.8	8.4	10.8	7.0	7.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

$\kappa^2 = 18.774$; $p = .016$

6.2.3 Routes of woodland acquisition

Seven routes of acquiring woodland were identified from the survey, comprising three direct routes and a further four multiple routes of two or more, as illustrated in Table 6.10. Just over 38% of the sample had purchased their woodland, with a further 13.3% owning areas of woodland that they had both bought and planted. Only 20.1% of the sample had planted their woodland and 15.3% had inherited their woodland. However, the route of acquisition varied between each study area, with 68.3% of the owners in the High Weald purchasing their woodlands, in contrast to only 27.1% in the Lake District and 16.0% in Cornwall. Woods in the Lake District tended to either be bought (27.1%) or inherited (27.1%), while in Cornwall the majority were planted (45.6%). This is reflected in the uptake of grants, with the area with the highest grant uptake being Cornwall. Such owners may have applied for grants for new woodland planting.

Table 6.10: Routes for acquisition of woodland

Route of acquisition			Study area (%)		
Single route of acquisition		**Total**	**Weald**	**Lakes**	**Cornwall**
1	Bought	38.5	68.3	27.1	16.0
2	Inherited	15.3	10.1	27.1	8.0
3	Planted	20.1	4.3	14.7	45.6
Multi-route of acquisition					
4	Bought + Inherited	1.5	2.2	2.3	-
5	Bought + Planted	13.3	6.5	17.1	18.4
6	Inherited + Planted	5.3	0.7	7.0	9.6
7	Bought + Inherited + Planted	2.4	1.4	3.1	2.4
8	Other	3.6	1.4	1.6	-
	n = 413		*n=129*	*n=139*	*n=125*

As illustrated in Table 6.11, the majority of estate woodland was inherited (64.8%), whereas only 8.8% of individually-owned woodlands were inherited, 23.2% of farm woodlands and 36.2% of family-owned woodlands. The majority of woodland on farms had been planted by the farmer (56.8%), and the majority of woodlands owned by individuals were purchased (72.8%)[13], reflecting potential differences in ownership patterns. Farmers may plant woodland in order to benefit from grants for new planting. Individuals may purchase woodland for its amenity or private consumption value.

Table 6.11: Acquisition of woodland by owner type

	Type of owner (%)						
	Farmer	**Individual**	**Family**	**Estate**	**Total**	X^2	**Sig.**
Bought	48.8	72.8	51.1	31.5	56.0	33.091	<.0001
Inherited	23.2	8.8	36.2	64.8	25.2	69.086	<.0001
Planted	56.8	34.7	55.3	27.8	43.7	21.709	<.0001

[13] The percentage figures for ownership types relate to both single-route and multi-route acquisition of woodland.

6.2.4 Motivations for woodland ownership

A cross-tabulation of the variables associated with the reasons for owning woodland (Question 7) revealed some difference in ownership motivations across the study areas (see Table 6.12).

Table 6.12: Cross-tabulation of motivations for owning woodland with study areas

Variable (Question 7)	κ^2	Sig.
Scenery	17.500	.025
Wildlife	13.189	.106
Investment	14.621	.067
Part of farm	*27.923*	*.000*
Privacy	*25.588*	*.001*
Enjoyment	*23.843*	*.002*
Climate	*21.582*	*.006*
Future	5.079	.749
Timber	*23.446*	*.003*
Non-wood products	5.198	.736
Biofuel	*29.839*	*.000*
Shooting	4.584	.801
Recreation	6.598	.581
Protect	7.681	.465
Educational	8.697	.368

Significant differences in italics at p = .01..

While there was no significant difference between the study areas in terms of enjoying scenery, enhancing wildlife, financial investment, future generations, non-wood products, shooting, recreation, protection from development and education, there were a number of notable differences. Firstly, timber products and biofuel were most important to owners in the High Weald and least important in Cornwall. However, owning woodland as part of the farm was most important in Cornwall, and least important in the High Weald. Privacy, personal enjoyment and mitigating climate change were also most important to owners in the High Weald and least important to those in the Lake District.

Of particular note is that the Cornwall and Lake District samples had a much higher uptake of grant schemes (96.9% and 91.5%, respectively) than the High Weald (72.7%) (κ^2 = 37.593; sig. <.0001). More participants in the Lake District and Cornwall also strongly agreed that the availability of grants was important to them (33.3% and 37.5%, respectively), compared to 18.7% in the High Weald (κ^2 = 24.733; sig. = .002).

A summary of the differences between the case study areas is presented in Table 6.13. The High Weald was characterised by ASNW that was under fairly new ownership. Most woodlands were purchased by individuals or were owned by farmers. The majority lived adjacent to their woodlands, but a notable proportion lived over 40 miles away. The motivations of woodland owners in the High Weald were mainly for scenery, privacy and personal enjoyment. They were generally not motivated to manage their woodland for sport shooting or public recreation and

this study area had the lowest uptake of incentive schemes. The Lake District was characterised by mixed woodland, which had been in the same ownership for over 31 years. Much of the woodland in this study area was inherited estates, but a substantial proportion had been purchased, by either farmers or individuals. The majority of owners lived adjacent to their woodland and there was a high uptake of incentive schemes. While there was no distinguishing motivations for woodland ownership, owners were not motivated by investment or protecting the woodland from development. In Cornwall the dominant woodland type was broadleaves, much of which was new planting and undertaken with the help of government grants. Owners were typically farmers or individuals living adjacent to their woodland. A strong motivation for woodland ownership was to provide wildlife habitats, while timber production was not seen as a priority.

Table 6.13: Summary of notable features of study areas

	Weald	**Lakes**	**Cornwall**
Woodland type	ASNW	Mixed	Broadleaved
Size of woodland	3-10ha	3-10ha	3-10ha
No. years owned	<5yrs	>31yrs	<5yrs
How acquired	Bought	Bought/ Inherited	Planted
Owner type	Individual/ Farmer	Individual/ Farmer/ Estate	Farmer/ Individual
Distance from wood	Adjacent/ Over 40 miles	Adjacent	Adjacent
Motivations	Scenery/ Privacy/ Personal enjoyment/ Biofuel		Wildlife
Not motivated by or dislikes	Non-wood products/ Shooting/ Recreation	Investment/ Protect from development/ Education	Timber
% uptake of grants	72.7	91.5	96.9

This section has presented a descriptive overview of the sample. It provides a general summary of the data with regard to woodland and owner characteristics and will be used for further profiling of the emergent woodland owner typologies later in the chapter. The following section presents the analysis and results of the factor analysis.

6.3 STAGE 1: FACTOR ANALYSIS - IDENTIFICATION OF UNDERLYING STRATEGIC VARIABLES

The aim of the factor analysis was twofold. First, it was to reduce the original variable set into a smaller, more manageable, one. Second, it was to further summarise the reduced variables into a smaller number of discrete underlying dimensions, or factors, which accounted for the maximum variance in the data for use in subsequent multivariate analysis (Tabachnick and Fidell, 2001; Hair et al., 2006; Warner, 2008). Principal component analysis was used to extract the factors in order to identify the different management strategies that characterise private woodland owners' objectives and attitudes (Tabachnick and Fidell, 2001; Hair et al., 2006; Warner, 2008).

6.3.1 Preparation and analysis of the data

The variables consisted of 5-point Likert scores from the questionnaire survey (Q7, 8, 14, 17, 18). Descriptive variables (i.e. Q1-6, 11, 12, 13, 15, 16, 23-26) were not included in the factor analysis, but were used in a subsequent bivariate statistical analysis to describe and profile the emergent dimensions. Questions 9, 10, 19, 20, 21 and 22 were also omitted from the factor analysis due to limited variation in responses[14]. This resulted in a total of 50 variables for inclusion (Appendix 9).

As reported in Section 4.1, there were 426 useable surveys returned. Thus, the raw sample of data contained 426 cases. Thirteen of these cases had missing data over 10% so these were not used for further analysis (Hair et al., 2006, p. 55). Multivariate outliers were assessed with the Mahalanobis D^2 measure[15]. The highest t-value was 1.92 which does not exceed the threshold value of 3 or 4 for large samples, with a probability of .001. Thus, the total number of cases for analysis was 413. In order to provide a suitable technique for analysis, it was necessary to have at least 5 cases per variable, preferably more (Hair et al., 2006, p. 112). This study consisted of 413 cases, so the maximum number of variables permitted was 83. Since the sample contained only 50 variables, it was, therefore, more than suitable for factor analysis.

Initially, the correlation matrix of the 50 variables was explored for intercorrelations between variables. Sufficient multicollinearity is desired as the aim of the factor analysis is to identify interrelated sets of variables (Hair et al., 2006, p. 114). Thus, any variables with correlations less than ±0.3 were removed (5 variables: v4, v30, v32, v33, v41). However, excess multicollinearity can occur, where one variable almost correlates exactly with another. In order to avoid this, any variables with correlations over ±.9 were removed. The variables v12: Reason:

[14] For example, Question 20 was omitted since a number of respondents put 5 for all the issues highlighted since they perceived the question as irrelevant to them if they did not allow public access.

[15] This method measures each case's distance in multidimensional space from the mean centre of all the cases, giving a single value for each case no matter how many variables. Higher D^2 values represent cases further removed from the general distribution. The D^2 value divided by the number of variables (D^2/df) is approximately distributed as a *t*-value. With a conservative level of significance (i.e. .005 or .001) D^2/df values in large samples exceeding 3 or 4 are potential outliers (Hair et al. 2006).

Shooting and v19: Importance: Shooting were removed as they were highly correlated (.911).

Next, the partial correlations among the variables were computed. A partial correlation is the correlation that is explained when the effects of the other variables are taken into account (Hair et al., 2006, p. 114). Large partial correlations suggest that there may be no underlying factors and so the sample may not be suitable for factor analysis (Hair et al., 2006). The anti-image correlation matrix (the negative value of the partial correlations) provided by SPSS v16 showed no large values in the sample.

In order to ensure that the data matrix had sufficient correlations among the variables to justify factor analysis, the Bartlett test of sphericity and the measure of sampling adequacy (MSA) were applied. The Bartlett test of sphericity tests that the correlation matrix has statistically significant correlations among some of the variables (Hair et al., 2006, p. 114). The Bartlett test calculated a chi-square value of 6542.075, which was highly significant ($p<.0001$).

However, the Bartlett test is more sensitive in detecting correlations with large samples, so the MSA was also examined. The MSA index ranges from 0 to 1[16]. Hair et al. (2006) suggests that the data must have an overall MSA value of above 0.50 in order to be suitable for factor analysis. The overall Keiser-Meyer MSA was 0.796, an acceptable value. Individual MSA scores were also assessed and any communalities less than ±0.50 were omitted from the factor analysis[17]. One variable was removed in this way (v10: Reason: Non-wood products), providing a total of 42 variables for further analysis.

The next step was the extraction of factors from the correlation matrix. Three criteria were used to evaluate the number of factors to be extracted – latent root criterion, scree plot test and the percentage of variance. The latent root criterion, devised by Kaiser (1959), requires that any factor should account for the variance of at least one variable if it is to be retained (Hair et al., 2006). Each variable contributes a value of 1 to the eigenvalue, so only factors with eigenvalues (or latent roots) in excess of 1 are retained. This method is most useful when the number of variables is between 20 and 50, as if there are over 50 variables, too many factors can often be extracted. In the initial extraction, 12 factors had eigenvalues over 1, accounting for 65.2% of the total variance explained by the extracted factors.

The scree test criterion, developed by Cattell (1966), plots the latent roots against the number of factors and the shape of the curve is used to determine how many factors to extract. The point

[16] Scores of 1 indicate a variable is perfectly predicted by the other variables. Hair et al. (2006) gives the following guidelines: 0.80 or above, meritorious; 0.70 or above, middling; 0.60 or above, mediocre; 0.50 or above, miserable; and below 0.50, unacceptable (Hair et al. 2006).

[17] Communalities measure the percent of variance in a given variable explained by all the factors. Thus, the communality is the squared multiple correlation for the variable using the factors as predictors. Communality for a variable is the sum of squared factor loadings for that variable. The communality will be 1.0 when all of the variance in the variables is explained by all the factors, which will be equal to the number of variables. The "extracted" communalities in the SPSS chart indicate the percent of variance in a given variable explained by the extracted factors, resulting in co-efficients less than 1.0.

at which the curve flattens out indicates the maximum number of factors to extract (Hair et al., 2006). The scree plot for this study suggested 9 factors before the curve started to flatten. The percentage of variance criterion was also applied. This method suggests that the number of factors to extract depends on the desired cumulative percentage of total variance explained by the extracted factors. In social science research it is acceptable for 60% of the total variance to be explained by the extracted factors (Hair et al., 2006). Since the last three factors extracted were difficult to name, only having 3, 2 and 3[18] variables respectively loading on them, and as each accounted for less than 3% of the variance explained, the extraction was limited to 9 factors. After re-checking the communalities and continuing to remove those variables with communalities under 0.50, the final solution involving 31 variables (Appendix 10) and 8 factors explaining 62.8% of the variance emerged[19] (see Table 6.14).

Table 6.14: Total Variance Explained for the 8 Extracted Factors

Component	Initial Eigenvalues			Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.171	16.679	16.679	5.171	16.679	16.679
2	3.878	12.510	29.189	3.878	12.510	29.189
3	2.323	7.493	36.682	2.323	7.493	36.682
4	2.120	6.839	43.521	2.120	6.839	43.521
5	1.764	5.691	49.212	1.764	5.691	49.212
6	1.549	4.996	54.209	1.549	4.996	54.209
7	1.361	4.391	58.599	1.361	4.391	58.599
8	1.287	4.153	62.752	1.287	4.153	62.752

Extraction Method: Principal Component Analysis; KMO = .792; Barlett's test of sphericity chi-square = 4628.502, sig. <.0001).

The final anti-image matrix showed no large values, the Bartlett test of sphericity chi-square value of 4628.502 was significant (<.0001), the overall MSA was 0.792 and the communality for each variable was greater than 0.50, thus confirming that the data was adequate for factor analysis.

The final step of the analysis was factor rotation. The coefficients, or factor loadings, in the component matrix indicate the strength of correlation between the factors and the variables. Factors are usually correlated with many variables, making interpretation difficult. Rotation redistributes the variance from the early factors to later ones to simplify the factor structure, making interpretation easier. Rotation can either be orthogonal (axes maintained at 90 degrees) or oblique (axes not constrained to 90 degrees) (Hair et al., 2006; Warner, 2008). Using SPSS v16, varimax rotation (orthogonal) was carried out on the component matrix to allow for a clearer interpretation of the emergent factors.

[18] Warner (2008) suggests that a minimum of 3 indicator variables per factor is required.
[19] When limited to 12 factors, 8 variables had communalities less than 0.50 and so were removed. Two factors had 3 or less variables loading on them, so these were removed by deleting the variables that only loaded on that factor and re-checking communalities, ensuring all were greater than 0.50.

Interpretation involves identifying variables that have large loadings on the same factor. Tabachnik and Fidell (2001) suggest that loadings in excess of 0.55 are good, 0.60 are very good and over 0.71 are excellent. However, Hair et al. (2006) suggest that significant factor loadings are dependent on the sample size. For samples of over 350 cases, they suggest that factor loadings in excess of 0.30 can be considered significant (based on 0.05 significance level, a power level of 80% and standard errors assumed to be twice those of the conventional correlation coefficient). McKeown and Thomas (1988) further suggest that factor loadings also depend on the number of variables, with loadings in excess of 2.5 times the standard error being significant. The standard error is calculated as $1/\sqrt{N}$ (where **N** = number of variables). With 31 variables, the standard error is 0.18 and so factor loadings in excess of ±0.45 would be considered significant. Thus, with a sample size of 413 woodland owners and 31 variables, factor scores of ±0.45 and above were considered significant (see the Rotated Component Matrix in Appendix 11). Each factor was interpreted and named according to its particular set of defining variables. The factor scores (mean 0, standard deviation 1) were saved for subsequent cluster analysis.

6.3.2 The Factors (Strategic Variables)

Eight distinct factors which explain 62.8% of the total variance gave the best representation of the interrelationship between the variables. A summary of the factor loading scores is presented in Table 6.15.

Table 6.15: Results of Principal Components Analysis of Variables

Var	Underlying Strategic Variables	Factor loading
	Factor 1: Financially-oriented	
v3	Reason for ownership: For financial investment	.720
v9	Reason for ownership: To produce timber products	.639
v16	Need for financial return	.772
v18	Importance of timber prices	.808
v22	Importance of grant availability	.471
v26	Maintaining quality of timber	.619
	Factor 2: Conservation	
v2	Reason for ownership: To enhance wildlife	.718
v7	Reason for ownership: To mitigate climate change	.514
v21	Importance of restoring broadleaves	.735
v27	Enhancement of wildlife habitats	.651
	Factor 3: Private consumption	
v9	Reason for ownership: To produce timber	.504
v11	Reason for ownership: To produce firewood or biofuel	.809
v17	Importance of wood for own use	.744
v49	Benefits: Woodfuel	.709
	Factor 4: Public amenity	
v13	Reason for ownership: For public recreation/enjoyment	.809
v15	Reason for ownership: For education	.633
v20	Importance of recreational opportunities	.677
v44	Benefits of woodland: Public recreation	.774

	Factor 5: Personal enjoyment	
v1	Reason for ownership: To enjoy scenery	.706
v5	Reason for ownership: For privacy	.724
v6	Reason for ownership: For personal enjoyment	.713
v23	Importance of improving scenery	.514
v46	Benefits: Property value	.461
	Factor 6: Environmental	
v7	Reason for ownership: To mitigate climate change	.557
v47	Benefits: Pollution control	.836
v50	Benefits: Carbon storage	.789
	Factor 7: Constrained	
v28	Constraints: Lack of money	.706
v29	Constraints: Lack of time	.813
v31	Constraints: Lack of skills	.544
v39	I would manage my woodland better if it was financially advantageous	.651
	Factor 8: Grant dependent	
v22	Importance of grant availability	.494
v42	Funding: grants	.793
v43	Don't want to be told what to do	-.767

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.792, $p<0.01$
Bartlett test of sphericity = 4628.502, $p<0.0001$

The following section summarises the interpretation of the eight distinct strategic variables (factors).

Factor 1: Financially-oriented

This factor, accounting for 16.7% of the variance, had high loading scores on statements relating to the importance of financial investment through timber production. Woodland owners who score highly on this factor were likely to view their woodland in terms of investment opportunities, and their management was dictated by timber prices and the need for financial return from their woodland.

Factor 2: Conservation

This factor, accounting for 12.5% of the variance, was concerned with wildlife conservation and the environmental benefits that woodland can provide. High loading scores on this factor were associated with owners who prioritised enhancing wildlife habitats over and above timber production or public access.

Factor 3: Private consumption

This factor placed the emphasis on extracting wood, usually in the form of woodfuel, from the woodland, for private consumption. This factor accounted for 7.5% of the variance. Woodland owners who load highly on this factor emphasised the importance of managing their woodland to provide themselves with a continuous supply of wood fuel.

Factor 4: Public amenity

The public amenity factor emphasised the importance of the recreational benefits of woodland

and accounted for 6.8% of the variance. Woodland owners who scored highly on this factor were likely to be open to allowing public access in their woodland and appreciated the social and health benefits that woodland can provide.

Factor 5: Personal enjoyment

This factor was concerned with privacy and an owner's personal enjoyment of their woodland. They valued the landscape benefits their woodland provides and appreciated that woodlands may increase the value of their property. This factor accounted for 5.7% of the variance.

Factor 6: Environmental

Woodland owners scoring highly on the environmental factor valued their woodland for its contribution towards mitigating climate change through carbon storage and its ability to help control pollution. This factor accounted for 5.0% of the variance.

Factor 7: Constrained

This factor, accounting for 4.4% of the variance, was restricted in the amount of woodland management that could be done, due to, firstly, a lack of financial resources and, secondly, available time. Woodland owners who loaded highly on this factor were likely to be frustrated that they cannot manage their woodland better due to financial limitations.

Factor 8: Grant dependent

Accounting for 4.2% of the variance, the grant dependent factor relied heavily on receiving grants in order to carry out management work in their woodland. Owners scoring highly on this factor also felt strongly that woodland owners need guidance and direction in how to manage their woodland.

The factor scores (mean = 0; standard deviation = 1) were subjected to a subsequent cluster analysis to develop the typology of private woodland owners.

6.4 STAGE 2: CLUSTER ANALYSIS - CLASSIFYING INTO STRATEGIC GROUPS

The first stage of the cluster analysis is the formulation of the research problem and the selection of the variables to be used to characterise cases in the clustering process. The basic research problem in this study was the formulation of a taxonomy or a classification of cases (Hair et al., 2006). In order to do this, it was important that the selected variables characterised the cases being clustered and that they related clearly to the objectives of the cluster analysis (Hair et al., 2006). In this case, the variables were the identified orthogonal standardized factor scores (mean = 0, standard deviation = 1) of the respondents. Factor scores are appropriate to use in cluster analysis as the raw variables because respondents may use the scale in the questionnaire differently, which might bias the cluster results. The use of latent root variables through the varimax solution removes these interdependencies and represents the raw variables as a smaller set of independent factors (Hair et al., 2006). Indeed, Lorr (1983)

recommends using factor scores as variables for cluster analysis as they are more reliable than single variables because they are weighted linear composites of variables that best define the factor.

6.4.1 Preparation and analysis of the data

The factor scores were initially scrutinised for outliers, as cluster analysis is particularly sensitive to them. Using the Mahalanobis D^2 method[20], cases 91, 369, 162 and 246 were identified as outliers, with standardized Mahalanobis D^2 values of 3.3, 3.8, 4.0 and 5.2 respectively. These cases were also disconnected from the remaining scores, further supporting their designation as outliers. Therefore, these four cases were removed from the analysis. Furthermore, since the factor scores are standardized variables, values that exceed ±3.0 were considered outliers, with 9 cases (377, 337, 165, 237, 35, 183, 173, 406 and 33) being removed as a result (Tabachnick and Fidell, 2001; Hair et al., 2006). The cluster analysis was, therefore, applied to the remaining 399 cases.

The second stage involved selecting the similarity measure to be used in the clustering process. The most commonly used measures of similarity are distance measures[21], which represent similarity as the proximity of cases to each other across the variables (Lorr, 1983; Hair et al., 2006, pg. 575). The most commonly used distance measure is the Euclidean distance, which is the square root of the sum of squared differences in values for each variable (Hair et al., 2006). The Squared Euclidean distance measure is the sum of squared differences, without taking the square root (Hair et al., 2006, pg. 575). This method was used in this case as the speed of computation is greater than the Euclidean distance, and it is the recommended distance measure for Ward's methods of clustering (Hair et al., 2006, pg. 575)[22].

The third stage is the selection of the partitioning procedure for the cluster analysis. The aim of the cluster process is to maximize the differences between clusters in relation to the variables within the clusters (Hair et al., 2006, pg. 584). There are two main procedures that are classified as either (a) hierarchical clustering, or (b) non-hierarchical clustering (Lorr, 1983; Romesburg, 2004; Hair et al., 2006, pg. 584).

Hierarchical techniques combine cases into a hierarchic (or tree-like) structure and can be either agglomerative or divisive. Agglomerative methods start with each case in its own cluster, with clusters merging to form larger clusters until all the cases belong to one cluster (Lorr, 1983;

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[20] Standardized Mahalanobis D^2 values over 3 or 4 are considered outliers in large samples (over 80 cases) (Hair et al. 2006, pg. 75).

[21] Similarity measures may be correlation measures (correlation co-efficients), distance measures (proximity of cases to one another across the variables) and association measures (used for nonmetric data) (Hair et al. 2006, pg. 573-576).

[22] Other distance measures include the City-block or Manhattan distance which uses the sum of the absolute differences of the variables; the Chebychev distance measures distance as the greatest difference across all of the clustering variables; and Mahalanobis distance (D^2) which relies on standardized variables and accounts for the correlations among the variables, weighting each variable equally (Hair et al. 2006, pg. 575).

Hair et al., 2006, pg. 584). Conversely, divisive methods start with all cases in a single cluster, dividing until each is a single cluster (Lorr, 1983; Hair et al., 2006, pg. 585). Most computer packages use agglomerative methods and there are various clustering algorithms used to measure similarity between clusters[23]. Ward's Method was used for this study as it is not a single measure of similarity, but measures the sum of squares within the clusters summed over all the variables (Hair et al., 2006, pg. 588). The decision on which two clusters to combine is based on minimizing the within-cluster sum of squares across the whole set of clusters (Hair et al., 2006, pg. 588). It also minimizes the chance of chaining of cases, which is common with linkage methods (Romesburg, 2004; Hair et al., 2006).

Non-hierarchical techniques assign cases into clusters once the number of clusters has been specified to find the best solution for that number of clusters. The process involves the selection of starting points for each cluster (or seed points) and then assigning all the cases to a cluster.

In this study, both hierarchical and non-hierarchical clustering techniques were used, as recommended by Hair et al. (2006) and Milligan (1980). The hierarchical method was used to identify a preliminary number of cluster solutions, profile the cluster centres to act as seed points and to identify any outliers. The non-hierarchical method used the seed points from the hierarchical method to produce the final cluster solution.

6.4.2 Hierarchical method

As described above, the clustering algorithm used was Ward's Method, using the Squared Euclidean distance measure. The number of clusters to extract was determined by examining the dendrogram plot and the cluster co-efficients.

Table 6.16 contains the cluster solutions for 2 to 10 clusters from the initial hierarchical analysis. The partition process was confined to 10 clusters, as it was anticipated that the final cluster solution would not exceed more than 7 clusters. It was useful to view several cluster solutions beyond what was expected to understand how the clusters combined to result in the cluster solutions of interest. Table 6.16 indicates that clusters 10 and 8 are combined first, resulting in 9 clusters, followed by the merger of clusters 6 and 7. The following cluster merger of cluster 9 and 8 involves combining a cluster (8) that is already the result of a previous merger (8 and 10), resulting in a larger cluster size of 93. However, what is of particular interest is that all of the clusters contain a satisfactory number of cases, with none containing very few cases.

[23] Most widely used clustering algorithms include the single linkage method (based on the shortest distance from any object in one cluster to any object in another cluster); complete linkage method (similar to single linkage method, but based on the maximum distance between cases in each cluster); average linkage (the average similarity of all cases in one cluster with all cases in another); centroid method (distance between cluster centroids) and Ward's method (the sum of squares within the clusters summed over all variables) (Hair et al. 2006, pg. 586).

Table 6.16: Cluster Sizes for the Initial Hierarchical Cluster Analysis

Cluster No.	Cluster Solutions (No. cases in clusters for each cluster solution)								
	10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**
1	37	37	37	37	37	37	78	78	78
2	56	56	56	56	56	88	88	175	321
3	41	41	41	41	41	41			
4	32	32	32	32	32				
5	53	53	53	53	146	146	146	146	
6	33	33	87	87	87	87	87		
7	54	54							
8	54	68	68	93					
9	25	25	25						
10	14								
n = 399									

(Table adapted from Hair et al. 2006, pg. 605).

The actual clustering process is determined by examining the dendrogram and the agglomeration co-efficient. The dendrogram output from SPSS v16 provides a tree-like graphical representation of the clustering process (Appendix 12) and suggests 4 or 7 clusters.

The stopping rule, the percentage increase of the cluster co-efficient to the next stage[24], was applied, with solutions of 2, 5, 6 and 7 clusters showing the greatest percentage increase to the next stage (4.7%, 3.1%, 3.6% and 4.8%, respectively) (see Table 6.17).

Table 6.17: Stopping rule for the Hierarchical Cluster Analysis (Between Groups Linkage)

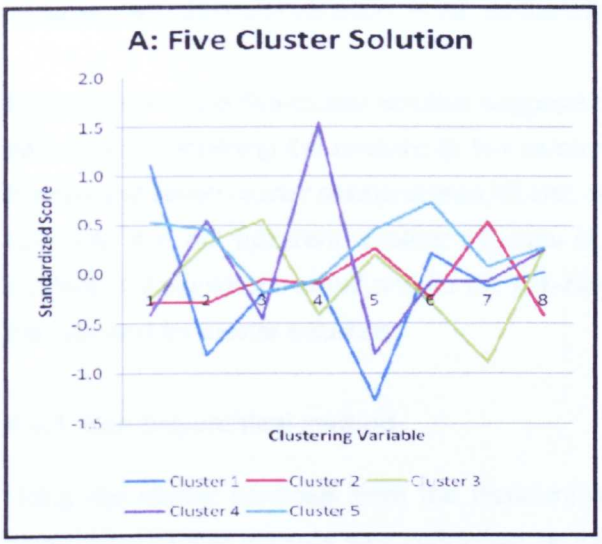
Stage	No. Clusters before joining	No. Clusters after joining	Co-efficient value	% increase to next stage
390	10	9	17.81	1.5
391	9	8	18.08	1.9
392	8	7	18.43	*4.8*
393	7	6	19.32	*3.6*
394	6	5	20.02	*3.1*
395	5	4	20.65	1.1
396	4	3	20.87	1.8
397	3	2	21.25	*4.7*
398	2	1	22.25	

The percentage increase in the final stage, combining two clusters into one, will always be large, but this does not indicate a meaningful representation of the data (Hair et al., 2006). Based on theoretical considerations, the two cluster solution was deemed as an insufficient explanation for the variation in the data, so cluster solutions of 5, 6 and 7 clusters were examined using non-hierarchical cluster analysis, to determine which solution offered the best explanation for the variance in the data.

Each of the cluster solutions was profiled on the clustering variables to ensure that each solution was distinctive and significant in terms of the research objectives (Figure 6.1).

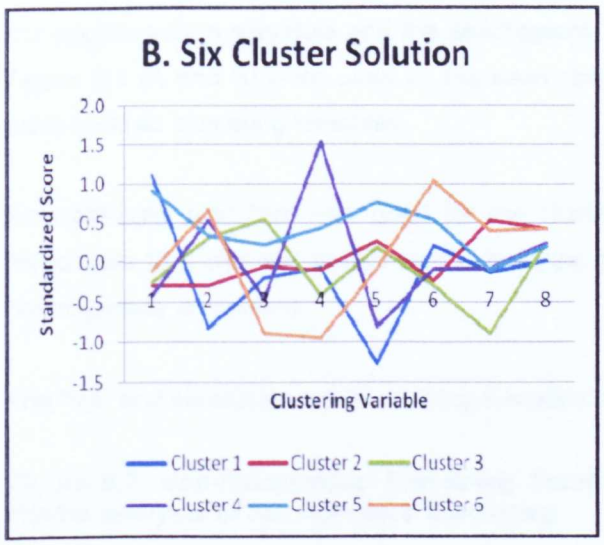
[24] A substantial increase in the value of the co-efficient suggests that two dissimilar clusters have been combined and the solution prior to the merger provides a better solution (Hair et al. 2006, pg. 610).

Figure 6.1: Profile Analysis of Standardised Clustering Variables for the Five-, Six- and Seven-Cluster Hierarchical Clustering Solutions



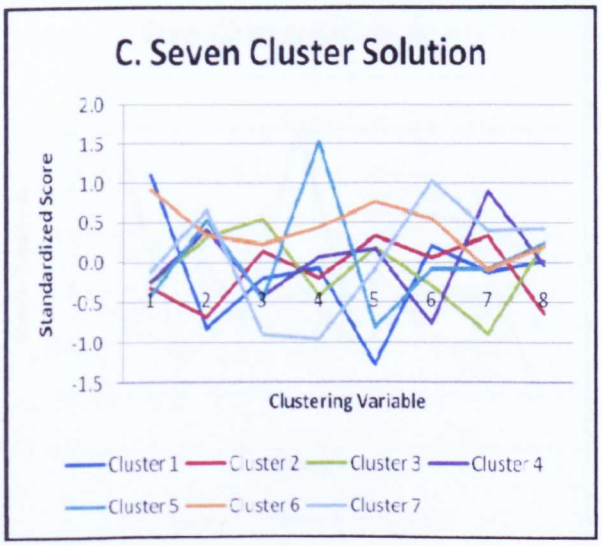
Clustering Variable	Cluster Centroids for the Five-Cluster Solution				
	1	2	3	4	5
X1	1.11	-0.29	-0.25	-0.41	0.53
X2	-0.82	-0.29	0.31	0.54	0.45
X3	-0.19	-0.06	0.55	-0.45	-0.19
X4	-0.07	-0.10	-0.41	1.54	-0.06
X5	-1.27	0.26	0.19	-0.80	0.45
X6	0.21	-0.24	-0.29	-0.07	0.73
X7	-0.12	0.53	-0.89	-0.07	0.08
X8	0.02	-0.42	0.24	0.24	0.27
No. cases	37	146	87	41	88

Note: All clustering variables statistically significant at p<.0001 significance level.



Clustering Variable	Cluster Centroids for the Six-Cluster Solution					
	1	2	3	4	5	6
X1	-0.29	0.91	-0.25	1.11	-0.41	-0.12
X2	-0.29	0.33	0.31	-0.82	0.54	0.66
X3	-0.06	0.22	0.55	-0.19	-0.45	-0.90
X4	-0.10	0.44	-0.41	-0.07	1.54	-0.95
X5	0.26	0.75	0.19	-1.27	-0.80	-0.08
X6	-0.24	0.55	-0.29	0.21	-0.07	1.03
X7	0.53	-0.10	-0.89	-0.12	-0.07	0.39
X8	0.42	0.19	0.24	0.02	0.24	0.41
No. cases	146	56	87	37	41	32

Note: All clustering variables statistically significant at p<.0001 significance level.



Clustering Variable	Cluster Centroids for the Seven-Cluster Solution						
	1	2	3	4	5	6	7
X1	-0.32	0.91	-0.25	1.11	-0.41	-0.12	-0.23
X2	-0.68	0.33	0.31	-0.82	0.54	0.66	0.40
X3	0.14	0.22	0.55	-0.19	-0.45	-0.90	-0.41
X4	-0.20	0.44	-0.41	-0.07	1.54	-0.95	0.07
X5	0.32	0.75	0.19	-1.27	-0.80	-0.08	0.17
X6	0.05	0.55	-0.29	0.21	-0.07	1.03	-0.76
X7	0.32	-0.10	-0.89	-0.12	-0.07	0.39	0.89
X8	-0.64	0.19	0.24	0.02	0.24	0.41	-0.04
No. cases	93	56	87	37	41	32	53

Note: All clustering variables statistically significant at p<.0001 significance level.

Moving from the seven- to six-cluster solution involved combining clusters 1 and 7 in the seven-cluster solution (Figure 6.1, C). These variables are fairly similar across almost all of the eight variables, with the most variation on X2, so this cluster solution was not kept for further analysis.

Examination of the five-cluster solution suggests that some of the variation in the sample may be lost by constraining the analysis to five clusters. Some of the variation between clusters in the six- and seven-cluster solutions (see X3 and X4) does not appear in the five-cluster solution. However, it is not apparent whether this loss of variation will impact on interpretation of the clusters to a significant extent and so the non-hierarchical cluster analysis was applied to both the five- and six-cluster solutions.

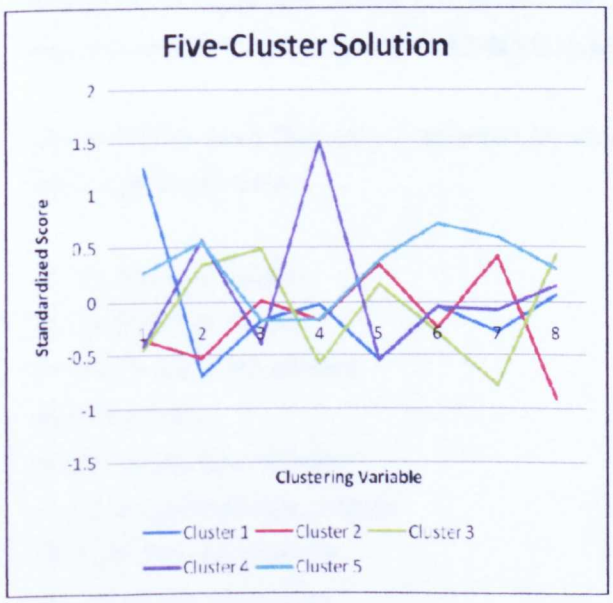
6.4.3 Non-hierarchical method

Using the cluster centroids from the hierarchical analysis as seed points, a K-means non-hierarchical cluster analysis was performed for the two different cluster solutions suggested by the agglomeration schedule and the dendrogram. The cluster centroids shown in the tables in Figure 6.1 (A and B) were used as the seed points. The 8 variables from the factor analysis were used as clustering variables.

An optimizing algorithm was used for the clustering process. This allows for cases to be reallocated to a different cluster as the analysis proceeds to ensure that a minimal amount of heterogeneity is reached.

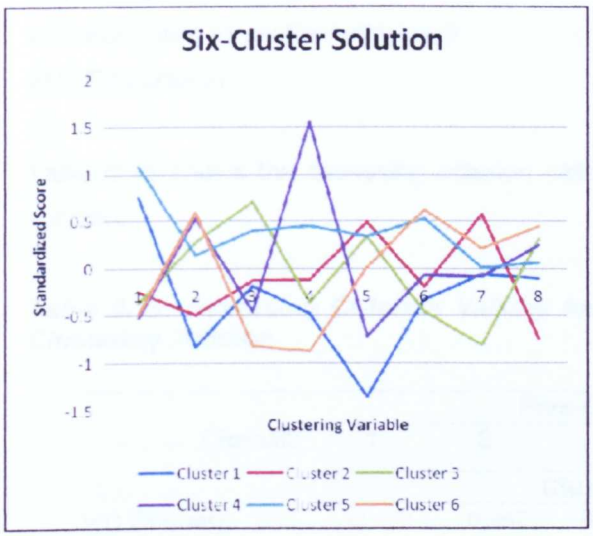
The five- and six-cluster solutions using K-means cluster analysis are shown in Figure 6.2.

Figure 6.2: Non-Hierarchical Clustering Solutions: Five- and Six-Cluster Solutions with Profile Analysis of Standardised Clustering



Clustering Variable	Cluster Centroids for the Five-Cluster Solution				
	1	2	3	4	5
X1	1.26	-0.35	-0.45	-0.42	0.27
X2	-0.69	-0.53	0.34	0.57	0.55
X3	-0.17	0.01	0.49	-0.39	-0.17
X4	-0.02	-0.17	-0.58	1.51	-0.16
X5	-0.54	0.35	0.16	-0.55	0.39
X6	-0.04	-0.24	-0.29	-0.05	0.73
X7	-0.28	0.42	-0.78	-0.08	0.6
X8	0.07	-0.9	0.43	0.15	0.31
No. cases	66	96	91	59	87

Note: All clustering variables statistically significant at p<.0001 significance level.



Clustering Variable	Cluster Centroids for the Six-Cluster Solution					
	1	2	3	4	5	6
X1	0.76	-0.25	-0.37	-0.52	1.09	-0.49
X2	-0.83	-0.49	0.28	0.54	0.14	0.6
X3	-0.18	-0.13	0.72	-0.46	0.4	-0.83
X4	-0.48	-0.12	-0.36	1.56	0.46	-0.88
X5	-1.35	0.49	0.34	-0.72	0.34	0.01
X6	-0.33	-0.19	-0.46	-0.07	0.54	0.63
X7	-0.06	0.58	-0.81	-0.09	0.01	0.22
X8	-0.1	-0.74	0.32	0.25	0.06	0.45
No. cases	38	96	78	50	79	58

Note: All clustering variables statistically significant at $p<.0001$ significance level.

6.4.4 Interpretation and validation

The non-hierarchical solutions have a more evenly dispersed range of cases per solution. For example, the six-cluster solution from the hierarchical analysis had 146, 56, 87, 37, 41 and 32 cases. The non-hierarchical solution had cluster sizes of 96, 79, 78, 38, 50 and 58.

In order to ensure the cluster solution is valid and has practical significance it must be tested to ensure the solution is stable. The validation process was conducted in two stages. First, the clusters were considered for predictive validity by profiling using variables that were not used in the cluster analysis. The variables were selected from Question 7 in the questionnaire, which asked respondents to indicate their reasons for owning woodland. Following the advice of Hair et al (2006), these variables are, conceptually, strongly related to the emerging clusters and should show significant differences across the clusters. If significant differences do exist on these variables, it can be concluded that the clusters represent groups with predictive validity.

The variables from Question 7 selected for assessing predictive validity in the five- and six-cluster solutions were:

v1: To improve scenery
v2: To enhance wildlife
v3: For financial investment
v5: For privacy
v6: For personal enjoyment
v7: To mitigate climate change
v8: For future generations
v9: For timber production
v11: To produce firewood or biofuel

v12: For sport shooting

v13: For public recreation/enjoyment

v15: Educational

Table 6.18 shows the assessing criterion validity of the five- and six-cluster non-hierarchical solution.

Table 6.18: Assessing Criterion Validity for the Five- and Six-Cluster Non-hierarchical Clustering Solution

	Five-Cluster Solution						
Cluster:	**1**	**2**	**3**	**4**	**5**	***F* Value**	**Sig.**
	Cluster Centroids						
v1: Scenery	-2.123	0.267	0.251	0.145	0.141	76.718	<.0001
v2: Wildlife	-1.413	0.309	0.180	0.300	-0.153	29.270	<.0001
v3: Invest	0.269	0.196	0.577	-0.453	-0.443	20.285	<.0001
v5: Privacy	-0.937	0.276	0.505	-0.762	0.066	30.823	<.0001
v6: Enjoy	-1.514	0.503	0.148	-0.484	0.127	45.586	<.0001
v7: Climate	-0.868	0.471	0.154	0.379	-0.504	28.899	<.0001
v8: Future	-0.969	0.193	0.564	0.425	-0.514	34.455	<.0001
v9: Timber	0.062	0.445	0.639	-0.161	-0.823	49.358	<.0001
v11: Biofuel	-0.342	0.605	0.573	-0.530	-0.613	48.024	<.0001
v12: Shoot	-0.012	-0.636	1.359	-0.380	-0.132	102.984	<.0001
v13: Recreation	-0.282	-0.160	0.004	1.543	-0.576	86.576	<.0001
v15: Education	-0.694	0.232	0.187	0.919	-0.633	43.325	<.0001

	Six-Cluster Solution							
Cluster:	**1**	**2**	**3**	**4**	**5**	**6**	***F* Value**	**Sig.**
	Cluster Centroids							
v1: Scenery	-2.123	0.282	0.154	0.198	0.333	0.042	62.993	<.0001
v2: Wildlife	-1.413	0.374	0.162	0.290	0.002	-0.168	23.898	<.0001
v3: Invest	0.292	0.204	0.716	-0.417	-0.095	-0.505	15.755	<.0001
v5: Privacy	-0.937	0.257	0.513	-0.716	0.423	-0.155	24.156	<.0001
v6: Enjoy	-1.571	0.490	0.067	-0.469	0.253	0.097	37.433	<.0001
v7: Climate	-0.825	0.541	0.522	0.346	-0.809	-0.247	35.893	<.0001
v8: Future	-0.878	0.180	0.650	0.476	-0.117	-0.497	22.211	<.0001
v9: Timber	-0.002	0.425	0.835	-0.084	-0.178	-0.888	36.641	<.0001
v11: Biofuel	-0.405	0.591	0.778	-0.513	0.172	-0.895	52.405	<.0001
v12: Shoot	-0.012	-0.632	1.393	-0.351	0.806	-0.563	104.117	<.0001
v13: Recreation	-0.282	-0.122	0.224	1.669	-0.600	-0.455	76.396	<.0001
v15: Education	-0.650	0.334	0.444	1.080	-0.786	-0.493	53.391	<.0001

The *F* values show that the cluster means for all of the twelve variables in both cluster solutions are significantly different, indicating that the clusters have predictive ability. On examination of the clusters between the two solutions, it is apparent that the clusters are fairly stable across both solutions, with 4 of the clusters in each solution loading highly on the same variables (Clusters 1-4 in both solutions). Cluster 5 in the five-cluster solution is a result of the merger between clusters 5 and 6 in the six-cluster solution. On examination of the profiles of the five- and six-cluster solutions, and the results of the validation cluster analysis, the six-cluster solution was deemed as the most appropriate to retain for further interpretation in order to avoid losing the variation in the six-cluster solution (Figure 6.2).

A second validity check was performed by running another non-hierarchical cluster analysis, but allowing SPSS v16 to randomly select the seed points for the six-cluster solution. The final cluster centroids were examined to ascertain whether there was consistency between the clusters derived from random seed points and those derived from the hierarchical cluster analysis.

Table 6.19 give the results of the validity check.

Table 6.19: Comparing Non-hierarchical Six-Cluster Solutions Using Seed Points from Hierarchical Cluster Analysis Versus Random Seed Points

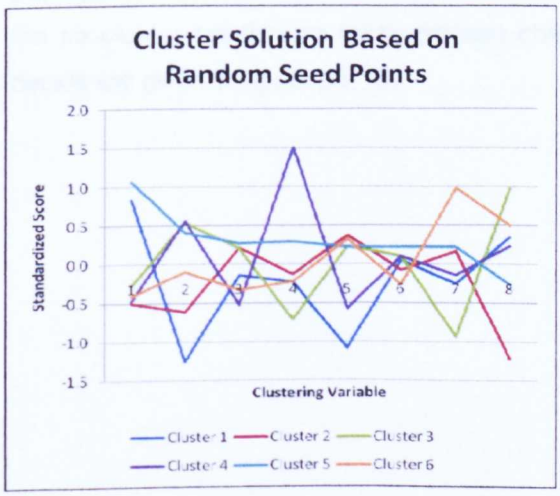
Non-hierarchical Six-Cluster Solution Based on Random Seed Points

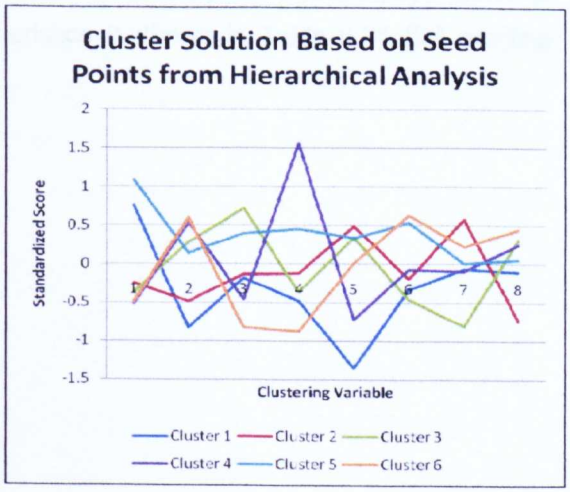
	Final Cluster Centroids					
Clustering Variables	**1**	**2**	**3**	**4**	**5**	**6**
X1: Finance	0.83	-0.51	-0.28	-0.48	1.07	-0.42
X2: Conservation	-1.26	-0.62	0.54	0.56	0.41	-0.10
X3: Wood Fuel	-0.14	0.21	0.20	-0.53	0.27	-0.34
X4: Recreation	-0.23	-0.13	-0.72	1.51	0.29	-0.23
X5: Personal enjoyment	-1.09	0.37	0.23	-0.58	0.22	0.32
X6: Environment	0.05	-0.08	0.10	0.10	0.22	-0.27
X7: Constrained	-0.25	0.16	-0.94	-0.14	0.22	0.98
X10: Grant dependent	0.35	-1.22	0.98	0.23	-0.26	0.50

Cross-Tabulation of Non-hierarchical Six-Cluster Solution

		Seed Points from Hierarchical Cluster Analysis						
	Cluster	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Random Seed Points	**1**	26	0	2	0	9	1	38
	2	2	51	8	2	1	1	65
	3	1	2	55	0	5	26	89
	4	0	1	0	46	1	4	52
	5	7	10	3	0	61	2	83
	6	2	32	10	2	2	24	72
	Total	38	96	78	50	79	58	399

Clustering Variable Profiles





The results in Table 6.19 show that there is a consistency between the six-cluster solution obtained using seed points from the hierarchical cluster analysis and the solution based on random seed points. The cluster profiles show similarity across the cluster variate and the cross-tabulation of the cluster solutions shows that over two thirds of each cluster are in comparable clusters in each solution.

When attempting to label cluster solutions based on the seed points from the hierarchical analysis and random seed points there is full correspondence affirming the validity of the cluster solution (see Table 6.20).

Table 6.20: Cluster Labels for the Six-cluster Solutions using Seed Points from Hierarchical Cluster Analysis versus Random Seed Points.

	Seed Points from Hierarchical Cluster Analysis	**Random Seed Points**
Cluster Labels	Individualist	Individualist
	Multifunctional	Multifunctional
	Private Consumer	Private Consumer
	Conservationist	Conservationist
	Investor	Investor
	Amenity	Amenity

As illustrated in the above table, there is a great deal of resemblance between the two cluster solutions. Most clusters match up well between the cluster solutions. Although there are some differences in the cluster centroids, these are minor and do not detract from the similarity of the cluster labels in both solutions. In order to verify the cluster solution, it was profiled against a number of descriptive variables to ascertain their validity and plausibility. The profiling is detailed in the following section.

6.4.5 Profiling Final Cluster Solution

Profiling involves describing the characteristics of each cluster and, importantly, to differentiate between them. Independent and demographic data not used in the cluster analysis were used to profile the clusters. The questionnaire survey collected characteristic information on participants which can be used to profile the clusters. A summary of the descriptive profile of the six-cluster solution on these thirteen characteristics is shown in Table 6.21 (full profiling details are given in Appendix 13).

Table 6.21: Profile Summary of the Six-Cluster Non-hierarchical Cluster Solution on Associated Independent Characteristics

Independent Characteristics	κ^2	p
I_1 Woodland Type	19.595	.484
I_2 Bought Woodland	25.546	.001
I_3 Planted Woodland	18.959	.005
I_4 Inherited Woodland	13.231	.05
I_5 Owner Type	87.725	.0001
I_6 Distance from Woodland	32.267	.05
I_7 Involved in grant scheme	18.820	.005
I_8 Gender	15.598	.01
I_9 Age	31.620	.169
I_{10} Employment	37.426	
I_{11} Woodland Area	66.385	.0001
I_{12} Years Owned	64.446	.0001
I_{13} Hours work in woodland per week	44.987	

Of these thirteen characteristics, three show significant differences at the .0001 level across all six clusters (I_5, I_{11}, I_{12}). These variables, relating to owner type, size of woodland and number of years owned, indicate that there are very significant differences between the six clusters on these variables. This finding suggests that the six clusters do indeed represent discrete owner categories. A further variable (I_2) is significant at the .001 level, two variables (I_3, I_7) at the .005 level, one variable (I_8) at the .01 level and two further variables (I_4 and I_6) at the .05 level of significance. Four variables are not significant across the clusters (I_1, I_9, I_{10} and I_{13}). These profiles helped to develop the distinctive label for each cluster and assisted in describing each cluster's characteristics. A full description and analysis of each cluster is presented in the following section.

6.4.6 Description of Identified Private Woodland Owner Groups

The six clusters were named according to the objectives, motivations and attitudes that each cluster appeared to represent. Mean factor scores for owners in each discrete group and the results of the ANOVA tests are shown in Table 6.22. High mean scores indicate that a particular factor is important to that cluster or owner type.

Table 6.22: Characteristics of Six Woodland Owner Types Derived from Cluster Analysis

	Owner Groups							
Factors	*1*	*2*	*3*	*4*	*5*	*6*	*F*	*Sig.*
X1: Financially-oriented	0.758	-0.253	-0.373	-0.521	1.093	-0.491	59.552	<.0001
X2: Conservation	-0.825	-0.491	0.282	0.541	0.14	0.599	27.157	<.0001
X3: Private consumption	-0.184	-0.13	0.716	-0.461	0.389	-0.827	28.830	<.0001
X4: Public Amenity	-0.483	-0.134	-0.361	1.561	0.459	-0.882	81.528	<.0001
X5: Personal enjoyment	-1.353	0.494	0.340	-0.723	0.345	0.011	48.746	<.0001
X6: Environmental	-0.327	-0.187	-0.463	-0.07	0.544	0.625	19.805	<.0001
X7: Constrained	-0.06	0.582	-0.809	-0.089	0.008	0.218	22.332	<.0001
X8: Grant dependent	-0.098	-0.736	0.323	0.251	0.059	0.448	18.577	<.0001
Numbers of cases (n=399)	38	96	78	50	79	58		

Note: Owner groups refer to (1) Investor; (2) Individualist; (3) Private Consumer; (4) Amenity Owner; (5) Multifunctional Owner; (6) Conservationist.

Drawing on the above results, the following section describes the six identified and named private woodland owner groups based on the derived factor scores and the profiling on associated demographic and independent variables. Figure 6.3 provides a graphical representation of the cluster characteristics.

6.4.6.1 Cluster 1: Investor

The Investors, the smallest group in the sample, comprised 38 woodland owners, accounting for 9.5% of the sample. This group scored highly on just one strategic variable – financially-oriented (X1). Of all the owner groups, it was the most financially-oriented and owners prioritised timber production and investment opportunities in their woodland over any other objectives. They clearly d not manage their woodland for their own personal enjoyment, nor for the public benefits of wildlife conservation or recreation.

6.4.6.2 Cluster 2: The Individualist

The largest group in the sample, the Individualists, contained 96 woodland owners, accounting for 24.1% of the sample. Cluster members scored highly on two strategic variables – personal enjoyment (X5) and constrained (X7). This suggests that this owner group valued highly their woodland for privacy and private amenity use. Individualists appreciated the landscape values of its woodland and were keen to protect it from future development. These owners had a very low score on 'grant dependent' (X8), indicating that, although they were constrained in their management by time and money, they did not tend to apply for grants to assist them. They were not motivated by the conservation of wildlife in their woodlands and were not financially motivated.

6.4.6.3 Cluster 3: Private Consumer

This owner group contained 78 owners, 19.5% of the sample. The Private Consumer group scored highly on three strategic variables – private consumption (X3), personal enjoyment (X5) and grant dependent (X8). This suggests that these owners valued their woodland for the wood products that they can harvest (such as wood logs, poles etc.) for their own domestic use. Private Consumers were not financially-oriented, nor were they constrained by a lack of time or money, but they did consider grants useful in assisting their management activities. While they did not manage for the environmental benefits of pollution control or carbon sequestration, they did appreciate the wildlife benefits their woodland provides. Private Consumers got personal enjoyment from managing their woodland, valuing the privacy it affords them. In this regard, they were not keen on opening up their woodland for public access.

6.4.6.4 Cluster 4: Amenity Owner

This group contained 50 woodland owners, constituting 12.5% of the sample. Amenity Owners scored highly on two strategic variables – public amenity (X4) and conservation (X2). This indicates that they were keen to open up their woodlands to public access in the form of informal recreation (walking, horse riding, cycling, nature watching), but also appreciated the conservation value of woodland. Amenity Owners were not financially-oriented, although they may apply for grants to assist with management activities. They also did not own their woodland for their own personal enjoyment or consumption, neither did they manage for environmental objectives. They do, however, support wildlife conservation and the educational benefits that this provides.

6.4.6.5 Cluster 5: The Multifunctional Owner

The Multifunctional Owner group, with 79 woodland owners, accounted for 19.8% of the sample. Members of this cluster scored highly on five out of the eight variables (X1, X3, X4, X5, X6) and were ambivalent towards the other three variables (X2, X7, X8). This owner group, therefore, had multiple objectives for managing and owning woodland. They were highly financially-driven, but combined their extraction of timber with recreation, environmental aspects and their own personal enjoyment. Their environmental objectives were more to do with mitigating climate change and pollution control, than managing the woodland for wildlife and habitats. The Multifunctional Owner was not constrained by time, money or skills, and did not rely on grants to assist with woodland management.

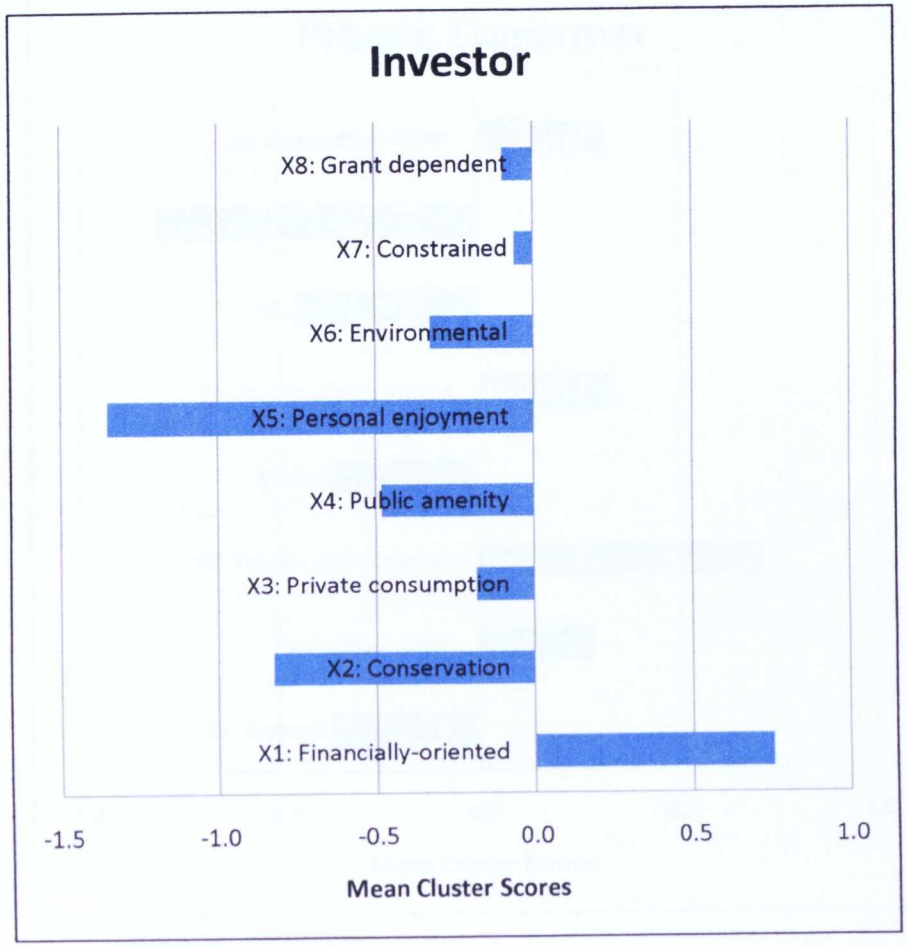
6.4.6.6 Cluster 6: The Conservationist

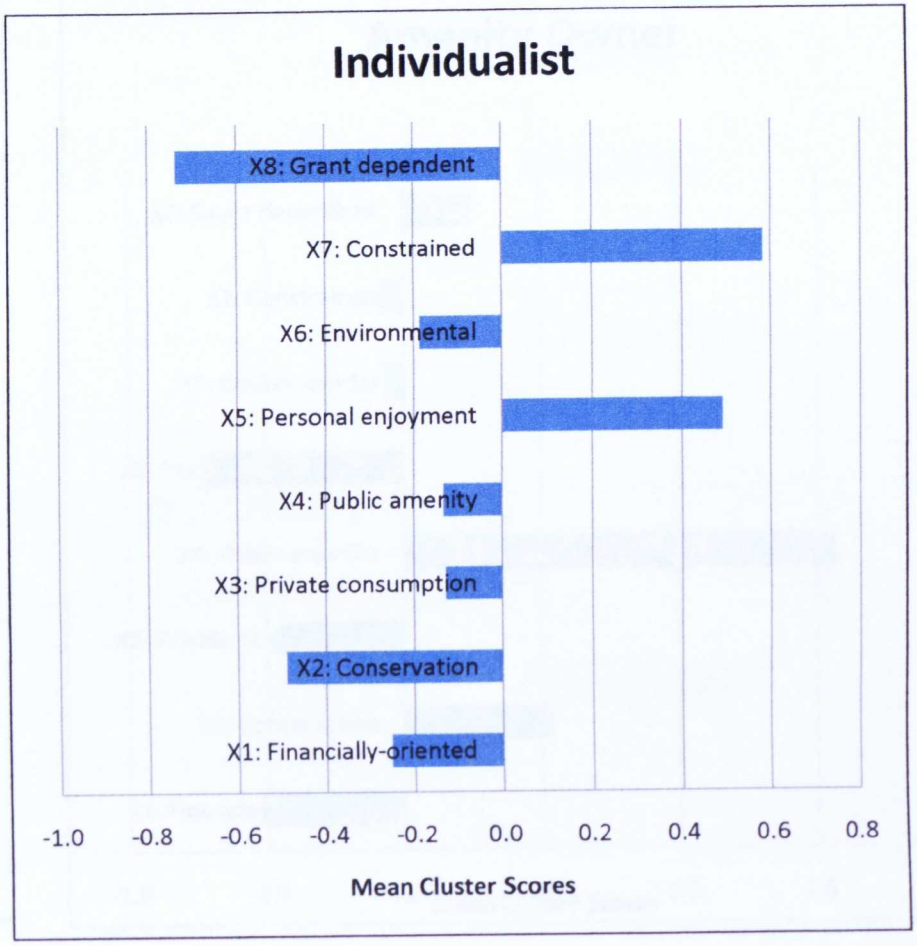
The Conservationist group contained 58 woodland owners, accounting for 14.5% of the sample. Cluster members scored highly on three strategic variables – conservation (X2), environment (X6) and grant dependent (X8). Thus, these owners are motivated to manage their woodlands to conserve wildlife habitats. They are opposed to recreational access in their woodlands. This

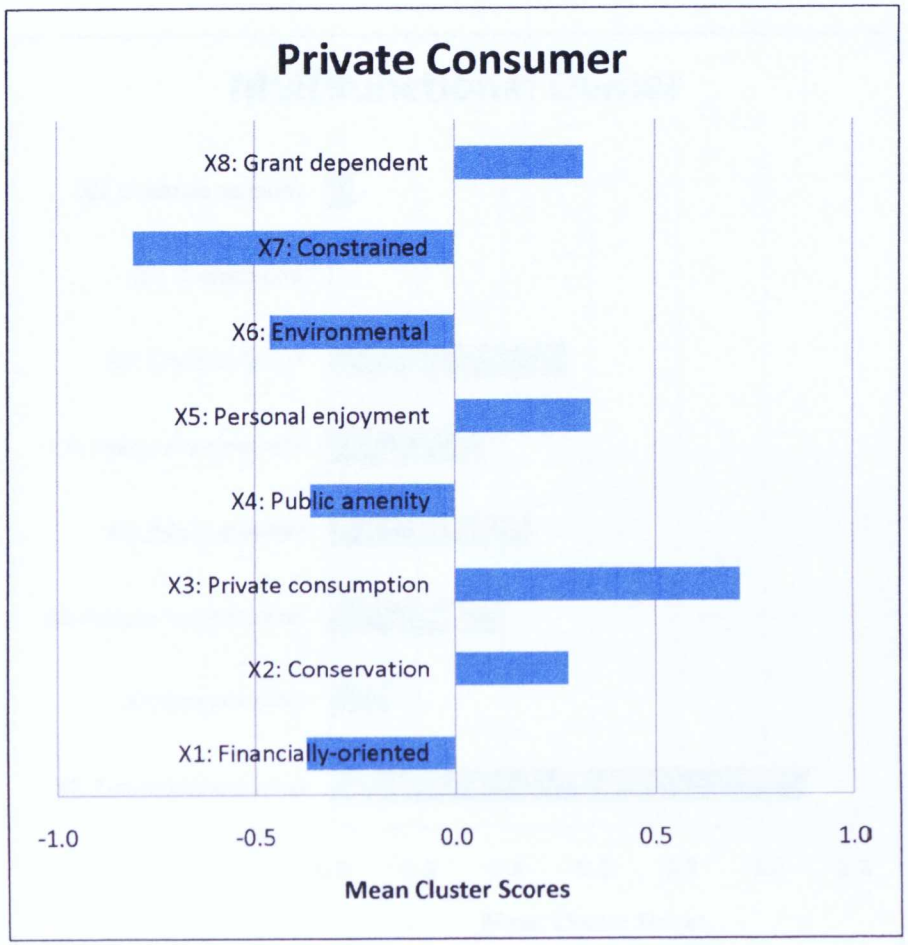
may be because they are fearful of the conflicts that can sometimes occur between people and wildlife. This owner group was not financially-motivated, but would apply for government grants to assist with management costs. The Conservationist owner group, whilst managing for wildlife conservation, also appreciated the broader environmental objectives, such as pollution control or climate change.

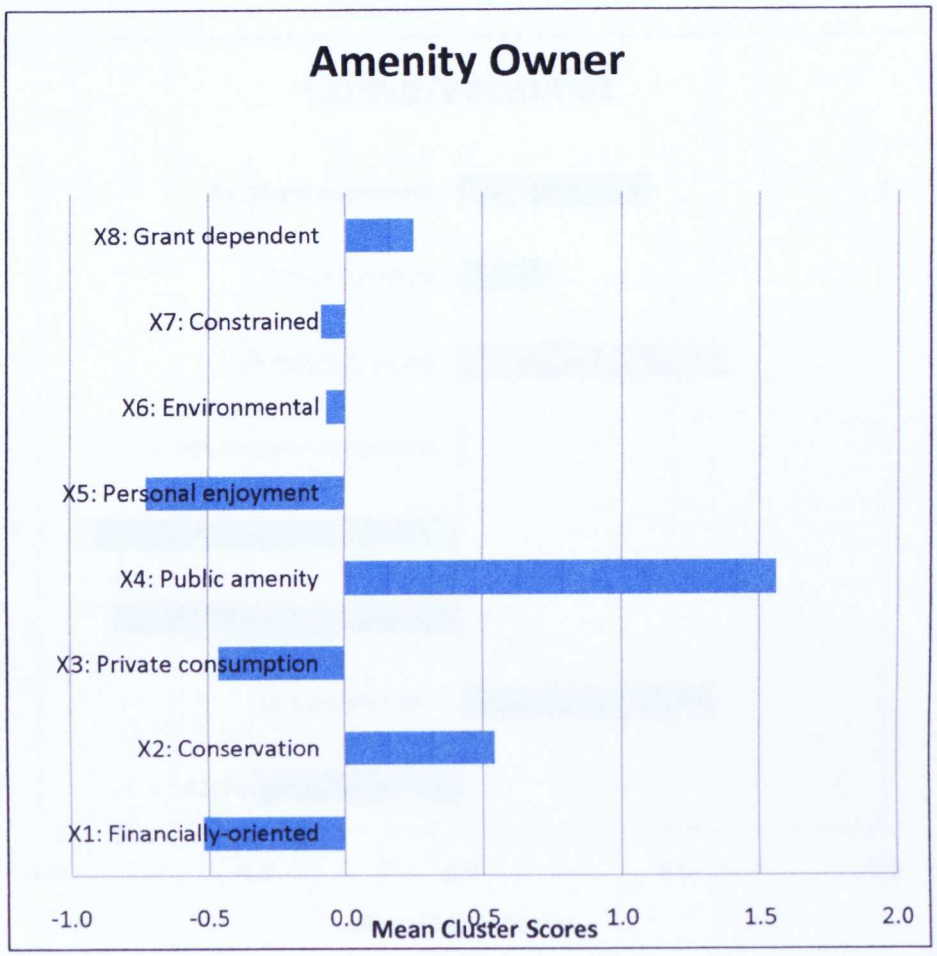
The following section outlines the discriminant analysis technique that was applied to validate the ability of the independent variables (X1-X8) to predict cluster membership and to aid in describing the differences between the cluster groups.

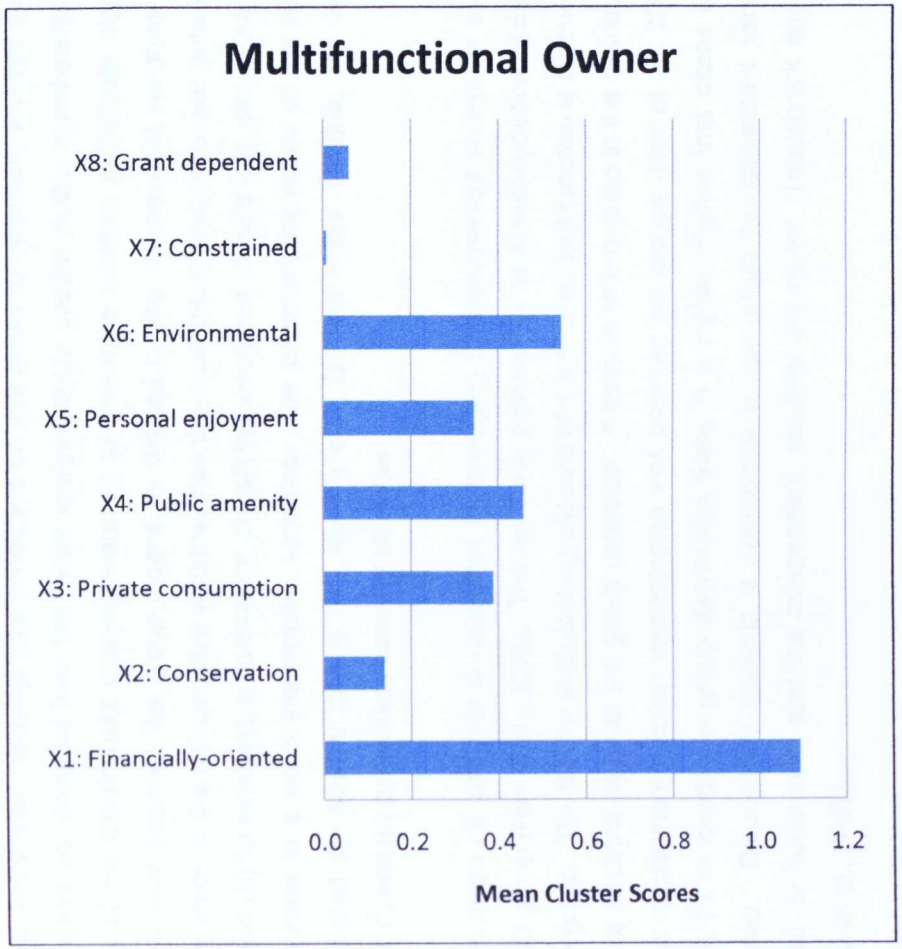
Figure 6.3: Strategic Variables (Factors) Associated with Private Woodland Owner Groups (Clusters)

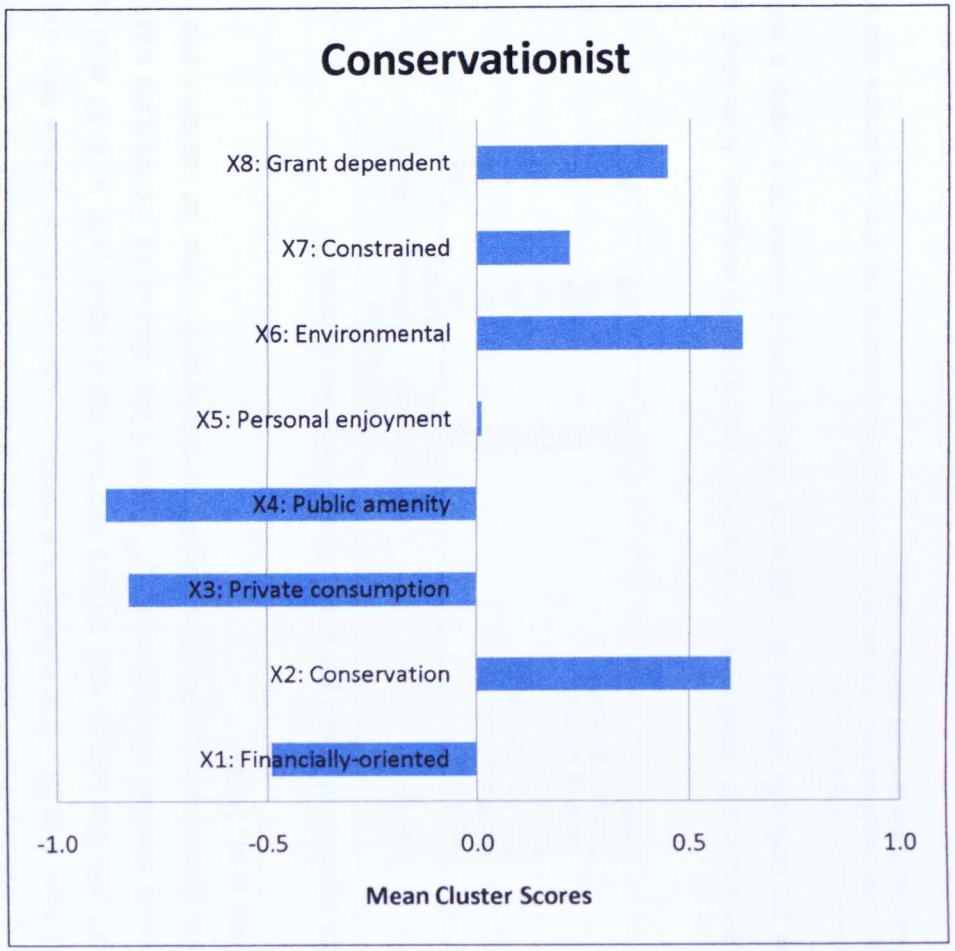





Private Consumer
X8: Grant dependent
X7: Constrained
X6: Environmental
X5: Personal enjoyment
X4: Public amenity
X3: Private consumption
X2: Conservation
X1: Financially-oriented
-1.0
-0.5
0.0
0.5
1.0
Mean Cluster Scores


Amenity Owner
X8: Grant dependent
X7: Constrained
X6: Environmental
X5: Personal enjoyment
X4: Public amenity
X3: Private consumption
X2: Conservation
X1: Financially-oriented
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
Mean Cluster Scores


Multifunctional Owner
X8: Grant dependent
X7: Constrained
X6: Environmental
X5: Personal enjoyment
X4: Public amenity
X3: Private consumption
X2: Conservation
X1: Financially-oriented
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Mean Cluster Scores


Conservationist
X8: Grant dependent
X7: Constrained
X6: Environmental
X5: Personal enjoyment
X4: Public amenity
X3: Private consumption
X2: Conservation
X1: Financially-oriented
-1.0
-0.5
0.0
0.5
1.0
Mean Cluster Scores

6.5 STAGE 3: DISCRIMINANT ANALYSIS - ASSESSING THE PREDICTIVE ABILITY OF THE STRATEGIC VARIABLES

A stepwise discriminant analysis was conducted on 399 cases to determine whether the eight strategic variables identified from the factor analysis could predict cluster membership. The objectives of the discriminant analysis were: (i) to determine whether statistically significant differences exist between the group means as defined by the independent variables; (ii) to determine which of the independent variables has the most discriminatory power between the groups; and (iii) to establish a method for classifying woodland owners into groups based on their responses to a set of independent variables. The discriminating power of the variables was evaluated by several criteria: (a) Mahalanobis D^2 and Wilks' lambda; (b) variance explained, I^2; and (c) percentage correctly classified.

The group mean (or centroid) is calculated by averaging the discriminant scores for all cases within each group (Hair et al., 2006). The centroids indicate the most likely position of cases for any given group. The test for statistical significance of the discriminant function is a generalised measure of distance between the group centroids. If there is little overlap in the distribution of cases, the discriminant function discriminates well between the groups (Hair et al., 2006). If there is a lot of overlap in group distribution there is a higher chance that cases may be misclassified. Discriminant analysis is appropriate to use when the dependent variable is categorical (or non-metric) and the independent variables are metric (Tabachnick and Fidell, 2001; Hair et al., 2006).

In this study, the dependent variable was the assigned cluster membership for each case (and so ranged from 1 to 6). The independent variables were the factor scores from the factor analysis (X1-X8).The sample was divided into two sub-samples (with a 50-50 split) using a proportionately stratified sampling strategy[25] (Table 6.23). One of the sub-samples was used to estimate the discriminant function (the analysis sample) and the other for validation (the holdout sample) (Hair et al., 2006).

Table 6.23: Number of cases per group in discriminant dataset

Group	No. of cases		
	Analysis sample	Holdout sample	Total
Individualist	48	48	**96**
Multifunctional	39	39	**78**
Private Consumer	39	39	**78**
Investor	25	25	**50**
Amenity Owner	29	29	**58**
Conservationist	19	19	**38**
Total	**199**	**199**	**398**

Discriminant analysis is sensitive to the size of the sample being analysed. A minimum number of 5 cases per predictor variable is suggested, although many researchers prefer a ratio of 20

[25] One case was removed from the sample to ensure that groups in the analysis sample had an equal number of cases as those in the holdout sample.

cases for each variable (Stevens, 2002; Hair et al., 2006). In this study, with 199 cases in each sub-sample and eight variables, there were 24.9 cases per variable. This was in excess of the minimum number of 5 as identified by Hair et al. (2006) and achieved the preferred ratio of 20:1. The sample size of each group in the dependent variable must also be considered. Hair et al. (2006) suggest that, at a minimum, the smallest group size must exceed the number of predictor variables, but preferably each group much have at least 20 cases. In this study, all groups were larger than the number of predictor variables, fulfilling the minimum requirements. Furthermore, each group had over 20 cases, except for one, which consisted of 19 cases.

6.5.1 Assumptions in discriminant analysis

There are a number of key assumptions made in a discriminant analysis: normality, linearity, non-muliticollinearity and homogeneity of covariance (Tabachnick and Fidell, 2001; Hair et al., 2006). An examination of the skewness and kurtosis values confirmed that all the variables had a normal distribution. An examination of scatterplots also indicated that all the variables were linear.

Multicollinearity among the independent variables can also impact on the discriminant functions. Multicollinearity, or tolerance, indicates that two or more independent variables are highly correlated, with one variable explaining or predicting the other. The tolerance values for all the variables were high (above .8), indicating only a small degree of multicollinearity[26].

Finally, there must be equal covariance matrices for the groups defined by the dependent variable, which was tested using Box's M test. The Box's M test value was 281.657; approx. F = 1.379; df1 = 180; df2 = 31738.446; p = .001, indicating that there was no departure from the null hypothesis of equal covariance matrices with an alpha level of .0001[27].

6.5.2 Estimating the discriminant model

When the dependent variable consists of two or more groups, the discriminant analysis calculates n-1 functions. This allows a greater level of discrimination and insight into the combinations of the independent variables that contributes to group discrimination (Hair et al., 2006). Thus, in this study, with six groups in the dependent variable, five discriminant functions were calculated. Two methods of estimation are available in discriminant analysis – simultaneous estimation and stepwise estimation. Simultaneous estimation computes the discriminant function considering all the independent variables at the same time (Hair et al., 2006). The stepwise method, however, enters the independent variables into the discrimant function one at a time, enabling the researcher to determine which are the most discriminating

[26] A tolerance value of 1 indicates that all the other independent variables do not collectively have any shared variance with the current variable (Hair et al. 2006).

[27] Box's M test is very sensitive to sample size and unequal group sizes, often indicating statistically significant violations of the homogeneity of covariance when the violations are not serious enough to cause a problem with the discriminant analysis. Warner (2008) suggests using a small alpha level with a large sample size (e.g. α = .001) to compensate for this. Since the sample size was large and the groups unequal, an alpha level of .0001 was used.

variables (Hair et al., 2006). Stepwise estimation was used in this study so that the discriminating power of each of the variables could be assessed.

The overall fit of the discriminant functions was assessed by calculating the discriminant Z scores for each case, evaluating the differences on the discriminant Z scores and assessing the accuracy of group membership prediction (Hair et al., 2006).

The discriminant functions are calculated for each case using the following equation, as provided in Hair et al. (2006):

$$Z_{jk} = a + W_1X_{ik} + W_2X_{2k} + \ldots + W_nX_{nk}$$

Where

Z_{jk} = discriminant Z score of discriminant function *j* for object *k*

a = intercept

W_1 = discriminant coefficient for independent variable *i*

X_{ik} = independent variable *i* for object *k*

The discriminant Z score allows cases on each function to be compared, with cases possessing similar Z scores assumed to be more alike than those with widely different scores. The group centroids (the average discriminant Z score for all group members) were compared using the Mahalanobis D^2 measure to assess the ability of the model to define significantly different group centroids (Hair et al., 2006). The test for statistical significance of the overall model using the Mahalanobis D^2 measure is given in Table 6:24. The test indicates that the overall model is statistically significant after the addition of the third variable (X4 Public Amenity), indicating a high level of validity in the model.

Table 6.24: Results of the Mahalanobis D^2 test for statistical significance of overall model.

Step	Variable	D^2	Between Groups	df2	Sig.
1	X5: Personal enjoyment	.018	2 and 4	194	.584
2	X3: Private consumption	.236	2 and 3	193	.102
3	X4: Public amenity	1.424	1 and 4	192	<.0001
4	X8: Grant dependent	1.819	2 and 3	191	<.0001
5	X6: Environmental	3.186	2 and 3	190	<.0001
6	X1: Financially-oriented	4.148	1 and 4	189	<.0001
7	X2: Conservation	4.962	1 and 3	188	<.0001
8	X7: Constrained	8.220	1 and 4	187	<.0001

At each step, the variable that maximizes the Mahalanobis distance between the two closest groups is entered.

The overall model was also tested for statistical significance using a multivariate goodness-of-fit statistic, Wilks' lambda (Λ) (Warner, 2008). Wilks' lambda assesses whether the model can

predict group membership better than chance, by calculating the proportion of variance in one or more discriminant functions that are not associated with group membership. There are three different degrees of freedom associated with Wilks' lambda, based on the number of cases, the number of groups and the number of independent variables. In order to simplify interpretation, SPSS converts Wilk's lambda into a chi-square (κ^2) value which can be assessed by comparing to the critical value for κ^2 at *n* degrees of freedom and $p = .001$. The overall Wilk's lambda (Λ) was significant ($\Lambda = .013$; $\kappa^2 = 664.80$; df = 40; $p<.0001$[28]), indicating that all eight variables differentiated across the six groups (Table 6:25). The residual Wilk's lambda ($\Lambda = .634$; $\kappa^2 = 87.45$; df = 4; $p<.0001$[29]) was also significant, indicating that after partialling out the effects of one discriminant function, the remaining predictors differentiated significantly across the six groups.

The first function explained 32.1% of the total amount of variance between the groups, with the remaining four functions explaining 23.3%, 17.9%, 15.5% and 11.2% of the total variance respectively (Table 6.25). Thus, no one of the discriminant functions explained all of the difference between each of the groups.

Table 6.25: Canonical discriminant functions

Function	Eigenvalue	% of Variance	Canonical Correlation
1	1.656	32.1	.790
2	1.201	23.3	.739
3	.925	17.9	.693
4	.798	15.5	.666
5	.577	11.2	.605

Function	Wilks' Lambda Λ	Chi-square κ^2	df	Sig.
1 thru 5	.031	664.80	40	<0.0001
2 thru 5	.083	477.28	28	<0.0001
3 thru 5	.183	325.80	18	<0.0001
4 thru 5	.353	200.08	10	<0.0001
5	.634	87.45	4	<0.0001

6.5.3 Validation of the discriminant functions

With large sample sizes, statistical significance between the groups can be indicated even when the group centroids are very similar. Thus, to assess the predictive accuracy of the discriminant functions classification matrices are constructed to identify the practical significance of the model. The hit ratio, or percentage of correctly classified cases, was examined to assess the

[28] Critical value for κ^2 with df = 40 and p = .001 is 73.40 (Warner 2008, p. 988).
[29] Critical value for κ^2 with df = 4 and p = .001 is 18.47 (Warner 2008, p. 988).

predictive ability of the model to correctly classify cases (Tabachnick and Fidell, 2001; Hair et al., 2006). If both the statistical significance of the model and the hit ratio validate the predictive accuracy of the discriminant model, the researcher can be confident of discrimination between the groups in the dependent variable (Hair et al., 2006).

The cutting score (critical Z value) for each discriminant function was determined as a weighted average based on the prior probabilities of group size (Hair et al., 2006, p. 297). However, since the cluster analysis used Ward's method, which tends to produce groups of fairly equal size, it was not possible to assume that the proportions in the groups were representative of proportions in the wider population. For this reason the assumption was made that each group had an equal chance of occurring[30].

The classification matrix was produced using the holdout sample to test how well the model can predict cluster membership. As noted in Section 6.5, the overall sample was divided into two groups of 199 cases each – the analysis sample, used to generate the discriminant functions; and the holdout sample, used to validate the discriminant functions through the classification matrix. In this analysis, the weights generated by the analysis sample are multiplied by the variable measurements of the holdout sample (Hair et al., 2006). The discriminant scores of the holdout sample are compared with the critical cutting score value and the results are presented in a classification matrix, given in Table 6.26.

Table 6.26: Classification Results of Overall Discriminant Model

Actual Group Membership	No. of cases	Predicted Group Membership No. cases (%)					
		Ind	**Mf**	**PC**	**Am**	**Con**	**Inv**
Analysis Sample							
Ind	48	47 (97.9)	0 (0.0)	0 (0.0)	1 (2.1)	0 (0.0)	0 (0.0)
Mf	40	0 (0.0)	39 (97.5)	1 (2.5)	0 (0.0)	0 (0.0)	0 (0.0)
PC	39	0 (0.0)	0 (0.0)	37 (94.9)	1 (2.6)	0 (0.0)	1 (2.6)
Am	29	1 (3.4)	0 (0.0)	0 (0.0)	28 (96.6)	0 (0.0)	0 (0.0)
Con	19	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	19 (100.0)	0 (0.0)
Inv	25	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	25 (100.0)

[30] Both equal group size and actual group size prior probabilities were tested, with no difference in the outcome of the classification matrix.

Holdout Sample							
Ind	48	46 (95.8)	0 (0.0)	1 (2.1)	0 (0.0)	1 (2.1)	0 (0.0)
Mf	39	3 (7.7)	34 (87.2)	1 (2.6)	0 (0.0)	1 (2.6)	0 (0.0)
PC	39	2 (5.1)	0 (0.0)	36 (92.3)	1 (2.6)	0 (0.0)	0 (0.0)
Am	29	0 (0.0)	0 (0.0)	1 (3.4)	27 (93.1)	1 (3.4)	0 (0.0)
Con	19	1 (5.3)	0 (0.0)	0 (0.0)	0 (0.0)	18 (94.7)	0 (0.0)
Inv	25	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.0)	24 (96.0)
Cross-validation Sample							
Ind	48	45 (93.8)	1 (2.1)	1 (2.1)	1 (2.1)	0 (0.0)	0 (0.0)
Mf	39	0 (0.0)	39 (97.5)	1 (2.5)	0 (0.0)	0 (0.0)	0 (0.0)
PC	39	1 (2.6)	0 (0.0)	35 (89.7)	2 (5.1)	0 (0.0)	1 (2.6)
Am	29	1 (3.4)	0 (0.0)	0 (0.0)	27 (93.1)	1 (3.4)	0 (0.0)
Con	19	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	19 (100.0)	0 (0.0)
Inv	25	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	25 (100.0)

% correctly classified				
Analysis sample	97.5%	C_{MAX}[31]	24.0%	(Threshold value[a]: 30.0%)
Holdout sample	93.0%	C_{PRO}	63.5%	(Threshold value[a]: 79.4%)
Cross-validation sample	95.0%			
Press's Q[32]				
Analysis sample	940.90			
Holdout sample	834.09			
p<0.0001				

[a]Threshold values = 25% greater than C_{MAX} and C_{PRO} value.

Note: Ind = Individualist; Mf = Multifunctional; PC = Private Consumer; Am = Amenity Owner; Con = Conservationist; Inv = Investor

[31] Maximum chance criterion arbitrarily assigns all cases to the largest group. In this case, the largest group has 48 cases, and so the maximum chance criterion value is 48/199 x 100.

[32] Critical value of Press's Q statistic at .01 significance level is 6.63.

The analysis sample correctly classified 97.5% and the holdout sample 93.0% (Table 6:26), indicating that the model shows a high degree of accuracy in classifying cases into the correct cluster.

In order to determine whether the hit ratio has an acceptable level of predictive accuracy, the percentage of cases that could be correctly classified by chance must be determined. When the sample sizes of the groups are unequal, the maximum chance criterion (C_{MAX}) and the proportional chance criterion (C_{PRO}) are applied. C_{MAX} considers only the largest group, but does not take into account the varying chance of a case being assigned to a group of a different size. C_{PRO}, on the other hand, is appropriate when the researcher wants to correctly identify the cases in all groups. The formula is:

$$C_{PRO} = p^2 + (1-p)^2$$

where p = proportion of individuals in group 1
and 1-p = proportion of individuals in group 2
(as in Hair et al., 2006)

C_{MAX} and C_{PRO} standards were calculated for both the analysis and the holdout samples. As a rule of thumb, Hair et al. (2006) suggests that the classification accuracy should be at least 25% more than that achieved by chance. In this study, all scores were greater than the threshold values of C_{MAX} (30.0%) and C_{PRO} (79.4%).

Finally, Press's Q statistic was calculated to statistically test the discriminatory power of the classification matrix. This test compares the number of correct classifications with the total sample size and the number of groups (Hair et al., 2006). The formula for the Q statistic is:

$$\text{Press's Q} = \frac{[N - (nK)]^2}{N(K-1)}$$

where N = total sample size
and n = number of cases correctly classified
and K = number of groups

If the value exceeds the critical value at the desired significance level[33], it can be assumed that the ratio of hits classification matrix is better than chance[34]. In this study, Press's Q statistic for both the analysis sample (940.90) and the holdout sample (834.09) is greater than the critical value of 6.63 at a significance level of .01. Press's Q statistic, therefore, indicates that the

[33] The critical value of Press's Q statistic at .01 significance level is 6.63.
[34] Press's Q statistic is highly sensitive to sample size. Large samples are more likely to show significance than smaller samples of the same classification rate (Hair et al. 2006).

classification of cases using the discriminant functions was statistically better than chance, supporting the predictive ability of the model (Table 6.26).

Cross-validation of the discriminant functions was also performed to test the external validity. Cross-validation calculates discriminant functions based on sub-sets of the sample, leaving one case out in each sub-set. Group membership for the removed case is predicted, based on the discriminant functions estimated on the remaining cases. The overall hit ratio for cross-validation was calculated at 95.0% (Table 6.26), which indicates a high level of predictive accuracy in the model.

The misclassified cases from the holdout sample were examined to ascertain whether there was a pattern regarding misclassification. No pattern was found and since the scatterplots (Appendix 14) showed some overlap between the clusters, it was likely that a small number of cases could equally be classified into one or other cluster.

6.5.4 Interpretation

The discriminant model was interpreted using three methods: standardized discriminant coefficients (weights); discriminant loadings (structure correlations); and partial F values and group centroids. The standardized discriminant coefficients represent the relative contribution of the variable to the function[35]. However, as with *b* coefficients in regression analysis, a small coefficient may either mean the variable's contribution is irrelevant on that function, or that it has been partialed out because of high multicollinearity (Hair et al., 2006, p. 307).

As can be seen from the discriminant function coefficients in Table 6.27, each discriminant function was characterised by a set of discriminating variables. Of particular note was discriminant function 2, which had high coefficients on seven out of the eight independent variables.

Table 6.27: Standardized Canonical Discriminant Function Coefficients

	Discriminant Function*				
Predictor Variables	**1**	**2**	**3**	**4**	**5**
X1: Financially-oriented	.191	**-.331**	**.820**	-.085	.228
X2: Conservation	**.588**	**.442**	**-.314**	.238	**.427**
X3: Private consumption	.074	**.497**	**.562**	-.115	**-.438**
X4: Public Amenity	**.753**	**-.313**	-.045	.283	**-.511**
X5: Personal enjoyment	-.195	**.459**	.283	**.817**	-.048
X6: Environmental	**.314**	-.095	.096	.273	**.687**
X7: Constrained	-.281	**-.618**	-.090	**.435**	.221
X8: Grant dependent	**.435**	**.536**	-.071	-.296	**.321**

*Coefficients greater than .300 are indicated in bold type.

[35] Larger weights indicate that the variable contributes more to the discriminatory power of the function than smaller weights.

Discriminant loadings are less affected by multicollinearity than discriminant function coefficients and so were used for interpretation purposes (Table 6.28), along with an examination of the group means (centroids) (Table 6.29). Structure correlations denote a simple linear correlation between a variable and function and are interpreted like factor loadings[36] alongside the group centroids.

Table 6.28: Discriminant Loadings on Groups

Independent Variables	Discriminant Functions 1	2	3	4	5
X4: Public Amenity	**.685**	**-.304**	-.078	.282	**-.546**
X2: Conservation	**.338**	.201	-.214	.173	**.316**
X7: Constrained	-.111	**-.350**	-.057	.229	.107
X8: Grant dependent	.243	**.301**	-.010	-.294	.137
X1: Financially-oriented	.167	**-.302**	**.755**	-.120	.283
X3: Private consumption	.092	**.330**	**.414**	-.119	-.287
X5: Personal enjoyment	-.228	**.371**	.211	**.757**	-.079
X6: Environmental	.208	-.042	.125	.183	**.472**

Pooled within-group correlations between discriminating variables and standardized canonical discriminant functions.
Loadings greater than .300 are indicated in bold type.

Table 6.29: Group centroids on discriminant functions

Group	Discriminant Functions 1	2	3	4	5
Individualist	1.380	.811	.110	-.813	.553
Multifunctional	-1.165	.166	-1.489	-.485	-.447
Private consumer	.234	-1.893	-.143	.467	.632
Amenity	.480	-.584	1.159	-.290	-1.469
Conservationist	.963	1.387	-.423	2.315	-.312
Investor	-2.441	.753	1.371	.185	.608

Unstandardized canonical discriminant functions evaluated at group means

An examination of the group centroids suggested that the fourth discriminant function discriminated between the Conservationist (mean 2.315) group and the other owner groups. Discriminant function five appeared to discriminate between the Amenity Owner (mean -1.469) and the other groups. The first discriminant function separated the Individualist (mean 1.380) from the Multifunctional Owner (mean -1.165) and the Investor (mean -2.441). Discriminant function two discriminated between the Private Consumer (-1.893) and the Conservationist (mean 1.387). The third discriminant function discriminated between the Multifunctional Owner (mean -1.489) and the Amenity Owner (mean 1.159) and the Investor (mean 1.371). Thus, each discriminant function contributed to explaining the differences between each of the woodland owner groups.

[36] Loadings of ±.40 or higher are considered substantive (Hair et al. 2006, p. 307).

The contribution of each variable to the total variance between groups was tested using Petersen and Mahajan's (1976) method. The variance between the groups (I^2) that was attributed to the total set of variables was calculated as $1-\Lambda$[37]. Variance partitioning for each of the variables was achieved by running separate discriminant analyses with varying combinations of predictor variables and then calculating the percentage contribution of each variable to the total variance between groups.

The eight predictor variables had large discriminatory power, with 96.9% (1 - Λ) of the variance in the dependent variable accounted for by all the predictor variables acting together as a set (Table 6.25). An evaluation of the predictor variables assessed which variables contributed the most discriminatory power to the overall prediction of 96.9% (Table 6.30).

Table 6.30: Variance partitioning of strategic variables.

Predictor Variables	I^{2a}	Contribution	% Contribution
Total set of variables	.969		
X4: Public Amenity	.934	.035	3.61
X5: Personal enjoyment	.943	.026	2.68
X1: Financially-oriented	.946	.023	2.40
X2: Conservation	.950	.019	1.96
X3: Private consumption	.953	.016	1.65
X8: Grant dependent	.955	.014	1.44
X7: Constrained	.956	.013	1.34
X6: Environmental	.959	.010	1.03

Adapted from Peterson and Mahajan (1976); variables ordered according to % contribution.
[a] $I^2 = 1 - \Lambda$

The contribution of each individual variable accounted for 16.11% of the total variance (Table 6.30). The remaining 83.89% of variance was a result of the interaction of the predictor variables in predicting cluster membership. The predictor variable *X4: Public Amenity* was the best discriminator at 3.61% and *X6: Environmental* was the least discriminating predictor variable, contributing only 1.03% to the variance. However, what was of particular note, was the large proportion of the variance that is accounted for by the interaction of two or more of the predictor variables. This implied that the groups were defined by a combination of variables and not by one variable alone.

In stepwise estimation, an examination of the partial F values can also assist in assessing the relative discriminatory power of the individual variables, with larger F values indicating greater discriminatory power (Hair et al., 2006). However, Warner (2008) warns that there is an increased risk of Type I errors[38] with the F statistic and suggests using the Bonferroni correction to reduce the risk of Type I errors. For an error rate of $\alpha = .05$, it is divided by the number of significance tests performed. Thus, in this case, there were eight significance tests (as there are 8 independent variables), so the Bonferroni corrected alpha level for each F test is .05/8 =

[37] Λ = Wilk's lambda (see Table 6.24).
[38] Type I error – probability of incorrectly rejecting the null hypothesis.

.006. Each F test must, therefore, be less than .006 to be statistically significant.

An examination of the partial F values (Table 6.31) suggested a similar ordering of variables to the variance partitioning in Table 6.30 according to their discriminatory power.

Table 6.31: Tests of Equality of Group Means

	Wilks' Lambda	F	df1	df2	Sig.
X4: Public Amenity	.470	43.758	5	194	<.0001
X5: Personal enjoyment	.570	29.232	5	194	<.0001
X1: Financially-oriented	.574	28.765	5	194	<.0001
X3: Private consumption	.734	14.041	5	194	<.0001
X2: Conservation	.734	14.037	5	194	<.0001
X8: Grant dependent	.778	11.099	5	194	<.0001
X6: Environmental	.804	9.456	5	194	<.0001
X7: Constrained	.820	8.516	5	194	<.0001

Variables ordered according to F value.

The independent variable providing the greatest discrimination between the six groups was *X4: Public Amenity,* weighted positively on discriminant function one and negatively on discriminant functions two and five (Table 6.27). *Personal enjoyment (X5)* and *X1: Financially-oriented* were the next most discriminating predictive variables. *Personal enjoyment (X5)* was represented by weights on discriminant functions two and four (differing from *X7: Constrained,* which while it was weighted heavily on discriminant functions four, was weighted negatively on discriminant function two). *X1: Financially-oriented* was weighted positively on discriminant function three, but negatively on discriminant function two. The variables *X2: Conservation* and *X8: Grant Dependent* were represented in discriminant functions one, two and five, although *X2: Conservation* was also weighted negatively on discriminant function three. The independent variable *X3: Private consumption* was important in discriminant functions two and three, and weighted negatively on discriminant function five. *Environmental (X6)* was important for discriminant functions one and five. This implies that no one discriminant function adequately discriminated between all six groups, suggesting that woodland ownership is complex with overlaps between each of the identified groups. This is also illustrated in scatterplots which graphically portray the group centroids and the distribution of cases in each group (see Appendix 14).

The discriminant analysis provided verification of the validity of the ability of the eight variables derived from the factor analysis to predict group membership. The high level of confidence in the variable's predictive ability is confirmation that the developed model is robust and provides a useful representation of the nature of private woodland ownership in England. In order to describe the revealed owner groups further, the clusters were profiled against the descriptive variables, detailed in the following section.

6.6 PROFILING OF WOODLAND OWNER GROUPS

In order to profile each of the identified cluster groups further, bivarate statistics were used to identify variables which differed significantly across the cluster groups. Chi-square tests of independence were used for nominal variables, and a one way ANOVA analysis was conducted on the remaining variables. The bivariate profiling allowed information from the survey, which was not used in the factor or cluster analysis, to further characterise the cluster groups. This data consists of descriptive variables, such as owner and woodland characteristics, as well as the management activities and knowledge gathering sources of woodland owners. The significant differences between the cluster groups on many of the variables supports the external validity of the clusters.

6.6.1 Woodland Owner Characteristics

There was a significant difference in the gender characteristics at the .005 significance level between the six owner groups, with less women in the Private Consumer (6.4%) and Investor (7.9%) owner groups than men. Women were most represented in the Conservationist (26.3%) and Amenity Owner (28.6%) groups (Table 6.32). There was no significant difference in age distribution among the owner groups (κ^2 = 29.347; df = 25; p = .250) with most owners aged between 50-69 years (58.5%) (Table 6.33). However, cross tabulation of the length of woodland ownership and owner group membership revealed that while over 40% of Individualists and Private Consumers had owned their woodland for less than 10 years, almost half of Conservationists had owned their woodland for less than 5 years and Multifunctional Owners had owned woodland for either less than 5 years or for over 31 years (Table 6.34). While 40% of Amenity Owners had owned their woodland for between 6 and 10 years, a further 20% had been in ownership for over 31 years. Similarly, just over 21% of Investors had owned their woodland for over 31 years, but over 36% had been in ownership for less than 10 years.

Table 6.32: Association Between Gender and Owner Groups

Owner Group	Gender	
	Male %	Female %
Ind	83.2	16.8
Mf	82.1	17.9
PC	93.6	6.4
Con	73.7	26.3
Inv	92.1	7.9
Am	71.4	28.6
n = 399		

κ^2 = 16.668; df = 5; p = .005

Table 6.33: Association Between Age and Owner Groups

Owner Group	Age (years)					
	<30 %	30-39 %	40-49 %	50-59 %	60-69 %	>70 %
Ind	0.0	4.2	21.1	30.5	29.5	14.7
Mf	1.3	13.9	22.8	31.6	20.3	10.1
PC	0.0	3.8	20.5	29.5	34.6	11.5
Con	0.0	3.5	19.3	26.3	33.3	17.5
Inv	0.0	5.3	13.2	28.9	26.3	26.3
Am	2.0	14.0	10.0	32.0	26.0	16.0
n = 399						

κ^2 = 29.347; df = 25; p = .250

Table 6.34: Association Between Experience and Owner Groups

Owner Group	Length of ownership (years) (%)						
	<5	6-10	11-15	16-20	21-25	26-30	>31
Ind	25.8	18.3	17.2	15.1	6.5	4.3	12.9
Mf	29.9	13.0	9.1	6.5	7.8	11.7	22.1
PC	23.3	21.9	19.2	12.3	12.3	2.7	8.2
Con	48.2	14.3	8.9	7.1	3.6	5.4	12.5
Inv	15.2	21.2	9.1	12.1	12.1	9.1	21.2
Am	8.0	40.0	14.0	10.0	4.0	4.0	20.0
n = 399							

κ^2 = 59.381; df = 30; p = .001

There was a significant difference at the .05 level in employment status between the owner groups. All owner groups were dominated by self-employed owners, except for the Conservationists, who had a relatively high proportion of retired owners (Table 6.35). A third of Private Consumers and Individualists were also retired. Multifunctional Owners were the least likely to be retired, with over 50% self-employed and a further 27.3% in full-time employment.

Table 6.35: Association Between Employment Status and Owner Groups

Owner Group	Employment status (%)					
	Full-time	Part-time	Self-employ	Not working	Retired	Other
Ind	26.3	3.2	34.7	2.1	31.6	2.1
Mf	27.3	10.4	51.9	0.0	10.4	0.0
PC	21.8	3.8	39.7	1.3	33.3	0.0
Con	13.8	6.9	34.5	1.7	41.4	1.7
Inv	15.8	7.9	52.6	0.0	23.7	0.0
Am	27.1	12.5	35.4	0.0	22.9	2.1
n = 399						

κ^2 = 37.953; df = 25; p = .047

A cross-tabulation of the six clusters with the owner type variables from the survey suggested different stated owner types across clusters (Table 6.36). It can be seen that the Individualist featured prominently for farmers, individual owners and family owners. Multifunctional Owners

were common across farm and family owners and estates. Private consumers were most likely to be individual owners and Amenity owners were most likely to be trusts, charities or other owner types. The Investor owner group was the least common cluster across the stated owner types, accounting for only 9.5% of all owners. The Amenity Owner was also not very common across most owner types, except for the individual owner, accounting for 12.5% of all owners. However, 60.0% of owners in the club, trust or charity category were Amenity owners, indicating that this type of owner is very likely to be willing to provide public access.

Table 6.36: Association Between Stated Owner Type and Owner Groups

	Owner Type (%)				
Owner Group	**Farm**	**Individual**	**Family**	**Estate**	**Other**
Ind	30.2	46.9	11.5	9.4	2.1
Mf	34.2	24.1	15.2	21.5	5.1
PC	23.1	56.4	6.4	12.8	1.3
Con	41.4	37.9	13.8	6.9	0.0
Inv	31.6	34.2	7.9	18.4	7.9
Am	26.0	18.0	14.0	12.0	30.0
n = 399					

$\kappa^2 = 88.752$; df = 20; $p < .0001$

6.6.2 Woodland Characteristics

A cross tabulation of the type of woodland owned with the owner groups revealed no significant difference between the owner groups ($\kappa^2 = 21.347$; df = 20; $p = .377$), with a fairly even split of ASNW, broadleaves and mixed woodland between the owner groups (Table 6.37). However, Multifunctional Owners tended to have the highest proportion of mixed woodland (41.8%), Private Consumers the highest proportion of ASNW (39.7%), and Conservationists the highest proportion of broadleaves (34.5%). Conifer was the least represented woodland type in the sample, accounting for just 0.8% of the sample, with 66.7% of coniferous woodland being owned by the Investors.

Table 6.37: Association Between Woodland Type and Owner Groups

	Type of Woodland (%)				
Owner Group	**ASNW**	**Broadleaves**	**Conifer**	**Mixed**	**Other**
Ind	32.3	30.2	1.0	34.4	2.1
Mf	32.9	22.8	0.0	41.8	2.5
PC	39.7	29.5	0.0	29.5	1.3
Con	37.9	34.5	0.0	25.9	1.7
Inv	23.7	34.2	5.3	36.8	0.0
Am	30.0	30.0	0.0	38.0	2.0
n = 399					

($\kappa^2 = 21.347$; df = 20; $p = .377$)

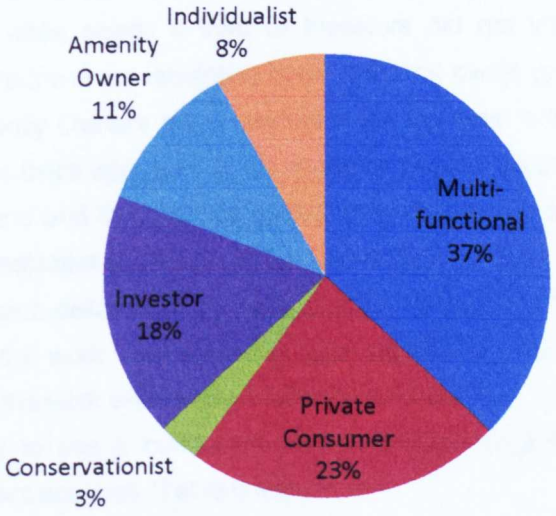
While the majority of woodlands in this study (almost 40%) were between 3 and10 hectares, there were significant differences in the size of woodland owned by the different owner groups. Very large woodlands (>50 ha) were most likely to be owned by Multifunctional Owners (31.6%) (Table 6.38). Very small woodlands (<2 ha) were most likely to be owned by Conservationists (31.6%), Private consumers (22.1%) or Individualists (17.6%).

Table 6.38: Association Between Area of Woodland and Owner Groups

	Area of Woodland (%)						
Owner Group	<2 %	3-10 %	11-20 %	21-30 %	31-40 %	41-50 %	>50 %
Ind	17.6	48.4	14.3	6.6	4.4	3.3	5.5
Mf	12.7	30.4	15.2	6.3	1.3	2.5	31.6
PC	22.1	41.6	9.1	9.1	1.3	5.2	11.7
Con	31.6	52.6	7.0	5.3	1.8	0.0	1.8
Inv	18.4	23.7	10.5	7.9	5.3	13.2	21.1
Am	18.8	27.1	14.6	10.4	6.3	2.1	20.8
n = 399							

$\chi^2 = 67.666$; df = 30; p <.0001

Figure 6.4: Total area of woodland by owner group



The highest proportion of the total woodland cover in this study was owned by Multifunctional owners (37%) and the smallest (3%) by Conservationists (Figure 6.4). When compared to the size of woodland owned and length of ownership, Multifunctional owners tended to own large woodlands and for longer (see Tables 6.34 and 6.38). Conservationists most commonly owned small (<10 ha) woodlands and had not owned their woodlands for long (<5 years), perhaps indicating more recent trends in woodland ownership. Table 6.39 indicates that most of the owner groups were more likely to buy their woodland, except Conservationists and Amenity Owners, who were more likely to have planted their woodland on existing land. The highest proportion of inherited woodland belonged to Individualists (26.5%), and the highest proportion

of planted woodland belonged to Conservationists (22.6%). The highest proportion of purchased woodlands was owned by Individualists (28.2%).

Table 6.39: Routes of Acquisition Between Cluster Groups

Owner Group	How acquired (%)		
	Bought	Inherited	Planted
Ind	64.6	27.1	33.3
Mf	53.2	31.6	40.5
PC	71.8	12.8	37.2
Con	37.9	24.1	65.5
Inv	50.0	36.8	34.2
Am	38.0	18.0	48.0
κ^2	25.620	12.533	18.615
df	5	5	5
Sig.	<.0001	.028	.002

6.6.3 Woodland Management Attributes

Table 6.40 presents the cross tabulation of the time spent working in the woodland between the groups. While there was no significant difference between the owner groups, Multifunctional and Amenity Owners were likely to spend the most amount of time per week working in their woodland, while nearly a third of Investors did not work in their woodland at all. When compared to the cross tabulation of the distance owner groups lived from their woodland (Table 6.41), Amenity Owners and Investors were the least likely to live adjacent to their woodland. Predictably, there appeared to be a relationship between the amount of time spent working in the woodland and the distance of the owner to the woodland (Table 6.42). Generally, owners who lived adjacent to their woodland were able to spend more time working in it than owners who live some distance away. Out of all the groups, Private consumers were the most likely to carry out the work themselves in their woodland, Amenity Owners were the most likely to undertake the work with family, Multifunctional Owners, Conservationists and Investors were the most likely to use a contractor, and Individualists generally used a woodman to carry out management activities (Table 6.43).

Table 6.40: Time Spent Working in Woodland Between Owner Groups

Owner Group	Number of hours worked in woodland (hours per week)								
	0 %	<1 %	1 %	2 %	3 %	4 %	5 %	6 %	7+ %
Ind	17.1	8.5	23.2	20.7	6.1	2.4	7.3	2.4	12.2
Mf	18.8	5.8	13.0	20.3	4.3	8.7	4.3	1.4	23.2
PC	16.2	13.5	13.5	14.9	10.8	8.1	6.8	5.4	10.8
Con	22.6	13.2	13.2	20.8	3.8	7.5	7.5	5.7	5.7
Inv	30.3	18.2	21.2	12.1	0.0	6.1	0.0	6.1	6.1
Am	18.2	11.4	6.8	18.2	4.5	13.6	2.3	4.5	20.5

n = 399

κ^2 = 44.496; df = 40; p = .288

Table 6.41: Distance from Woodland of Owner Groups

	Distance from Woodland (miles)				
Owner Group	0 %	1 %	2-10 %	10-40 %	>40 %
Ind	63.2	11.6	12.6	6.3	6.3
Mf	62.8	12.8	9.0	5.1	10.3
PC	64.1	9.0	14.1	9.0	3.8
Con	65.5	15.5	6.9	0.0	12.1
Inv	34.2	15.8	28.9	7.9	13.2
Am	54.0	6.0	20.0	6.0	14.0
n = 399					

κ^2 = 30.652; df = 20; p = .060

Table 6.42: Cross tabulation of distance from woodland and hours worked

Number hours worked in woodland (hours per week)	Owner residence distance from woodland (miles)				
	0 %	1 %	2-10 %	10-40 %	>40 %
0	45.6	16.2	10.3	7.4	20.6
<1	64.1	7.7	12.8	5.1	10.3
1	63.6	10.9	10.9	1.8	12.7
2	67.7	7.7	18.5	3.1	3.1
3	80.0	15.0	0.0	0.0	5.0
4	57.7	7.7	23.1	11.5	0.0
5	78.9	5.3	0.0	15.8	0.0
6	57.1	14.3	21.4	0.0	7.1
7+	52.1	10.4	20.8	12.5	4.2
n = 399					

κ^2 = 53.409; df = 32; p = .010

Table 6.43: Woodland Worker Between Owner Groups

	Main woodland worker				
Owner Group	Self %	Contractor %	Estate worker %	Family %	Woodman %
Ind	79.0	49.8	62.5	81.2	93.2
Mf	51.6	75.0	67.3	57.7	70.8
PC	62.5	43.3	43.3	35.2	43.7
Con	39.6	53.3	35.6	52.6	24.3
Inv	24.3	42.3	35.6	12.5	23.9
Am	43.0	36.3	55.8	60.8	44.1
κ^2	20.089	27.927	25.011	35.008	25.699
df	20	20	20	20	20
Sig.	.107	.111	.201	.020	.176

Note: Percentage relates to owners who stated that all, most or quite a lot of the woodland management was carried out by the respective workers.

Eight variables relating to management activities carried out in the woodland were examined to determine which owner types might be more involved in thinning, coppicing, removal of non-natives, replanting, ride maintenance, fencing, clearfell and the control of pests. The results of

the ANOVA are presented in Table 6.44. The significant results suggest that Multifunctional Owners were most likely to carry out management activities, except for the removal of non-native species, which was most likely to be undertaken by Amenity Owners.

Table 6.44: Management Activities Between Owner Groups

Owner Group	Management Activity (Means)							
	Thinning	Coppicing	Non-natives	Replant	Rides	Fencing	Clearfell	Pest Control
Ind	2.55	3.02	3.06	3.03	3.20	3.00	4.25	3.05
Mf	1.85	2.39	2.39	2.14	2.57	2.51	3.49	2.19
PC	2.32	2.42	2.69	2.73	2.81	2.82	4.17	2.83
Con	2.62	3.19	2.81	2.53	3.05	2.76	4.19	3.02
Inv	2.42	3.47	3.29	2.47	3.58	2.95	3.50	2.47
Am	2.54	2.60	2.26	2.26	2.92	2.74	4.00	2.98
F	4.456	5.980	5.219	5.862	3.763	1.339	6.515	4.872
Sig.	.001	<.0001	<.0001	<.0001	.002	.247	<.0001	<.0001

Note: Responses in survey were given on a 5-point Likert scale, ranging from 1 = Very Important to 5 = Not at all important.

While most of the survey respondents indicated that they extracted either nothing or very little wood products from their woodland, there was some difference between the owner groups regarding the products they did extract (Table 6.45). The most harvested product was firewood, with Private Consumers extracting the most. Sawlogs or small-roundwood were also extracted, and these were most likely to harvested by Multifunctional Owners or Investors.

Table 6.45: Wood Products Between Owner Groups

Owner Group	Wood Products (Mean)										
	Saw-logs	Small round-wood	Veneer	Pulp	Wood-chip	Fire-wood	Poles/ stakes	Fenc-ing	Char-coal	Crafts	Xmas trees
Ind	4.27	4.38	4.94	4.78	4.73	3.36	4.42	4.45	4.92	4.75	4.85
Mf	3.71	3.73	4.62	4.39	4.43	3.10	4.43	4.05	4.72	4.56	4.80
PC	3.90	4.12	4.94	4.78	4.81	3.00	4.32	4.42	4.78	4.64	4.85
Con	4.53	4.78	5.00	5.00	4.97	4.03	4.67	4.83	4.98	4.83	5.00
Inv	3.84	3.89	4.84	4.39	4.74	3.71	4.79	4.39	4.92	4.76	4.92
Am	4.34	4.22	4.94	4.76	4.68	3.66	4.36	4.42	4.68	4.52	4.86
F	6.917	9.216	8.986	6.314	4.033	7.497	3.152	5.747	3.592	2.291	1.720
Sig.	<.0001	<.0001	<.0001	<.0001	.001	<.0001	.008	<.0001	.003	.045	.129

Note: Responses in survey were given on a 5-point Likert scale, ranging from 1 = Very large amount to 5 = None.

6.6.4 Game Management

Sport shooting did not appear to be a strong motivation for woodland ownership, with 57.4% of the sample participants stating that shooting was not at all important to them. Only 7.5% of the sample participants stated that shooting was very important.

Table 6.46 presents the cross tabulation of shooting between the owner groups. Of the owner groups, the Multifunctional Owner was the most likely to be engaged in sport shooting activities, with 17.7% of owners in this group stating that shooting is very important to them. 10% Individualists and Private Consumers also stated that shooting is very important. Amenity Owners and Conservationists were the least likely to be involved in sport shooting, with 72.0% and 67.2%, respectively, stating that shooting is not at all important to them.

Table 6.46: Importance of shooting between owner groups

Owner Group	Very Important %	Important %	Slightly Important %	Not Very Important %	Not at all Important %
Inv	5.3	18.4	23.7	15.8	36.8
Ind	10.4	11.5	16.7	16.7	44.8
PC	10.3	9.0	9.0	11.5	60.3
Am	0.0	12.0	10.0	6.0	72.0
Mf	17.7	19.0	12.7	12.7	38.0
Con	1.7	6.9	15.5	8.6	67.2
κ^2			44.288		
df			20		
Sig.			.001		

When asked if shooting was a recreational activity in their woodland, 71% of Conservationists and 70% of Amenity Owners stated that there was no shooting at all in their woodland (Table 6.47). Only 32% of Investors and 38% of Multifunctional Owners stated that no shooting occurred in their woodlands. However, 33% of Multifunctional Owners and 24% of Investors stated that shooting occurs to quite a high extent in their woodlands, while only 8% of Amenity Owners and 5% of Conservationists indicated that shooting occurred to quite a high extent.

Table 6.47: Extent of shooting in woods belonging to owner groups

Owner Group	High extent %	Quite a high extent %	To some extent %	To a limited extent %	No extent %
Inv	7.9	15.8	23.7	21.1	31.6
Ind	9.4	10.4	19.8	13.5	46.9
PC	11.5	5.1	11.5	7.7	64.1
Am	0.0	8.0	14.0	8.0	70.0
Mf	16.5	16.5	12.7	16.5	38.0
Con	3.4	1.7	15.5	8.6	70.7
κ^2			48.485		
df			20		
Sig.			<.0001		

There was no significant difference in the likelihood of owners engaging in shooting activities between the study areas.

6.6.5 Financial Characteristics

Survey participants were asked to indicate how they financed their woodland management and their involvement in grant schemes to support their activities. Table 6.48 illustrates a significant difference between the relationship of owner groups and their level of involvement in grant schemes. While the majority of the survey participants indicated that they had been involved in a grant scheme, Individualists were the least likely to have applied for a grant. Of the owners who did apply, Private Consumers, Amenity Owners and Individualists were more likely to apply themselves, rather than using an agent or other party. Investors, Conservationists and Multifunctional Owners were more likely to use an agent to apply on their behalf.

Table 6.48: Wood Products Between Owner Groups

	Grant Scheme Involvement			
	Applied	Who applied		
Owner Group	%	Myself %	Agent %	Other %
Ind	74.0	59.2	38.0	2.8
Mf	93.7	43.8	54.8	1.4
PC	83.3	76.9	23.1	0.0
Con	91.4	40.4	55.8	3.8
Inv	92.1	34.3	62.9	2.9
Am	92.0	54.3	41.3	4.3
κ^2	20.194		29.107	
df	5		10	
Sig.	.001		.001	

There was also a significant difference between the sources of funding for woodland management between the owner groups (Table 6.49). Conservationists, Multifunctional Owners, Amenity Owners and Investors were most likely to apply for grants. Private Consumers and Individualists were most likely to fund the management themselves. Of all the owner groups, the Multifunctional Owners and Investors were the most likely to fund their woodland management through the sale of timber.

Table 6.49: Sources of Funding for Woodland Management

	Source of Funds		
Owner Group	Grants (Mean)	Self (Mean)	Sale of timber (Mean)
Ind	2.47	1.95	4.04
Mf	1.54	1.95	2.53
PC	2.43	1.88	3.78
Con	1.48	1.74	4.29
Inv	1.87	2.32	2.82
Am	1.80	2.14	3.90
F	9.682	1.607	21.094
df	5	5	5
Sig.	<.0001	.157	<.0001

Note: Responses in survey were given on a 5-point Likert scale, ranging from 1 = Very important to 5 = Not at all important.

6.6.6 Knowledge and Information Sources of Woodland Owners

Survey participants were asked to indicate which woodland or environmental organisations they belonged to, namely the Woodland Trust, the Small Woods Association, the Royal Society for the Protection of Birds, the Royal Forestry Society, ConFor, Wildlife Trusts, County Land Association and the National Farmers' Union.

Table 6.50: Membership of Organisations of Owner Groups

	Membership or organisation (%)							
Owner Group	Woodland Trust	SWA	RSPB	RFS	ConFor	Wildlife Trust	CLA	NFU
Ind	15.6	12.5	10.4	2.1	2.1	8.3	22.9	22.9
Mf	10.1	8.9	13.9	16.5	10.1	20.3	30.4	39.7
PC	11.5	17.9	26.9	10.3	3.8	17.9	20.5	28.2
Con	13.8	5.2	15.5	0.0	0.0	10.3	17.2	19.0
Inv	7.9	2.6	10.5	15.8	10.5	15.8	36.8	23.7
Am	14.0	10.0	14.0	12.0	6.0	28.0	10.0	26.0
Total	12.5	10.5	15.5	8.8	5.0	16.0	22.8	27.1
κ^2	2.253	9.481	10.596	24.141	15.985	12.195	12.738	9.400
df	5	5	5	5	5	5	5	5
Sig.	0.813	0.091	0.060	0.007	0.100	0.032	0.026	0.094

Table 6.50 indicates that the most popular organisation for private woodland owners was the NFU, with 27.1% of the sample being members. The owner group with the highest proportion of members was the Multifunctional Owners, which is not surprising as this owner group is characterised by a high proportion of farmers. The variation in membership between owner groups was significantly different for the RFS, Wildlife Trusts and the CLA, with Multifunctional Owners having the largest proportion of members of the RFS, Amenity Owners the highest proportion of members of Wildlife Trusts and Investors the highest proportion of members of the CLA. Of all the owner groups, Conservationists were the least likely to be members of the RFS

or the CLA, and Individualists were the least likely to be members of a Wildlife Trust. Individualists was the owner group most likely to be members of the Woodland Trust, with Investors the least likely. SWA and RSPB members were most likely to be Private Consumers and ConFor was most likely to have members who were Investors.

Table 6.51: Sources of Information for Owner Groups

	Information Source (Mean)							
Owner Group	**Ind**	**Mf**	**PC**	**Con**	**Inv**	**Am**	**F**	**Sig.**
Own Experience	2.44	2.10	2.29	2.83	2.53	2.40	2.818	.016
Time in Wood	2.08	1.73	1.79	2.21	2.68	1.92	7.544	<.0001
College	4.26	3.44	3.91	4.07	4.45	3.94	6.457	<.0001
Seminars	3.98	3.06	3.62	3.72	4.29	3.62	8.324	<.0001
FC pubs	3.25	2.52	2.96	2.86	3.32	2.84	5.442	<.0001
Journals	3.44	2.51	3.36	3.21	3.45	2.88	8.495	<.0001
FC officers	3.28	2.39	2.69	2.81	3.50	2.72	7.679	<.0001
Contractor	3.34	2.56	3.51	2.97	3.03	3.10	5.185	<.0001
Other Owner	3.15	2.71	3.23	3.43	3.39	3.10	3.313	.006
Books	3.18	2.45	2.77	3.02	3.39	2.67	6.305	<.0001

Note: Responses in survey were given on a 5-point Likert scale, ranging from 1 = Very important to 5 = Not at all important.

Woodland owners gained knowledge about woodland management from a number of sources (Table 6.51). The most cited source of knowledge was time spent in the wood, except for Investors, who stated that their own experience was their primary source of information about woodland management. Of all the woodland owner groups, Multifunctional Owners were the most likely to seek information from all of the sources indicated.

Table 6.52: Potential Sources of Information for Owner Groups

	Information Source (Mean)							
Owner Group	**Ind**	**Mf**	**PC**	**Con**	**Inv**	**Am**	**F**	**Sig.**
Pamphlets	2.63	2.10	2.37	2.19	2.53	2.10	3.560	.004
Books	2.81	2.15	2.36	2.28	2.87	2.28	5.763	<.0001
Magazines	2.95	2.27	2.50	2.47	2.84	2.46	5.045	<.0001
Internet	3.16	2.38	2.88	2.60	3.45	2.62	5.518	<.0001
Conferences	3.61	2.79	3.35	3.33	3.39	3.00	5.070	<.0001
DVDs	3.38	2.97	3.42	3.00	3.76	3.32	3.077	.010
TV/radio	3.27	2.68	3.04	2.95	3.55	2.90	4.729	<.0001
Visit wood	2.65	1.92	2.35	2.70	2.84	2.10	9.418	<.0001
Contractor	2.44	1.81	2.09	2.00	2.21	1.92	4.576	<.0001
Other owner	2.55	1.97	2.32	2.54	2.87	2.00	6.903	<.0001
Woodland org	3.29	2.33	2.77	3.10	3.10	2.42	7.546	<.0001

Note: Responses in survey were given on a 5-point Likert scale, ranging from 1 = Very important to 5 = Not at all important.

There were significant differences between the owner groups regarding the sources of information that woodland owners stated they would potentially utilise if it were available (Table 6.52). Multifunctional Owners would be the most likely to utilise all the stated sources of information. The most likely potential source of information was contractors (mean = 2.10) and the least likely was DVDs (mean = 3.28).

6.6.7 Cross tabulation of Study Areas and Owner Groups

When the cluster solution was profiled against the case study areas, it was clear that there was a difference in ownership type in each of the study areas (Table 6.53). Individualists (26.8%), Private Consumers (26.1%) and Multifunctional Owners (21.8%) were more likely to be found in the High Weald. Individualists (24.2%) were most commonly found in the Lake District and Conservationists (26.4%) in Cornwall. Investors were generally more common in the Lake District (17.2%). The largest proportion of Investors (57.9%) and Amenity Owners (36.0%) were found in the Lake District, the largest proportion of Conservationists (58.6%) were found in Cornwall, and the largest proportion of Individualists (39.6%), Multifunctional Owners (39.2%) and Private Consumers (47.4%) were found in the High Weald.

Table 6:53: Cluster groups across study areas

	Study area (%)			
	Weald	**Lakes**	**Cornwall**	**Total**
Ind	26.8	24.2	20.9	24.1
Mf	21.8	15.6	21.7	19.8
PC	26.1	19.5	12.4	19.5
Con	8.5	9.4	26.4	14.5
Inv	4.9	17.2	7.0	9.5
Am	12.0	14.1	11.6	12.5
Total	100.0	100.0	100.0	100.0

$\kappa^2 = 39.703$; df = 10; $p < .0001$

6.7 CONCLUSION

This chapter has presented the results of the analysis on the self-completion survey data. It has revealed that there are heterogeneous types of private woodland owners, with distinct characteristics and motivations for woodland ownership and management. A summary of each of the owner groups identified is given in this conclusion, drawing on the demographic and profiling characteristics from section 6.2 of this chapter, alongside the multivariate results.

6.7.1 Individualist

Individualists primarily valued the privacy and personal enjoyment they get out of their woodland. They appreciated the landscape values of their woodland and were keen to protect it from future development. Owners were most likely to be men between 50-69 years old who were either self-employed or retired. Of all the owner groups, Individualists were the least likely

to apply for a grant to assist in their woodland management. Although Individualists were likely to be found in each of the study areas, almost 40% were located in the High Weald AONB. They typically owned fairly small woods of between 3 and 10 hectares, consisting of mixed, ASNW or broadleaf woodlands. About 25% had owned their woodland for less than 5 years and over 75% had owned their woodland for less than 20 years. The majority were likely to have bought their woodland and lived adjacent to it. Almost 47% of owners in this group were individuals, but a further 30% were farmers. Individualists were most likely to use a woodman to carry out the management activities in their woodland. They were not motivated by financial return and did not encourage recreational access in their woods. In terms of woodland area, the Individualists made up only 8% of the total woodland area in the sample.

6.7.2 The Multifunctional Owner

Multifunctional Owners had multiple objectives for managing and owning woodland. They were concerned about investment and financial considerations, but they combined extracting wood products with recreation, environmental aspects and their own personal enjoyment. Owners were most likely to be self-employed men aged between 50 and 59 years. Although Multifunctional Owners were not constrained by money and did not rely on grants to assist with woodland management, of all the owner groups they were the most likely to apply for a grant (with 93.7% stating that they had applied for a grant). While Multifunctional Owners were likely to be found in each of the study areas, almost 40% were located in the High Weald AONB and just over 35% in Cornwall. Multifunctional Owners may own woodlands of varying sizes, but they were most likely to have either fairly small woods (3-10 hectares) or very large woods (over 51 hectares). Their woodlands were most likely to be mixed and had either been bought or planted and they were likely to live adjacent to the woods. Almost 30% of the owners had owned their woodlands for less than 5 years, but just over 22% had been in ownership for over 31 years. Just over a third of Multifunctional Owners were farmers, but almost 25% were individuals, and just over 21% were estate owners. The larger woods in this owner group were most commonly found on estates. Multifunctional Owners were most likely to use a contractor to carry out the management work. In terms of woodland area, the Multifunctional Owner was the largest of the owner groups, accounting for 37% of the area in the sample.

6.7.3 The Private Consumer

Private Consumers valued their woodland primarily for the wood products they can harvest (such as wood logs, poles etc.) for their own domestic use. However, they also appreciated the wildlife benefits and their own personal enjoyment of the woodland. Owners were most likely to be between 60 and 69 years old who were either retired or self-employed. Of all the owner groups, the Private Consumer was the most dominated by men, with only 6.4% owners in this group being women. Although 83.3% of owners in this group stated that they had applied for a grant, this is second least likely group to have done so. They did consider grants useful in assisting their management activities, but as this owner group was not financially-oriented, nor were they constrained by a lack of time or money, they were less likely to apply for a grant than

other, more grant-dependent, owner groups. Private Consumers were found in all study areas, but 47.4% were located in the High Weald, the largest owner group in this study area. Their woodlands were generally small (3-10ha) or very small (less than 2ha) and dominated by ASNW. Almost 65% had owned their woodland for less than 15 years, but 36% of these had been owned for less than 5 years. The majority of Private Consumers were individual owners living adjacent to their woodland and they were likely to carry out the management work themselves. Private Consumers were not motivated by financial return and, since they valued their own privacy, were not keen on opening up their woodland for public access. In terms of woodland area, the Private Consumer was the second largest of the owner groups, accounting for 23% of the total woodland area in the sample.

6.7.4 The Investor

Investors were the most financially-oriented of all the owner groups and prioritised timber production and investment opportunities in their woodland over any other objectives. Owners were likely to be men between 50 and 59 years old who were self-employed. The Investors were the second most likely owner group to apply for a grant to assist in their management of their woodlands. The majority of this owner group (almost 60%) was likely to be found in the Lake District. They either owned small woodlands (3-10 ha) or very large woodlands (over 51 ha) which were either mixed or broadleaves. Just over 20% had owned their woodlands for between 6 and 10 years and a further 20% had owned their woodlands for over 31 years. Investors had either bought or inherited they woodland and they either lived adjacent to it or a short distance (between 2-10 miles) away. Investors were most commonly individual owners or farmers who used a contractor to carry out management activities. They were not motivated to manage their woodland for their own personal enjoyment, nor for the public benefits of wildlife conservation or recreation. In terms of woodland area, the Investor was the third largest of the owner groups, accounting for 18% of the total woodland area in the sample.

6.7.5 The Amenity Owner

Amenity Owners were the keenest of all the owner groups to open up their woodlands to public access in the form of informal recreation. This owner group had the highest proportion of women (28.6%) and owners were likely to be between 50 and 59 years old who are self-employed. Amenity Owners were very likely to apply for a grant to assist with their management activities and were found equally in each of the study areas. Amenity Owners either owned small woodland (3-10ha) or very large woodlands (over 51ha) which were either mixed, ASNW or broadleaf. Much of amenity woodland had reportedly been planted. While 40% had owned their woodlands for between 6 and 10 years, a further 20% had owned their woodlands for over 31 years. While Amenity Owners were often found to be farmers, this group was associated with the highest proportion of charity, trust or club ownership. Accordingy, they had the largest proportion (14%) of owners who did not live adjacent to the woodland (over 40 miles). While owners did a lot the work in their wood themselves, they also relied on other family members to assist with the management tasks. This group of owners was not financially-

oriented nor did they own their woodland for their own personal enjoyment or consumption. In terms of woodland area, the Amenity Owner group accounted for 11% of the total woodland area in the sample.

6.7.6 The Conservationist

The Conservationists were primarily motivated to manage their woodlands to conserve wildlife habitats. They also appreciated the broader environmental objectives, such as pollution control or climate change. This owner group had a high proportion of women (26.3%) and owners were most commonly between 60 and 69 years old who were either retired or self-employed. Conservationists were more likely to apply for a grant to assist with the management of their woodland. Almost 60% of this owner group was located in Cornwall, with almost 50% owning their woodland for less than 5 years. Conservationists generally owned small woodlands of less than 10 hectares or very small woodlands of less than 2 hectares. Generally, their woodlands were either ASNW or broadleaf. While some of the woodland had been bought or inherited, the Conservationist Owners had the largest proportion of planted woodland of all the owner groups (65%). Owners were either farmers or individual owners who lived adjacent to their woodland and they generally used a contractor to carry out the management work. This owner group was not financially-motivated and they were opposed to recreational access to their woodlands. In terms of woodland area, the Conservationists accounted for the smallest proportion of owners, with only 3% of the total woodland area in the sample.

The following chapter discusses the findings of this study in terms of their theoretical, methodological and policy implications. It makes suggestions for policy makers for enhancing public benefits in private woodlands and also presents some suggestions for future research.

CHAPTER SEVEN
DISCUSSION AND CONCLUSIONS

7.1 INTRODUCTION

This chapter presents a discussion of the study findings and fulfils the primary aims set out in Chapter One: to assess the scope for enhancing the public benefits derived from private woodland and forests in England. The findings are considered with respect to the five issues posed in Chapter 3 and are discussed in relation to the existing literature on private woodland owner typologies, as well as to the theoretical body of literature on public good provision in forests and woodlands. The implications of the findings for policy development at a local and national level are discussed and suggestions are made for the development of improved policy measures. In addition, the chapter discusses the advantages and limitations of the methodology adopted in this study, and identifies areas of further work that could be usefully undertaken. The chapter ends with a summary of the key findings; both in terms of their practical application for policy and the contribution to methodological development in this field.

7.2 OWNERSHIP TYPOLOGIES

A typology of private woodland owners was developed using a mixed method approach. The three methods (Grounded Theory qualitative interviews, Q Methodology and self-completion surveys) were used sequentially, both to design and develop the methods and to triangulate the findings of each method. The initial Grounded Theory study, conducted in a preceding Masters study (Urquhart, 2006) and subsequently published in *Small-scale Forestry* (Urquhart et al., 2010), was used to generate hypotheses regarding private woodland owners' motivations and their willingness and ability to deliver public good benefits. The findings from this study, alongside a review of existing ownership typologies were used to design the subsequent Q Methodology study, from which four owner types were identified: Multifunctional, Custodian, Hobby Conservationist and Individualist. These owner types were further verified and developed through a self-completion postal survey, which identified six woodland owner types: Multifunctional Owners, Individualists, Private Consumers, Conservationists, Amenity Owners and Investors. Although there was some overlap and fluidity between the owner groups, the overall symmetry of findings from the three methods suggests that the derived typology is robust and replicable.

The findings of this study confirm that woodland ownership in England is charactersied by diverse types of owner, with owners having a range of attitudes towards the delivery of public good benefits in their woodland. The six discrete owner types identified reflect differing approaches to woodland management, with certain owner types more predisposed towards public good delivery than others. This finding supports the hypothesis that ownership objectives influence public good provision.

It is likely that the management objectives of the different owner types will lead to the provision of particular public benefits and disbenefits. For example, **Investors**, who prioritise timber production, will provide carbon sequestration benefits[39], some niche habitats[40] and some recreational opportunities[41], but the relatively intense nature of production may have adverse effects on wider biodiversity and landscape. The monoculture of a young single-species plantation, often densely planted with little ground flora, has limited attraction for informal recreation (although upland sites may provide opportunities for mountain biking). Less intensive timber production, such as low intensity harvesting of wood fuel for private use, as carried out by the **Private Consumer**, also has carbon sequestration benefits and replaces fossil fuel use. Their woodlands, however, will often be able to provide more diverse wildlife habitats than is possible with intensive timber production regimes. They are often broadleaved woods and are managed by coppicing or thinning regimes, creating varying habitat types within a single woodland block. They can also provide more informal recreational opportunities, such as walking and nature watching. There may be some negative landscape impacts (such as a newly-coppiced site) which can arouse public concern. With the decline in traditional management techniques, such as coppicing, there is often public misunderstanding when these practices are re-instated. Woodlands are often associated with place identity and are perceived as a symbol of nature (Henwood and Pidgeon, 2001). For example, a newly-coppiced site can often look untidy and may be perceived by local residents as destruction of a much-loved wood that they had been familiar with and visited for many years. Public education and information to highlight the purpose and benefit of the various woodland management activities is, therefore, important.

Amenity Owners are keen to manage their woodland primarily for personal/private recreational benefits. They will ensure that footpaths and trails are kept in good order and may clear small areas of woodland for picnic sites or viewing points and thin the woodland to ensure the site is light and welcoming. Such management will also, as a by-product, benefit wildlife by providing a range of habitats in the rides and clearings, low shrub areas and canopy woodland. In heavily-used sites, there may, however, be a negative impact on wildlife due to noise and disturbance. For this reason, **Conservationist** owners are often unwilling to open up their woodlands for public access. They primarily manage their woods for wildlife and, thus, wish to avoid the potential conflicts that might occur with public access. There may also be limited recreational benefits in the form of quiet nature watching.

Of all owner types revealed, the **Multifunctional Owner** is the most likely to want to incorporate a range of public benefits. Their pragmatic stance to woodland management means that they appreciate all the public good opportunities their woodland can provide and wish to find a balance in provision. Such woodland owners are more likely to encourage public access,

[39] Many factors determine the rate of carbon sequestration by trees, including silviculture, site conditions, age and vigour of trees, harvesting operations and rotation length (Bateman & Lovett 2000; FTA 2004; Nabuurs et al 2002; Masera et al 2003; Liski et al 2001; Seely et al 2002).
[40] For example, nightjars nest on newly clearfelled sites (http://www.forestry.gov.uk/forestry/nightjar).
[41] For example, access into the woods using forest tracks for machinery.

provide a range of wildlife habitats and utilise any harvested wood (either timber or wood fuel). Of the six owner types identified in this study, **Individualists** are the least likely to be predisposed towards anything involving use values of public goods, owning their woodland for their own personal enjoyment and valuing the privacy it affords. They have a strong sense of ownership and property rights, which presents clear challenges for policy-makers in terms of influencing the management activities of this group, an issue that will be considered more fully in section 7.6 of this chapter.

The derived typology, therefore, demonstrates some important distinctions between owner types with respect to their willingness and ability to deliver public benefits. The location of woodlands is also likely to impact on an owner's ability to deliver public benefits. Indeed, findings from both the Q Methodology and the self-completion survey suggested that there are important locational differences between each of the study areas. These are discussed in the following section.

7.3 LOCATIONAL DIFFERENCES

Three study areas were utilised in this research for two main reasons. First, to ensure that the typology was broadly representative of England as a whole and did not just represent one region. Second, to identify if there were any differences between the study areas and, if so, to assess the implications of this for public good provision. In order to maximise their potential representativeness, the three study areas were selected to represent areas of production and/or protection/consumption (Holmes, 2006). Due to its status as an AONB, the High Weald was deemed an area of protection; as a National Park, the Lake District was deemed an area of consumption; and Cornwall, with its recent emphasis on woodland planting for commercial reasons, was deemed an area of production. However, in practice, the predominant owner types identified in each area suggested that these labels could be more appropriately assigned. For example, the findings suggested that the Lake District is also an area of production, with its high proportion of Investors. Similarly, the High Weald can be viewed as an area of consumption, with its high proportion or Private Consumers, and Cornwall can be viewed as an area of protection, as it has a large proportion of Conservationists. An investigation of further areas in England may reveal other combinations of owner types, but the prominence of protection/consumption and production values across all the areas suggests that the study is likely to encompass owner types that are found across England.

The descriptive statistics from both the Q Methodology and the self-completion surveys suggested that there are indeed differences between the study areas. The Lake District had the highest proportion of estate woodlands (21%) out of the study areas and woodlands had also been owned for longer, as estate woodlands often (although not always) stay in the same family ownership from generation to generation. In contrast, over 60% of owners in Cornwall and almost half of owners in the High Weald had owned their woodland for less than 10 years. This, combined with an average age of owners at 50-69 years, suggests that the turnover of

woodland ownership is high, and is likely to continue in the near future. This presents both challenges and opportunities for policy-makers to support and influence the increasing population of new, and often inexperienced, woodland owners.

In terms of ownership, a high proportion of Investors were found in the Lake District, whilst the High Weald had a higher proportion of Private Consumers and Cornwall a higher proportion of Conservationists. These findings clearly indicate some spatial variation in woodland ownership characteristics across the country, which may impact on their willingness or ability to deliver public benefits. Ownership differences may, to an extent, reflect the physical differences of the woodland in terms of topography and woodland structure. For example, the High Weald had a history of coppiced woodlands (although many have fallen into disrepair), especially sweet chestnut and hornbeam. New woodland owners in this area are often keen to re-establish coppicing and, as a result, are able to benefit from a supply of wood fuel from their woods, perhaps reflected in the high proportion of Private Consumers. The estate woodlands of the Lake District are often owned by individuals for whom the estate is often their main livelihood. Thus, since they need some form of financial return, these owners are often classified as Investors. The inclusion of three study areas enabled this regional variation of woodland and ownership patterns to be revealed. In turn, the findings suggest that a regional (and, where possible, local) approach to forest policy is appropriate, a point which is discussed further in section 7.6.

The study findings also indicate that much private woodland ownership in England is made up of small-sized holdings, with almost 60% of owners having less than 10 ha of woodland, with over half of these woodlands being less than 2 ha. There has clearly been an increase in the popularity of purchasing woodland over the last 20 years, with large plots of woodland often divided into smaller lots and sold off to private individuals, especially in southern England (Carter, 2007). Anecdotal evidence suggests that the fragmentation of ownership in woodland plots can be detrimental in terms of woodland management, with owners having varying management objectives leading to piecemeal management practices which makes it harder to protect biodiversity (Gulland, 2007). In turn, this can impact on the ability of woodlands to provide public goods. For example, one owner may be willing to provide permissive footpaths for informal recreational access, while his or her neighbour may be strongly opposed to public access. With the management of a large woodland divided into small ownership blocks (of perhaps only 1-2 ha) it becomes even more difficult to ensure optimum provision of public benefits. While larger woodlands offer more potential for biodiversity and recreational access, management of these woodlands needs to be established with a co-operative and coordinated approach rather than on an *ad hoc* basis which relies on owner willingness to deliver public good benefits.

In this context, it is appropriate to consider the term 'multipurpose forestry' in more detail. A number of writers on multipurpose forestry have adopted the view that these multiple uses

should be achieved in individual woodland stands (see for example Gong (2002)). In other words, timber and non-timber services should be jointly produced to provide an optimal mix. However, others, such as Seely et al. (2002), advocate managing competing demands at the landscape scale, where each stand is developed to meet a single objective but the sum total of all the stands satisfies multiple criteria. This approach may fit well with the fragmented and diverse ownership pattern evident in many private woodlands in England, as multifunctionality within single small woodlands is problematic. In this respect, it is appropriate to consider the increasing interest, both in Europe and the UK, in using an Ecosystems Approach to help decision-makers to take full account of ecological systems and their associated biodiversity. These ecosystem services include 'provisioning services' such as food, water, timber and fibre; 'regulating services' that affect climate, floods, waste and water quality; 'cultural services' that provide recreational, aesthetic and spiritual benefits; and 'supporting services' such as soil formation, photosynthesis and nutrient cycling (MEA, 2005). Woodlands and forests provide a range of ecosystem services that provide benefits for people. Thus, an Ecosystems Approach is a way the overall health and integrity of ecosystems can be assessed and multiple benefits derived from them, with woodlands and forests an integral part of this process. Similarly, a landscape ecology approach may enable 'habitat networks' and semi-natural 'wildlife corridors' to be established in order to enable animals and plants to be more resilient to the impacts of climate change. Large woodlands are better for wildlife as they tend to have larger populations of animals and plants (and, thus, a larger gene pool) and a greater range of habitats to allow species to migrate as the climate changes. On average, a ten-fold increase in the size of a site leads to a doubling of species numbers (MacArthur and Wilson, 1967), but the minimum size of woodland differs for different species. In general, though, in lowland arable landscapes in eastern England, most bird species (except for the commonest) probably do not reach 100 per cent breeding capacity until woodlands reach at least 10 ha (WT, 2000b). For example, research suggests that marsh tits require at last 25 ha of continuous woodland cover and nuthatches require 100 ha (Hinsley et al., 1994).

However, locational differences may also occur with respect to the alignment of the woodland location and owner willingness to deliver public benefits, as the following section discusses.

7.3.1 Exploring the consonance between location and ownership with respect to public good delivery

While this study has developed a robust typology of private woodland owners with respect to their willingness and ability to deliver public good benefits, it has also raised a number of questions with respect to the spatiality of public good value. As demonstrated in Chapter Three, public good value varies geographically, with high public good values most frequently found in woodlands close to centres of urban population. While this study has revealed that certain owner types are more likely to be willing to deliver public goods than other, their ability to do so is likely to be contingent on the location of their woodland. This, therefore, raises the following question: are woodlands with high public good value managed by owners who are willing to deliver public good benefits? If a wood close to an urban centre has high public good value, the

delivery of that public good is likely to be compromised if the owner is unwilling to provide the good. Thus, following this study it would be logical to examine the degree of consonance between woodland location and ownership and the willingness of owners to deliver public benefits. While it was not possible to conduct a comprehensive study of this nature here, a small indicative review of the collected data was undertaken to ascertain if there were any patterns in the spatial distribution of ownership that may go towards informing a future investigation. The following section describes the approach taken and discusses the outcomes of this exploratory exercise.

A small random sample of 30 woodlands (10 from each study area) was selected from the dataset and an indicative public benefit index was compiled against which to profile the owners. The index was based on the information that had been collected in the self-completion survey and examination of OS maps, and so was limited to an extent. In particular, it was not possible to create an index for carbon sequestration, as this is dependent on a variety of factors, including soil type, topography, aspect, site conditions, tree species, management regime and so on; and such data was not collected as part of the survey. Thus, the public benefit index was limited to recreation, biodiversity and landscape. A number of criteria were selected to assess a particular woodland's value in terms of these public goods. Each site was scored according to the criteria outlined in Table 7.1, with a maximum score of 22 available for each public benefit, and a maximum of 66 for overall public good value. Each site was assessed and scored from the survey data and information gleaned from OS maps, with higher scores indicated higher public good value.

Table 7.1: Criteria used to create the public benefit index

Recreation	Biodiversity	Landscape
Size of forest	**Size of forest**	**Size of forest**
Species mix	Species mix	Species mix
Public accessibility	Links with other woodland	Distance from large town
Distance from large town	Designations (e.g. SSSI)	Distance from village/hamlet
Distance from village/hamlet		Visual aspect
Distance from other recreational site		Topography
Parking		
Road accessibility		

Note: Details of scoring for criteria is presented in Appendix 15

Table 7.2 presents the public benefit index scores for each of the 30 woodland sites, together with the owner type derived from the classification.

Table 7.2: Public benefit index showing woodlands with high public good value and owner classification (high value in red font; low value in blue font)

Study Area	Recreation	Biodiversity	Landscape	Total PG Value	Owner Type
Cornwall	10.5	7	9	26.5	Amenity
	11	6	10.5	27.5	MF
	11.5	8	9.5	29	Cons.
	10.5	8	12.5	31	Investor
	10.5	6	11.5	28	Amenity
	15.5	12	14	41.5	Cons.
	9	9	11	29	Amenity
	9	11	12	32	Investor
	10	6	11	27	Amenity
	9	8	8	25	Investor
Weald	16.5	12	11	39.5	Investor
	11	8	14	33	Amenity
	11.5	10	11.5	33	Investor
	18	11	13.5	42.5	Cons.
	11	5	11	27	MF
	10.5	9	14.5	34	MF
	13.5	10	12	35.5	Cons.
	11	7	10.5	28.5	MF
	13.5	12	16	41.5	Investor
	8.5	10	9.5	28	MF
Lake District	14.5	7	11.5	33	MF
	10	8	10	28	MF
	12.5	5	12	29.5	MF
	11.5	9	8.5	29	Investor
	9	6	7.5	22.5	Priv. Cons.
	11.5	10	12.5	34	Amenity
	12.5	12	13	37.5	MF
	15	14	14.5	43.5	MF
	11.5	9	8.5	29	Cons.
	16.5	16	14.5	47	Investor

The data in Table 7.2 suggests that, in the Cornwall sub-sample, the woodland with the highest recreational value was owned by a Conservationist, who may be unwilling to allow public access. Likewise, in the High Weald sub-sample, two of the sites with high recreational values were owned by Conservationists and two by Investors, posing potential constraints on the delivery of recreational benefits in these sites. However, two of the highly valued recreational sites in the Lake District sub-sample were owned by Multifunctional Owners; owners that may be well placed to deliver recreational benefits, although the site with the highest recreational

value was owned by an Investor, who may be less inclined to deliver recreational benefits.

When the ten highest scoring sites for each of the public benefits are compared with their owner types, it is evident that there are potential sites of high public good value owned by individuals who are unwilling to provide those benefits (Figure 7.1). Conversely, a comparison of sites with low public good value reveal a number of owners willing to deliver these public benefits.

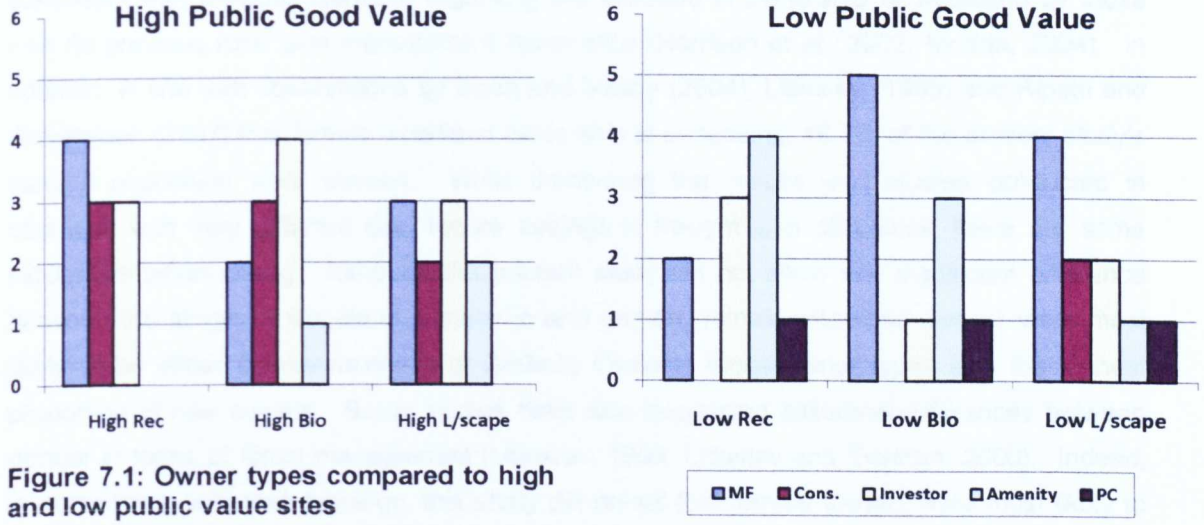


Figure 7.1: Owner types compared to high and low public value sites

From Figure 7.1 it can be inferred that, in the sub-sample, 6 out of 10 owners of high value recreational sites were owned by individuals who were unlikely to be willing or able to provide recreational opportunities (Conservationists and Investors). Six owners of woodlands with low recreational value were, nevertheless, very likely to be keen to provide recreational opportunities (four Amenity Owners and two Multifunctional Owners), indicating a potential mis-match between woodlands of high public good value and willing owners. Likewise, four of the sites with high biodiversity value were owned by Investors, who were unlikely to prioritise this public benefit. However, five of those with low biodiversity value were Multifunctional Owners, who were likely to be willing to enhance biodiversity in their woodlands and four of the low landscape value sites were owned by Multifunctional Owners, who would be willing to enhance the landscape values of their woodland.

This indicative exploration suggests a disparity may exist between the availability of high public good value sites and owner willingness to provide those benefits. If a site with high public good value is owned by an individual not willing to provide public benefits, it is likely that public goods will be underprovided in that woodland. This will have clear implications and challenges for policy, as discussed further in section 7.6 of this chapter.

Before considering the policy implications of the findings, it is appropriate to consider them in relation to the existing academic and theoretical literature. The following section first positions the research in the context of existing woodland owner studies.

7.4 FINDINGS IN RELATION TO OTHER LITERATURE

This section discusses the study in light of existing woodland owner classifications, highlighting this study's contribution to the debate. The findings of this study broadly concur with existing studies on private woodland ownership. There are, however, a number of notable differences. The results of the bivariate analysis indicate that almost half of the survey participants are 'new' woodland owners (i.e. who have owned woodland for less than 10 years). These findings are consistent with previous literature regarding the increase in ownership of woodland by those with no previous rural land management experience (Harrison et al., 2002; Kvarda, 2004). In addition, in line with observations by Boon and Meilby (2004), Lidestav (1998) and Ripatti and Jarvelainen (1997) that female woodland ownership is increasing, 16.3% of the present study's sample population were women. While comparing the results with studies conducted in countries with very different land tenure settings is fraught with difficulties, there are some similarities worth noting. Although the present study did not show any significant difference between the length of woodland ownership and gender, female woodland owners were most likely to be either Conservationists or Amenity Owners; those owner types with the highest proportion of new owners. Some studies have also suggested attitudinal differences between gender in terms of forest management (Lidestav, 1998; Lidestav and Ekstrom, 2000). Indeed, in accordance with their typology, this study did reveal that female owners were most likely to have protection or consumption values, while production values were most likely to be held by men. It is not clear, however, whether this finding suggests that female owners are more likely to be inclined to deliver public good benefits than male owners, or whether it is the "new" owners who are more willing, regardless of gender. Further investigation is required in this respect, to clarify whether there are indeed gender differences in owner willingness to deliver public goods.

Following on from this, the findings of the study suggest that a growing number of owners are managing their woodland for their own personal enjoyment, as a hobby, concurring with Tornqvist (1995). Those hobby woodland owners who carry out a significant part of the management in their woodland themselves also gain much personal enjoyment from such activities. Other studies suggest various reasons why woodland owners like to manage their woodland themselves; it can help reduce stress or provide a challenging alternative to their job, be a form of self-expression, or provide evidence of an activity that will outlive the owner (Bliss and Martin, 1989). Certainly there is a strong degree of pride in creating and maintaining a well-kept forest, as Tornqvist (1995) observes. This raises the question as to whether the state should support woodland owners who are likely to manage their woodlands (at a loss) as a hobby anyway. Indeed, such owners may not actually be motivated by financial incentives. In this respect, the study findings concur with those of Boon and Meilby (2005) who assert that traditional large-estate woodland owners and production-oriented owners are more likely to be concerned about the economic gains or losses from their woodland than those owners who are motivated by more socially-oriented objectives, such as wildlife conservation or personal enjoyment. The policy implications of this are further discussed in section 7.6 of this chapter.

As outlined in Chapter Three, woodland owner typologies often distinguish between agricultural and non-agricultural woodland owners (see Kvarda 2004 for example). While the findings of this study concur with Kvarda (2004) and others (Ripatti and Jarvelainen, 1997; Karpinnen, 1998; Ziegenspeck et al., 2004) that the ownership of woodlands by farmers is diminishing (with less than a third of owners in the survey stating that they were farmers) they do not suggest that agricultural forest owners constitute a discrete type based on their attitudes towards public good delivery. Indeed, the findings indicate that farmers are represented in all of the identified woodland owner groups (at least 25% of participants in each owner group were farmers). The reason for this difference could be that Kvarda's study focused on the background characteristics of woodland owners (i.e. farmer or non-farmer), whereas the present study clustered woodland owners based on their attitudes towards public benefits in woodlands, regardless of their background characteristics (although these characteristics were used to profile the emergent owner types). Alternatively, it may be a reflection of the differing composition of woodland ownership in Europe, with some countries having very different tenure arrangements. Woodland ownership in Scandinavia, Germany and Austria in particular is traditionally associated with farming. Thus, the present findings infer that woodland owner typologies in England that are based on a farming versus non-farming distinction do not accurately reflect the diversity of ownership attitudes towards public good provision in this country. Agricultural owners, just as non-agricultural owners, have a range of objectives and motivations that will influence their willingness to deliver public benefits, which is highlighted by the distinct owner groups that emerged in this study. Thus, in terms of classifying woodland owners with respect to their attitudes towards public good provision, this study supports Schraml and Memmler's (2005) conclusion, that a dichotomous 'agricultural' versus 'non-agricultural' typology is unhelpful and limiting. The agricultural/non-agricultural classification is effectively redundant, given that this and other studies have found around two thirds of woodland owners proved to be characterised as 'non-farming' and that farmers are clearly represented in each of the identified woodland owner types.

Further, the findings suggest that the term 'non-industrial private forest owner', which characterises owners who do not manage their forests commercially, adopted by Harrison et al (2002) and Kurttila et al (2001), is limited in terms of informing policy in England. While this term may be more appropriate than "non-agricultural forest owners", all the owner types revealed in this study, except the Investor, could be classified as 'non-industrial private forest owners', implying that the existing classification is far too simplistic. 'Non-industrial private forest owners' are a heterogeneous and diverse group of owners, with varying priorities with respect to production, protection and consumption goals. As the typology suggests, each of these owner types have a particular stance regarding the provision of public benefits with various classes of 'non-industrial private forest owner' requiring differing policy approaches.

Building on this critique of the 'non-industrial private forest owner' classification, the present

findings suggest that classifying woodland owners into either production-oriented or consumption/protection-oriented groups, typical in many owner typologies (see for example Dhubhain et al (2006)), is too simplistic as owner types do not fall neatly into one or other of these categories. Owners will often have a combination of one or more production, consumption or protection goals. For example, Private Consumers have a combination of protection and production goals, and Multifunctional Owners possess production, protection and consumption values. This finding is illustrated in a number of other studies, with classifications including *multi-objective owners* (Kuuluvainen et al., 1996; Karpinnen, 1998; Kline et al., 2000; Boon et al., 2004; Mizaraite and Mizaras, 2005), *multi-functional forest owners* (Wiersum et al., 2005), *universally motivated* (Becker et al., 2000), *conceptually interested* (Bieling, 2004) and *timber conservationists* (Marty et al., 1988). Clearly these multifunctional owner types combine both production and/or protection/consumption goals. These findings have implications for the theoretical underpinnings of understanding private woodland owners. This will be discussed further in the following section, where an alternative model for conceptualising private woodland ownership is presented.

Table 7.3 aligns the findings with other empirical studies and illustrates the contribution of this study to the existing literature. Each of the owner types identified are found to have commonality, to varying degrees, with existing classifications, with many similarities found across the classifications.

Table 7.3: Comparison of typology with other owner classifications

Study	Present Study Identified Owner Types					
	Investor	**Multi-functional**	**Private Consumer**	**Amenity Owner**	**Conser-vationist**	**Indivi-dualist**
(Kurtz and Lewis, 1981)	Timber agriculturist				Forest environ-mentalist	
(Marty et al., 1988)	Timber agriculturist	Utilitarians Timber conser-vationists		Forest recrea-tionists		
(Kuuluvainen et al., 1996)	Investor Self-employed owner	Multi-objective owner		Recrea-tionist		
(Loenstedt, 1997)	Formal economic goals Production goals		Informal economic goals		Environ-mental goals	
(Karpinnen, 1998)	Investor Self-employed owner	Multi-objective owner		Recrea-tionist		
(Volz and Bieling, 1998)	Homo oecono-micus	Traditionalist Responsible owner			The idealist	The resigning owner

Table 7.3 cont.: Comparison of typology with other owner classifications

(Becker et al., 2000)	Economically oriented	Universally interested			The ecological type	
(Kline et al., 2000)	Timber producer	Multi-objective		Recreationist		Passive
(Von Mutz et al., 2002)	Economically oriented			Leisure-oriented		
(Bieling, 2004)	Economically interested	Conceptually interested				Disinterested
(Boon et al., 2004)	Classic forest owner	Multi-objective			Hobby owner	Indifferent farmer
(Hugosson and Ingermarson, 2004)	Production motivations Economic efficiency goals				Conservationist	
(Mizaraite and Mizaras, 2005)	Businessman	Multi-objective	Consumer		Ecologist	
(Wiersum et al., 2005)		Multi-functional	Individualist		Environmentalist	Indifferent
(Urquhart, 2006)	Traditional			Community owner		Farmer
(Serbruyns and Luyssaert, 2006)	Materialistic Profit-seeking			Satisfied recreational Dissatisfied recreational		
(Van Herzele and Van Gossum, 2006)	Economist			Recreationist		Passive
No. studies	**16**	**10**	**3**	**8**	**8**	**7**

Table 7.3 illustrates the consonance between the study findings and the 17 other empirically-based typologies, conducted across Europe and the US. Almost all of the studies identified an owner type comparable to the Investor, typifying owners with production goals. However, owners with consumption/protection goals are labelled differently by each of these studies, illustrating the heterogeneous nature of owners with consumption/protection goals. It should be noted, though, that all owner characteristics identified in previous studies have been identified in this study in various guises. Indeed, none of the other studies included in Table 7.3 include all six owner types identified in this typology. Often the classifications identify either Amenity-oriented owners (e.g. "forest recreationists" in Marty et al's 1988 study) or conservation-oriented owners (e.g. "forest environmentalists" in Kurtz and Lewis' 1981 study), but not both. The present findings suggest that both types of owner are likely to exist, with differing, and

sometimes conflicting, objectives for woodland management. Only three of the studies in Table 7.3 identified an owner type aligned to the Private Consumer, which represents a potentially important group in terms of influencing their activities. They may be influenced by different policy measures than amenity- or conservation-oriented owners. For example, market mechanisms, in the form of setting up small-scale supply chains, may be attractive to this owner type, who value the wood products that they are able to utilise from their woodland. The Custodian Owner type identified in the Q Methodology study is comparable to either "the traditionalist" or "the responsible owner" in Volz and Bieling's (1998) study of private forest owners in Germany. When the present findings are added to Table 3.7 (see page 59) each of the discrete owner orientations of production goals, multiobjective goals, and consumption/protection goals (wood consumption, non-wood consumption/protection, passive) are represented (Table 7.4).

Table 7.4: Typology location in production versus consumption/protection goals

Production goals	**Multiple objectives**	**Consumption/protection goals**		
		Wood consumption	**Non-wood consumption/ protection**	**Passive**
Investor	Multifunctional Owner Custodian	Private Consumer	Amenity Owner Conservationist	Individualist

No other study includes all owner orientations, thus indicating the broad range of ownership motivations found in English woodlands. This may either suggest that woodland ownership is more diverse in English woodlands than in other countries, or that this study has better captured all of the underlying ownership perspectives present in the sample. Either way, it would be useful to replicate this study in a number of European countries to assess whether the same owner types are revealed using the same methodology. While the findings in Tables 7.3 and 7.4 illustrate the broad nature of the typology developed in this study, they also represent a robust and comprehensive classification of private woodland owners which provides a valuable contribution to the literature on private woodland ownership in two main ways. First, it constitutes the first statistically robust classification of private woodland owners in England; and second, it provides a comprehensive assessment of private woodland owner types, often not fully achieved in previous studies.

7.5 THEORETICAL ASPECTS OF THE STUDY FINDINGS

Chapter Two outlined the philosophical challenges and theoretical underpinnings of forest research. Environmental pragmatism was put forward as a way of overcoming the often paralysing debates between weak and strong sustainability or ecocentrism versus anthropocentrism. This study, reflecting an environmental pragmatist approach, sought to find practical and workable solutions to the delivery of public goods in private forestry. This approach is reflected when dealing with the problem of a potential lack of consonance between ownership motivations and the public good value of the woodland as outlined in section 7.3. A

practical approach is suggested which involves, first, identifying those woodlands of high public good value and, second, identifying the owners willing to provide public benefits. This should be followed by a targeted approach which seeks to influence owners whose underlying motivations are generally consistent with policy objectives and whose woodlands have high public good value. For those woodlands of high public good value but with unwilling owners, policy-makers need to employ measures that accord with woodland owners' existing motivations and objectives.

In terms of conceptualising rural space, the findings of this study suggest that a co-constructionist approach, in accordance with Murdoch 2001, Michael 1996 and Barry 1999, should be adopted when considering public good delivery in private woodlands. Elements of both realism and constructionism can add to an understanding of the situation. This, indeed, will influence a woodland's public good value and its ability to deliver public goods. Likewise, how owners construct and value what is important in their woodland will influence its ability to deliver public benefits. For example, an owner with strong conservationist values (i.e. who has constructed their woodland as a place for wildlife conservation) will be more predisposed to providing biodiversity benefits than recreational benefits in their woodland. Both the practical considerations of the woodland site and the motivational aspects of the owner must be taken into account when designing policies to influence private woodland owners to better deliver public good benefits. The following sections discuss two main aspects of theoretical development achieved in this study. First, the limitations of the term 'post-productivism' are considered with respect to private woodland ownership in England. Second, a new model for conceptualising private forest ownership is put forward to overcome the limitations of a binary production versus consumption/protection model.

7.5.1 Post-productivism versus multifunctionality

The theoretical review in Chapter Two discussed the debate around the use of the terms 'post-productivist' and 'multifunctional' when referring to forestry and other land uses. The findings appear to concur with the views of Wilson (2001; 2006) that the term post-productivism can be potentially limiting, due to its implied binary assumption which labels forestry as either productivist or post-productivist. Since 18% of the sample were Investors (owners with clear productivist goals), forestry cannot be considered a purely post-productivist industry. However, the rest of the sample clearly do have post-productivist motivations, in line with Goodin's (2001) view that post-productivists have simply switched the emphasis from production to more consumption or protection goals. These owners are not opposed to economic output, but this is not their primary motivation and they could be considered as "post-productivist" in this respect. Clearly, the majority of private woodland owners do have post-productivist goals; however, there is also a significant proportion that maintains productivist motivations. Unless the post-productivist term can be clearly defined to avoid an either/or stance towards productivist goals it is limited in its application and, as Evans et al (2002) assert, may even be a "distraction".

A more appropriate term may be "multi-purpose" or "multifunctional" (Wilson 2001) forestry. The findings of this study, as illustrated in Figure 7.2, indicate that woodland owners have diverse objectives with respect to production, protection and consumption goals. These goals illustrate the multifunctional attributes of woodlands, with owners having a clear range of objectives. Thus, the findings concur with Slee et al. (2005) that rural land use, including forestry, is likely to have a hybrid and diverse mix of productivist, non-productivist and post-productivist elements. The findings also support Ilbery and Bowler's (1998) assertion that there is likely to be a co-existence of productivist and post-productivist systems. Although, the term "multifunctional" may be used to describe forestry on the landscape scale, its application for individual woodland owners is limited. Multifunctional Owners are only one type of woodland owner identified in this study, accounting for 37% of the sample. The remainder of the participants often had more specific and exclusive goals, such as nature conservation or timber production.

7.5.2 Ownership typologies and modes of occupance

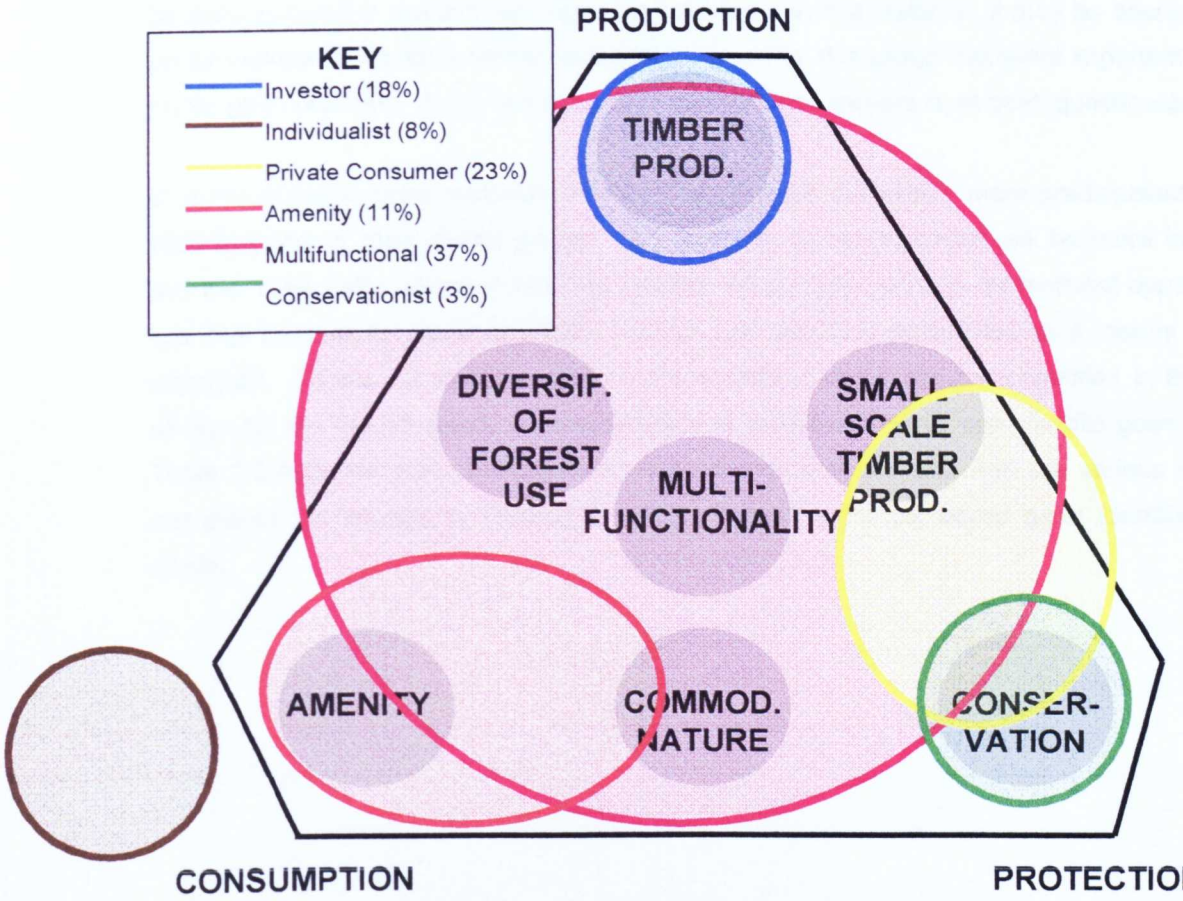
The findings from this study are also relevant in terms of wider rural discourses, especially with reference to farmer typologies and behaviour, such as engagement with agri-environment schemes. As outlined in section 3.5, farmer typologies that rely on attitudes alone have often been criticized as a poor predictor of behaviour (Burton, 2004). The literature suggests that landowners' decisions are influenced by a range of external (e.g. policy, resources, political economy) and internal (e.g. attitudes, values, identity, social norms) factors (Pike, 2008; CCRI, 2009). Indeed, the findings from the present study concur that landowners, in the context of woodland management, are not solely influenced by economic factors and they do not always act in economically rational ways. This aligns with observations from Pike (2008), who indicates that farmers do not always make decisions based on a cost-benefit analysis, but will be influenced by a range of other personal factors, including attitudes, beliefs, values or a desire to achieve a particular lifestyle. Similarly, Garforth and Rehman (2006) summarise their review of literature on farmers' motivations and behaviours to inform modeling research: "It is widely recognised that farmers' business and land management decisions are influenced by factors other than profit, including perceptions of risk, attitudes (including attitudes towards new technology, government and the future of the agricultural sector), issues of family life cycles and succession, and the opinions of other farmers and the professionals with whom they interact. As rural economic and land use policy itself becomes less focused on production and productivity, it is essential that policy analysis and appraisal is informed by models that reflect this wider range of factors which influence farmers' decisions" (pg. xv). The woodland owner types identified in this study support this, with a number of owner types motivated and influenced by non-economic objectives such as nature conservation and other environmental values. These owners will also be more inclined to enter into agri-environmental schemes, as the schemes objectives are likely to align with their personal objectives and values for their land holding. This study, therefore, adds to the literature in terms of developing models that fully reflect the attitudes and behaviours of landowners.

In this regard, Chapter Two introduced Holmes' (2006) descriptive model as a way of conceptualising rural space. The model, which identifies seven modes of rural occupance, was utilised in this study to reflect the particular "modes of occupance" within forestry. This model was used to assist in selecting the study areas to ensure that areas encompassing production, protection and consumption values were included.

This section presents an adaptation of Holmes' (2006) descriptive model of rural occupance, which provides a useful framework for understanding which owner types are predisposed to providing certain public goods. Comparing the findings of this study to an extant conceptual framework enables the framework to be adapted and developed in the context of forestry. It also allows the findings to be assessed with respect to existing conceptualisations of rural space, giving the study greater theoretical relevance and grounding.

The emergent woodland owner types (Investor, Individualist, Private Consumer, Amentiy, Multifunctional and Conservationist) were overlaid onto the adaptation of Holme's descriptive model as depicted in Figure 7.2.

Figure 7.2: Modes of forest occupance and private woodland owner typolology (with percentage of woodland area in the sample for each category).



Source: Adapted and developed from Holmes (2006)

Figure 7.2 illustrates the relationship between each of the woodland owner groups in terms of Holme's modes of occupance (adapted for a forestry context). As can be seen, all the owner types, except for the Individualists, overlap to varying degrees. Although the Multifunctional Owner group encompasses all the modes of rural occupance identified by Holmes, this does not infer that all owners in this group will be engaged in all modes illustrated. There will, however, generally be evidence of protection, consumption and production values to varying degrees. For example, a Multifunctional owner may provide permissive footpaths for the public, create a range of wildlife habitats and extract and sell some wood products. The "diversification of forest use" mode encompasses the entrepreneurial activities that are often present in Multifunctional Owners. Owners in this group seek opportunities to diversify and may be engaged in ecotourism, formal forest recreation such as mountain biking or the provision of educational trails and facilities.

Of particular note are the Individualists who have little or no interrelationship with any of the other owner groups. These owners are not motivated by protection, consumption or production values and value their woodland for the privacy it provides and for their own personal

enjoyment, with little regard for the typical externalities demanded by society. The Individualist represents potentially the most difficult woodland owner type for policy makers to influence because he/she is not interested in providing any public good benefits and is reluctant to become involved in government incentive schemes. In this instance, it may be appropriate for policy makers to identify whether woodlands owned by this group represent important sites for public good provision. If not, the case for targeting these owners is, at best, questionable.

In terms of public good provision, different owner types are clearly more predisposed towards providing one or more public goods. For example, Conservationists will be more inclined to provide biodiversity, whereas Amenity Owners will primarily provide recreational opportunities, but may be keen to preserve wildlife habitats and use their woodlands as a means of public education. Figure 7.2 indicates that all the woodland owner groups indentified in this study, except for the Individualists, are predisposed to providing one or more public good benefits. Table 7.5 indicates the primary public good benefits that will flow from the various modes of occupance put forward by Holmes and relates these to the six owner types identified in this study.

Table 7.5: Public benefits and disbenefits of modes of forest occupance

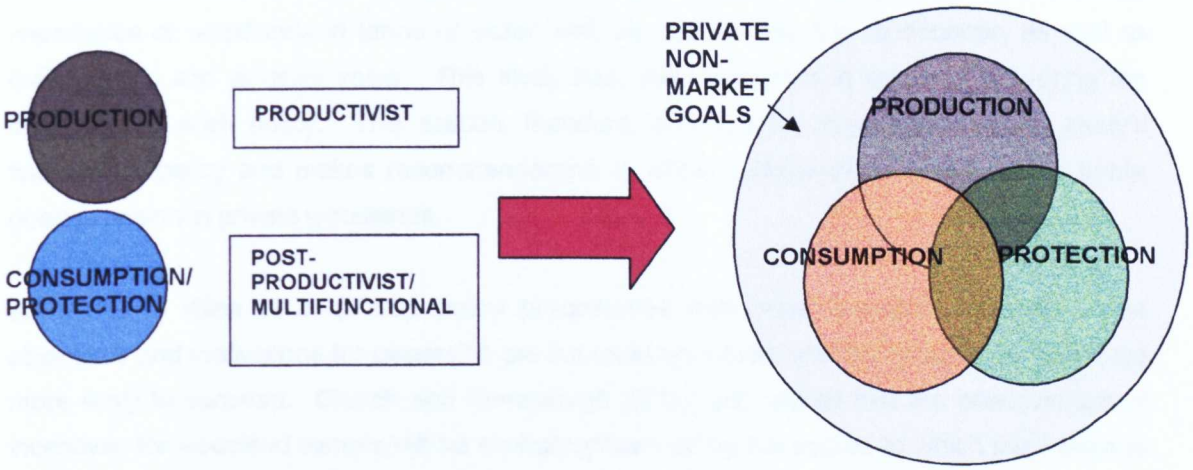
Mode of occupance (adapted from Holmes)	Primary Benefits	Secondary Benefits	Disbenefits	Provider
Timber Production	Locking up carbon	Niche habitats Some recreational opportunities	Limited biodiversity Limited recreation Landscape impacts	Investor Multifunctional Owner
Diversification of forest use	Locks up carbon Replaces fossil fuel Recreational opportunities	Niche habitats Landscape	Limited biodiversity	Multifunctional Owner
Small-scale timber production	Locks up carbon Replaces fossil fuel	Some recreational opportunities Diverse habitats Landscape Nature watching	Landscape impacts	Multifunctional Owner Private Consumer
Conservation	Wildlife habitats	Stores carbon Limited recreation Landscape	Conflicts with recreation	Multifunctional Owner Conservationist
Commodified Nature	Wildlife habitats Nature watching	Landscape Stores carbon	Conflicts between wildlife and recreation	Multifunctional Owner Amenity Owner
Amenity	Recreation	Landscape Habitats Stores carbon Replaces fossil fuel	Disturbance to wildlife	Multifunctional Owner Amenity Owner
Multifunctional	Stores carbon Replaces fossil fuel Recreation Provides habitats	Landscape	Can be conflicts between timber production /wildlife/recreation	Multifunctional Owner

It can be inferred from Table 7.5 that the Multifunctional Owner has the potential to provide a wide range of public benefits and may contain elements of all Holmes' "modes of occpuance". The other owner types are more specific in the public goods they are willing to provide, with Conservationists providing wildlife habitats as a primary benefit, with carbon sequestration and limited recreation as secondary benefits. Likewise, Amenity Owners provide recreational opportunities and nature watching as primary benefits, and carbon sequestration, habitat protection and improved landscapes as secondary benefits.

Given the limitations of concepts such as post-productivism and, to a lesser extent, multifunctionality, the adaptation of Holmes' (2006) descriptive model (Figure 7.3) can be used

to conceptualise woodland ownership with respect to the provision of public goods. It presents a useful framework that encompasses the complex and often overlapping objectives held by private woodland owners. Thus, it is suggested that a move from a production versus consumption/protection concept to a framework that includes overlapping goals provides a more useful tool for understanding and assessing private woodland owners' willingness to deliver public goods.

Figure 7.3: Private woodland owner framework of goals



Existing framework for conceptualising private woodlands owners

Proposed new framework for conceptualising private woodland owners

This revised framework for private woodland ownership clearly requires a more nuanced policy approach. The various owner types will be influenced in different ways according to their particular perspective. While some owners clearly fit neatly into one category (such as Conservationists or Investors), others may hold values that incorporate two or more perspectives (Private Consumers may hold both production and protection values) or none (Individualists). As has been found with farmer typologies, private woodland owners may hold varying attitudes towards ownership and management of their woodlands. A range of external and internal factors will influence their decision-making process. For example, one woodland owner in the study had differing objectives and attitudes towards two different woodlands he owned. In one woodland, which was an ancient woodland located adjacent to his house, he was not keen on allowing public access, but wished to enjoy the privacy of the woodland and maintain it for wildlife. The other, a larger woodland of mixed broadleaves and conifers, was about 15 miles from where he lived. He was more inclined to allow access in this woodland, and was also keen to extract some wood products as part of his on-going management of the woodland. Thus, the woodland owner types identified in this study, while extremely useful, are somewhat fluid and overlapping, presenting potential dilemmas for policy makers. The following sections discuss the potential implications of these and other findings in terms of policy and put forward some policy recommendations.

7.6 IMPLICATIONS FOR POLICY

As this is an ESRC-CASE study, it is appropriate to consider the practical implications of the study findings in terms of its relevance to the Forestry Commission, the co-sponsor. In England, the Forestry Commission administers the government's English Woodland Grant Scheme and strategically develops and promotes forest policy. The *Strategy for England's Trees, Woods and Forests* (Defra 2007) aims to provide a resource of trees and woods that can deliver environmental, social and economic benefits now and in the future, ensuring that such woodlands are resilient to the effects of climate change. The policy highlights the environmental importance of woodlands in terms of water, soil, air, biodiversity and landscapes, as well as their cultural and amenity value. This study has clear relevance in terms of delivering the objectives of such policy. This section, therefore, sets out the implications of the study's findings for policy and makes recommendations to assist policy-makers in enhancing public good provision in private woodlands.

According to Kline et al (2000), policy programmes that target woodland owners whose objectives and motivations for ownership are the most consistent with the programme goals are more likely to succeed. Church and Ravenscroft (2008) also assert that the effectiveness of incentives for woodland owners will be strongly influenced by the degree to which they relate to ownership motivations. Other researchers, such as Marty et al (1988) and Pregernig (2001) also stress the importance of owner motivations and attitudes in determining the success of policy instruments. Furthermore, Serbruyns and Luyssaert (2006) suggest that different owner types are likely to accept or reject different policy instruments. Clearly there is not a one-size-fits-all approach when designing policy measures.

The study findings have potential relevance for policies that seek to maximize public good benefits in private woodlands. A range of policy options are likely to be required to meet the varying demands of the English forest estate, including advisory services, government intervention and market mechanisms. This section identifies the extent to which the six types of woodland owner are likely to be influenced by various policy measures. It also addresses how such measures might be tailored in order to help meet the needs of both the woodland owner and strategic policy objectives.

Table 7.5 and Figure 7.2 (see pages 188 and 186) indicate that different owner types are more predisposed towards delivering certain public goods than others. Of all owner types, Multi-functional Owners are the most likely to deliver a range of public benefits, while Individualists are unlikely to explicitly provide any public goods (some public good values will automatically be provided, such as landscape values or air quality control, without any input from the owner). It, therefore, follows that each of the identified owner types will be likely to accept or reject various policy instruments, depending on their motivations and objectives. Table 7.6 summarises the policy measures that are likely to be the most effective at stimulating and supporting public good delivery in private woodlands for each of the woodland owner types identified.

Table 7.6: Policy measures likely to be adopted by private woodland owner types

Owner Type	% woodland area	% Sample	Policy Measure	Comments
Individualists	8	24.1	Advisory services	Value privacy & against public access, often new owners with small woodlands. Need education and information about benefits of management.
Multifunctional Owners	37	19.8	Grants Market mechanisms Advisory services	Not constrained by money, entrepreneurial, adaptable and willing to try new things.
Private Consumers	23	19.5	Advisory services Market mechanisms	Value privacy, not constrained by money. Often new owners with small woodlands. Information and advice regarding best practice required and development of a market for their small wood products.
Conservationists	3	14.5	Grants Advisory services	Often new owners with small woodlands, many of which are planted. Need information and advice and funds to manage woodland for wildlife.
Investors	18	9.5	Market mechanisms Some grants Advisory services	Timber producers and long-term investment. Will apply for regeneration grants after harvesting. Mostly incentivised by market mechanisms.
Amenity Owners	11	12.5	Grants Advisory services	Grants required for management for recreational access. Education and information also helpful, especially to new owners.

As illustrated in Table 7.6, a range of policy measures are likely to be required in order to work alongside the existing motivations and objectives of private woodland owners. The following sections consider the potential implications of the woodland owner typology on various policy measures: incentive schemes, market mechanisms and advisory services. Each instrument is considered according to its relative fit with the motivations of different woodland owner types.

7.6.1 Government intervention

Direct government intervention occurs mainly through the provision of grants. The Forestry Commission currently offers a suite of grants under the English Woodland Grant Scheme (EWGS). These provide funds towards the cost of woodland planning, assessment, regeneration, improvement, management and creation. Farms may also be eligible under Defra's Environmental Stewardship Higher Level Scheme for tree planting. The funds, however, do not cover the full costs of management and applicants are also expected to contribute to the management costs themselves. For some woodland owners, the symbolic capital of being accepted for a grant is of more value than the financial contribution. Involvement in a grant can provide assurance to the woodland owner that they are managing their woodland appropriately and can give them access to advice and other sources of information and financial assistance.

However, according to Serbruyns and Luyssert (2006), owners are often only likely to apply for subsidies that support the management activities that they would implement anyway. Some writers suggest that the uptake of incentive schemes may be rejected by woodland owners due to a mistrust of state intervention (Sample, 1994), protection of privacy (Rickenbach et al., 1998; Wicker, 2002), incentive payments being too low (Kline et al., 2000b) or changes in ownership structure (Weber, 2000). Indeed, the findings of the present study concur that certain owner types, such as Individualists or Private Consumers, may reject participation in incentive schemes to maintain autonomy over woodland management. These owners may feel that by accepting a grant they will lose some of the control over the management of their woodland. They do not wish to be told what to do and may mistrust the motives of grant providers. These owners may also feel very attached to their woodland implying that, as Sime et al (1993) found, maintaining rights of ownership and control is likely to be more important than the offer of a grant in influencing the attitude of such owners.

In addition, woodland is increasingly purchased for its social or positional value, as demonstrated by the prices paid for woodland in the south of England in recent years (£8-12,000 per ha in 2008, Tilhill & Savills 2009). Slee (2006) refers to the positional good argument which questions whether it is necessary to financially support, through policy means, the delivery of environmental benefits when affluent woodland owners are likely to continue to manage woodlands at a loss, as a hobby activity for their personal amenity. For example, in this study, Conservationists are the least motivated or constrained by money and are not interested in making a profit from their woodlands or harvesting wood products. This group of owners manage their woodland as a hobby and most appear to have both the time and money to do this adequately. Thus, it is unlikely that they will be attracted by grant incentive schemes, especially if it entails providing public access. Indeed, it could be argued that public funds should not be used to subsidise a group of owners that would carry out the required management at their own expense anyway.

Furthermore, the present findings support those of Slee et al (2006), which suggest that some private woodland owners may not apply for a grant because they find the process of form-filling too complex or not worth the effort (especially for very small woodlands). Furthermore, grants received often do not cover the extra cost to the woodland owner of providing long-term management for the provision of public goods. Reluctance to engage with grant schemes may also reflect woodland owners' understanding of the term 'public goods'. 'Public good' is an economic term and does not refer specifically to public use values, but relates to non-market, or 'public', goods and services, as opposed to 'private' goods (as outlined in section 3.2). Participants in the study often referred to public goods in the context of public recreation. They associated public benefit with access and often did not appreciate the broader aspects of public benefit in terms of biodiversity, landscape, flood control, pollution control or carbon sequestration. Thus, this misunderstanding of the term 'public good' by woodland owners, and indeed some decision-makers, can often present a stumbling block. The association of public good with access promotes fear and disregard among landowners. Perhaps using the term 'ecosystem services' to deliver non-access related public goods, from biodiversity to flood protection, could help take the enhanced delivery of all forestry-related public goods out of the ghetto of access-related public goods. For owners who do not wish to encourage public access in their woodlands and are reluctant to engage in incentive schemes, due to a perception that provision of public access would be a condition of the scheme, a simple change in terminology may alleviate their fears.

Both the Individualists and the Private Consumers, along with Conservationists, indicated that they were reluctant to increase public access in their woodlands. This finding is supported by Church et al (2005) whose study of private woodland owners in south-east England concluded that grants relating to the provision of public access were unlikely to attract much interest from woodland owners. These three owner groups account for a third of the sample in terms of woodland area, so it is important to understand their attitude towards public access. Their reluctance to encourage public access may occur for two reasons. Firstly, the woodland owner may wish to maintain exclusive personal use of the woodland, as suggested by Slee (2006) and evidenced by the Private Consumers and Individualists revealed in this study. For these owners, their perceived property rights are central in determining decisions regarding recreational access. Secondly, owners who manage their woodland with the primary objective of nature conservation, such as Conservationists, are often reluctant to increase public access for fear of disturbing wildlife.

Thus, it is clear from the findings of this study that different woodland owner types will be more predisposed to applying for grants than others. It may, therefore, be appropriate to target particular types of owner and, in this regard, social marketing may offer some useful tools that can be applied in the context of public good delivery in private woodlands (see, for example, Ok, 2005). The aim of social marketing is to achieve a social good with clearly defined behavioural goals. The term was first coined by Kotler and Zaltman (1971) who referred to the application of

marketing in the context of social and health problems. There are a number of stages in social marketing that may help to target government incentive schemes for public good delivery in private woodlands. Firstly, it is important to understand the knowledge base, attitudes and beliefs of the target audience (i.e. private woodland owners) along with their social context. The typology developed here represents an indepth "customer orientation" of private woodland owners which should prove useful in defining the target audience. Secondly, the developed classification outlines the behaviour and goals of private woodland owners which is crucial for developing a social marketing programme. Third, an "intervention mix" should be clearly defined, outlining the appropriate methods for achieving the behavioural goals. This section outlines the intervention mix combining incentive schemes, market mechanisms and advisory services which may be effective at delivering public benefits in private woodlands. Fourth, the typology will also provide specific targeting of these policy measures by segmenting the audience, identifying which owner groups are the most appropriate for incentive targeting. Finally, the cost to the private woodland owner of implementing the desired programme should be defined, together with the identification of other factors that may compete for their time.

The developed typology suggests that Multifunctional Owners and Amenity Owners are the most likely to apply for, and be influenced by, incentive schemes. Investors are also likely to apply for grants, but they will be influenced by different objectives. Therefore, woodland grants schemes do need to be flexible and reflect the motivations of the woodland owners they are targeting. Investors may be influenced by policy makers to manage their woodland in a certain way if it is shown to provide financial return, whereas the consumption or protection-focused woodland owner, such as the Conservationists and Amenity Owners, may be influenced by management approaches which emphasise nature conservation or amenity, as opposed to financial gain.

In this regard, initial discussions with Forestry Commission conservancy regional directors suggest that the typology put forward in this thesis may be useful in tailoring Forestry Commission advice and information for particular owner types. For instance, information about grants can easily be adapted (especially electronic versions) to reflect the interests and needs of particular groups. Grant information targeted at the Conservationists, for example, would emphasise the biodiversity benefits of woodland management, while that aimed at Private Consumers would highlight the wood products derived from woodland management. If the typology can be usefully incorporated into Forestry Commission datasets it may offer a useful tool. The South-East England Conservancy is currently considering trialling the typology in their region. Woodland officers would attempt to assign private woodland owners to one of the six identified types during site visits using a set of criteria and indicators. This would assess the practicality and usefulness of the typology for classifying woodland owners on the ground.

Furthermore, the funds for grants are limited and thus need to be targeted to those woodlands and owners where the maximum public good benefits may be achieved. For example, grant

priorities can often exclude owners whose woodlands do not meet the set criteria, even though the owners themselves are willing to deliver significant public benefits. As suggested in the previous section, the issue of the match of owner willingness and public good value is crucial. Woodlands with the potential to generate high public good values (such as those close to population centres) may be owned by individuals who are opposed to providing public benefits (such as Individualists). Conversely, woodland owners who are willing to provide public goods may have woodlands located in remote, inaccessible areas where public good value is low (at least in terms of recreation and landscape). Criteria for the selection of which woodlands to support needs to target both the woodlands and owners that can deliver the greatest public good benefit. If woodland officers are able to classify woodland owners as suggested above, this, combined with spatial data on woodland size and location, could usefully identify priority woodlands for public sector support in a systematic and rigorous way.

As well as incentive schemes, government intervention can include regulatory mechanisms for planting and felling (such as felling licences and certification), environmental standards (such as environmental impact assessments), regulation of plant health (such as controlling imports to prevent the spread of pests and diseases) and the regulation and registering of seeds and plants under the EU Directive of Forest Reproductive Material. Fiscal measures include the exemption of commercial woodlands from income tax, corporation tax, capital gains tax and inheritance tax. The role of certification and standards in ensuring sustainable forest management will be discussed in the following section, along with potentially useful market mechanisms for enhancing the delivery of public good benefits and how these could be adapted and improved upon in light of the present findings.

7.6.2 Market Mechanisms

In an economic analysis of forestry policy in England, CJC Consulting (2003) asserted that there is no evidence to support government intervention for timber production. They advise that any government intervention for timber must demonstrate a high return of public good delivery. Indeed, England's forest strategy (Defra, 2007a) states that one of the aims of the strategy is to "improve the competitiveness of woodland businesses and promote the development of new or improved markets for sustainable woodland products and ecosystem services *where this will deliver identifiable public benefits*, nationally or locally, including the reduction of carbon emissions" (emphasis added). Many woodland owners in this study expressed a desire to manage their woodlands better, especially if there was a market for their wood products. This concurs with Church et al. (2005) who showed that private woodland owners are more interested in improving general woodland management in their woodland through appropriate incentives than in increasing public access (in fact 80% already had public rights of way).

The findings of the present study suggest that, for some owner types, such as Investors, Multifunctional Owners and Private Consumers, stimulating the market for timber or other wood products may provide an appropriate form of government intervention alongside subsidies.

Research undertaken by Slee et al (2006) for the Forestry Commission concluded that moderate levels of woodland management for timber or wood products can have a beneficial impact on public good benefits, especially biodiversity and recreation. With the growth in energy requirements from wood fuel and the government's commitment to increasing the renewable energy sector, this presents a potentially growing market for low-grade timber from England's woodlands. The UK government has set a target of bringing 2 million tonnes of new material to the market by 2020 (FC, 2007a), most of which is likely to come from unmanaged woodlands in private sector. Early signs suggest difficulties in overcoming disjointed supply chains with owners being disconnected from markets. Although the domestic wood log market is currently flourishing, despite (or perhaps because of) the economic recession, it is dependent on supplies of the right species in areas with the highest demand.

7.6.2.1 Designing new initiatives

The future challenges for forestry are likely to centre on providing renewable energy and sustainable building materials, as well as ensuring that woodlands and forests are resilient to climate change, as well as having potential to protect soil carbon and mitigate floods. If this can be successfully achieved, other public benefits, such as recreation and biodiversity, may be provided as joint products. As with any programme, funding is always limited and can restrict the scope of what can be achieved. If renewables are a priority for government, there may be a case for a complete revision of the existing grant scheme to provide funds primarily for supporting sustainable timber and wood production, including wood fuel. In order to facilitate this, a strategic timber renewable programme needs to be designed to meet the government's target of 2 million tonnes of new wood production by 2020. The initial challenges will be to connect up supply chains – often a barrier to the success of such markets. A small investment by government (for example, in the form of grants or loans or the provision of advice and subsidised training) could stimulate small-scale supply chains and enable the external benefits of public good provision to be internalised within wood production as a joint product. An example of this may be heating public buildings such as schools or care homes with wood fuel extracted from local woods. A return to cooperative schemes, such as those adopted in the agricultural sector to share farm machinery after the Second World War may also be worth adapting in order to overcome the initial obstacles of capital investment for small producers. In addition, marketing cooperatives and credit unions might enable small wood producers to benefit from economies of scale.

Alongside undertaking a renewable timber programme, Multifunctional Owners are keen to diversify their activities in their woodland. Opportunities exist for the development of commercial recreational sites, such as visitor centres, eco-tourism and mountain bike trails. Such enterprises are often the domain of public-owned forests, such as Bedgebury Pinetum and Coed-y-Brenin. Public sector support in joint projects between state and private owners to invent or exploit new opportunities or improve the scope of existing ones may encourage certain types of woodland owner, particularly Multifunctional Owners or Investors, to diversify, although

care must be taken to avoid government spending on business opportunities that would otherwise be taken up by private enterprises.

While many woodlands are currently harvesting below their sustainable increment, there is a danger that stimulating the market to enhance public good provision could result in over-management, leading to a reduction in public good benefits. As a result, there is a need for regulation and compliance monitoring to ensure that any management enhances, rather than compromises, public good benefits. This could be achieved by using the UK Woodland Assurance Scheme (UKWAS) as a platform for promoting sustainability, regulation and marketing. Certification, especially through partnerships between owners, may provide a practical way to provide both public good benefits and economic profitability. The high cost of certification is often a barrier to small woodland owners, so a partnership approach may provide a cost-effective strategy to starting up in business. Wood fuel standards could also be further encouraged to ensure high quality wood fuel for the consumer and high quality public good benefits in woodlands.

7.6.3 Advisory Services

All owner groups in this study indicated that some form of advisory service was important to them to one degree or another. Information and advice is especially important to new woodland owners. Almost half of the survey sample had owned their woodland for less than 10 years. Conservationists were the newest owners, with 62% owning their woodland for an equivalent time. In contrast, only 36% of Investors had owned their woodland for less than 10 years. Providing woodland owners with the practical advice and skills required in order to better manage their woodland resource is vital, especially for those new woodland owners with no background in land management. The most cited source of information for woodland owners in the survey was time spent in the woodland and personal experience. Owners clearly place great value on learning about, and gaining experience of, managing their woodland. Interestingly, after personal experience, the woodland owners in this study most frequently sought advice from reading books about managing woodland or through Forestry Commission officers and publications. While the widespread use of Forestry Commission officers and publications may be because there are few alternatives, it does present an excellent opportunity for the Forestry Commission to develop an advisory programme to provide education and advice to woodland owners. As well as practical advice on woodland management, information about the wider public good benefits provided by woodland is needed. The Forestry Commission is well placed to educate owners about what public good benefits are and how such benefits can often align with the owner's motivations and management objectives. Providing owners with access to information and advice on woodland management will enable them to make informed choices about managing their woodland. For example, the Forestry Commission has recently published a booklet entitled, "So you own a woodland?" designed for new woodland owners. The guide includes basic information on the need for woodland management and possible management objectives and includes a range of resources for the woodland owner to access if required.

Supplementing this publication with some of the lessons and implications from this study would help to promote public good provision in the private sector.

As well as increasing access to information through publications, the Forestry Commission has a powerful advisory tool in its woodland officers, who visit and advise private woodland owners on a range of issues. Many owners in this study indicated that they found the help and advice they had received from a Forestry Commission officer very useful, although it is evident that trust needs to be fostered between the woodland officer and the private woodland owner. However, some commented that making contact with a Forestry Commission officer was sometimes difficult as they always seemed to be very busy and overstretched. Woodland advisory officers might, therefore, benefit greatly from engagement with best practice extension services in other rural land-use sectors, such as agriculture. In order to enhance the delivery of public benefits from private woodlands it is likely that government investment in advisory services will ultimately be required to enhance the support and training of woodland officers.

Most owners also indicated that they would seek advice from contractors, other woodland owners and visit other woodlands, suggesting that owners are keen on sharing best practice. The development of online forums and cooperatives for woodland owners to share experiences, such as the Woodland Initiatives Network (funded by the Forestry Commission and the Countryside Agency, and hosted by the Small Woods Association), can provide support to woodland owners and link up wood producers with consumers. Good practice and successful woodland management could be shared in the form of demonstration projects. Forest Enterprise may be able to facilitate this, providing advice and sharing their experiences with private woodland owners. There is good evidence from the farming community that action research and practical engagement of landowners and managers can provide a suitable platform for enhanced environmental management of rural resources (see for example Curry 1997 and Stobbelaar et al 2009). Such projects require skilled facilitation and it can be important to engage the right individuals who can provide endorsement of the approach.

Of all the owner types, Individualists are the most likely to talk to others and share experiences. Thus, the development of online forums for woodland owners may provide an opportunity to reach this owner type, which appears to be the most reticent about engagement with public bodies. The present findings suggest that woodland owners are least likely to access sources of information through DVDs, conferences or TV/radio programmes. The most successful forms of engagement with private woodland owners are likely to be through the development of Forestry Commission advisory services and woodland owner forums and cooperatives.

This section has discussed the study findings with regard to their implications for policy. A number of recommendations are made relating to incentive schemes, market mechanisms and advisory services. These are summarised in Table 7.7, along with some suggested first steps that could be undertaken by the Forestry Commission.

Table 7.7: Policy recommendations

Tool	Policy recommendation	Suggested first steps
Incentive Schemes	Target woodlands with high public good value and willing owners	Send a simple questionnaire to owners to gauge characteristics
	Seek consonance between scheme objectives and owner motivations	Provide grants for general good practice woodland management to bring woodlands back into management
	Offer incentives for broader public good values for sites where recreational access is not appropriate or possible	Simplify forms and application procedure
	Ensure grant application procedure is simple and straightforward	
	Ensure funding offered covers the majority of costs involved, where possible	
Market Mechanisms	Support the development of supply chains for wood fuel and small timber	Provision of grants/loans/ subsidised training for business set-ups
	Facilitate woodland owner cooperatives and joint partnerships (including between public and private owners) for certification and sharing equipment costs	Support entrepreneurial and innovative activity in the private sector through FC demo projects
	Target supply chains that deliver public benefits	Design and develop timber renewable programme
	Facilitate and encourage entrepreneurship	
	Regulate and monitor to ensure woodland management enhances public good benefits	
Advisory Services	Facilitate the development of woodland owner online forums to share best practice	Revise "So you own a woodland?" to educate owners about public good benefits
	Make Forestry Commission publications more accessible and focused on educating about public good benefits	Further publications might be more specific, including "Managing a woodland for wildlife", "Getting the most out of your woodland: small-scale timber production" and "Providing safe and attractive woodland recreation"
	Enhance services provided by woodland officers through staff support and training	

Having considered the policy implications, the following section discusses the methodological issues relevant to this study.

7.7 METHODOLOGICAL CONSIDERATIONS

The use of three complementary methods in this study has provided a useful example of the benefits of adopting a mixed methods approach. Without the initial scoping study utilising a Grounded Theory methodology (see Urquhart 2006 and Urquhart et al 2010), the research would not have benefitted from a rich pool of qualitative statements relating to woodland ownership and management, which were crucial in designing the Q Methodology. This initial scoping study also highlighted potential hypotheses for further exploration in the Q Methodology and self-completion surveys. In turn, without the Q Methodology, a thorough testing of the qualitative statements, many of which were subsequently used to design the self-completion survey, would not have been possible. Furthermore, the use of both Q Methodology and self-completion surveys to develop a private woodland owner typology allowed the findings of each method to validate each other. Despite using different data sets, the results were very similar, with three of the owner types in the Q Methodology (Multifunctional Owners, Individualists and Hobby Conservationists) directly comparable to three of the owner types in the self-completion survey (Multifunctional Owners, Individualists and Conservationists). The mixed methods approach was, therefore, crucial for the development and validation of the private woodland owner typology. Without it the findings of any single method would be, at best, incomplete and, at worst, questionable.

A further discussion on the benefits and disbenefits of the adopted research methodology can be addressed in terms of both data collection and data analysis for each of the methods used. Firstly, the data collection for the Q Methodology proved very successful. Participants were interested in the novel method and found it stimulating and thought-provoking. Further, it allowed the researcher to directly engage with the woodland owners while also eliciting rich and meaningful data. The strength of Q Methodology is that it allows statements to be ranked by participants according to how much they agree or disagree with the statement. In a survey questionnaire each question is discrete and does not relate to another question. With Q Methodology, however, each statement is ranked in relation to all the other statements, providing a much more nuanced response.

The small sample size is perhaps the most limiting factor of Q Methodology. With only 30 participants it is not possible to ascertain the proportion of each owner type in the wider population and this should be borne in mind when interpreting the results. Fewer categories of owner types were revealed by the Q Methodology in comparison to the survey. With only 30 participants, it is possible that one or more sub-sections of the population were not included, which represents a potential limitation to this method, especially when investigating populations that are likely to be diverse. Future Q Methodology studies may wish to adopt a more selective sampling procedure to ensure that a broader range of woodland owners are included. Since the dataset used to select the sample for this study was limited to owner names and addresses, a more purposeful sampling strategy was not possible. The inclusion of a larger set of statements

for sorting may have also revealed further owner categories and is recommended for future studies.

As noted in Section 4.4.4, the sorting process is often tackled differently by participants, with some finding it easier than others. It is, therefore, crucial that the researcher clearly explains what is expected of the participants and carefully observes the sorting process to ensure that the participant has understood correctly. A further limitation of the method is that it is time consuming, requiring the researcher to visit each participant individually. Future studies may wish to consider administering the Q sort by post (or email), although this would require very clear written instructions and is unlikely to be as effective as face-to-face implementation. There is also the risk that the participant may lose interest or not devote adequate time to fully consider their Q sort.

The second method employed in this study, a self-completion postal survey, also proved highly successful. The response rate to the survey was high (81%), supporting Dillman's assertion that his Total Design Method can consistently generate responses of at least 70% (Dillman, 2007). This not only illustrates the benefits of employing carefully designed postal surveys to collect attitudinal data, but reflects the success of the questionnaire design, the sampling frame and the strategy of multiple mailings to encourage response. The small number of incomplete surveys reflects the success of the questionnaire layout and the wording of each question, indicating that the questionnaire was clear and easy to complete. The high response rate ensured a very small non-response error, so it can be assumed that the responses are fairly typical of the sample population. While Dillman's method, if conducted carefully, can generate a good response rate, there are a number of limitations. Firstly, the application of five contacts is very time consuming, taking between 6-8 weeks from the first mailing to the final contact. Secondly, the method is costly due to the multiple mailings using first class stamps and the expense of including an incentive. Administering the postal survey cost almost £1900 for this study, contrasting with just over £750 for the Q Methodology study. Future studies may wish to consider the use of internet surveys to reduce mailing costs. This would, however, require access to participants' email addresses, which may be difficult to acquire.

The main pitfall of this study was the potential omission of a relevant owner group – disengaged woodland owners. It was very difficult to gain access to woodland owners who have no affiliation to any agency. A number of owners in this category were contacted via snowballing (6 participants) and 55 of the respondents stated that they had had no involvement with grant schemes. These participants may have a similar profile to the disengaged woodland owner. Of these owners, 25 were Individualists and a further 13 were Private Consumers. Only 3 were Investors, 4 were Amenity Owners and 5 were Multifunctional Owners and Conservationists. Thus, the findings from this small indicative sample suggest that the largest proportion of disengaged woodland owners may fall into the category of Individualists. This is unsurprising, as it is unlikely that disengaged owners are actively seeking to provide public benefits in their

woodlands. Thus, the proportion of Individualists identified in this study (relating to 8% of the woodland area) may well be an underestimate and should be treated with some degree of caution. Future studies should seek to ensure that this potentially under-sampled group is included, although it may prove difficult to achieve because complete lists of private woodland owners, including disengaged owners, are not readily available.

The mixed methods approach employed in this study provides an example of how triangulation can be used, both developmentally and for validation purposes. The Q Methodology informed the subsequent postal survey and the findings of the Q Methodology and the self-completion survey revealed much consonance in the emergent woodland owner groups (Table 7.8).

Table 7.8: Private woodland owner typology

TYPOLOGY CLASSIFICATION	GROUP FROM Q METHODOLOGY	GROUP FROM SURVEY QUESTIONNAIRE
Investor		Investor
Individualist	Individualist	Individualist
Private Consumer		Private Consumer
Amenity Owner		Amenity Owner
Multifunctional Owner	Multifunctional Owner	Multifunctional Owner
	Custodian	
Conservationist	Hobby Conservationist	Conservationist

The Q Methodology study revealed four owner groups, while the self-completion survey unveiled six owner groups. Three of the owner groups from each method are very similar: the Multifunctional Owner, the Individualist and the Conservationist. The Q Methodology also revealed an owner type which was labelled the Custodian Owner. This owner type was typified by owners who are keen to preserve their woodland for future generations and are very much dependent on grants for any management activities they carry out. When the owner types from the questionnaire are profiled on the variable "I own my woodland to preserve it for future generations", almost half of participants in each owner type stated that this factor was either 'important' or 'very important'. However, over 80% of Multifunctional Owners and Amenity Owners perceived this factor to be important. The Custodian Owner in the Q Methodology study was not in favour of public access in their woodlands, so it is likely, therefore, that they were represented as a sub-group of the Multifunctional Owner in the survey questionnaire data. The remaining two owner types, the Private Consumer and the Investor, were identified in the self-completion survey but not the Q Methodology. This may be because the Q Methodology involved a sample of only 30 participants and the self-completion survey sample was made up of around 600. It is, therefore, probable that a certain sub-set of private woodland owners was omitted in the Q Methodology which was subsequently identified in the survey. Also of note is the identification of Private Consumers and Amenity Owners in the self-completion survey, but not in the Q Methodology. As noted earlier, this may be because the Q Methodology sample

was limited and may not have been large enough to identify these groups, highlighting a potential problem with the Q Methodology approach. While it is clearly a useful method for identifying groups within a particular community, the small sample cannot be assumed to be representative of the wider population.

That said, the general consonance of the results between the two methods provides validation that the statistically derived typology is robust. While some authors question the validity of landowner typologies (for example, Burton (2004)) due to the wide range of external and internal factors that influence their decisions, the typology confirms the heterogeneity of private woodland owners in England, with clear owner groups being revealed and the results show that these owner types have differing attitudes towards public good provision, particularly with regard to recreational access and biodiversity.

The analytical method represents a useful example of how different multivariate techniques can be used sequentially to analyse a complex dataset and verify the results. Factor and cluster analysis are useful techniques, although require careful preparation of the data and effort on the part of the analyst to extract the most meaningful interpretation of the data. In terms of validating the derived classifications, the discriminant analysis also proved to be a useful tool, as found by McLeay et al. (1996), Davies (2001) and Tsourgiannis (2007) in their studies of farmer marketing behaviour. The results of the validation exercise using discriminant analysis and triangulation of the results from both the Q Method and the self-completion survey indicate that the methodology employed could be usefully replicated in other study areas throughout the UK and other parts of the developed world.

7.8 SUGGESTIONS FOR FURTHER WORK

As mentioned earlier, a drawback of the study is the potential omission of disengaged woodland owners from the sampling frame. Despite the intuitive conclusion that disengaged woodland owners are likely to be classified as Individualists, this cannot be empirically tested from this sample. Thus, it is likely that either the proportion of Individualists identified in this study is an under-estimate or that disengaged owners represent a discrete, and as yet unidentified, owner type.

Future studies will need to overcome the difficulties of identifying and accessing disengaged woodland owners. A map-based approach could usefully be adopted, with researchers seeking to identify all woodland owners in, say, 5km^2 plots. These owners could be identified through a combination of land registry searches, word of mouth or knocking on doors. The problem with this approach, though, is that it can be very time consuming and expensive. Furthermore, it may not be possible to identify all the owners in the plot and a number may refuse to participate.

This study has also highlighted that there may be discrepancies between woodland with potentially high public good value and ownership motivations. This study has necessarily

focussed on the supply of public benefits by classifying private woodland owners, the providers of those benefits. The next step would be to assess the demand for these public benefits building on the existing work on benefit transfer (for example, Brainard et al. (2001)). A useful way forward would be to, firstly, assess the spatial distribution of public good benefits. One approach could be to undertake a contingent valuation exercise focusing on the demand for public good benefits in woodlands in different spatial contexts. Willis and Garrod (1991), for example, estimated the variations of value on recreation between different woodland sites, ranging from £2 per hectare per year in a sparsely populated area in Argyll, to £445 in highly populated Cheshire. Such an approach could be applied to a range of public benefits on a more local scale. For example, taken on the parish level, are woodlands on the edge of a town or village of greater value than more remote woodlands? Also, are woodlands of greater value if there is no other area of public open space nearby? An assessment of public good value in private woodlands on the local scale, combined with the characterisation of private woodland owners from this study, would enable policy makers to target particular woodland sites and owners for public benefit provision.

While this study investigated private woodland ownership, institutional ownership was beyond its scope. It would, therefore, be appropriate to investigate the opportunities for public good enhancement in voluntary-sector woodlands. Some of these owners, such as the Woodland Trust, may be well placed to deliver public benefits. Others, such as Wildlife Trusts, may have more specific biodiversity goals. As well as their ability to provide a broad range of public goods, it would also be appropriate to consider the role that institutionally-owned woodlands could play in a timber renewable programme. Further research is required to assess the scope for developing a sustainable timber and wood products programme to meet the government's target of 2 million tonnes of new material by 2020. A targeted approach is needed to assess the ability of private and voluntary sector owners to contribute to this target and to assess and recommend measures that will facilitate this, such as linking up supply chains and overcoming initial capital costs. There are many individual small-scale projects across the UK and Europe exploring renewable energy and new business opportunities. It would be useful to undertake a review of these and the potential for knowledge exchange and sharing of best practice. Such a review could identify gaps in information or funding that could be usefully addressed.

In addition, the methodology for classifying private woodland owners in this study could usefully be applied on a larger scale across Europe, which would allow a consistent approach to the identification of private woodland owners to be taken. This would have relevance to broader European forest policy that is seeking to implement sustainable forest management policies (FERN, 2005).

7.9 CONCLUSIONS

This study has developed a robust typology of private woodland owners in England with respect to their willingness and ability to deliver public good benefits. Using Q Methodology and a self-

completion survey in three study areas: the Lake District, Cornwall and the High Weald AONB, the study has identified six different types of private woodland owner: the Investor, the Multifunctional Owner, the Amenity Owner, the Private Consumer, the Conservationist and the Individualist. Each of these owner types has a distinct identity with respect to their objectives for woodland management and their reasons for ownership. Investors are the most financially-oriented of all the owner groups and prioritise timber production and investment opportunities in their woodland over any other objectives. They are not motivated to manage their woodland for their own personal enjoyment, nor for the public benefits of wildlife conservation or recreation. Multifunctional Owners have multiple objectives for managing and owning woodland. They are concerned about investment and financial considerations, but they combine extracting wood products with recreation, environmental aspects and their own personal enjoyment. Amenity Owners are the keenest of all the owner groups to open up their woodlands to public access in the form of informal recreation, while Conservationists are primarily motivated to manage their woodlands to conserve wildlife habitats. Private Consumers value their woodland primarily for the wood products they can harvest (such as wood logs, poles etc.) for their own domestic use. However, they also appreciate the wildlife benefits and their own personal enjoyment of the woodland. Individualists primarily value the privacy and personal enjoyment they get out of their woodland. They appreciate the landscape values of their woodland and are keen to protect it from future development.

Classifying woodland owners as either 'agricultural' or 'non-agricultural' is clearly unhelpful in terms of informing policy. Indeed, this study found farmers to be represented in all of the identified woodland owner types, highlighting the diverse range of motivations they hold. A further consideration is that classifying woodland owners into either production-oriented or consumption/protection-oriented groups, as in the term 'non-industrial private forest owner', is also misleading in terms of policy. Some of the owner types identified in this study have a combination of one or more production, consumption or protection goals. The findings further suggest that terms such as 'post-productivist' and, to a lesser extent, 'multifunctional', when applied to private forestry, are limiting with regards informing policy.

A new conceptual model, based on Holmes' (2006) descriptive model, is put forward that moves away from a simple production (productivist) versus consumption/protection (post-productivist/ multifunctional) concept to a framework that includes overlapping goals (as illustrated in Figure 7.2). By adapting the descriptive model proposed by Holmes (2006) regarding modes of rural occupance, a framework for conceptualising which owner types are predisposed to providing certain public goods is developed. Most of the owner types have objectives relating to one or more production, consumption and protection goals, except for the Individualists, who value their woodland for the privacy it affords them and for personal enjoyment. This study builds upon previous classifications by developing a statistically robust typology based specifically on owners' attitudes towards public good delivery. While the revealed owner types have been identified in previous empirical studies, this research has identified a broader range of owner

types encompassing production, consumption and protection goals. Previous studies have only identified owner types in one or more categories.

Given the Treasury and Defra's position to intervene with policy to support public good delivery, a typology based on owners' willingness to deliver public goods provides a more realistic criterion on which to base policy recommendations. With a diverse range of objectives and goals held by private woodland owners, a range of policy options will be required to meet these varying demands, including advisory services, incentives and market mechanisms. This study identifies four owner types that are most likely to be influenced by grant incentive schemes: Multifunctional Owners, Amenity Owners, Conservationists and Investors. However, each of these is likely to be motivated by different goals, with Amenity Owners likely to be willing to provide recreational access, while Conservationists will be motivated by management activities to improve biodiversity and Investors will be incentivised by economic profitability. Out of all the owner types, Multifunctional Owners are the most amenable to providing a range of public good benefits in their woodlands. Private Consumers and Individualists are the least likely to be influenced by subsidies to encourage public good delivery. These owners have a strong sense of perceived property rights and privacy, fearful that they will lose some of their control if they accept state support. A set of criteria for selecting which woodlands to support needs to target those woodlands that can deliver the greatest public good, but also targets owner types whose objectives are most in line with, or amenable to, policy goals. A social marketing approach may provide a useful tool for targeting owner groups.

This finding supports the evidence presented in previous studies (see Church et al., 2005) that many woodland owners are more interested in improving general woodland management in their woodland than in specifically improving public access. Multifunctional Owners, Private Consumers and Investors (accounting for almost 80% of the sample) are likely to be influenced to manage their woodlands via market mechanisms. These findings suggest that government investment to stimulate small-scale supply chains for small wood products and wood fuel may enable the external benefits of public good provision to be internalised by the woodland owner. Also, Multifunctional Owners may well be influenced by public sector support or partnerships in new projects, such as visitor centres, eco-tourism or mountain bike facilities.

All of the owner groups in this study are likely to benefit from some form of advisory service. The findings suggest that the most successful forms of engagement with private woodland owners are likely to be, firstly, the development of Forestry Commission advisory publications and the support offered to woodland owners through their woodland officers; and secondly, the development of online forums and cooperatives for woodland owners to share experiences, to provide support and to link up wood producers and consumers.

Findings also reveal a difference between the study areas in terms of woodland ownership and woodland type. The High Weald AONB is characterised by small (3-10ha) plots of mainly

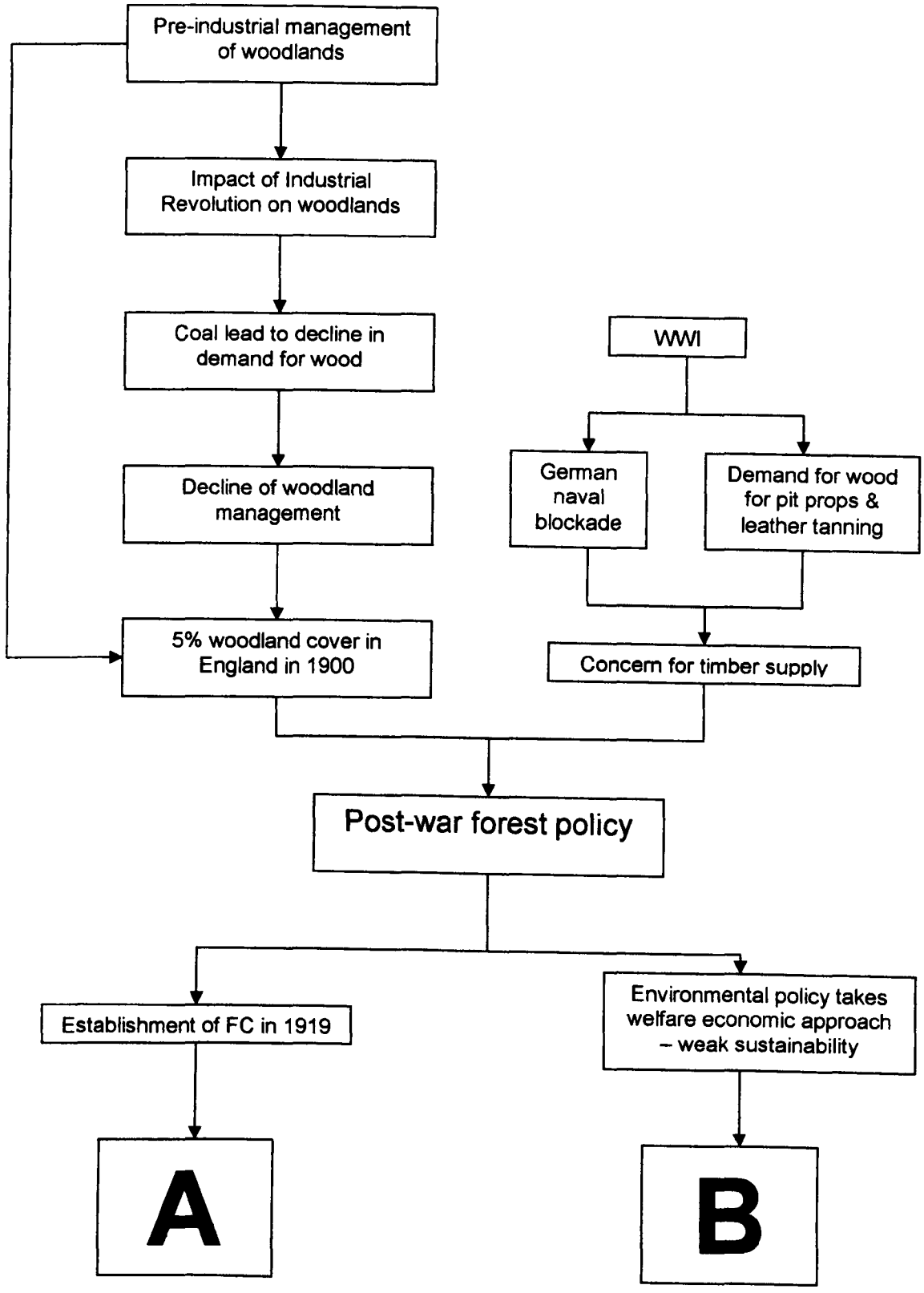
ASNW under new ownership (less than 5 years). Owners are typically either individuals or farmers, with the majority living adjacent to their woodland, but with a substantial minority living over 30 miles away. Of all the study areas, take up of grant schemes in the High Weald is the lowest, with the main motivations for ownership being scenery, privacy, personal enjoyment and wood fuel for personal consumption. The Lake District consists of mainly mixed woodland which has been in the same ownership for over 30 years. Much has been inherited and there are a large proportion of estate woodlands, as well as individual and farm ownership. Cornwall consists of primarily broadleaved woodland, much of which has been planted. Many owners have owned woodland for less than 5 years and are mainly farmers or individuals. Wildlife conservation is a strong motivation for management and this study area has the highest uptake of government grant schemes. In highlighting spatial variation, these findings suggest that a regional approach is needed when targeting programmes for the delivery of public good benefits across England. An important finding is that owner willingness does not always match to an appropriate woodland site, suggesting that any policy measures need to take a targeted approach that seeks alignment between sites with high public good value and owners willing to provide appropriate public benefits.

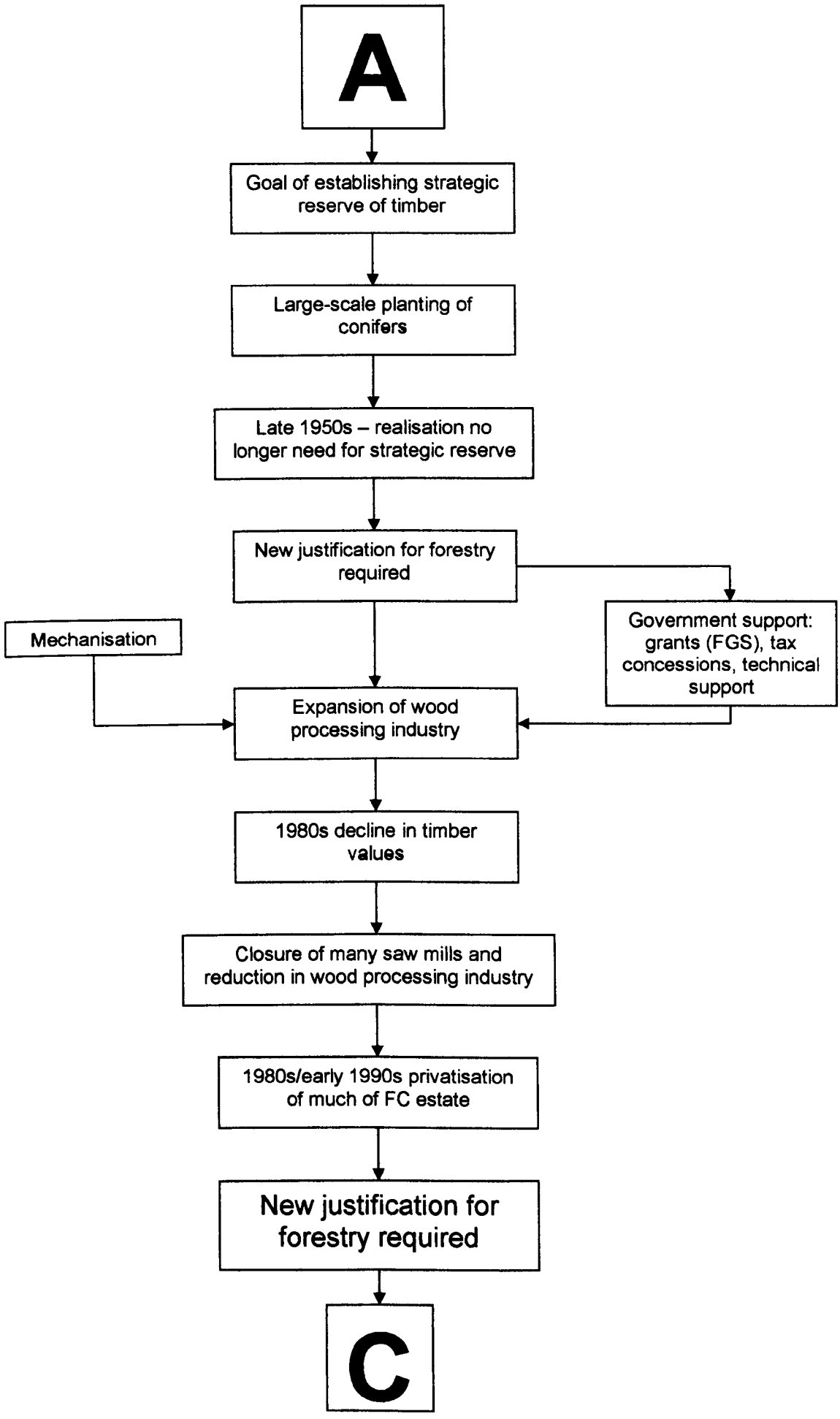
The use of three research methods (qualitative interviews in a Grounded Theory scoping study, Q Methodology and a self-completion postal survey) to develop the typology provided a robust approach and enabled the validation and verification of the findings from each of the methods. Furthermore, applying Dillman's Total Design Method resulted in a high response rate to the survey (81%), reducing any potential non-response error. The survey questionnaire was analysed and the typology developed using a combination of factor analysis, cluster analysis and discriminant analysis, which proved successful in producing a statistically robust typology that could be usefully replicated in other study areas. A logical next step in this respect would be to roll out the methodology in a number of EU countries.

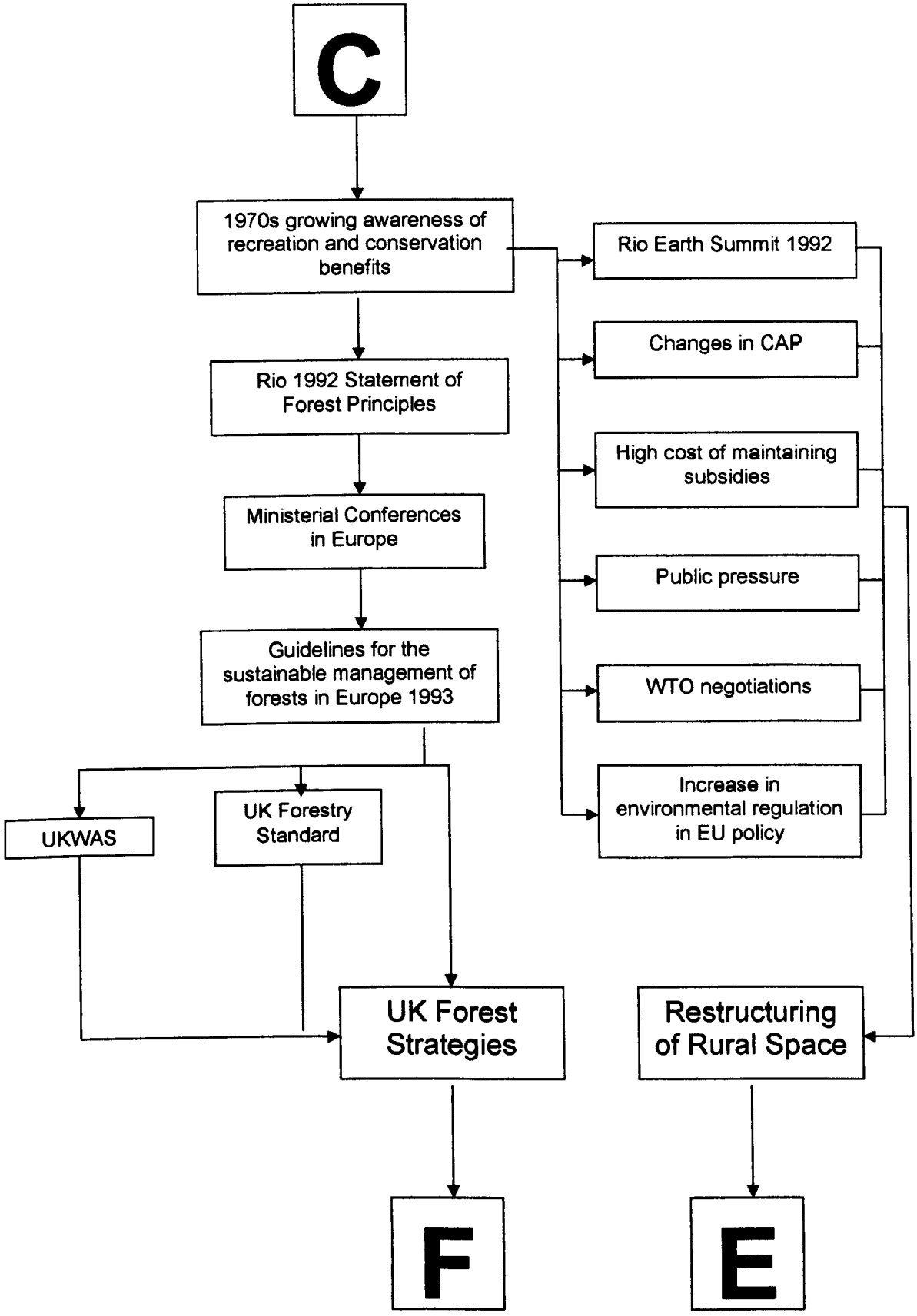
Any future study would need to attempt to identify disengaged woodland owners as these may represent an owner type not discretely identified in this study. It would also be useful to map the spatial variability (and the trade offs between) different public goods, or ecosystem services, together with a stakeholder analysis to bring together woodland owners, policy makers, forestry consultants, woodland users and academics to discuss and share their varying perspectives on the delivery of public good benefits in private woodlands. The key is to identify where to concentrate resources in order to get the best value for public money.

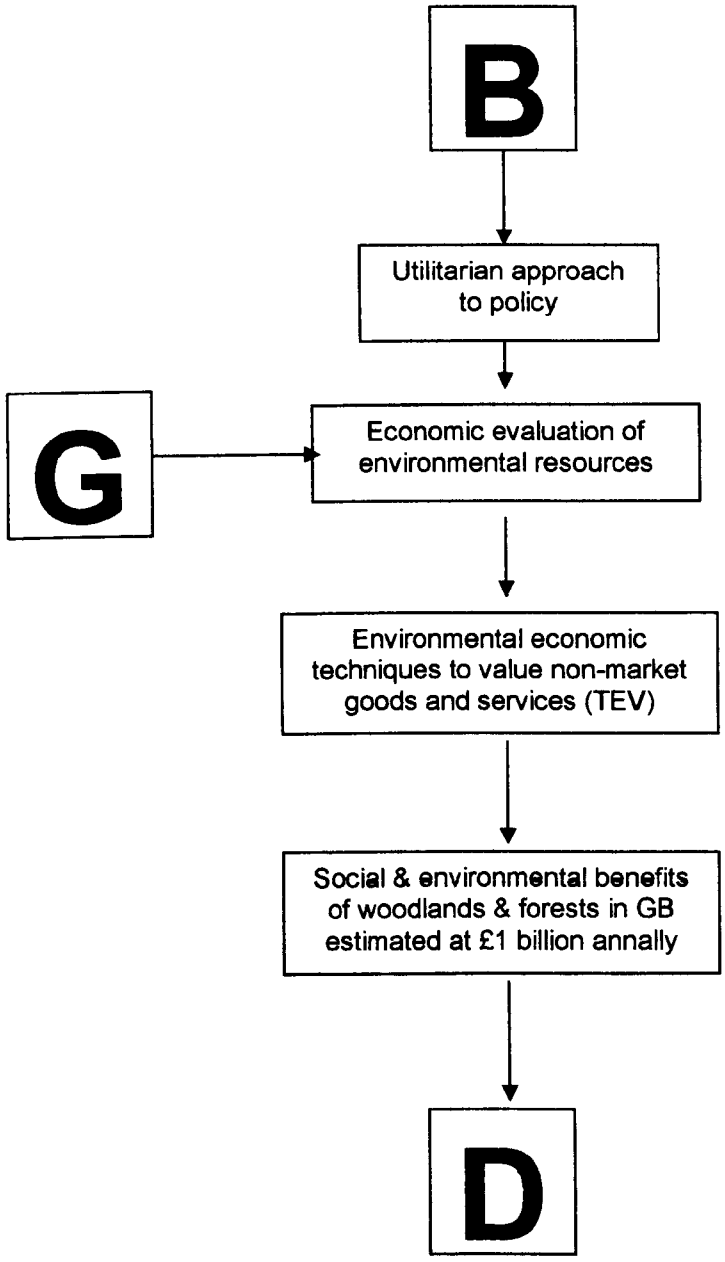
In conclusion, the study has yielded a useful and robust typology of private woodland owners in England. A valid and reliable methodology has been developed which could be used to replicate further studies across the UK, Europe and beyond. The derived classification of owners represents a useful tool for informing public policy on the provision of public good benefits in private woodlands in England.

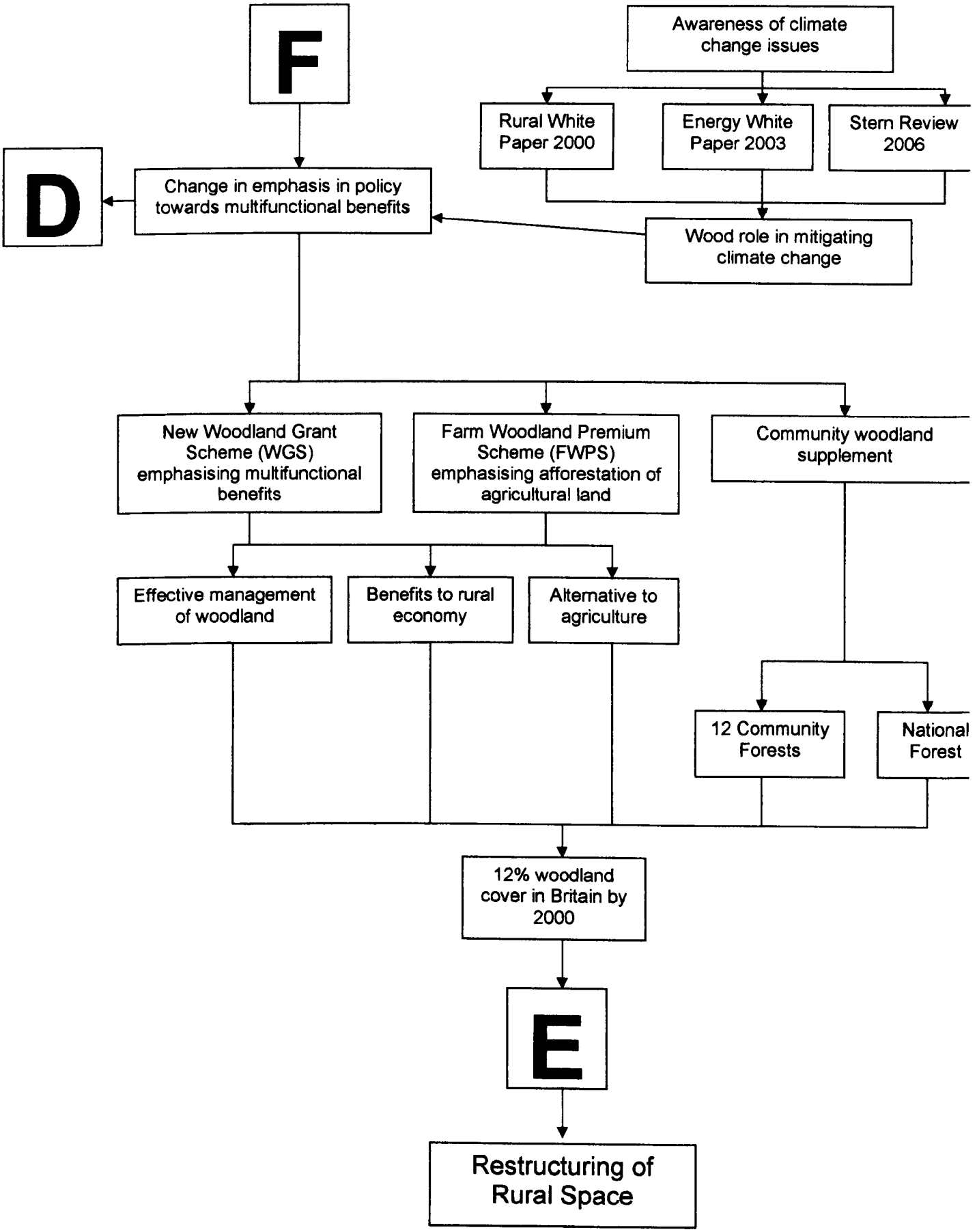
APPENDIX 1: MAP OF CONCEPTUAL MODEL

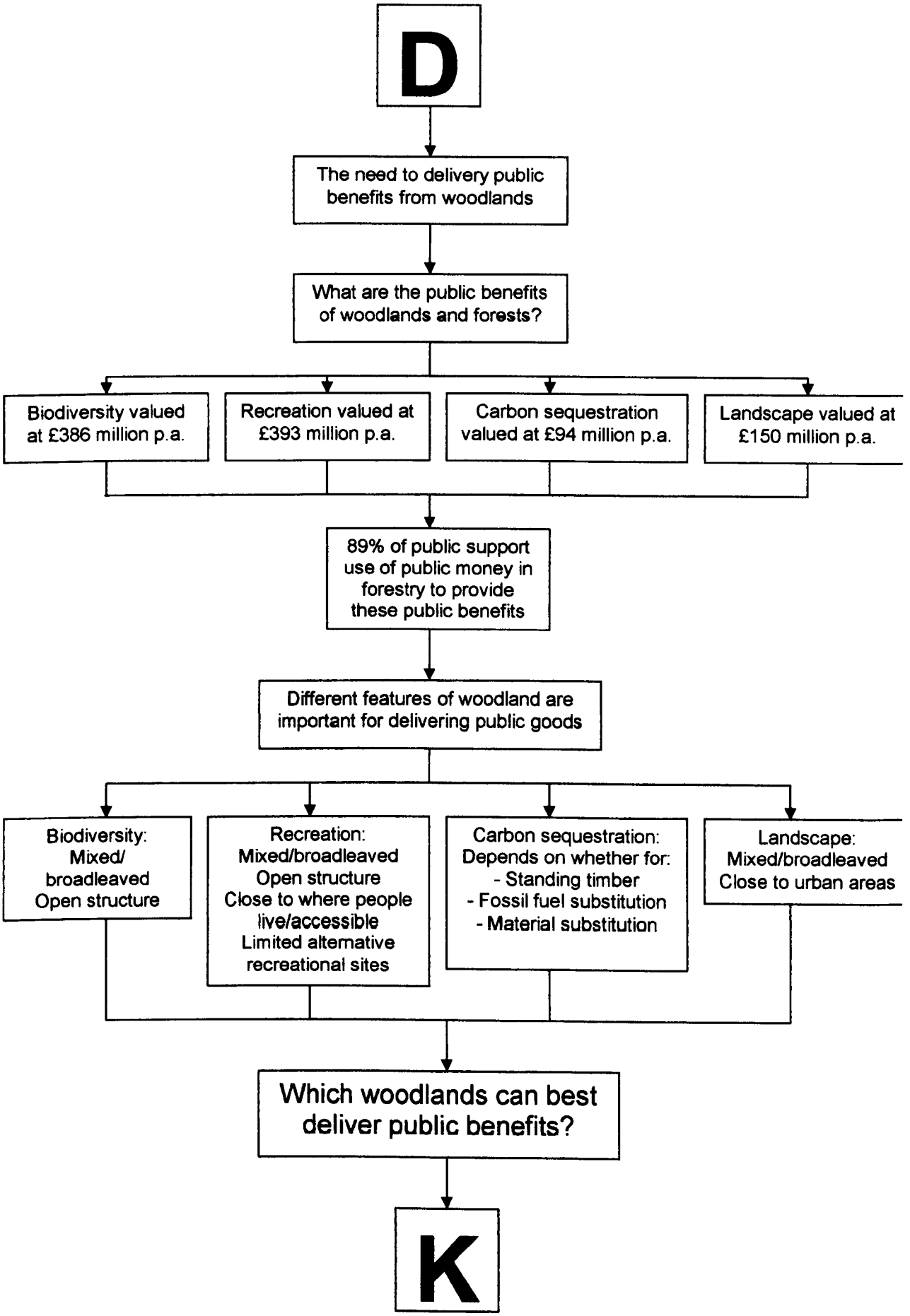


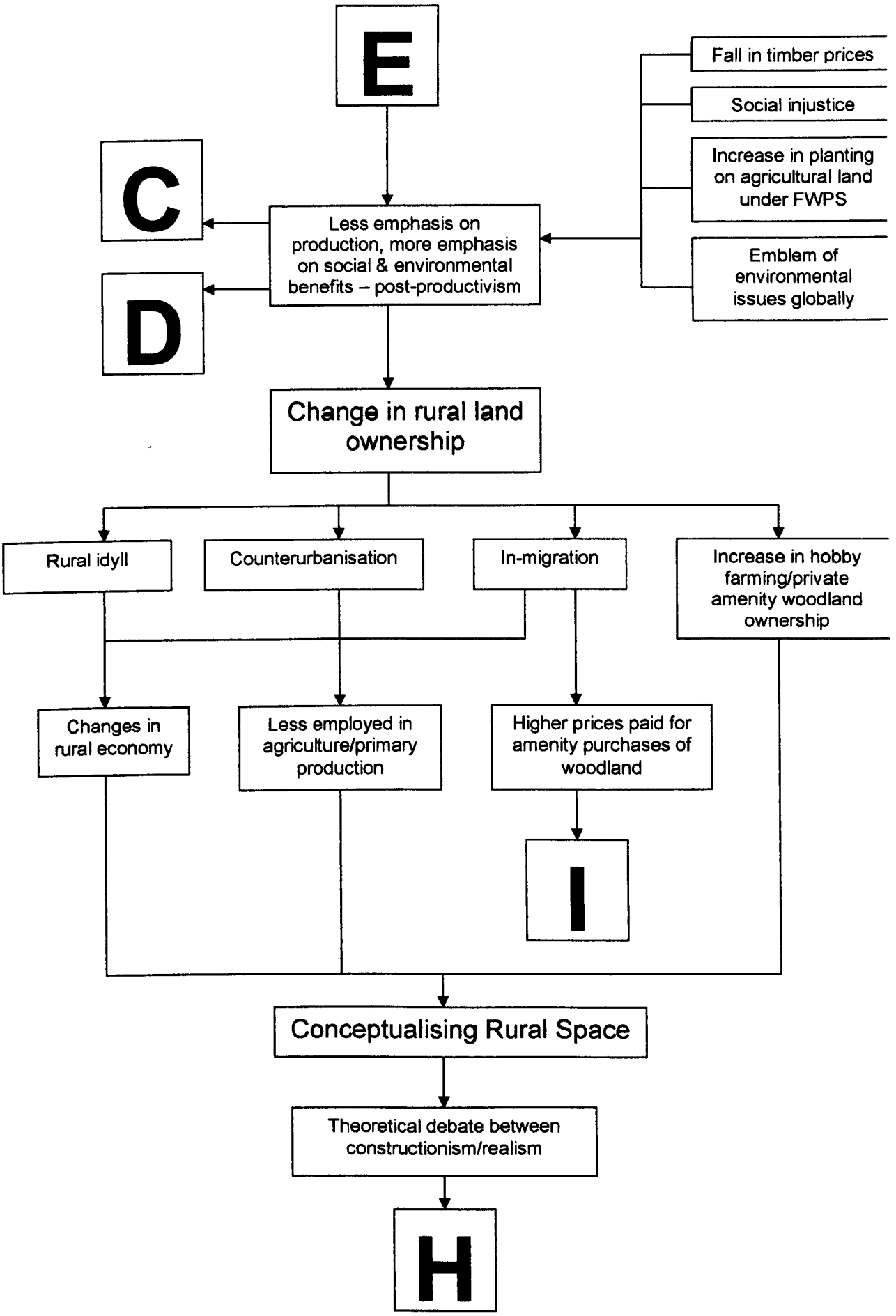

A
Goal of establishing strategic reserve of timber
Large-scale planting of conifers
Late 1950s – realisation no longer need for strategic reserve
New justification for forestry required
Mechanisation
Government support: grants (FGS), tax concessions, technical support
Expansion of wood processing industry
1980s decline in timber values
Closure of many saw mills and reduction in wood processing industry
1980s/early 1990s privatisation of much of FC estate
New justification for forestry required
C

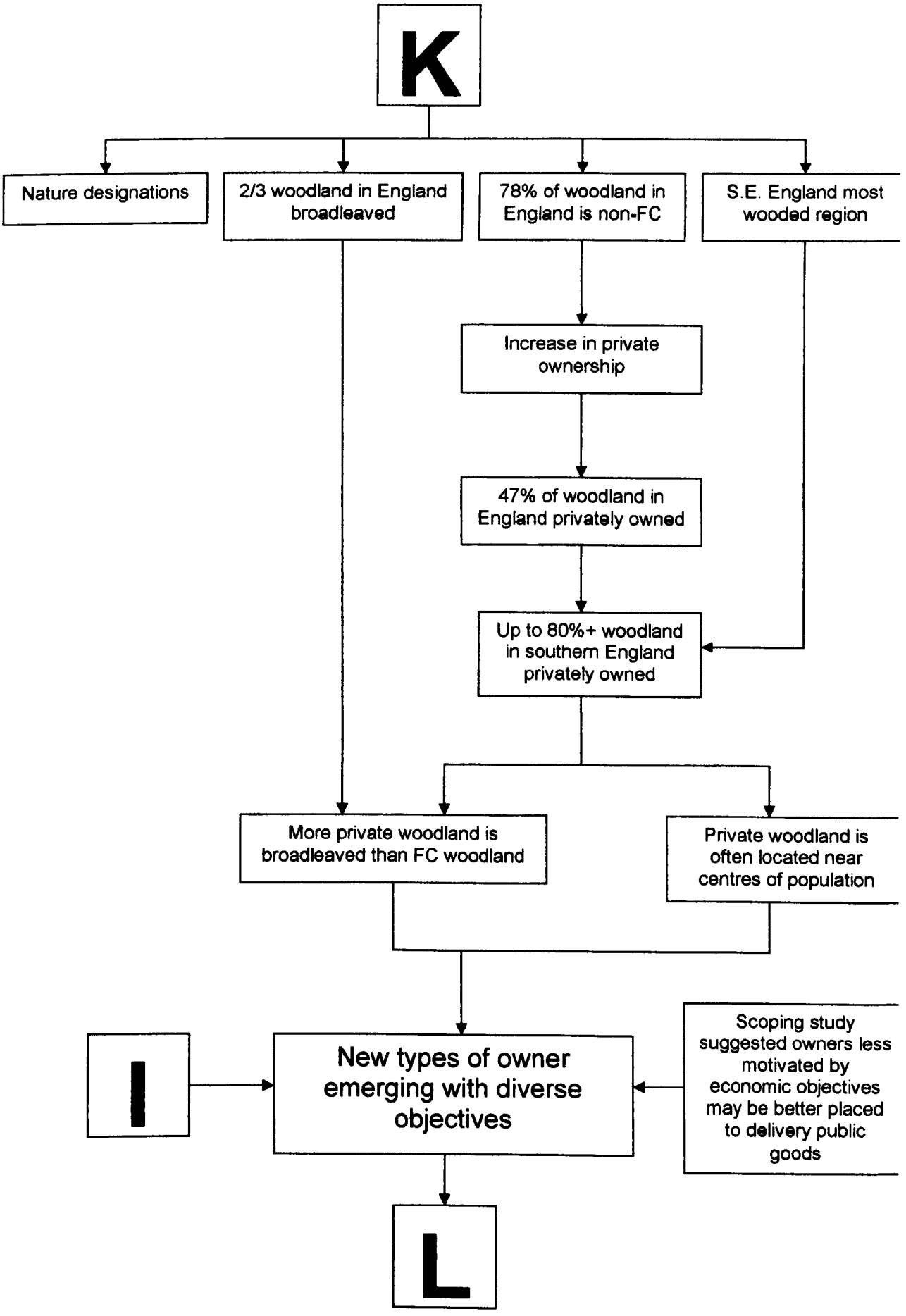

C
1970s growing awareness of recreation and conservation benefits
Rio 1992 Statement of Forest Principles
Ministerial Conferences in Europe
Guidelines for the sustainable management of forests in Europe 1993
UKWAS
UK Forestry Standard
Rio Earth Summit 1992
Changes in CAP
High cost of maintaining subsidies
Public pressure
WTO negotiations
Increase in environmental regulation in EU policy
UK Forest Strategies
Restructuring of Rural Space
F
E

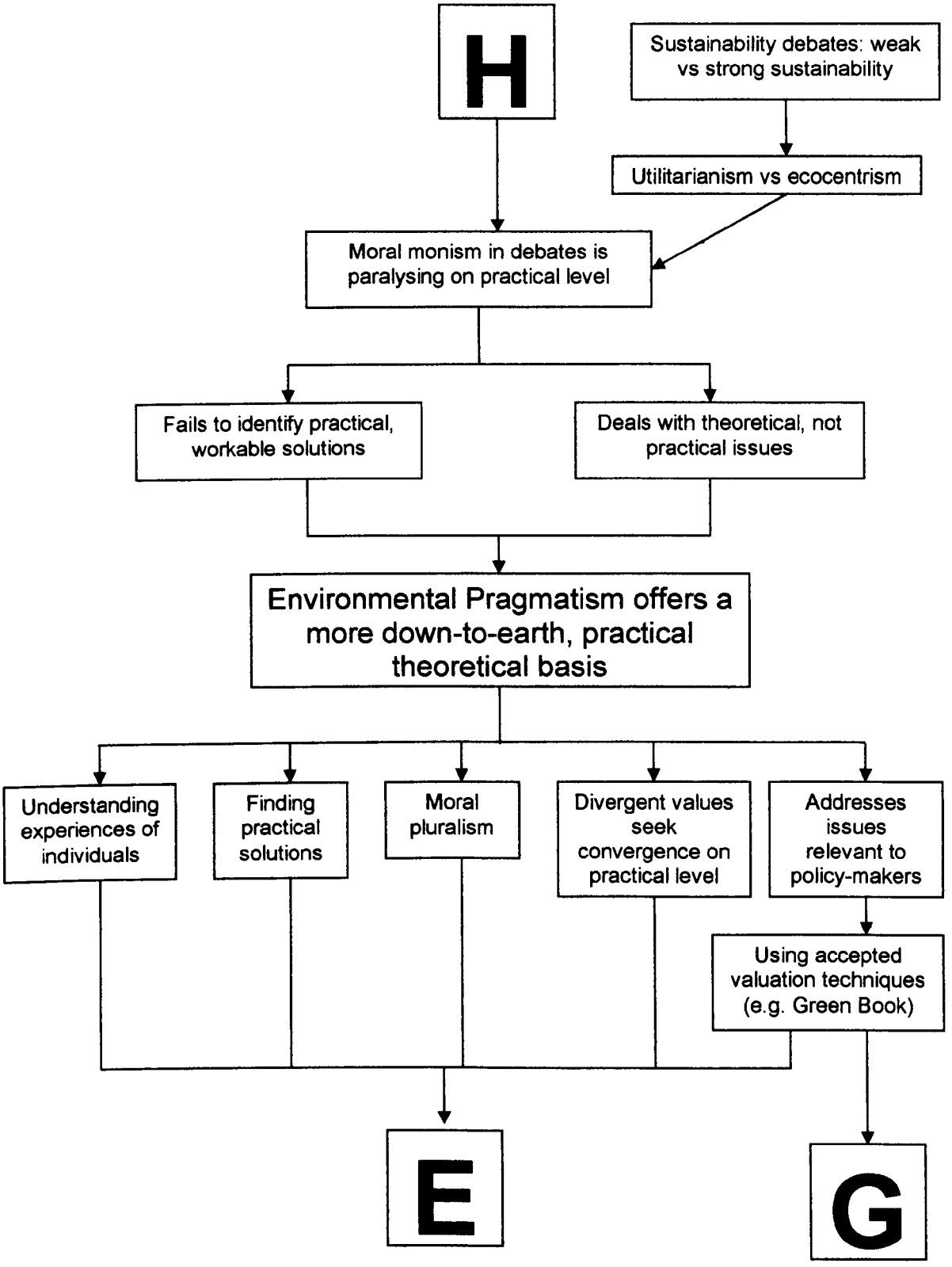

B
Utilitarian approach to policy
G
Economic evaluation of environmental resources
Environmental economic techniques to value non-market goods and services (TEV)
Social & environmental benefits of woodlands & forests in GB estimated at £1 billion annally
D

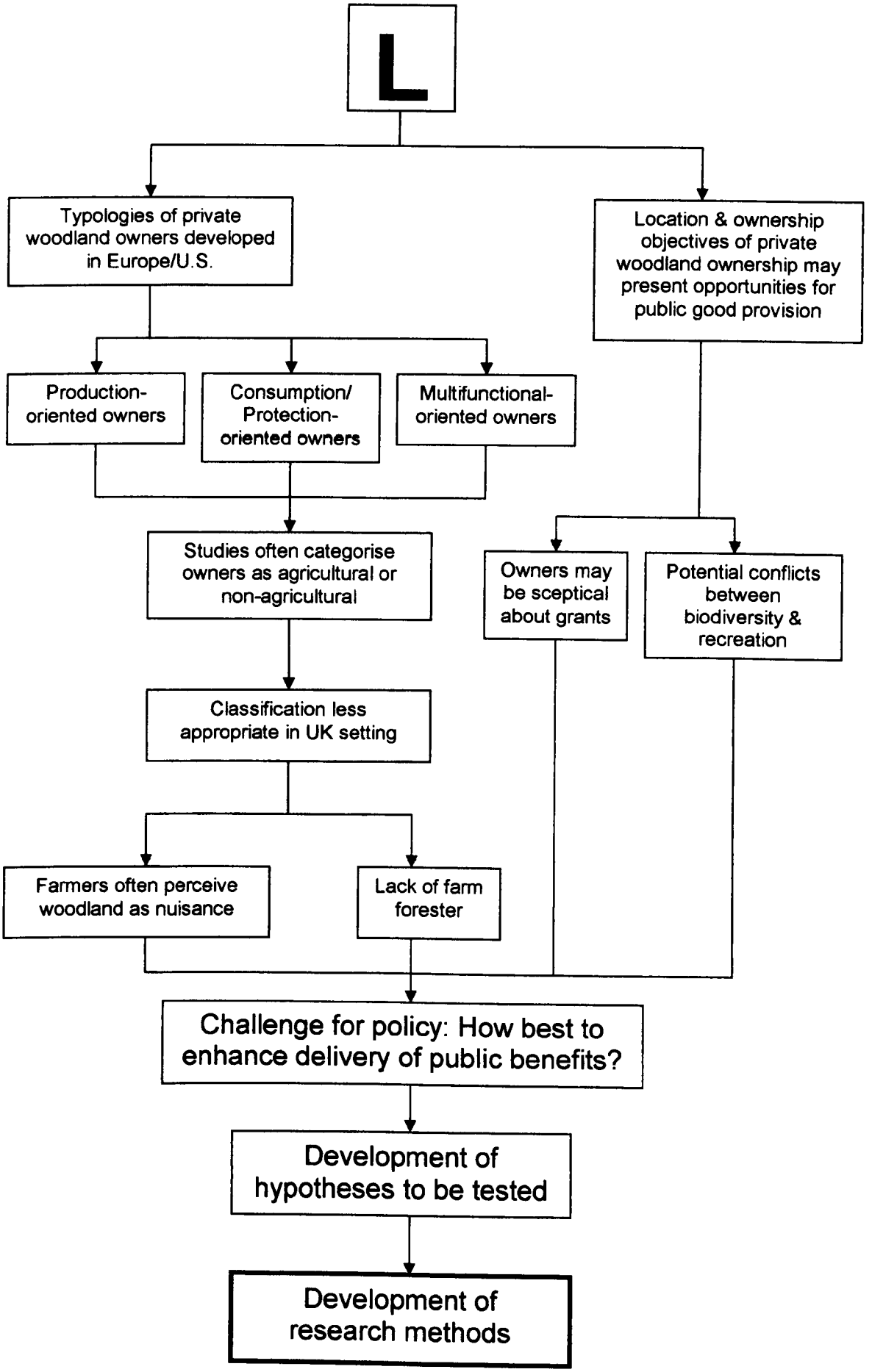

F
Awareness of climate change issues
Rural White Paper 2000
Energy White Paper 2003
Stern Review 2006
D
Change in emphasis in policy towards multifunctional benefits
Wood role in mitigating climate change
New Woodland Grant Scheme (WGS) emphasising multifunctional benefits
Farm Woodland Premium Scheme (FWPS) emphasising afforestation of agricultural land
Community woodland supplement
Effective management of woodland
Benefits to rural economy
Alternative to agriculture
12 Community Forests
National Forest
12% woodland cover in Britain by 2000
E
Restructuring of Rural Space


D
The need to delivery public benefits from woodlands
What are the public benefits of woodlands and forests?
Biodiversity valued at £386 million p.a.
Recreation valued at £393 million p.a.
Carbon sequestration valued at £94 million p.a.
Landscape valued at £150 million p.a.
89% of public support use of public money in forestry to provide these public benefits
Different features of woodland are important for delivering public goods
Biodiversity: Mixed/ broadleaved Open structure
Recreation: Mixed/broadleaved Open structure Close to where people live/accessible Limited alternative recreational sites
Carbon sequestration: Depends on whether for: - Standing timber - Fossil fuel substitution - Material substitution
Landscape: Mixed/broadleaved Close to urban areas
Which woodlands can best deliver public benefits?
K


E
C
D
Fall in timber prices
Social injustice
Increase in planting on agricultural land under FWPS
Emblem of environmental issues globally
Less emphasis on production, more emphasis on social & environmental benefits – post-productivism
Change in rural land ownership
Rural idyll
Counterurbanisation
In-migration
Increase in hobby farming/private amenity woodland ownership
Changes in rural economy
Less employed in agriculture/primary production
Higher prices paid for amenity purchases of woodland
I
Conceptualising Rural Space
Theoretical debate between constructionism/realism
H


K
Nature designations
2/3 woodland in England broadleaved
78% of woodland in England is non-FC
S.E. England most wooded region
Increase in private ownership
47% of woodland in England privately owned
Up to 80%+ woodland in southern England privately owned
More private woodland is broadleaved than FC woodland
Private woodland is often located near centres of population
I
New types of owner emerging with diverse objectives
Scoping study suggested owners less motivated by economic objectives may be better placed to delivery public goods
L

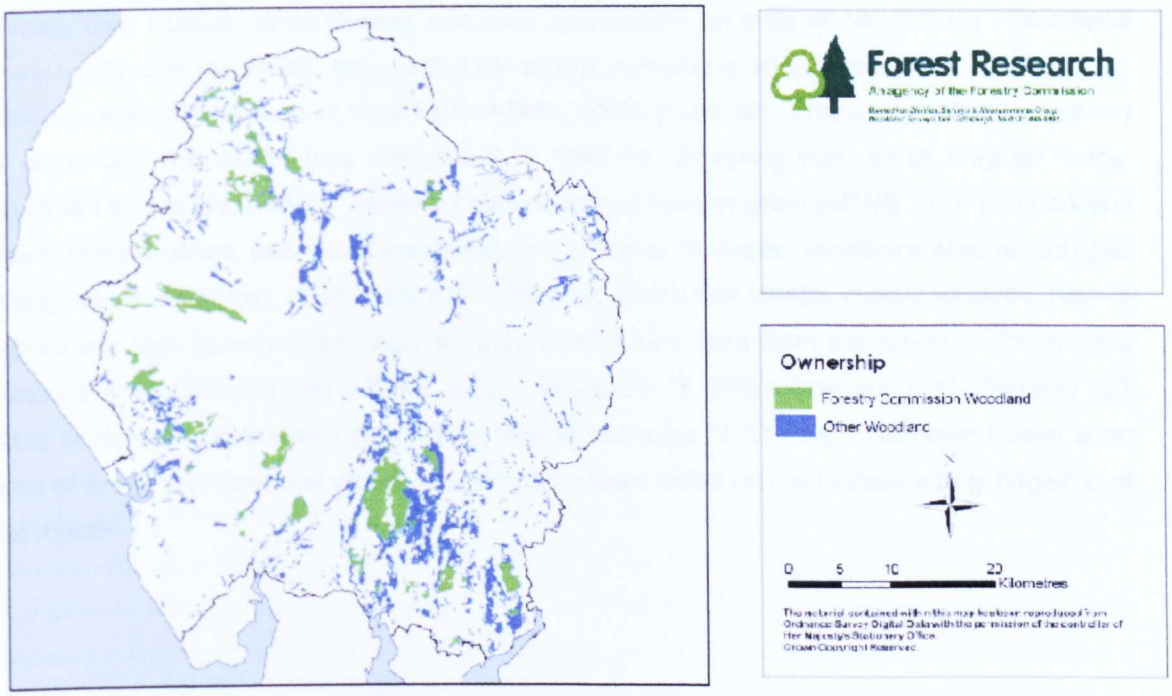

H
Sustainability debates: weak vs strong sustainability
Utilitarianism vs ecocentrism
Moral monism in debates is paralysing on practical level
Fails to identify practical, workable solutions
Deals with theoretical, not practical issues
Environmental Pragmatism offers a more down-to-earth, practical theoretical basis
Understanding experiences of individuals
Finding practical solutions
Moral pluralism
Divergent values seek convergence on practical level
Addresses issues relevant to policy-makers
Using accepted valuation techniques (e.g. Green Book)
E
G


L
Typologies of private woodland owners developed in Europe/U.S.
Location & ownership objectives of private woodland ownership may present opportunities for public good provision
Production-oriented owners
Consumption/ Protection-oriented owners
Multifunctional-oriented owners
Studies often categorise owners as agricultural or non-agricultural
Owners may be sceptical about grants
Potential conflicts between biodiversity & recreation
Classification less appropriate in UK setting
Farmers often perceive woodland as nuisance
Lack of farm forester
Challenge for policy: How best to enhance delivery of public benefits?
Development of hypotheses to be tested
Development of research methods

APPENDIX 2: STUDY AREAS

Lake District National Park

The Lake District National Park, established in 1951, is located in Cumbria in the North West of England and has a population of just over 42,000 (Census 1991). It covers an area of 229,200 ha and is the largest National Park in England, consisting of a mix of fells, lakes, villages, towns, beaches and areas of remote wilderness. In Cumbria, woodland accounts for 9.5% of land cover (FC, 2001), almost half of which is conifer. The remainder is broadleaf (36.5%), mixed (8.2%) and ASNW (2.8%). The woodlands are rich in Atlantic mosses, ferns and lichens because of the high rainfall and lack of pollution. There are many examples of wood pasture, pollards and old coppice. The Lake District also has the largest concentration of common land in Britain, possibly in Western Europe (LDNP, 2007).



Lake District National Park, distribution of woodland over 2 ha by owner (FC 2007).

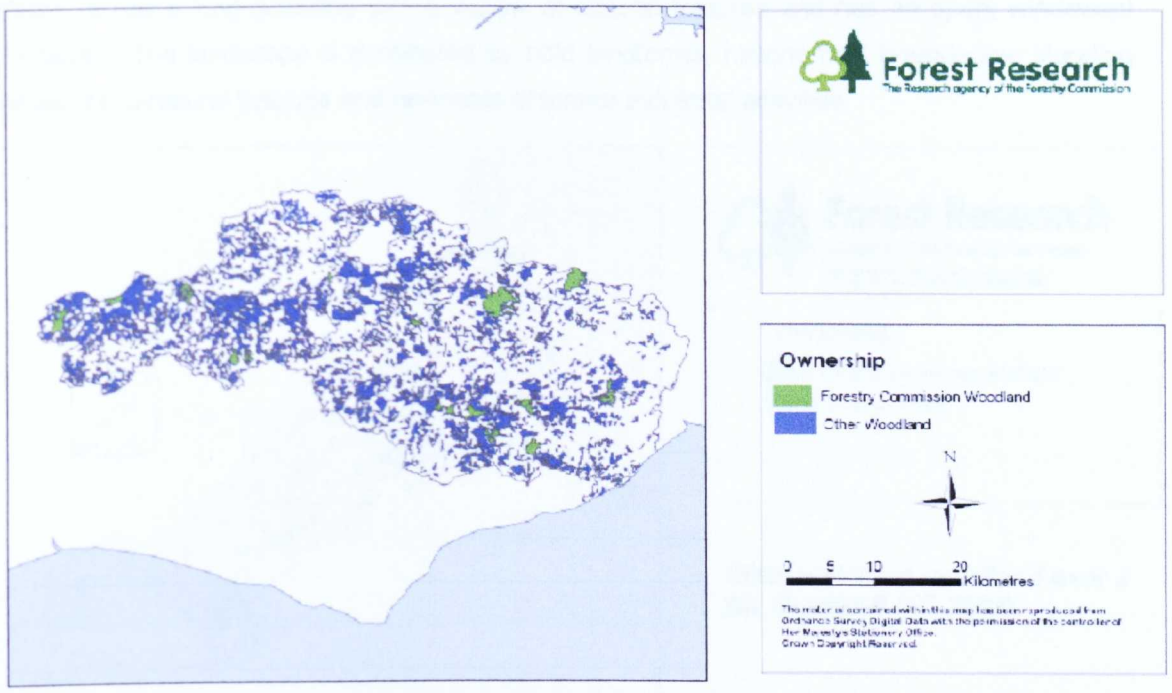
The Lake District has over 14 lakes and tarns which are nationally important for their range of habitats. People have been settled here since the end of the last Ice Age and there are many examples of prehistoric and medieval field systems and archaeological monuments. The National Park has the largest concentration of outdoor activity centres in the UK and is the birthplace of mountaineering, having the highest mountain in England, Scafell Pike, rising to 978 metres above sea level. There is unrestricted access to the fells and a huge range of tourist facilities and attractions available. The area has been a popular place for visitors and recreation since the 19th Century, with Wordsworth's "Guide to the Lakes" published in 1810. The railway came to Windermere in 1847, bringing day-trippers. In 1994 the All Parks Visitor Survey estimated that there were almost 17 million recreational visitor days in the Lake District

annually; 89% of these arriving by private motor vehicle. Tourism has a major impact on the local economy, supporting 42,000 jobs in Cumbria and 50% of the workforce in the National Park (LDNPA, 2005).

Most of the farming in the Lake District consists of grazing on Less Favoured Areas (LFA) and, out of all the study areas, has the highest proportion (18%) of farms over 100 ha, compared to 8% for Cornwall and the High Weald (Defra, 2006b). However, it also has the least amount of people employed in agriculture, with just over 2700 working on farms (Defra, 2006b), which amounts to 45 ha per person employed, in contrast to approximately 20 ha per person employed in Cornwall and the High Weald. It also has the smallest amount of land devoted to agriculture of the three areas, with just 53.7% of land used for farming (Defra, 2006b).

High Weald Area of Outstanding Natural Beauty (AONB)

The High Weald AONB is located in the south east of England, extending across parts of Surrey, East Sussex, West Sussex and Kent, and covers an area of 145,707 ha. Woodland covers a third of the AONB area, with 70% of this comprising ancient woodland, having been continuously wooded since at least 1600 (AONB, 2009) (nationally, only about 19% of woodland is ancient). The AONB was designated in 1983 for its rolling hills, small irregular fields, abundant woods and hedges, scattered farmstead and sunken lanes (AONB, 2007). It contains flower-rich meadows, patches of heathland, hop gardens, orchards, sandstone outcrop and gills (steep wooded ravines). The linear gill woodlands, which line steeply incised streams, have a particularly high conservation value as they contain relic flora from the forest of the Atlantic period over 5,000 years ago (AONB, 2007). There are 76 SSSIs (covering 5,373 ha) and 227 Sites of Nature Conservation Importance (SNCI) (covering 10,211 ha). Ashdown Forest is an area of open heathland and woods covering 10 square miles on the highest sandy ridge-top of the AONB.



High Weald Area of Outstanding Natural Beauty distribution of woodland over 2 ha by owner (FC 2007).

There are 121,000 people living within the boundary of the AONB and the largest built-up area is the historic town of Battle, with a population of 5,500. There is a dispersed settlement pattern of farmsteads, hamlets and villages, with 30% of the population living outside villages. The main form of agriculture is small livestock farms, which constitute 67.7% of the land area, with other types of farming including horticulture and cereals (Defra, 2006b). 4500 people are employed in agriculture, which equates to about 22 ha per person employed (Defra, 2006b).

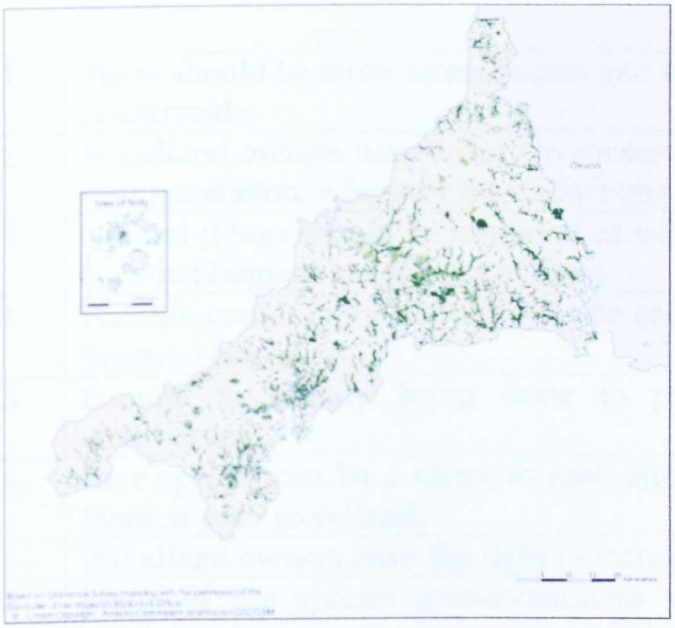
In contrast to National Parks, AONBs are not bound under statute to offer public recreational opportunities as part of their designation. However, there are 96 visitor attractions in the AONB, including 9 National Trust properties and 2 country parks. These include Bedgebury Pinetum, owned by the Forestry Commission and consisting of the most complete collection of conifers on one site anywhere in the world. Bedgebury has over 10,000 trees growing in 320 acres, including rare, historically important and endangered trees and 56 vulnerable or critically endangered species. It contains some of the oldest and largest examples of conifers in Britain. The AONB also contains the largest public access site in the South East, Ashdown Forest, which covers 2,396 ha, although less than 40% is woodland.

The ancient woodlands in the wider AONB are under threat from a decline in coppice management, neglect, overgrazing, the creation of leisure plots and over-tidiness (AONB, 2007).

Cornwall

Cornwall is located in the far south west of England and has a population of 506,000 (ONS,

2002). It has a long coastline with a variety of coastal features and has an open, windswept character. The landscape is dominated by bold landforms, historic field boundaries, standing stones, semi-natural habitats and remnants of former industrial activities.



Distribution of woodland over 2 ha, Cornwall (FC 2002).

The total area of woodland in Cornwall covers 26,869 ha, which is 7.5% of the land area. Just over 66% of this woodland is broadleaved, with oak comprising the main broadleaved species (12.3% of all broadleaved species). Conifers accounts for 19.0% of all woodland, with Sitka spruce comprising the main conifer species (18.8% of all conifer species) but there is a large amount of over-stocked Douglas Fir (Harrison, 2007, pers. comm.). The Forestry Commission own only 11% of all woodland, with 54% of all woodland in private ownership (FC, 2002). The remainder is owned by businesses, charities, local authorities and other public bodies. There are 1,675 woods over 2 ha (mean wood area is 16.1 ha) and 164 woods between 0.1 and 2.0 ha (mean wood area is 0.6 ha). Woodland cover has increased by over 8,500 ha from 5.1% to 7.5% of the land area between 1980-1997 (FC, 2002). Much of the woodland is located in steep valleys, often making harvesting difficult and expensive.

In 2005 there were an estimated 4.4 million day visitors to Cornwall (CTB, 2006), spending about £1,088 million. Cornwall contributes 3.1% to UK tourism.

Cornwall has the highest amount of land in agriculture out of the study areas, with almost 80% of the land area being farmland (Defra, 2006b). Most of this consists of livestock grazing in LFA and almost 14,000 people are employed in agriculture (Defra, 2006b).

APPENDIX 3: ORIGINAL CONCOURSE SET OF STATEMENTS FOR Q METHODOLOGY

(Derived from interviews from scoping Masters study)

1	There should be more access routes into woodland to help people visit the countryside.
2	Woodland owners have a duty to conserve the woodland resource for the next generation, whatever the impact on profits.
3	Natural things should be respected as valuable in themselves and not just for what humans can get out of them.
4	Wildlife conservation should only be considered once you have reached financial objectives.
5	Enough is already being done to protect and enhance the rural environment.
6	Rare species can be a chore to look after and you're better off without them in your woodland.
7	Woodland owners have the right to manage their own land as they wish.
8	Many of the species conservationists want to protect are not worth worrying about.
9	Forest owners have a greater responsibility to produce timber than to preserve everything in the rural environment.
10	Forest owners who cause environmental damage should be more heavily punished.
11	Wherever possible, woodland labour should be replaced by more efficient machines and technologies.
12	Maintaining an attractive-looking countryside should be an important goal of woodland owners.
13	Woodland owners should always protect unique or rare habitats on their land regardless of what compensation is available.
14	Achieving high timber yields is the sign of a good forester.
15	Financial viability has to be the judge of everything you do in a woodland.
16	Woodland management is important for maintaining biodiversity.
17	Woodland owners should be paid for providing good wildlife habitats.
18	Woodland owners should be compensated for providing access and recreation.
19	Woodland owners have a duty to allow the public to have informal recreational access (walking, dog walking) to their woodland.
20	Woodland owners should be compensated for providing an attractive landscape which local people can enjoy.
21	Woodland and trees are very important for mitigating the effects of climate change.
22	Woodlands have great potential to supply biofuel (wood logs, chips, short-rotation coppice) as a renewable energy.
23	More timber would be harvested from woodlands if it was economically feasible to do so.
24	Woodlands should pay for themselves.

25	Managing a woodland is a hobby and a privilege.
26	Woodland owners gain much personal enjoyment from their woodland.
27	Woodland management should optimize timber yield and financial return.
28	Woodland management should be sensitive to the needs of wildlife.
29	Grant schemes are too restrictive on woodland owners.
30	The government should provide incentives to boost the commercial potential of woodlands.
31	Woodland owners would manage their woodlands better if they could afford to.
32	Woodland owners don't manage their woodland to make money.
33	Woodlands can improve the quality of life for the general public.
34	There are conflicts between managing a woodland for wildlife and allowing public access.
35	Woodlands should be neat and tidy.
36	Public safety is an important consideration for woodland management.
37	Owning a woodland is a nuisance because it doesn't make money.
38	If woodlands were more profitable woodland owners would be more inclined to manage them.
39	Woodlands are dead ground financially.
40	Nature should be allowed to take its course in a woodland with little intervention.
41	Owning a woodland provides the owner with their own private space in the countryside.
42	Making money out of a woodland is not a primary objective for woodland ownership.
43	Woodlands provide an escape from every-day life by allowing people to get close to nature.
44	Control of invasive species is important.
45	The Forestry Commission provides useful advice to woodland owners.
46	Owners should learn as much as possible about their woodland in order to manage it properly.
47	Spending lots of time in the woodland helps owners get a feel for what needs doing.
48	There are many other demands on owners, such as jobs and family, that prevent them from spending more time learning about woodland management.
49	Access to information on woodland management is difficult.
50	The public often misunderstand the benefits of woodland management, e.g. coppicing.
51	Incomes moving into the countryside do not understand countryside management.
52	Woodland owners can only afford to manage their woodlands if they do a lot of the work themselves.
53	Local woodmen are a valuable asset to woodland owners.
54	It is difficult to find skilled people to work in the wood.
55	If there was a market for timber or wood products woodlands would be

	better managed.
56	Most woodlands are under-utilized.
57	Market forces will be more effective at stimulating woodland management than public sector intervention.
58	Private woodlands don't provide public benefits, they are for the private benefit of the owner.
59	Woodland and trees are important for air and water pollution control.
60	Small woodlands cannot sustain high levels of public access.
61	There is no point in owning your own woodland if it is opened up for public access.
62	Allowing access to woodlands causes problems with litter or vandalism.
63	Multipurpose forestry - delivering social, environmental and economic benefits together - is not possible.
64	Woodland grant schemes really help owners to carry out management activities in their woods.
65	The money paid out by the Woodland Grant Scheme does not cover the cost of the work involved.
66	Woodland owners often have a better idea of appropriate management than woodland officers.
67	There is a strong level of pride in creating and maintaining a well-kept forest.
68	Most woodland owners don't have the time to manage their woodland adequately.
69	Owning a woodland is both rewarding and satisfying.
70	Information and advice for woodland owners needs to be more readily accessible.
71	Grant schemes need to be more flexible to account for the variations in woodland across the country.
72	The state should encourage woodland owners to become independent of grants.
73	Woodland ownership should be passed down from generation to generation.
74	Managing for profit means harming nature.
75	Without grants and financial assistance woodland management would be impossible.
76	The beauty of the woodland around me impresses me daily.
77	The world timber market and cheap imports will continue to prevent the private timber producer from being viable.
78	Decisions about woodland are made by outsiders in offices about land they do not know.
79	The majority of woodland owners are ecologically-minded.
80	The government should take responsibility for legislating on environmental issues much more than it does.
81	I have become more environmentally-aware since owning a woodland.
82	Woodland can provide an entirely sustainable fuel source.
83	Managing a woodland is a physically demanding job.
84	All human activity should be sustainable.

85	The more a wood is used by local people the more value it has.
86	Woodland is an important part of our natural heritage.
87	Any management must have a financial return.
88	Woodlands are important in the wider landscape.
89	Public access is difficult to control.
90	There is a conflict between public access and managing a wood for sport shooting.
91	The litigious nature of society is a disincentive to allowing public access.
92	Until there is a use for low-grade hardwood timber there won't be long-term management of woodlands.
93	Car parks should be provided to promote access to woodlands.
94	It is important to have a diverse mix of tree species.
95	Where replanting takes place it should always be native species.
96	Filling in the forms for grants is not worth the effort.
97	The size of the woodland will dictate which benefits can be provided.
98	Managing a wood for sport shooting puts money into the local economy.
99	I wish I had more time to devote to the woodland.
100	The public should be involved in deciding how local woodlands are managed.
101	Woodlands are a wonderful asset to the local community.
102	Woodlands provide an educational resource for the local community.
103	It is a shame that so many woodlands are under-managed.
104	Land managers have to put their effort into what will make a profit.
105	My wood gives me much joy.
106	Opening up the wood to allow light to the forest floor is beneficial for biodiversity.
107	I don't manage the woodland for money.
108	The woodland provides us with a free fuel source.
109	Spending time in the wood helps me decide what management needs to be done.
110	I rely on consultants to advise on how to manage my woodland.
111	Bringing dogs into the wood disturbs the wildlife.
112	It is important for children to play and learn in woodlands.
113	I do a lot of the physical work in the woodland myself.
114	Standing deadwood is a valuable habitat for wildlife.
115	The grant schemes are only worth applying for if you have a large woodland.
116	It is fine for local people to use the woods, but I wouldn't want to encourage visits from further afield.
117	We use the woodland at weekends for family picnics and camping.
118	The main reason for owning the woodland is to preserve it as a wildlife reserve.
119	Woodland owners should be compensated for the wider benefits to society their woods provide.
120	The wood provides all our requirements for wood fuel and other wood products.

121	If there was money to be made out of woodlands there would be more incentive to manage it.
122	Forestry contractors are more interested in larger woodlands, not the small-scale woodland owner.
123	All woodlands are of benefit to society.
124	Owning woodland protects the land from being developed.

APPENDIX 4: PRE-NOTICE LETTER

Name
Address

Date

Dear

A few days from now you will receive in the post a request to fill out a short questionnaire for an important research project being conducted by the Countryside and Community Research Institute (CCRI) at the University of Gloucestershire, supported by the Forestry Commisson.

The survey concerns the experiences of private woodland owners and their motivations for woodland management and has been developed by Julie Urquhart of the CCRI.

I am writing to you in advance because we have found that many people like to know ahead of time that they are to be contacted. The study is an important one that will help government agencies such as the Forestry Commission better support private woodland owners and understand whether their expectations and needs are being met.

Thank you for your time and consideration. It is only with the kind help of people like you that our research can be successful.

Yours sincerely,

Name of FC officer
Job title
Forestry Commission

P.S. A small token of appreciation will be enclosed with the questionnaire as a way of saying thank you.

PRIVATE WOODLAND OWNER SURVEY

Countryside and Community Research Institute
University of Gloucestershire
2008

Please return your completed questionnaire in the enclosed postage-paid envelope to:
Julie Urquhart, CCRI, University of Gloucestershire,

START HERE

GENERAL QUESTIONS ABOUT YOUR WOODLAND

1. What is the area of your woodland?

_____ acres OR _____ hectares

2. Which of the following best describes your woodland type? Mark ☒ ONE box.

- ☐ Ancient semi-natural woodland
- ☐ Broadleaves (not ASNW)
- ☐ Conifer
- ☐ Mixed (broadleaves and conifers)
- ☐ Other (please specify) .....

3. How did you acquire your woodland? Mark ☒ ALL that apply.

- ☐ I bought it
- ☐ I inherited it
- ☐ I planted it
- ☐ Other (please specify) .....

4. How long have you owned your woodland?

_____ years

5. There are many different types of woodland ownership. Of the ownership types listed below, which BEST describes your ownership? Mark ☒ ONE box.

- ☐ Farm woodland owner
- ☐ Individual or joint ownership
- ☐ Family partnership
- ☐ Estate
- ☐ Trust
- ☐ Club or association
- ☐ Charity
- ☐ Other (please specify) .....

6. How far away from your woodland do you live? Mark ☒ ONE box.

☐ Adjacent / on-site ☐ Within 1 mile ☐ Within 2-10 miles

☐ 10-40 miles ☐ Over 40 miles

7. People own woodland for many different reasons. How important are the following reasons to you? Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.

Very important	Important	Slightly important	Not very important	Not at all important
1	2	3	4	5

☐ To enjoy scenery

☐ To enhance wildlife

☐ For financial investment

☐ As part of my farm

☐ For privacy

☐ For personal enjoyment/recreation

☐ To mitigate climate change

☐ To pass on to future generations

☐ To produce timber products

☐ To produce non-wood products

☐ To produce firewood or biofuel

☐ For sport shooting

☐ For public recreation/enjoyment

☐ To protect my property from development

☐ Educational

☐ Other (please specify).....

8. Please indicate the relative importance of the following factors when deciding whether or not to carry out woodland management. Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.

Very important	Important	Slightly important	Not very important	Not at all important
1	2	3	4	5

☐ Need for financial return

☐ Need wood for my own use

☐ Timber prices

☐ Improving shooting opportunities

☐ Improving recreational opportunities

☐ Restoring broadleaf woodland

☐ Grant availability

☐ Improving scenery

☐ Removing trees damaged by natural occurrences

☐ Trees in dangerous state

☐ Improving/maintaining timber quality

☐ Enhancement of wildlife habitats

☐ Other (please specify) .....

WOODLAND MANAGEMENT AND ATTITUDES

9. How important are the following management activities for achieving your objectives for your woodland? Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.

Very important	Important	Slightly important	Not very important	Not at all important
1	2	3	4	5

- ☐ Thinning
- ☐ Coppicing
- ☐ Removal of invasive non-native species
- ☐ Replanting
- ☐ Other (please specify) .....
- ☐ Ride maintenance
- ☐ Fencing
- ☐ Clear felling
- ☐ Control of pests (deer, rabbits, squirrels)

10. In what proportion do you harvest the following woodland products from your woodland? Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.

Very large amount	Large amount	Fair amount	Little	None
1	2	3	4	5

- ☐ Sawlogs
- ☐ Small roundwood
- ☐ Veneer logs
- ☐ Pulp-wood
- ☐ Wood chips
- ☐ Firewood
- ☐ Bean poles/stakes
- ☐ Wood for fencing
- ☐ Charcoal
- ☐ Wood for hurdles/crafts
- ☐ Christmas trees
- ☐ Other, please specify.....

11. Out of the following options, please indicate who carries out the physical work in your woodland? Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.

All the work	Most of the work	Quite a lot of the work	Some of the work	None of the work
1	2	3	4	5

- ☐ Myself
- ☐ Family/friends
- ☐ Contractor
- ☐ Estate/farm worker
- ☐ Local woodman

12. **On average, how much time do you spend working in your woodland per week?**

_____ hours

13. **Please indicate why you carry out physical management tasks in your woodland yourself. Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.** ***If you do NOT carry out any tasks yourself, please select '3 – Neutral'.***

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	2	3	4	5

- ☐ To save money
- ☐ Because I enjoy it
- ☐ It is a hobby
- ☐ It's my job
- ☐ Exercise
- ☐ Other (please specify) .....
- ☐ To reduce stress

CONSTRAINTS ON WOODLAND MANAGEMENT

14. **Please indicate to what extent you agree or disagree with the following statements regarding factors that may constrain your woodland management activities. Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.**

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	2	3	4	5

- ☐ I would manage my woodland better if I had the money
- ☐ I do not have enough time to manage my woodland properly
- ☐ Access into my woodland is restricted and so limits management activities
- ☐ I do not have the necessary skills or knowledge to manage my woodland properly
- ☐ Woodland owners should have the right to manage their woodland as they wish
- ☐ I am not really interested in managing my woodland
- ☐ I feel that the level of management in my woodland is about right

15. **To what extent are the following sources of finance important for funding management activities in your woodland? Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.**

Very important	Important	Slightly important	Not very important	Not at all important
1	2	3	4	5

- ☐ Woodland management grants
- ☐ Selling timber / wood products
- ☐ My own funds
- ☐ Other (please specify) .....

16. Have you ever been involved in any woodland grant schemes? Mark ☒ ONE box.

☐ Yes ☐ No

If YES, please indicate who makes the grant application? Mark ☒ ONE box.

☐ Myself ☐ Agent ☐ Other (please specify) .....

Which grants(s) you have been involved in (e.g. Woodland Grant Scheme):

.....

17. Please indicate to what extent you agree or disagree with the following statements regarding funding your woodland management. Please respond to EVERY statement and print the appropriate number from the scale below in the box beside EACH statement.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	2	3	4	5

☐ I do not manage my woodland primarily to make money

☐ I bought my woodland as an investment

☐ Owners should be rewarded for the benefits to society their woodlands provide

☐ I would like to see a better developed market for wood products

☐ I would manage my woodland better if it was financially advantageous

☐ Grants usually don't pay out enough

☐ Form filling for grants is too complicated

☐ I'm not interested in grants because I don't want to be told what to do in my wood

☐ Grant schemes help owners to manage their woods

☐ Other (please specify) .....

PUBLIC BENEFITS FROM YOUR WOODLAND

18. Please indicate the extent to which you agree or disagree that your woodland provides the following benefits to wider society. Please respond to EVERY statement and print the appropriate number from the scale below in the box beside EACH statement.

Strongly agree	Agree	No opinion	Disagree	Strongly disagree
1	2	3	4	5

☐ Recreation

☐ Provides an attractive landscape

☐ Increases the value of local property

☐ Pollution absorption

☐ Protects local wildlife/habitats

☐ Wood fuel

☐ Carbon storage

☐ Other (please specify) .....

19. Please indicate the extent to which you allow the following activities in your woodland? Please respond to EVERY statement and print the appropriate number from the scale below in the box beside EACH statement.

High extent	Quite a high extent	To some extent	To a limited extent	No extent
1	2	3	4	5

- ☐ Dog walking
- ☐ Walking on woodland paths
- ☐ Horse riding
- ☐ Cycling on woodland tracks
- ☐ Nature watching
- ☐ Off-road driving
- ☐ Sport shooting
- ☐ School/scout visits
- ☐ Fishing
- ☐ Other (please specify) .....

20. Please indicate how concerned you are about the following issues relating to public access in your woodland. Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH item.

Very concerned	Concerned	Slightly concerned	Not very concerned	Not at all concerned
1	2	3	4	5

- ☐ Risk of being sued
- ☐ Litter/rubbish dumping
- ☐ Vandalism
- ☐ Theft (e.g. equipment)
- ☐ Disturbance to wildlife
- ☐ Accessibility of woodland
- ☐ Injury to public (e.g. falling branch)
- ☐ Crime (attacks on public)
- ☐ Cost of insurance
- ☐ Intrusion on my privacy
- ☐ Woodland is too small
- ☐ Disturbance to game birds

SOURCES OF INFORMATION

21. Woodland owners receive advice or information about managing their woodland from a variety of sources. How important are the following sources of information to you. Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.

Very important	Important	Slightly important	Not very important	Not at all important
1	2	3	4	5

- ☐ Own prior experience
- ☐ Spending time in my wood
- ☐ College/university courses
- ☐ Seminars/workshops
- ☐ Forestry Commission publications
- ☐ Forestry journals/magazines
- ☐ Forestry Commission officers
- ☐ Forestry contractor
- ☐ Other woodland owner
- ☐ Books
- ☐ Other (please specify) .....

22. How useful would the following ways of learning about woodland management be to you? Please respond to EVERY item and print the appropriate number from the scale below in the box beside EACH statement.

Very useful	Useful	Slightly useful	Not very useful	Not at all useful
1	2	3	4	5

- ☐ Pamphlets, brochures
- ☐ Books
- ☐ Magazines, newspapers
- ☐ Internet
- ☐ Conferences//seminars
- ☐ DVDs for home training
- ☐ TV or radio programmes
- ☐ Visiting other woodlands
- ☐ Talking with foresters/consultants
- ☐ Talking with other woodland owners
- ☐ Membership of woodland-related organisation
- ☐ Other (please specify) .....

GENERAL QUESTIONS ABOUT YOU

23.Gender:

- ☐ Male
- ☐ Female

24.Which of the following age categories describes you? Mark ☒ ONE box.

- ☐ Under 30
- ☐ 30-39
- ☐ 40-49
- ☐ 50-59
- ☐ 60-69
- ☐ 70 or over

25.Which of the following best describes your employment status? Mark ☒ ONE box.

- ☐ Full-time employment
- ☐ Part-time employment
- ☐ Self-employed
- ☐ Not working
- ☐ Retired
- ☐ Student
- ☐ Other (please specify) .....

26.Are you a member of any of the following organisations? Mark ☒ ALL that apply.

- ☐ Woodland Trust
- ☐ Small Woods Association
- ☐ RSPB
- ☐ Royal Forestry Society
- ☐ ConFor/Forestry and Timber Association
- ☐ Wildlife Trust
- ☐ Country Land & Business Association
- ☐ National Farmers Union
- ☐ Other woodland-related organisation (please specify) .....

Thank you for taking the time to complete this questionnaire. If you have additional comments or concerns that you would like to share with us, please do so in the space provided below. Please also indicate if you are involved in any unusual or interesting activities in your woodland (e.g. eco-tourism, educational visits etc.).

Please return your completed questionnaire in the postage-paid envelope provided.

If you have any questions or comments about the survey you would like to discuss, please contact:

Julie Urquhart, Private Woodland Owner Survey, CCRI, University of Gloucestershire,
Telephone: 01
Email: jurquhart@glos.ac.uk

Supported by:

Forestry Commission

Supported by:

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

APPENDIX 6: SURVEY COVER LETTER

Name
Address

Date

Dear

I am writing to ask for your assistance with a study of private woodland owners that I am conducting in England. This study is part of an effort to learn about what motivates woodland owners to manage their woodlands, their needs with regard this management and whether they are happy or unhappy with existing state support.

As part of the study, we are contacting a random sample of private woodland owners from three case study areas - Cornwall, Cumbria and Kent/Sussex - to ask why they own woodland, what woodland management activities they carry out (if any) and what helps or hinders them achieving their objectives.

The survey is being conducted as part of my PhD programme and the results will be used to help improve state support for forestry. By understanding what motivates woodland owners, agencies such as the Forestry Commission will be able to do a better job providing information and financial support for woodland management. By knowing more about the objectives and experiences of private woodland owners, public agencies will also be able to help make the most of what private woodlands contribute to wider public benefits, such as wildlife conservation, scenery and recreation.

Your answers are **completely confidential** and will be released only as summaries in which no individual's answer can be identified. When you return your completed questionnaire your name will be deleted from the mailing list and never connected to your answer in any way. Although the survey is voluntary, you will help us very much by taking a few minutes to complete the questionnaire and sharing your experiences of woodland ownership.

We have enclosed two first class stamps as a way of saying thank you for your help. Please use one to return the questionnaire and keep the other as a token of our appreciation.

If you have any questions or comments about this study, please feel free to contact me on email: jurquhart@glos.ac.uk, or you can write to me at the address on the letterhead.

Thank you very much for helping with this important study.

Yours sincerely,

Julie Urquhart
Research Student
Countryside and Community Research Institute
University of Gloucestershire

P.S. If by some chance we have made a mistake and you no longer own any woodland, please return the questionnaire blank. Thank you.

APPENDIX 7: POSTCARD REMINDER

Date
Last week a questionnaire seeking information about your experiences of woodland ownership was sent to you. Your name was drawn randomly from a list of private woodland owners in the Lake District, Cornwall, Kent and Sussex.

If you have already completed and returned the questionnaire to us, please accept our sincere thanks. If not, we would greatly appreciate it if you could do so today. We are especially grateful for your help because it is only by asking people like you to share your experiences that we can understand how agencies such as the Forestry Commission can better support you.

If you did not receive a questionnaire, or if it was misplaced, please call us on 01732 882087 or email jurquhart@glos.ac.uk and we will get another one in the post to you today.

With thanks,
Julie Urquhart
Countryside and Community Research Institute
University of Gloucestershire

APPENDIX 8: REPLACEMENT SURVEY COVER LETTER

Name
Address

Date

Dear

About three weeks ago I sent a questionnaire to you that asked about your experiences of woodland ownership. To the best of our knowledge, it has not yet been returned.

The comments of people who have already responded include a wide variety of reasons for owning woodland. Many have described their experiences, including the benefits and difficulties of woodland ownership. We think the results are going to be very useful to the Forestry Commission and others.

We are writing to you again because of the importance that your questionnaire has for helping us to obtain accurate results. Although we sent questionnaires to woodland owners in three case study areas, it is only by hearing from nearly everyone in the sample that we can be sure that the results are truly representative.

A few people have written to say that they should not have received the questionnaire because they no longer own woodland. If this applies to you, please let us know on the cover of the questionnaire and return it in the enclosed envelope so that we can delete your name from the mailing list.

Again, I would like to assure you that all responses will be treated in the strictest **confidence**. A questionnaire identification number is printed on the back cover of the questionnaire so that we can check your name off of the mailing list when it is returned. Your name will never be connected to the results in any way.

I have enclosed a replacement questionnaire in case you have misplaced the original one sent to you. Opportunities for private woodland owners to respond to and influence forest policy are scarce, so we hope that you will take advantage of this opportunity and complete the questionnaire. We would very much appreciate it if you would return the questionnaire by Friday 11th July 2008 at the latest.

Yours sincerely,

Julie Urquhart
Research Student
Countryside and Community Research Institute
University of Gloucestershire

P.S. If you have any questions, please feel free to contact me. The telephone number where I can be reached is [redacted] or if you prefer to email, jurquhart@glos.ac.uk.

APPENDIX 9: ORIGINAL 50 VARIABLES USED FOR FACTOR ANALYSIS

v1:Reason: scenery	v26: Importance: quality of timber
v2: Reason: wildlife	v27: Importance: improve habitats
v3: Reason: investment	v28: Constraints: lack of money
v4: Reason: part of farm	v29: Constraints: Lack of time
v5: Reason: privacy	v30: Constraints: Access
v6: Reason: personal enjoyment	v31: Constraints: Skills
v7: Reason: Climate	v32: Constraints: Right to manage
v8: Reason: Future generations	v33: Constraints: lack of interest
v9: Reason: Timber products	v34: Constraints: Level right
v10: Reason: Non-wood products	v35: Funding mgmt: not to make money
v11: Reason: Biofuel/woodfuel	v36: Funding mgmt: investment
v12: Reason: Shooting	v37: Funding mgmt: reward for benefit
v13: Reason: public recreation	v38: Funding mgmt: market for wood
v14: Reason: Protect from development	v39: Funding mgmt: financially good
v15: Reason: Educational	v40: Funding mgmt: grants not enough
v16: Importance: Financial Return	v41: Funding mgmt: forms too hard
v17: Importance: Wood for own use	v42: Funding mgmt: don't want to be told
v18: Importance: timber prices	v43: Funding mgmt: grants help
v19: Importance: shooting	v44: Benefits: Recreation
v20: Importance: recreational	v45: Benefits: Landscape
v21: Importance: restore broadleaf	v46: Benefits: Property value
v22: Importance: grant available	v47: Benefits: Pollution control
v23: Importance: improve scenery	v48: Benefits: Wildlife
v24: Importance: damaged trees	v49: Benefits: Woodfuel
v25: Importance: dangerous trees	v50: Benefits: Carbon storage

Extraction Method: Principal Components Analysis

APPENDIX 10: FINAL 31 VARIABLES USED FOR FACTOR SOLUTION

	Extraction		Extraction
v1:Reason: scenery	.663	v23: Importance: improve scenery	.550
v2: Reason: wildlife	.622	v26: Importance: quality of timber	.533
v3: Reason: investment	.559	v27: Importance: improve habitats	.611
v5: Reason: privacy	.616	v28: Constraints: lack of money	.625
v6: Reason: personal enjoyment	.614	v29: Constraints: Lack of time	.703
v7: Reason: Climate	.632	v31: Constraints: Skills	.627
v9: Reason: Timber products	.703	v39: Funding mgmt: financially good	.669
v11: Reason: Biofuel/woodfuel	.733	v42: Funding mgmt: don't want to be told	.624
v13: Reason: public recreation	.713	v43: Funding mgmt: grants help	.653
v15: Reason: Educational	.575	v44: Benefits: Recreation	.539
v16: Importance: Financial Return	.660	v46: Benefits: Property value	.731
v17: Importance: Wood for own use	.643	v47: Benefits: Pollution control	.525
v18: Importance: timber prices	.714	v48: Benefits: Wildlife	.602
v20: Importance: recreational	.560	v49: Benefits: Woodfuel	.719
v21: Importance: restore broadleaf	.583	v50: Benefits: Carbon storage	.532
v22: Importance: grant available	.620		

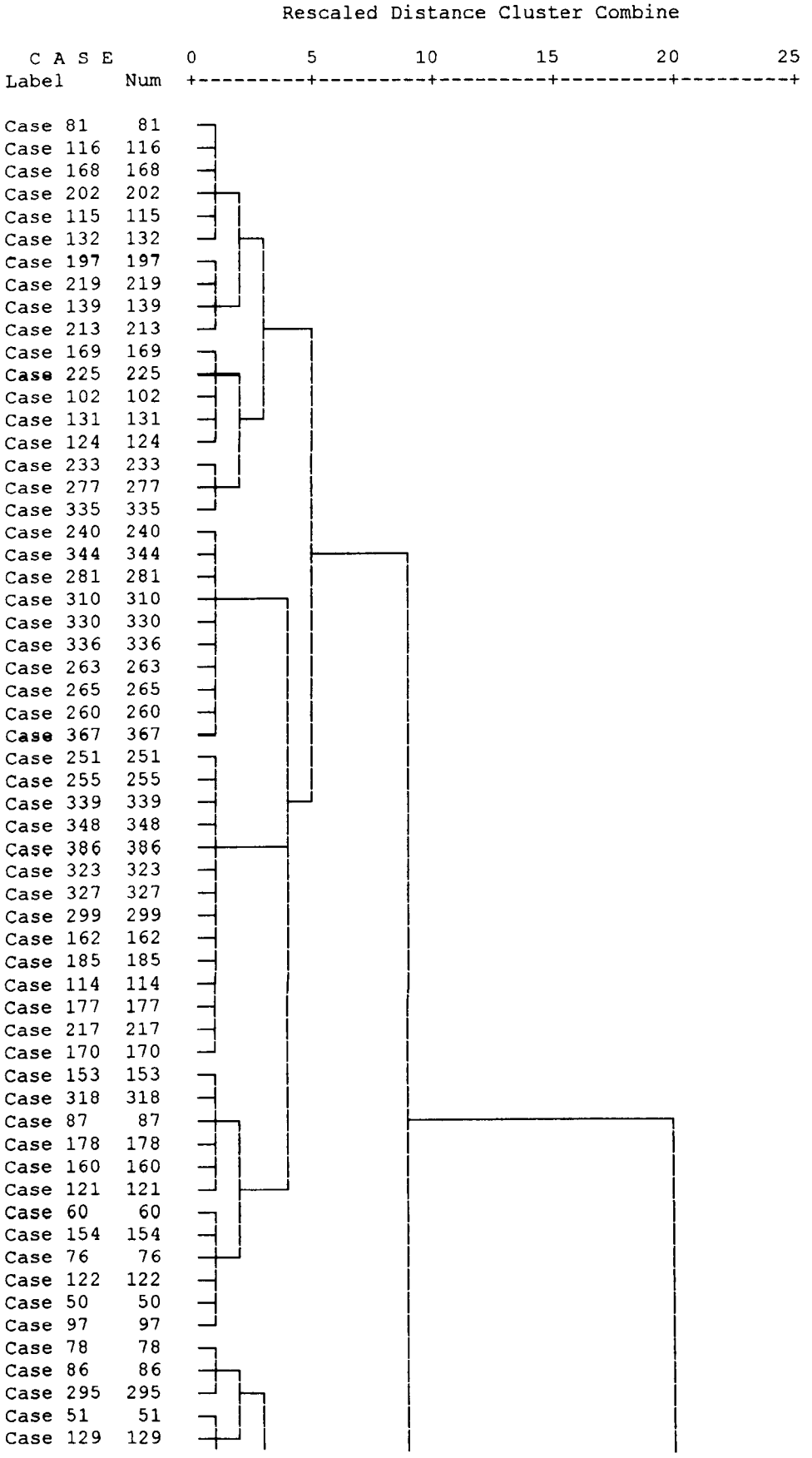
APPENDIX 11: ROTATED COMPONENT MATRIX

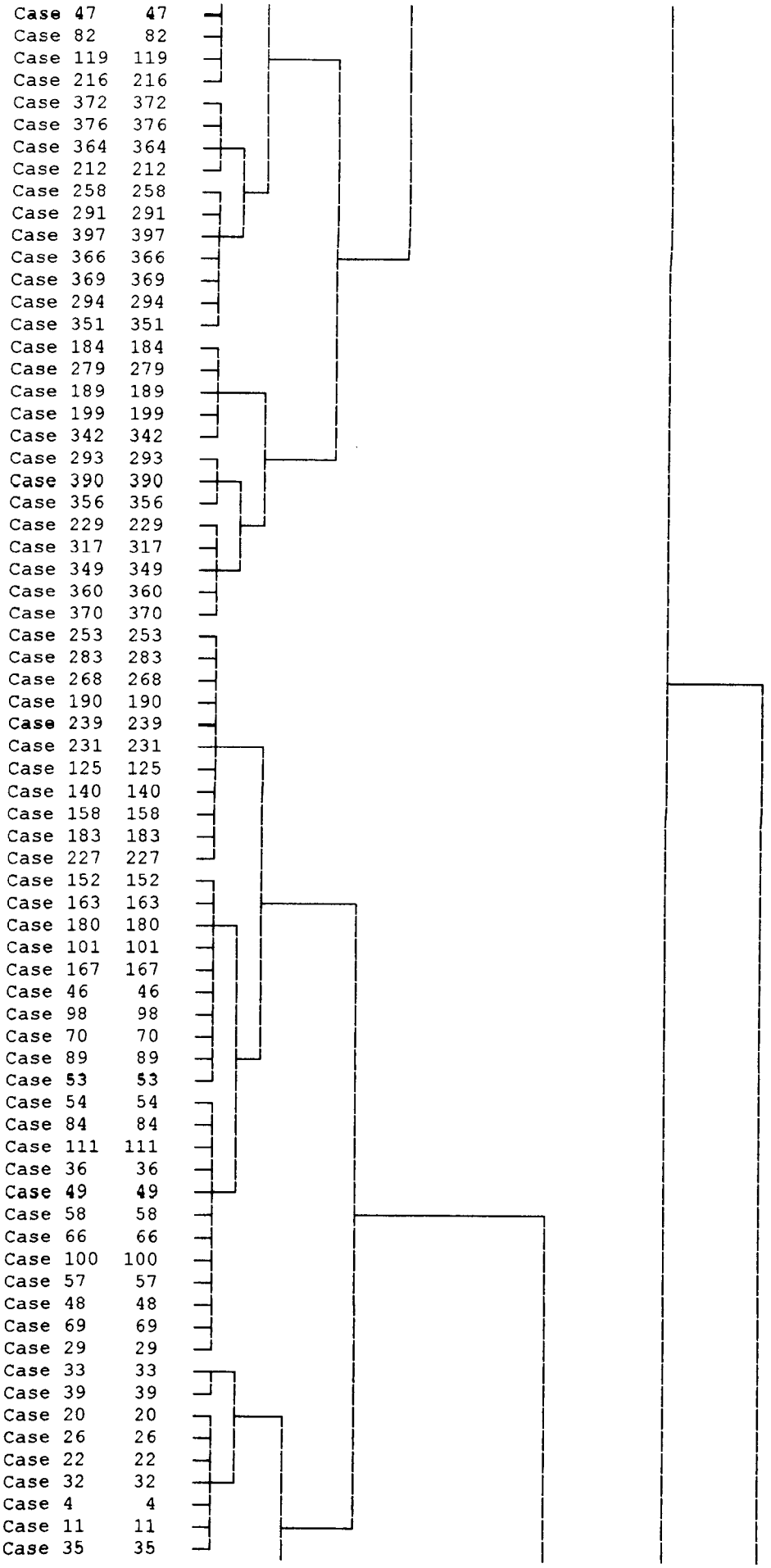
	Component							
	1	2	3	4	5	6	7	8
v1:Reason: scenery	-.002	.346	.003	.195	**.706**	-.070	.016	.039
v2: Reason: wildlife	-.138	**.718**	.102	.043	.267	.017	.055	.030
v3: Reason: investment	**.720**	-.137	.064	-.001	.120	.024	-.011	.054
v5: Reason: privacy	.072	-.085	.221	-.155	**.724**	.068	.010	-.035
v6: Reason: personal enjoyment	-.055	.249	.158	.000	**.713**	.024	-.073	-.099
v7: Reason: Climate	.126	**.514**	.004	.194	.003	**.557**	-.034	-.053
v9: Reason: Timber products	**.639**	.040	**.504**	.145	-.072	.088	-.069	-.015
v11: Reason: Biofuel/woodfuel	.198	.168	**.809**	-.017	.075	.063	.017	.007
v13: Reason: public recreation	.068	.158	-.011	**.809**	-.147	.032	-.028	.069
v15: Reason: Educational	.045	.334	.135	**.633**	.059	.133	-.126	-.068
v16: Importance: Financial Return	**.772**	-.164	.067	.033	-.042	.033	.139	.094
v17: Importance: Wood for own use	.168	.092	**.744**	-.044	.161	.034	.147	-.057
v18: Importance: timber prices	**.808**	-.092	.186	.044	-.034	.047	.098	.066
v20: Importance: recreational	.022	.155	-.028	**.677**	.272	.024	.045	.006
v21: Importance: restore broadleaf	-.003	**.735**	.033	.099	.076	.130	.014	.097
v22: Importance: grant available	**.471**	.171	-.162	-.026	.097	.000	.299	**.494**
v23: Importance: improve scenery	.077	.389	-.128	.212	**.514**	.192	.051	.169
v26: Importance: quality of timber	**.619**	.154	.340	.072	.068	.005	-.008	-.027
v27: Importance: improve habitats	-.270	**.651**	.132	.127	.081	.258	-.025	.077
v28: Constraints: lack of money	.159	.003	.115	.060	.050	.068	**.706**	.278
v29: Constraints: Lack of time	-.109	-.003	**.144**	.027	-.033	-.005	**.813**	-.089
v31: Constraints: Skills	.018	.178	-.261	-.179	.015	.050	**.544**	-.319
v39: Funding mgmt: financially good	.250	-.097	.141	.084	-.001	.034	**.651**	.322
v42: Funding mgmt: don't want to be told	-.102	-.087	.032	.024	.142	.002	-.003	**-.793**
v43: Funding mgmt: grants help	-.017	.051	.037	.101	.101	.063	.084	**.767**
v44: Benefits: Recreation	.039	-.166	.017	**.774**	.002	.055	.119	.084
v46: Benefits: Property value	.076	-.272	.023	.161	**.461**	.437	.145	.092
v47: Benefits: Pollution control	.003	.130	.030	.042	.068	**.836**	.084	.016
v48: Benefits: Wildlife	-.368	.291	.272	.040	.148	.390	.068	.224
v49: Benefits: Woodfuel	.170	-.057	**.709**	.087	.087	.204	.092	.045
v50: Benefits: Carbon storage	.083	.175	.240	.026	.004	**.789**	-.023	.020

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 8 iterations.

APPENDIX 12: DENDROGRAM OF HIERARCHICAL CLUSTER ANALYSIS

Dendrogram using Ward Method

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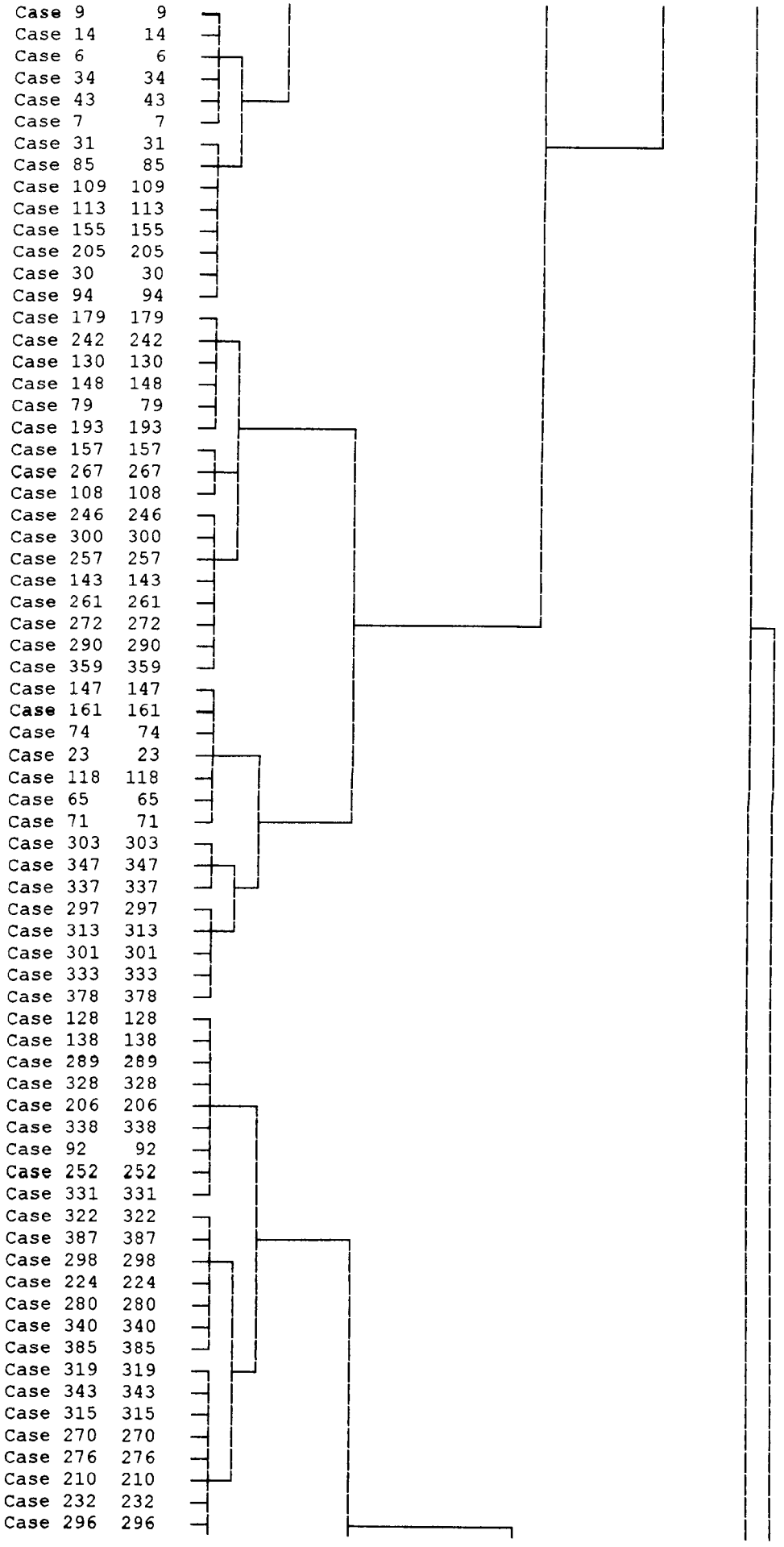
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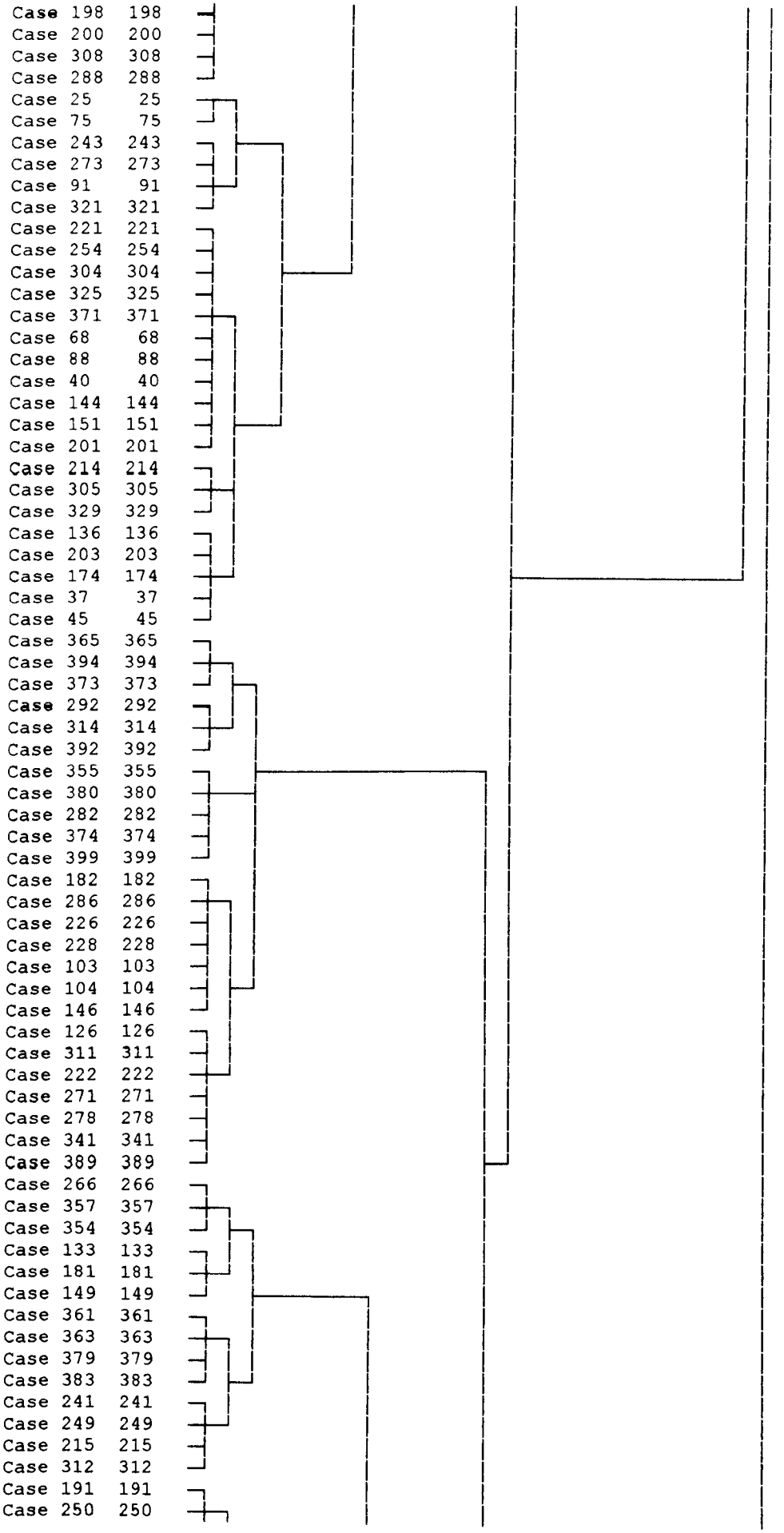
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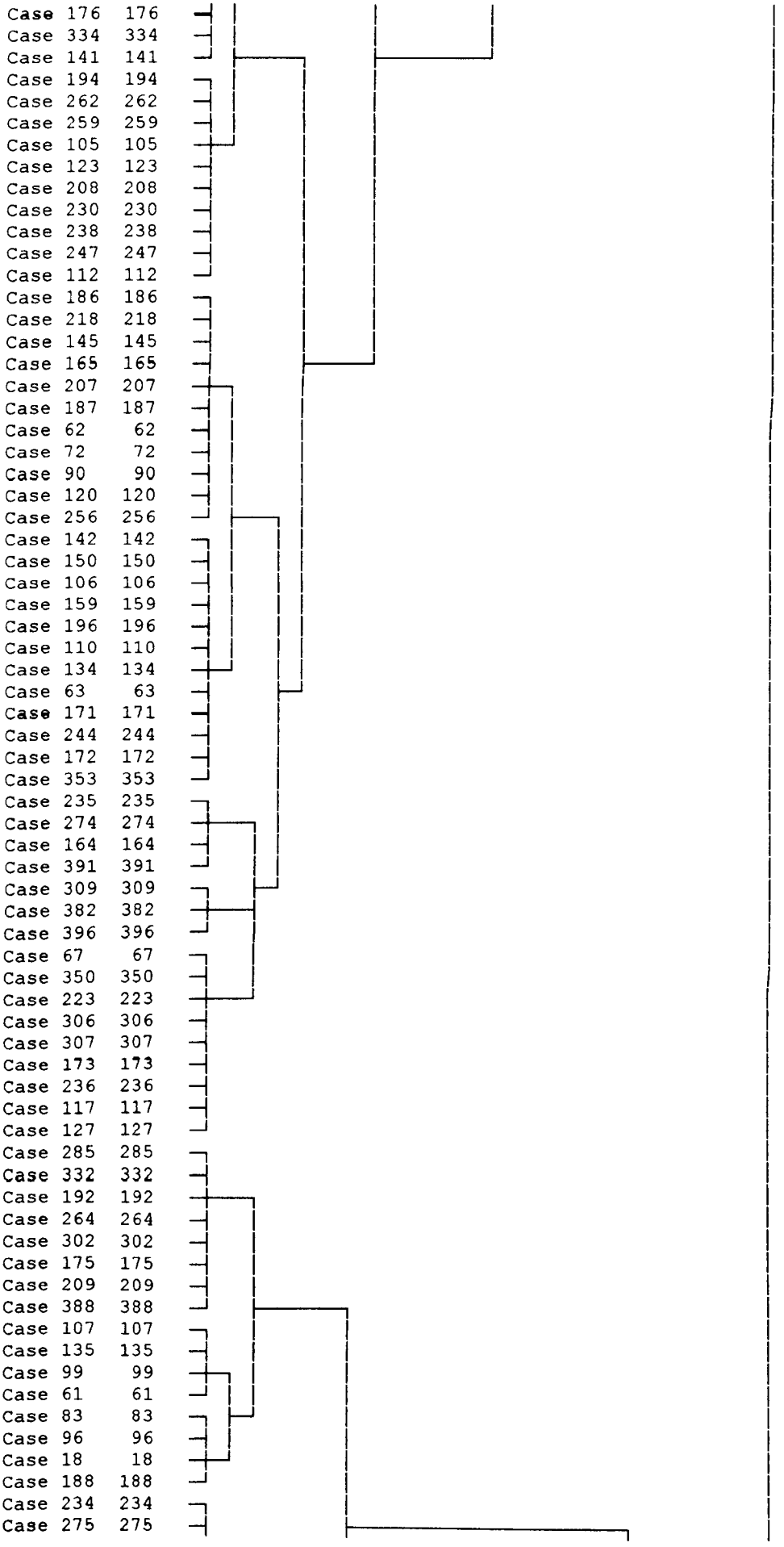
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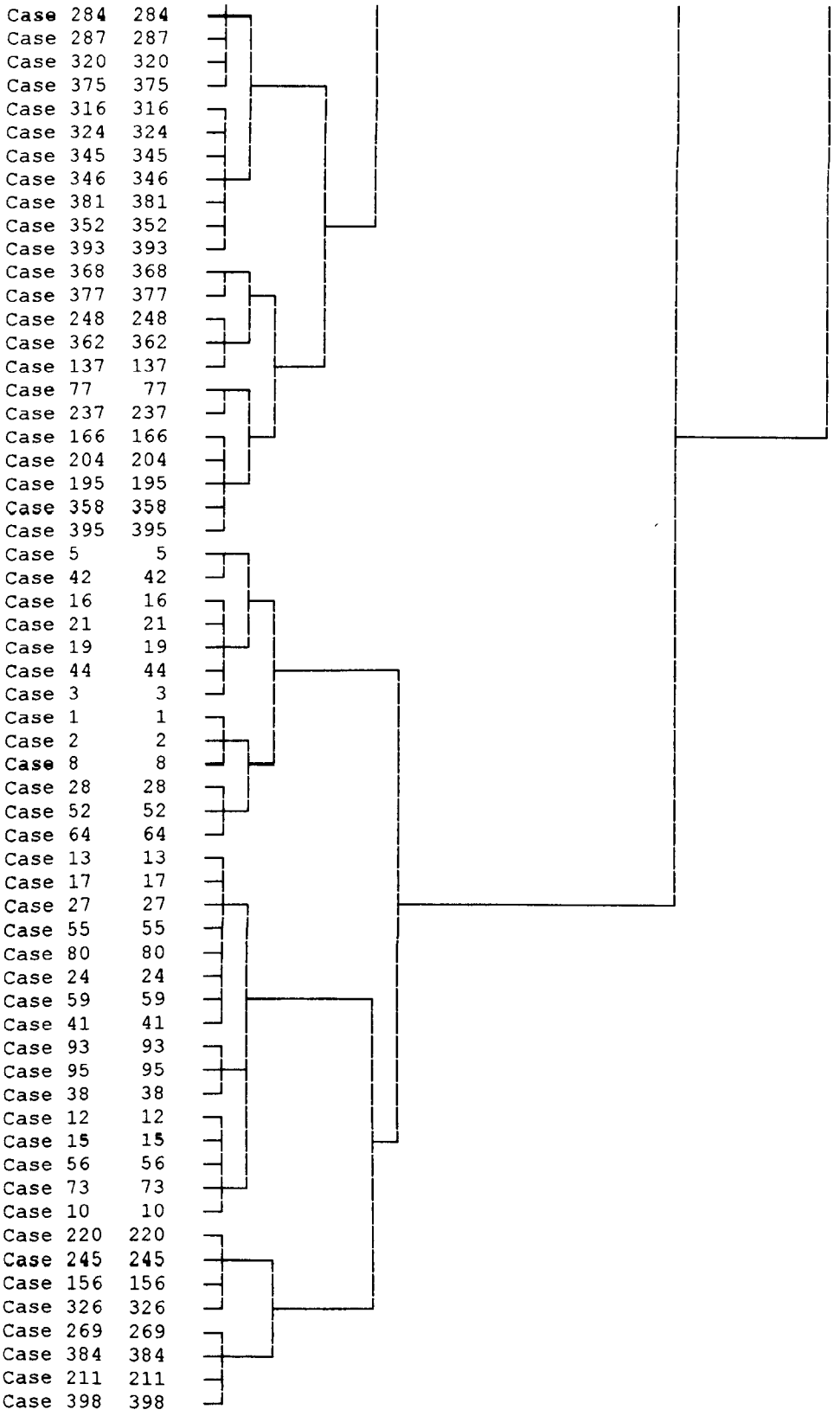
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APPENDIX 13: PROFILING THE SIX-CLUSTER NON-HIERARCHICAL CLUSTER SOLUTION ON ASSOCIATED INDEPENDENT CHARACTERISTICS

I_1 Woodland Type		Cluster 1	2	3	4	5	6	Total
ASNW	Count	31	25	30	22	11	15	134
	% within cluster	32.3%	32.1%	39.0%	37.9%	27.5%	30.0%	33.6%
Broad-leaves	Count	29	18	23	20	13	15	118
	% within cluster	30.2%	23.1%	29.9%	34.5%	32.5%	30.0%	29.6%
Conifer	Count	1	0	0	0	2	0	3
	% within cluster	1.0%	.0%	.0%	.0%	5.0%	.0%	.8%
Mixed	Count	33	33	23	15	14	19	137
	% within cluster	34.4%	42.3%	29.9%	25.9%	35.0%	38.0%	34.3%
Other	Count	2	2	1	1	0	1	7
	% within cluster	2.1%	2.6%	1.3%	1.7%	.0%	2.0%	1.8%
Total	Count	96	78	77	58	40	50	399
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 19.595 is not significant (p = .484).

I_2 Bought Woodland		Cluster 1	2	3	4	5	6	Total
Yes	Count	62	43	55	22	19	19	220
	% within cluster	64.6%	55.1%	71.4%	37.9%	47.5%	38.0%	55.1%
No	Count	34	35	22	36	21	31	179
	% within cluster	35.4%	44.9%	28.6%	62.1%	52.5%	62.0%	44.9%
Total	Count	96	78	77	58	40	50	399
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 25.546 is significant at .001 level.

I_3 Planted Woodland		Cluster 1	2	3	4	5	6	Total
Yes	Count	32	32	29	38	13	24	168
	% within cluster	33.3%	41.0%	37.7%	65.5%	32.5%	48.0%	42.1%
No	Count	64	46	48	20	27	26	231
	% within cluster	66.7%	59.0%	62.3%	34.5%	67.5%	52.0%	57.9%
Total	Count	96	78	77	58	40	50	399
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 18.959 is significant at .005 level.

I_4 Inherited Woodland		Cluster 1	2	3	4	5	6	Total
Yes	Count	26	23	10	14	16	9	98
	% within cluster	27.1%	29.5%	13.0%	24.1%	40.0%	18.0%	24.6%
No	Count	70	55	67	44	24	41	301
	% within cluster	72.9%	70.5%	87.0%	75.9%	60.0%	82.0%	75.4%
Total	Count	96	78	77	58	40	50	399
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 13.231 is significant at .05 level.

I_5 Owner Type		Cluster 1	2	3	4	5	6	Total
Farm	Count	29	26	18	24	13	13	123
	% within cluster	30.2%	33.3%	23.4%	41.4%	32.5%	26.0%	30.8%
Individual	Count	45	19	43	22	14	9	152
	% within cluster	46.9%	24.4%	55.8%	37.9%	35.0%	18.0%	38.1%
Family	Count	11	12	5	8	3	7	46
	% within cluster	11.5%	15.4%	6.5%	13.8%	7.5%	14.0%	11.5%
Estate	Count	9	17	10	4	7	6	53
	% within cluster	9.4%	21.8%	13.0%	6.9%	17.5%	12.0%	13.3%
Other	Count	2	4	1	0	3	15	25
	% within cluster	2.1%	5.1%	1.3%	.0%	7.5%	30.0%	6.3%
Total	Count	96	78	77	58	40	50	399
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 87.725 is significant at .0001 level.

I_6 Distance from Woodland		Cluster 1	2	3	4	5	6	Total
Adjacent	Count	60	50	49	38	13	27	237
	% within cluster	63.2%	64.9%	63.6%	65.5%	32.5%	54.0%	59.7%
Within 1 mile	Count	11	8	7	9	8	3	46
	% within cluster	11.6%	10.4%	9.1%	15.5%	20.0%	6.0%	11.6%
2-10 miles	Count	12	7	11	4	11	10	55
	% within cluster	12.6%	9.1%	14.3%	6.9%	27.5%	20.0%	13.9%
10-40 miles	Count	6	4	7	0	3	3	23
	% within cluster	6.3%	5.2%	9.1%	.0%	7.5%	6.0%	5.8%
Over 40 miles	Count	6	8	3	7	5	7	36
	% within cluster	6.3%	10.4%	3.9%	12.1%	12.5%	14.0%	9.1%
Total	Count	95	77	77	58	40	50	397
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 32.267 is significant at .05 level.

I_7 Involved in grant scheme		Cluster 1	2	3	4	5	6	Total
Yes	Count	71	72	65	53	37	46	344
	% within cluster	74.0%	92.3%	84.4%	91.4%	92.5%	92.0%	86.2%
No	Count	25	6	12	5	3	4	55
	% within cluster	26.0%	7.7%	15.6%	8.6%	7.5%	8.0%	13.8%
Total	Count	96	78	77	58	40	50	399
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 18.820 is significant at .005 level.

I_8 Gender		Cluster 1	2	3	4	5	6	Total
Male	Count	79	64	72	42	36	35	328
	% within cluster	83.2%	83.1%	93.5%	73.7%	90.0%	71.4%	83.0%
Female	Count	16	13	5	15	4	14	67
	% within cluster	16.8%	16.9%	6.5%	26.3%	10.0%	28.6%	17.0%

Total	Count	95	77	77	57	40	49	395
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 15.598 is significant at .01 level.

		Cluster						
I_9 Age		1	2	3	4	5	6	Total
Under 30	Count	0	1	0	0	0	1	2
	% within cluster	.0%	1.3%	.0%	.0%	.0%	2.0%	.5%
30-39	Count	4	11	3	2	2	7	29
	% within cluster	4.2%	14.1%	3.9%	3.5%	5.0%	14.0%	7.3%
40-49	Count	20	18	16	11	5	5	75
	% within cluster	21.1%	23.1%	20.8%	19.3%	12.5%	10.0%	18.9%
50-59	Count	29	25	22	15	12	16	119
	% within cluster	30.5%	32.1%	28.6%	26.3%	30.0%	32.0%	30.0%
60-69	Count	28	16	27	19	10	13	113
	% within cluster	29.5%	20.5%	35.1%	33.3%	25.0%	26.0%	28.5%
70+	Count	14	7	9	10	11	8	59
	% within cluster	14.7%	9.0%	11.7%	17.5%	27.5%	16.0%	14.9%
Total	Count	95	78	77	57	40	50	397
	% within cluster	100.0%	100.0%	100.0 %	100.0%	100.0%	100.0%	100.0%

Chi-square value of 31.620 is not significant (p = .169).

		Cluster						
I_{10} Employment		1	2	3	4	5	6	Total
Fulltime	Count	25	21	17	8	6	13	90
	% within cluster	26.3%	27.6%	22.1%	13.8%	15.0%	27.1%	22.8%
Partime	Count	3	8	3	4	3	6	27
	% within cluster	3.2%	10.5%	3.9%	6.9%	7.5%	12.5%	6.9%
Self-employed	Count	33	39	31	20	21	17	161
	% within cluster	34.7%	51.3%	40.3%	34.5%	52.5%	35.4%	40.9%
Not working	Count	2	0	1	1	0	0	4
	% within cluster	2.1%	.0%	1.3%	1.7%	.0%	.0%	1.0%
Retired	Count	30	8	25	24	10	11	108
	% within cluster	31.6%	10.5%	32.5%	41.4%	25.0%	22.9%	27.4%
Other	Count	2	0	0	1	0	1	4
	% within cluster	2.1%	.0%	.0%	1.7%	.0%	2.1%	1.0%
Total	Count	95	76	77	58	40	48	394
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 37.426 is not significant.

		Cluster						
I_{11} Woodland Area		1	2	3	4	5	6	Total
<2ha	Count	16	10	17	18	7	9	77
	% within cluster	17.6%	12.8%	22.4%	31.6%	17.5%	18.8%	19.7%
3-10ha	Count	44	25	31	30	9	13	152
	% within cluster	48.4%	32.1%	40.8%	52.6%	22.5%	27.1%	39.0%
11-20ha	Count	13	12	7	4	4	7	47
	% within cluster	14.3%	15.4%	9.2%	7.0%	10.0%	14.6%	12.1%
21-30ha	Count	6	4	7	3	4	5	29
	% within cluster	6.6%	5.1%	9.2%	5.3%	10.0%	10.4%	7.4%
31-40ha	Count	4	1	1	1	2	3	12

	% within cluster	4.4%	1.3%	1.3%	1.8%	5.0%	6.3%	3.1%
41-50ha	Count	3	2	4	0	5	1	15
	% within cluster	3.3%	2.6%	5.3%	.0%	12.5%	2.1%	3.8%
>51ha	Count	5	24	9	1	9	10	58
	% within cluster	5.5%	30.8%	11.8%	1.8%	22.5%	20.8%	14.9%
Total	Count	91	78	76	57	40	48	390
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square value of 66.385 is significant at .0001 level.

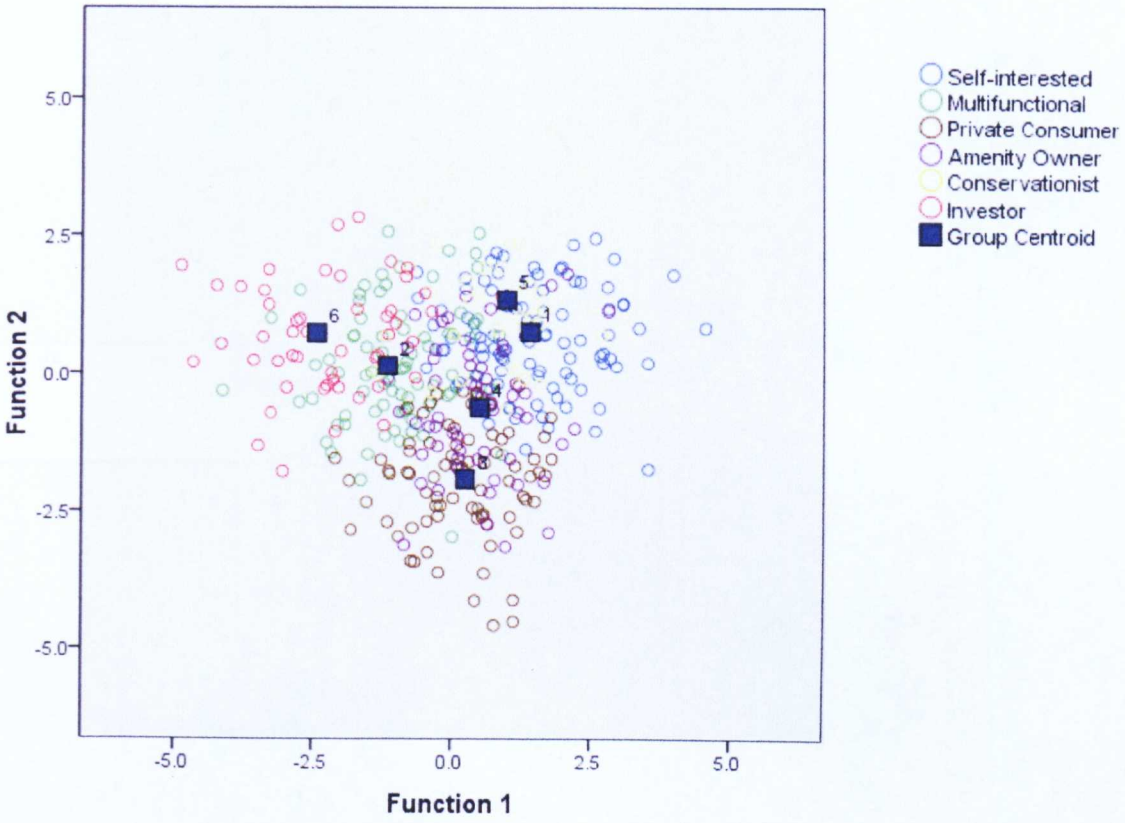
		Cluster						
I_{12} Years Owned		**1**	**2**	**3**	**4**	**5**	**6**	**Total**
<5yrs	Count	16	10	17	18	7	9	77
	% within cluster	17.6%	12.8%	22.4%	31.6%	17.5%	18.8%	19.7%
6-10yrs	Count	44	25	31	30	9	13	152
	% within cluster	48.4%	32.1%	40.8%	52.6%	22.5%	27.1%	39.0%
11-15yrs	Count	13	12	7	4	4	7	47
	% within cluster	14.3%	15.4%	9.2%	7.0%	10.0%	14.6%	12.1%
16-20yrs	Count	6	4	7	3	4	5	29
	% within cluster	6.6%	5.1%	9.2%	5.3%	10.0%	10.4%	7.4%
21-25yrs	Count	4	1	1	1	2	3	12
	% within cluster	4.4%	1.3%	1.3%	1.8%	5.0%	6.3%	3.1%
26-30yrs	Count	3	2	4	0	5	1	15
	% within cluster	3.3%	2.6%	5.3%	.0%	12.5%	2.1%	3.8%
>31yrs	Count	5	24	9	1	9	10	58
	% within cluster	5.5%	30.8%	11.8%	1.8%	22.5%	20.8%	14.9%
Total	Count	91	78	76	57	40	48	390
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

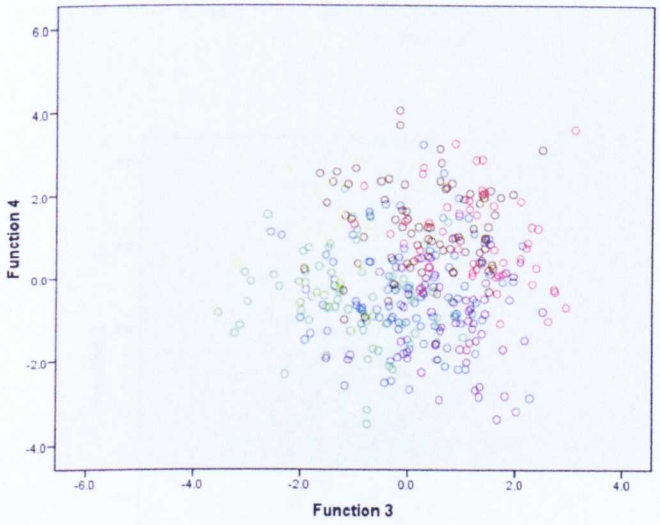
Chi-square value of 64.446 is significant at .0001 level.

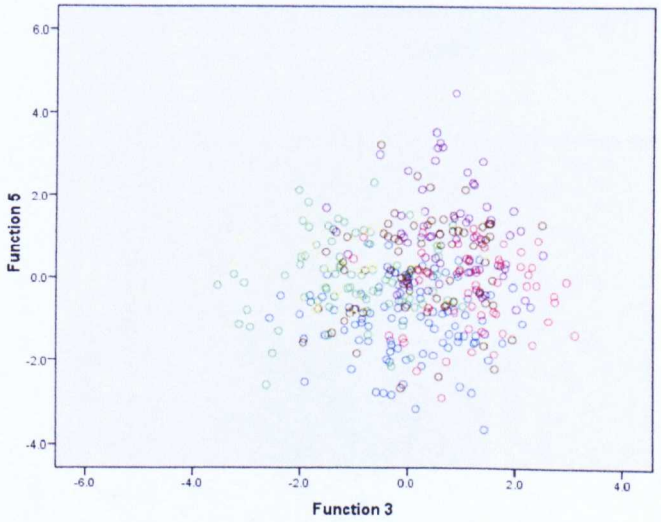
		Cluster						
I_{13} Hours work in woodland per week		**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Nil	Count	16	10	17	18	7	9	77
	% within cluster	17.6%	12.8%	22.4%	31.6%	17.5%	18.8%	19.7%
<1hr	Count	44	25	31	30	9	13	152
	% within cluster	48.4%	32.1%	40.8%	52.6%	22.5%	27.1%	39.0%
1 hr	Count	13	12	7	4	4	7	47
	% within cluster	14.3%	15.4%	9.2%	7.0%	10.0%	14.6%	12.1%
2 hrs	Count	6	4	7	3	4	5	29
	% within cluster	6.6%	5.1%	9.2%	5.3%	10.0%	10.4%	7.4%
3 hrs	Count	4	1	1	1	2	3	12
	% within cluster	4.4%	1.3%	1.3%	1.8%	5.0%	6.3%	3.1%
4 hrs	Count	3	2	4	0	5	1	15
	% within cluster	3.3%	2.6%	5.3%	.0%	12.5%	2.1%	3.8%
5 hrs	Count	5	24	9	1	9	10	58
	% within cluster	5.5%	30.8%	11.8%	1.8%	22.5%	20.8%	14.9%
6 hrs	Count	91	78	76	57	40	48	390
	% within cluster	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
>7 hrs	Count	16	10	17	18	7	9	77
	% within cluster	17.6%	12.8%	22.4%	31.6%	17.5%	18.8%	19.7%
Total	Count	44	25	31	30	9	13	152
	% within cluster	48.4%	32.1%	40.8%	52.6%	22.5%	27.1%	39.0%

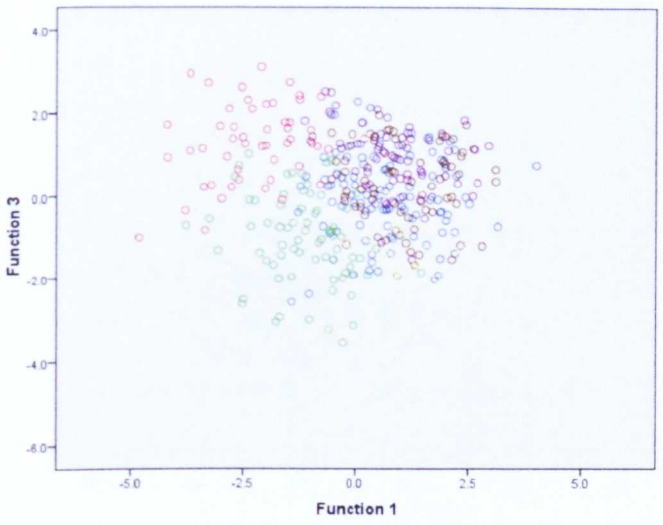
Chi-square value of 44.987 is not significant.

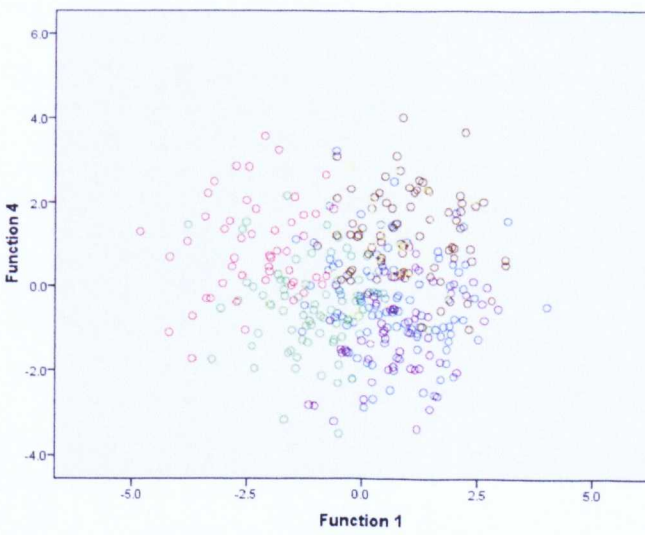
APPENDIX 14: GROUP CENTROIDS IN DISCRIMINANT SPACE

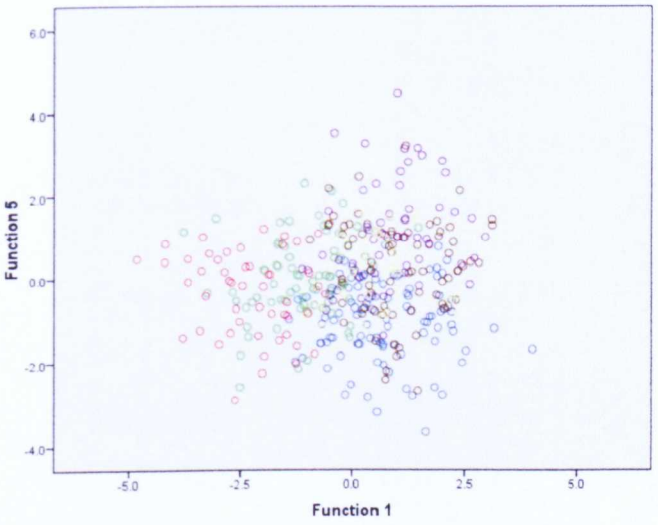


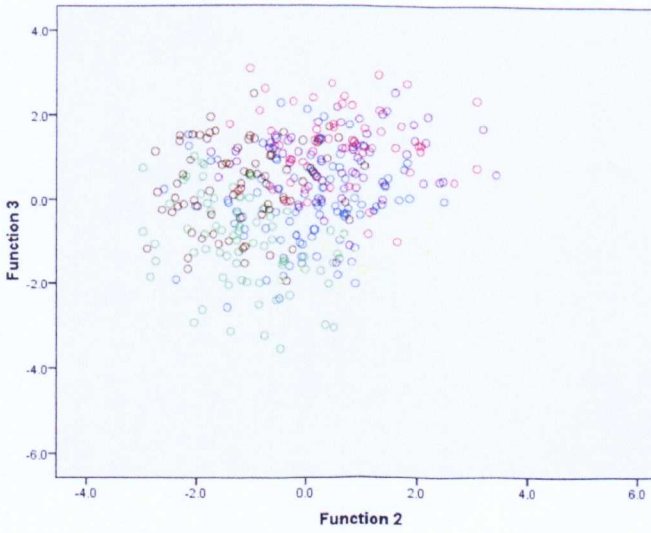


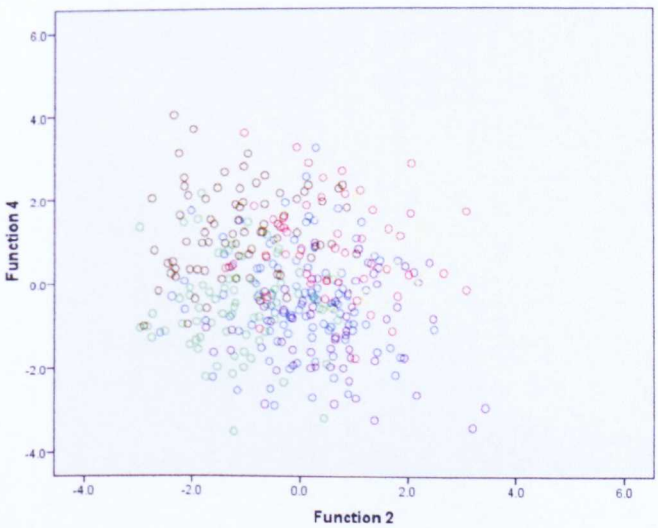


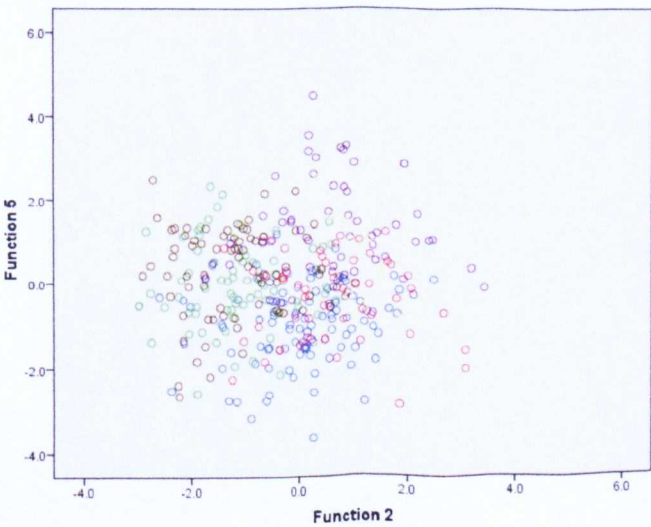

Function 3
Function 1

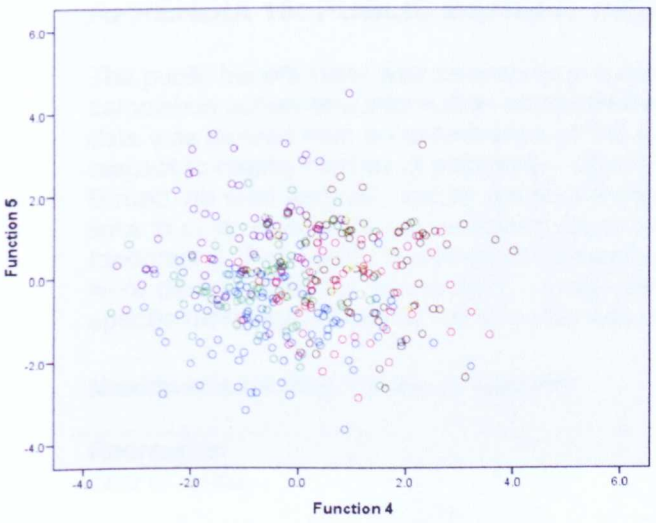

Function 4
Function 1


Function 5
Function 1


Function 3
Function 2


Function 4
Function 2


Function 5
Function 2


Function 5
6.0
4.0
2.0
0.0
-2.0
-4.0
-4.0
-2.0
0.0
2.0
4.0
6.0
Function 4

APPENDIX 15: PUBLIC BENEFIT INDEX

The public benefit index was devised from a combinationof the data collected as part of the self-completion survey and information extracted from Ordnance Survey maps. For instance, spatial data was derived from an examination of OS maps to determine each woodland's location with respect to nearby centres of population, size of those urban areas, accessibility (i.e. main road, B road, no road access), nearby areas of recreational space, connectivity in the landscape (i.e. links to other woodlands via woodland strips, hedgerows, agricultural fields, water courses) and topography. Data such as woodland size and type, nature designations and permissive access were derived from the survey data. It was not possible to consider whether a woodland had specific recreational facilities, as this data was not collected as part of the survey.

Maximum score=22/Minimum score=3

Recreation			
Size of forest	<2ha = 1 <10ha = 2 <30 ha = 3 >30ha = 4	*Species mix*	mixed = 3 Broadleaf = 2 Conifer =1
Public access	many footpaths thru forest = 3 One footpath thru forest =2 Footpath on edge =1	*Distance from large town (eg. Kendal)*	<0.5km =2.5 <4km =2 <10km =1.5
Distance from village/hamlet	<0.5km=2.5 <4km=2 <10km=1.5	*Distance from other recreational site*	<1km =1 <5km = 2 <10km =3 <15km =4
Parking	car park =1 Layby=0.5	*Accessibility*	A road = 2 B road = 1.5 Small lane = 1 Track = 0.5
Biodiversity			
Size of forest	<2ha = 2 <10ha = 4 <30 ha = 6 >30ha = 8	*Species mix*	mixed = 3 Broadleaf = 2 Conifer =1
Links with other woodland	Woodland link = 4 Hedgerow link=3 Moorland=2 Agricultural land =1	*Designations*	ASNW/SSSI/ MSPA/NNR/ SAC/LNR/BAP – 1 for each
Landscape			
Size of forest	<2ha = 1 <10ha = 2 <30 ha = 3 >30ha = 4	*Species mix*	mixed = 3 Broadleaf = 2 Conifer =1
Distance from large town (eg. Kendal)	<0.5km = 4 <4km = 3.5 <10km =3	*Distance from village/hamlet*	<0.5km=3 <4km=2.5 <10km=2
Visual aspect	View from town=4 View from road=3 View from hamlet=2 View from minor road=1	*Topography*	top of hill=4 Hillside=3 Lower hillside=2 Valley=1

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