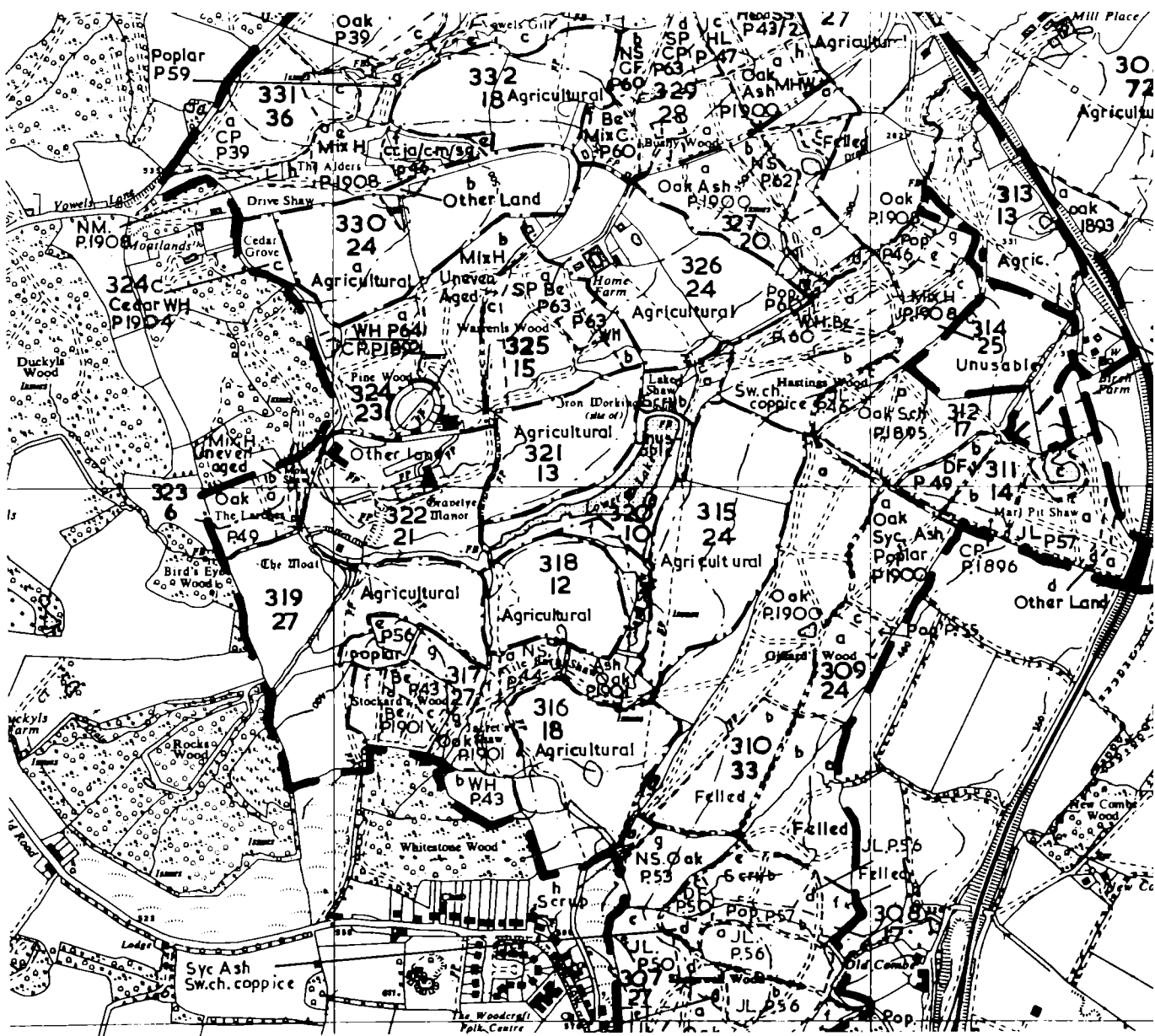


By D. C. NICHOLLS, M.A., Ph.D.



The front cover shows a map of the Gravetye Estate, near East Grinstead, which forms part of Maresfield Forest in East Sussex. Gravetye was formerly owned by William Robinson, a noted horticulturist, who bequeathed it to the Forestry Commission. Its layout is typical of private estates in South East England; woods occupy the steeper slopes and poorer soils, with farms on the better land. Scale: 6 inches to 1 mile.

FORESTRY COMMISSION BULLETIN

No. 39

Use of Land for Forestry within the Proprietary Land Unit

A STUDY OF LAND USE ON WOODED PRIVATE ESTATES
IN ENGLAND AND WALES

By D. C. NICHOLLS, M.A., Ph.D.

LONDON: HER MAJESTY'S STATIONERY OFFICE

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FOREWORD

This Bulletin presents the results of an enquiry by Dr. D. C. Nicholls, now a lecturer in the Department of Town and Regional Planning in the University of Glasgow, into the factors that influence the use of land for forestry on private estates in England and Wales.

It was prepared as a dissertation for the degree of Doctor of Philosophy in the University of Cambridge, and is published with the kind permission of the Board of Graduate Studies of that University.

The survey of private estates on which the author's conclusions are based was carried out with the full co-operation of the Forestry Commission's research and development staff, but all statements of opinion should be read as the author's personal views rather than as expressions of Forestry Commission policy.

This paper was completed in November 1965, and since then there have been minor changes in the taxation of private estates and in the legal bases for the payment of grants for establishing woodlands; these are covered by appropriate footnotes. The general framework of grant aid and taxation remains unaltered, but it should be noted that the capital value of growing timber (as distinct from the land on which it stands) does not attract Capital Gains Tax. Also, that most employment in Forestry is exempt from Selective Employment Tax.

Since the establishment of the Forestry Commission under the Forestry Act of 1919, it has consistently pursued, as one of its main objectives, the promotion of profitable timber growing on private estates. This is the first assessment of the effects of this assistance on the general land-use pattern of private estates. It should prove a useful guide to all who are concerned with the allocation of rural land, whether they be landowners, foresters, farmers, land agents or experts on regional planning.

FORESTRY COMMISSION
July 1968

AUTHOR'S PREFACE

This dissertation is based on two original surveys of selected proprietary land units in England and Wales. The three-fold objective of the study was to investigate the present pattern of forest land use; to determine the most important factors which have influenced this pattern; and to assess the role of forestry within the proprietary land unit and the role of private forestry in the national forest policy.

After a brief introductory section, the early chapters describe the original survey work and the scope of the enquiry, leading on to detailed analyses of the present land use patterns, the proprietor's attitude towards forestry and the extent to which various factors, both internal and external to the proprietary unit, and physical and abstract attributes of it, have affected the forest policies. The effects of the three main facets of Government policy for private forestry are discussed in Chapters 5 to 7. Then follow two chapters devoted to certain aspects of the marketing of woodland produce and the probable long-term trends in demand for timber, in so far as these topics have an important bearing on the economic stability of private forestry. Chapter 10 contains a general discussion of British forest policy, and in particular, the role of private woodlands. The succeeding chapter opens with a discussion of the economics of private forestry and various economic problems confronting the industry, and then there is a brief assessment of the future prospects for forestry within the proprietary land unit, provided that certain specified conditions can be fulfilled. The final chapter contains a brief summary of practical considerations for private forest policies which emerged from the studies.

The published sources from which information has been derived are indicated specifically in footnotes, and there is a comprehensive bibliography in an appendix. Certain information of a general nature was obtained from various sources, including officers and members of the Forestry Commission, the Royal Forestry Society of England, Wales and Northern Ireland and the Timber Grower's Organisation Limited. I wish to record my gratitude to these individuals and to the many estate proprietors, land agents and foresters who so readily co-operated in the surveys.

I am especially grateful to Mr. J. N. R. Jeffers, formerly Chief Statistician in the Forestry Commission (now with the Nature Conservancy) for invaluable help with the computer analyses; to others at the Research Station, Alice Holt Lodge, for much helpful comment; and to Mr. H. L. Edlin, Forestry Commission Publications officer, for a great deal of work in the preparation of this Bulletin. I should also like to acknowledge my indebtedness to members of the Department of Land Economy in the University of Cambridge for advice, criticism and guidance, in particular my supervisor, Mr. J. F. Q. Switzer, and the Head of Department, Professor D. R. Denman. The responsibility for all the shortcomings of the dissertation rests, of course, with the author. Finally, I wish to express my gratitude to the managers of the Harold Samuel Research Fund for the award of the studentship which enabled me to undertake this study.

D. C. NICHOLLS

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Chapter 1

THE PRELIMINARY SURVEY

Introductory

"The national land use pattern is a mosaic fashioned from the use patterns of resources within proprietary land units".¹ Any consideration of national land use policy must therefore give due attention to the means whereby such policy may be effected within the framework of the multitude of proprietary units which comprise the land of the nation. Any description of national land use patterns solely in terms of the aggregate areas under different uses will be incomplete in so far as it fails to indicate the infinite variety of land use patterns within the land units of a vast number of proprietors. These land units may vary from millions of acres owned by the state to a small fraction of an acre in the ownership of an individual. The national land use pattern is thus a consequence of decisions taken by every landowner, acting within certain limits which may be imposed by central government, local authorities or any other kind of planning body, and subject to certain rights and interests of other landowners. The proprietary land unit, as the decision-making unit has been called, thus forms the basic unit for disposition of land resources. It is desirable not only to know the detailed pattern of resource use within each proprietary unit, but also to have an understanding of the factors which have led to the present distribution of these resources and the motives behind each proprietor's land use policy. It is important to discover the main reasons for a proprietor's decisions on matters relating to the allocation of land resources, as well as the effect of these decisions.

The study of aspects of forest land use within selected proprietary land units in England and Wales, which forms the basis of this dissertation, was designed to make a contribution to knowledge in these two respects—firstly, to provide information concerning the nature, extent, and detailed use and management of the woodlands, and their relationship to the rest of the proprietary unit, and secondly, to discover the principal factors which influence a proprietor's forest policy.

In Britain, the Forestry Commission possesses detailed census reports on all woodlands, and much additional information about woodlands owned by the Commission and those woodland areas which have been dedicated under the Forestry Act 1947² or approved for one of the other grant-aid

schemes,³ but it has not probed deeper to discover the reasons for the existence of those private woodlands or why they are being maintained at the present time. It is important to know the principal considerations which underlie private forest policies—even though, or perhaps especially because the conclusion in many cases may be that the proprietor is quite unaware of some of the factors involved, or that for say, reasons of social tradition or a personal whim, he is strongly prejudiced for or against afforestation. Such knowledge could be of value not only to the individual proprietor who might thereby be moved to consider additional factors and, as a consequence, to adopt a policy more beneficial to him and to his successors in title. It could also benefit a nation faced with increasing competition for the use of land, since it is of paramount importance that every parcel of land should be put to the "best" use.

The Proprietary Land Unit

The proprietary land unit has been defined as "an area of land managed as a single entity and co-extensive in its physical dimensions with a title to the rights of user, disposition and alienation which the common law in England calls property in land".⁴ This definition is of universal application, but for the present investigation, attention has been confined to a selection of land units with particular characteristics. Each of the proprietary units in the survey samples included agricultural land as well as woodland, and contained at least one tenanted agricultural holding; that is, units entirely owner-occupied were not considered. Various features peculiar to such units were deemed to merit a separate study, outside the scope of this present investigation.

The stated acreages of proprietary units exclude land used for purposes not directly associated with agriculture or forestry (in most cases urban property) and small amounts of such land have been disregarded. Where a proprietor's total wealth included a significant proportion (by value) of urban property, this property, whether strictly a part of the unit under consideration or not, was noted as a source of consociate capital,⁵ as distinct from the estate capital which comprised the proprietor's farm land and woodland and the fixed equipment thereon.

¹ Denman, D.R.—Paper to Land Use Course for Forestry and Agriculture, Commonwealth Forestry Institute, Oxford, 1963.

² Since consolidated by the Forestry Act, 1967.

³ See Chapter 7, page 41.

⁴ Denman, D. R.—*op. cit.*

⁵ See Denman, D. R.—*Estate Capital*, page 60 ff.

Ownership Personality

The following forms of proprietorship, or ownership personality,¹ were represented in one or both of the surveys which form the basis of this dissertation:

(1) Single Person—for the purposes of this study, this category includes individuals who are tenants for life under settlements. It is considered appropriate to separate this category of trustee from others (see below), since such a tenant for life is both trustee and beneficiary. He is not subject to the sanction of an independent body of trustees in many matters of management and disposition. In many instances covered by the surveys, the settlement was created by the present life-tenant, and the change in legal ownership had little apparent effect on the management policy.

(2) Trustees—all the proprietorships in this group belonged to the class of trustees virtually possessing the powers of a tenant for life, but lacking his status. These trustees owned land for the purpose of executing specific beneficial trusts in it.²

(3) Company—one of the two forms of corporate ownership examined in the surveys. Most of the companies were private estate companies which had been formed expressly to own and administer the estate. A few were public companies owning an estate as an incidental interest.

(4) Charity—this category includes various types of corporations which may be termed broadly "charitable institutions", such as colleges. All were exempt from income tax and wholly immune from estate duty.

Duration

One further abstract attribute of proprietary land units should be considered briefly at this point. An estate in land extends in time, and its duration is the length of time it has remained in the ownership of a single family, or of a corporation or other type of owner, as the case may be. Family ownership is reckoned to be continuous whether the title passed to successive members of the family by inheritance, purchase or any other means, and even if the title has recently been vested in a company or trust, so long as the virtual control of the estate is unaffected. Similarly, a line of inheritance may be preserved even though the physical form of the estate may have undergone great change over the years. For the main survey, three duration categories were differentiated—estates whose titles originated before the end of the nineteenth century, those which arose between 1900 and 1945, and those of even more recent origin.

Other attributes are defined and discussed elsewhere at the appropriate places in the dissertation.

The Preliminary Survey

The investigation has taken the form of two surveys, of which the main feature has been a discussion with the proprietor and/or his agent or forester, on matters relating to the general pattern and management of his estate and in particular, the forest policy and programme. The nature and scope of the information required clearly rendered the normal type of written questionnaire impracticable.

A preliminary survey of 20 estates was carried out, to investigate the general attitudes which the owners had adopted towards forestry, some of the problems which they faced and some of the advantages and disadvantages of forestry within the proprietary land unit. This survey was largely confined to the four southern English counties of Oxfordshire, Buckinghamshire, Berkshire and Hampshire, although opportunity was taken to obtain information from four estates elsewhere. The southern region was chosen principally because the proportion of its area occupied by private woodlands is relatively high, being 8.6 per cent, compared with the average for England and Wales of 4.9 per cent,³ and one might therefore reasonably expect the landowners to be more aware of the potentialities of forestry than in a region where it is of lesser importance.

The estates were chosen to obtain a fair distribution among the various size classes and certain types of owner, as shown in Tables 1.1 and 1.2. A discussion was held with the owner or agent of each estate, and in the case of 14 estates part at least of the estate was inspected. The remaining six estates were either very scattered, or were located some distance from where the discussion took place and in an area familiar to the writer.

A number of interesting features emerged from the results of this preliminary survey, most of which were examined more fully in the main survey, but which

TABLE 1.1
DISTRIBUTION OF THE ESTATES IN THE PRELIMINARY SURVEY ACCORDING TO SIZE

Size Class (acres)	No. of Estates (Total 20)
Up to 1,000	3
1,001– 2,500	6
2,501–10,000	7
Over 10,000	4

¹ See Denman, D. R.—*Estate Capital*, page 29 ff.

² *ibid.*, page 30.

³ Percentages based on figures from Forestry Commission *Census Report*, No. 1, 1952, Tables H and T—excludes woods less than 5 acres.

TABLE 1.2

DISTRIBUTION OF THE ESTATES IN THE PRELIMINARY SURVEY ACCORDING TO OWNERSHIP PERSONALITY

Ownership Personality	No. of Estates
Single Persons ..	10
Companies ..	3
Charities ..	7

should be mentioned briefly as pointers towards possible general patterns, and as determinants of the scope of the main enquiry.

(1) Of the 20 estates, four were found to include no woodlands and on a further two estates there was no attempt at systematic woodland management, leaving 14 estates with "productive" woodland. Figure 1.1 contains frequency diagrams showing the number of estates having a given percentage of their total area under woodland, distinguishing between "all woods" and "productive woods". The distribution of estates with productive woodlands with respect to size class is given in Table 1.3, together with the average percentage of productive woodlands in each size class.

FIGURE 1.1

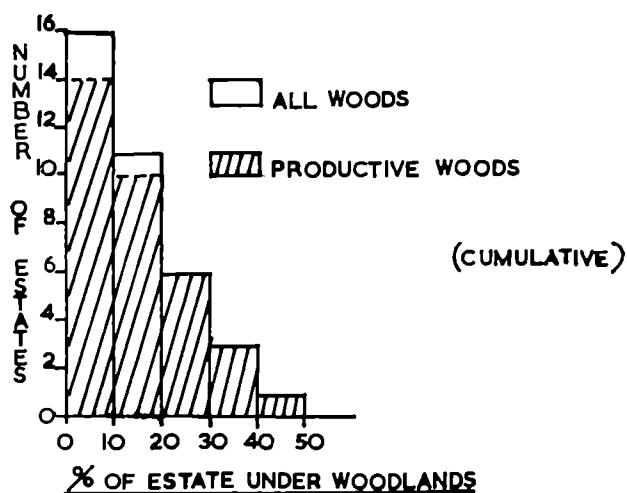
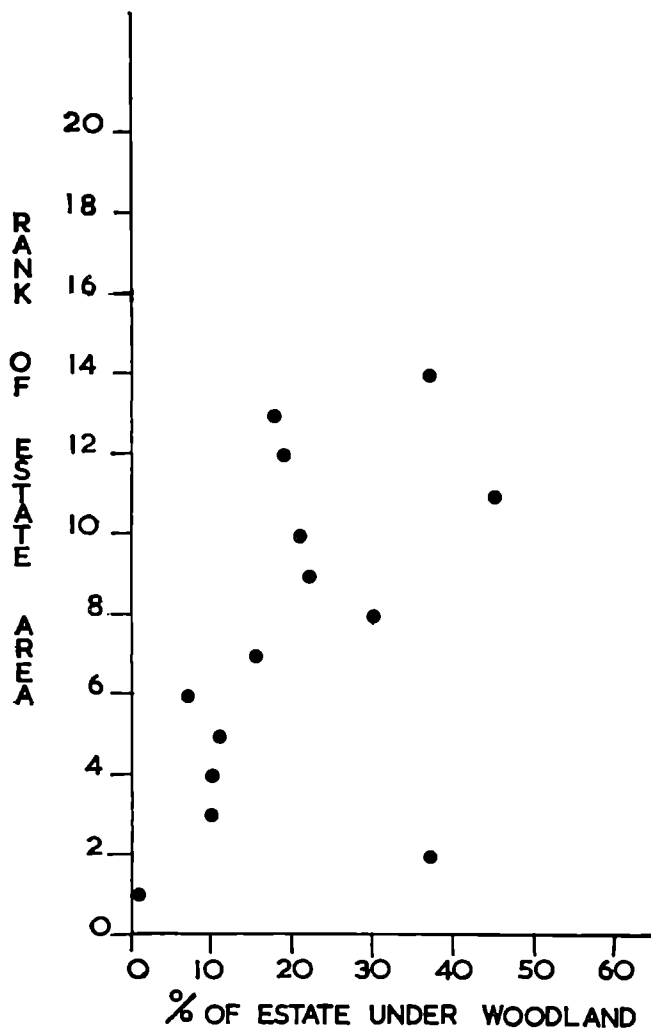
PRELIMINARY SURVEYESTATES WITH WOODLAND

TABLE 1.3
DISTRIBUTION OF ESTATES WITH PRODUCTIVE WOODLANDS ACCORDING TO SIZE CLASS

Estate Size Class (acres)	Total No. of Estates	Estates with Productive Woodlands				Range (%)
		No. of Estates	Total Area (acres)	Woodland Area (acres)	Woodland Area as Percentage of total	
Up to 1,000	3	—	—	—	—	—
1,001–2,500	6	4	7,170	2,350	30	18–45
2,501–10,000	7	6	32,250	5,170	16	7–30
Over 10,000	4	4	67,500	9,600	14	1–37
Totals	20	14	106,920	17,120	16	—

FIGURE 1.2

PRELIMINARY SURVEYPRODUCTIVE WOODS ONLY

The relationship of the woodland acreage to the total estate area is shown in Figure 1.2, in which the woodland area of each estate, expressed as a percentage of the total, is plotted against the rank number of the total estate acreage, the estates being ranked in ascending order of size. A definite, though small, degree of negative correlation is evident.

(2) On none of the estates had there been any appreciable transfer of land use between agriculture and forestry from 1945 to 1965. In one case, 50 acres of moderate agricultural land were about to be planted with Christmas trees. The general position appeared to be an acceptance of the existing land use pattern on the estate, with the management of the agricultural part aimed towards maximum financial return, whereas the woodlands tended to be regarded as an asset (or liability) of amenity value and as a hobby, with economic timber production only a secondary consideration in many cases. On all types of estate, the attention given to the woodlands depended to a large extent on the degrees of enthusiasm of the owner and his agent.

(3) The chief reason put forward to explain why derelict woods had not been rehabilitated, and why only an insignificant proportion of the area of all the estates had shown a change of use in favour of forestry in recent years, is the long term nature of investment in forestry. Most owners are unable or unwilling to invest capital for, say, 50 to 100 years knowing that the returns will be concentrated largely, at the end of that period, and having doubts as to whether, on a strictly economic basis, the returns will be commensurate with the sacrifices involved. Yet there is a reluctance to remove any part of their woods partly because of the amenity value and partly

because of uncertainty as to the profitability of such removal to make way for agriculture, although often the owners were confident that many woodlands were on sites of an inherent quality quite comparable to the farmland. It is apparent that many owners are ignorant of the economic factors involved, and have little idea of the potential financial yield of well managed woodlands or of land reclaimed for agriculture.

(4) There was no productive woodland on estates of under 1,000 acres, and of the 14 estates where the production of timber was an important object of management, eight had a woodland area of between 10 and 22 per cent of the total estate area. With one exception, there was some attempt at management where the woodland acreage represented more than 5 per cent of the estate—there was either an estate woodland staff supplemented to varying degrees by contract labour, or the woods were let on long lease to the Forestry Commission, or, in one case, a forestry syndicate.¹ The most common motive for leasing woods to the Forestry Commission was a desire to preserve the woodlands coupled with an inability to provide the capital necessary for their rehabilitation. In such cases, it was considered more desirable to get a nominal rent than to allow the woods to remain more or less derelict and unproductive. Many owners appreciated that timber production need not be inconsistent with the preservation of amenity, and that good management can enhance the appearance of the woods.

(5) The effect of ownership personality on the woodland area is shown in Table 1.4, and, for two categories, is illustrated by Figure 1.3.

TABLE 1.4
DISTRIBUTION OF PRODUCTIVE WOODLAND ESTATES ACCORDING TO OWNERSHIP PERSONALITY

Ownership Personality	Total No. of Estates	Estates with Productive Woodlands				Range of (%)
		No. of Estates	Total area (acres)	Woodland area (acres)	Woodland area as percentage of total	
Single Persons	10	7	38,920	6,560	17	10-37
Companies	3	3	28,010	8,510	30	7-45
Charities	7	4	39,590	2,050	5	1-18
Totals	20	14	106,520	17,120	16	—

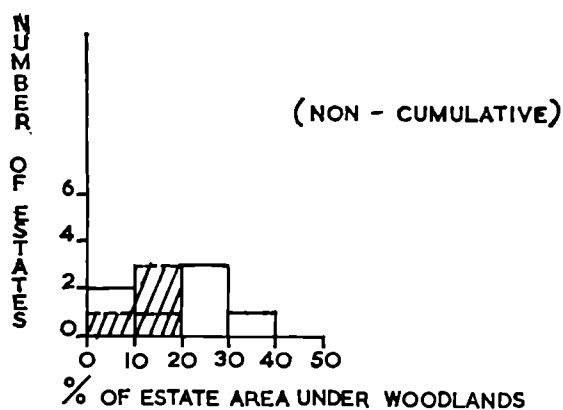
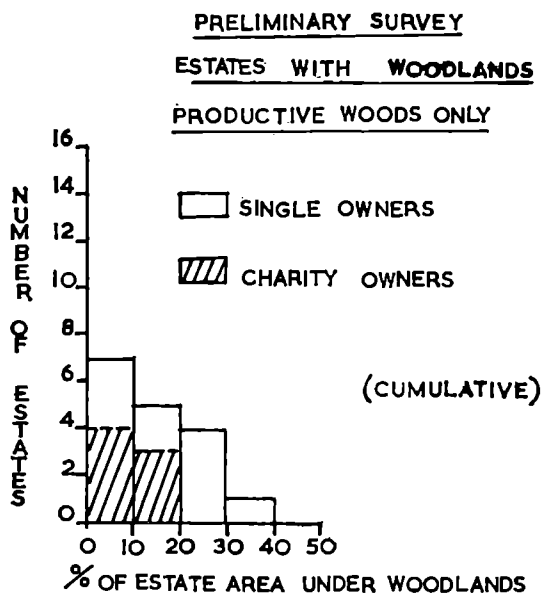
These figures indicate that the single owner, who can take advantage of income tax and estate duty concessions relating to woodlands² is more favourably disposed towards forestry than the charity owner to whom none of these concessions is appli-

cable. A survey carried out by the Department of Land Economy of Cambridge University in the period 1952-56 revealed that for estates of over 1,000 acres, charity policy of investment of consociate funds is concentrated in stocks and shares and other land,

¹ See discussion of syndicates following in Chapter 11, page 63.

² See Chapters 5 and 6, pages 31 and 35.

FIGURE 13



with only 1.1 per cent held as timber. By contrast, the proportion of the consociate funds held as timber by non-charity estates of the same size class was 28.0 per cent.¹

The Department's survey was concerned with a different measure, not with the pattern of land use within the proprietary unit, but its findings reflect the same attitude on the part of the charity owner. Further, on a decision of the proprietor, the distribution of consociate funds can be altered more easily than the composition of the land unit. Even so, four

of the charity owners had sold woods in recent years to realise capital for investment elsewhere.

The explanation may also be partly that ownership by an individual gives scope for an intimate contact between owner and land, and for an expression of personal fancies such as the visual amenity of woodlands. Inevitably, corporate ownership provides much less intimate contact with the land, and a natural tendency towards a relatively greater emphasis on purely economic factors. Further evidence of such emphasis is provided by the fact

¹ Denman, D. R.—*Estate Capital*, page 179.

that, of the estates surveyed, the rents received from the agricultural holdings on charity estates appeared to be nearer the rack rental value than on other estates.^{1, 2}

The average percentage of woodlands on the company-owned estates is very high, and the range is so wide as to be meaningless for such a small sample. The reason for the highest figure of 45 per cent woodland is that the present estate is the residue of a much larger unit of which a considerable acreage of agricultural land was sold in recent years. Another estate with a high proportion of woodland is on relatively poor agricultural land, whereas the third estate, at the lower end of the scale, is predominantly land of high agricultural quality. In these cases, soil

quality appears to have overshadowed any effect of ownership personality.

It is recognised that the data on which these tentative conclusions are based represent a very small number of estates, and that the sample has no statistical significance. Nevertheless, it is submitted that the figures are useful in so far as they may be taken to indicate possible patterns, and as pointers to a number of aspects which could be profitably pursued in the main survey. As a general examination of various broad aspects of private forestry, the preliminary survey has fulfilled its function in bringing to light certain problems and attitudes, and in signposting many avenues worthy of further exploration.

¹The average rent on charity estates was 94 per cent of the estimated rental value, and only 76 per cent on other estates.

²See also Denman and Stewart—*Farm Rents*, Chapter 11. In 1957 rents of farms owned by charities averaged £2 6s. 7d. per acre, as against the National Average of £1 18s. 9d., and was the highest of the ownership personality class.

Chapter 2

THE MAIN SURVEY

The Sample

The preliminary survey covered 20 proprietary land units, selected on the basis of size, and mostly situated in the South of England. In addition to units on which the woodland area was managed under a positive plan, there were some units where the woods were neglected, and others consisted wholly of agricultural holdings. While one could, with profit, examine the reasons behind the owner's attitude to forestry in each category, it was decided to concentrate the main survey upon land units known to include "managed" woodland: that is, woodland managed under a definite plan of operations—in most cases, one which has been approved by the Forestry Commission for the purposes of one of the grant-aid schemes.¹ This decision was made largely

because the limited time and resources available for this investigation necessitated a narrow field of enquiry and it was felt to be more desirable to confine the study thus, but to extend the range by including estates from the whole of England and Wales. Such coverage has made possible a study of the effects of widely differing geographical conditions and different forestry traditions. The regional officers of The Timber Growers' Organisation Ltd. and of the Royal Forestry Society were most co-operative in supplying names of estates on which a definite forest policy was being pursued. Ten of the estates used in the preliminary survey were adjudged to fulfil this condition and they have been incorporated into the Main Survey to give a total sample of 72 estates, with the following distribution (Table 2.1).

TABLE 2.1
REGIONAL DISTRIBUTION OF ESTATES IN THE MAIN SURVEY

Region	Counties	No. of Estates
1. Far West	Cornwall, Devon	7
2. Mid-West	Dorset, Somerset, Gloucestershire, Wiltshire, Oxfordshire (ex. Chilterns)	8
3. South-East	Hampshire, Berkshire, Middlesex, Surrey, Sussex, Kent	8
4. West Midlands ..	Herefordshire, Worcestershire, Warwickshire, Shropshire, Staffordshire, Cheshire	6
5. Chilterns	Parts of Oxfordshire and Buckinghamshire	8
6. East Midlands ..	Buckinghamshire (ex. Chilterns), Bedfordshire, Northamptonshire, Leicestershire, Nottinghamshire, Derbyshire, Lincolnshire, Rutland ..	7
7. East Anglia	Huntingdonshire, Cambridgeshire, Norfolk, Suffolk, Essex, Hertfordshire	6
8. North	Lancashire, Yorkshire, Cumberland, Westmorland, Northumberland, Durham	10
9. South Wales	Monmouthshire, Glamorganshire, Carmarthenshire, Pembrokeshire, Cardiganshire, Breconshire, Radnorshire	4
10. North Wales	Anglesey, Caernarvonshire, Flintshire, Denbighshire, Montgomeryshire, Merionethshire	8
	Total	72

The areas of agricultural and forest land included in the survey totalled 561,010 acres, about 1½ per cent of the total land area of England and Wales,

37,130,637 acres.² The total woodland acreage surveyed, 78,395 acres, represents 4.1 per cent of the area of private woodlands in the two countries,

¹ See Chapter 7, page 41.

² Ministry of Agriculture, Fisheries and Food: *Agricultural Statistics for England and Wales, 1961-62*.

1,801,000 acres.¹ At 30th September 1963, 601,751 acres of woodland in England and Wales were included in Dedicated or Approved Woodland schemes,² or planned for such inclusion,³ and of the woods in the main survey, 74,985 acres were either Dedicated or Approved, representing 12·5 per cent of the national total in these two categories. In addition, two estates totalling 9,600 acres of Dedicated Woodland were visited, but they have been excluded from the survey results since they consisted wholly of woodland in hand and this did not satisfy the definition of a proprietary land unit for the purposes of this study.⁴

Unlike the Preliminary Survey, the area of the estates and the ownership personality were disregarded in the selection. It will be seen below⁵ that in fact there is a reasonable size-class distribution. Various other distributions also will be examined in

the detailed analysis of the results which follow in the next chapters.

The Survey

The method of survey was as before: a discussion with the owner or his agent or forester (frequently with all three persons) coupled with a tour of at least a part of the estate, looking especially at the woodlands. A detailed questionnaire, to be rigidly adhered to in every case, was inappropriate, but Table 2.2 gives the main headings under which information was collected. It will be seen that there are three main sections. The first deals with the general description of the estate, its composition, ownership and management. Sections II and III deal in more detail with the agricultural and forestry portions respectively.

TABLE 2.2
THE MAIN SURVEY HEADINGS

I. General	Land Use pattern (areas). Location and shape. Ownership (Personality, Duration, Consociate Capital). Management structure.
II. Agriculture ..	Area let—Number of holdings, present rents, estimated rental values. Area in hand—Number of holdings, comparison with tenanted land. Predominant farming systems. Future policy—especially regarding the size of holdings.
III. Forestry	Area let—rents and reasons for letting. Area in hand—geographical distribution. Woodland sites—determinants of present pattern. History of management since 1920—and earlier if possible. Main species and Age structure. Labour, Utilisation and Marketing methods. Economics and Finance. Tradition. Factors influencing policy and practice. Future policy.

It is regretted that in a very few cases it has not been possible to obtain all the information desired. Generally the explanation is that the owner could not be interviewed and the agent was unable to divulge certain highly confidential facts, or was ignorant of some matters relating to the ownership and capital resources and of what might be in the mind of the owner as a long-term policy.

The Main Survey was carried out over a period of

approximately 12 months from January 1963, the preliminary enquiry having been conducted in the first half of 1962.

Methods of Analysis

Two important analyses were carried out on a Ferranti Pegasus computer at the Forestry Commission's Research Station. Details of these analyses are given in subsequent chapters—a principal

¹ Forestry Commission *Census Report*, No. 1, 1952.

² See Chapter 7, page 41.

³ Forestry Commission—*Forty-Fourth Annual Report of the Forestry Commissioners for the year ended 30th September, 1963*, Tables 23 and 24.

⁴ See Chapter 1, discussion of Proprietary Land Unit, page 1.

⁵ See Table 3.3, page 16 and Appendix A, page 70.

component analysis¹ and an association analysis of 51 characteristics of each of the 72 estates.² In addition, a number of patterns and relationships between various factors are discussed in Chapter 3, while others were tested and found to be without significance. Various diagrams and graphs are included.

Much of the detailed description and analysis is contained in the next two chapters, but some of the main features of the survey have been dealt with in separate chapters. These include the impact of various Government measures upon proprietary forest policies,³ more particularly taxation and grant-aid schemes. The marketing of woodland produce is also given special attention.⁴

It is emphasised that the results of the surveys are not to be interpreted as representative of all proprietary land units. The sample was given a bias deliberately, to obtain a more complete picture of the forestry pattern and policy for a certain type of land unit, but many of the conclusions have a more general application. The factors which have been found to influence forest policies in these particular cases may have some relevance for other proprietors, many of whom (on the evidence of the Preliminary Survey⁵) are probably unaware of various important facts. The pattern found to exist on the selected units may give an indication of the pattern which could exist on land units where similar basic conditions obtain.

¹ See Chapter 3, page 11.

² See Chapter 4, page 20.

³ See Chapters 5-7, page 31 on.

⁴ See Chapters 8 and 9, page 46 on.

⁵ See Chapter 1, page 1.

ANALYSIS OF INFORMATION

I. PRINCIPAL COMPONENT ANALYSIS

Tradition and Estate Policy

Some of the dominant features of the present-day patterns of land use and land ownership in Britain originated many decades or even many centuries ago. Much of the landscape is as it was laid out 150 years ago, in terms of the areas under various uses. The trees may now be mature, some of the crops in the fields may be recent introductions, but the basic patchwork of woodland and meadow over large parts of Britain remains unaltered. The influence of tradition on estate policy, and on forestry policies in particular, is considerable, and this must be borne in mind when examining in detail the patterns within proprietary land units.

There is a wide variation among the sizes of the proprietary units,¹ and certain regional characteristics are evident. These are discussed later,² and are undoubtedly partly the outcome of long-standing traditional patterns of land ownership. The impact of tradition in this respect is perhaps even greater in parts of Scotland, but regrettably that country could not be included in the survey. Geographical and climatic factors are very important, but cannot provide the whole explanation of the differences between the regions now. If economics were the only determinant, the number and arrangement of estates throughout the land would probably be very different. A viable unit in the early nineteenth century may not be one in the second half of the twentieth, yet while some estates have been "broken up" and others have been enlarged, the majority, perhaps, have undergone very little change in size and shape.

The land use patterns within the proprietary units have remained even more static in recent years than has the distribution of the units. The surveys revealed much evidence of this fact. On 31 of the estates in the main survey, there had been changes of use from agriculture to forestry since 1945, involving more than 10 acres of farmland, but with very few exceptions the acreage involved was an insignificant proportion of the whole estate and was usually confined to oddly shaped or remote areas. Changes of use in the reverse direction, since the second World War, had occurred on only two out of the 72 estates surveyed. Most proprietors were content to accept the pattern which they had first known. Where the primary object of management was the maximisation of profit, the two main enterprises—

agriculture and forestry—were usually considered separately for this purpose rather than viewed as components of the whole estate in respect of which the total profit was to be made as large as possible. There were few cases where much consideration had been given to the possible effects on estate income of extensive land use changes, and there was further evidence that some owners were ignorant of the probable cost of, and return from, the rehabilitation of derelict woodland as compared with a transfer to agricultural use.³ Very often the traditional pattern had been accepted unquestioningly. It is possible that this pattern was the one best suited to satisfy all of the proprietor's requirements, including, perhaps, visual and sporting amenities. However, the impression was often gained that the sole reason for the current allocation of the land between agriculture and forestry within the proprietary unit was that the same allocation had been adopted or accepted by the proprietor's predecessor in title.

Another example of the influence of tradition on forest policy was provided by many of the estate sawmills. Sawmills were found on 43 estates out of the 72 estates in the sample, and 18 of these were used only to convert timber for use on the estate. Produce was sold from 25 sawmills. Some of the sawmills were known to be running at a considerable annual loss, but they were kept in operation nonetheless. Many of the owners of these sawmills stated that their mill was still used because there had "always been a sawmill on the estate". Yet although these same owners would not contemplate the purchase of the new sawmill equipment, they were very reluctant to cease using the old one. On the other hand, some of the larger estate sawmills were efficiently used, and formed by far the most profitable part of the whole forestry enterprise. Tradition was followed with more justification in such matters as the choice of tree species known to produce good timber on particular sites.

Undoubtedly much can be learned from proprietary land use policies of the past, but it is important that these should be critically re-appraised in the light of current conditions, and not be perpetuated simply because they are traditional. Some of the evidence of the survey suggests that in many cases the grip of tradition is too rigid for the economic well-being of the estate.

¹ See Table 3.3, page 16 and Appendix A, page 70.

² See page 12, for discussion of Components, within this present Chapter.

³ See page 5, Chapter 1.

Principal Component Analysis

The quantitative data was collected under the following headings for each of the 72 estates in the sample¹:

- (1) Total Estate Area.
- (2) Total Agricultural Area.
- (3) Agricultural Area in Hand.
- (4) Agricultural Area Let.
- (5) Estimated Average Rental Value.²
- (6) Total Woodland Area.
- (7) Woodland Area in Hand.
- (8) Woodland Area Let.
- (9) Estate Woodland Staff.

These nine variables were analysed on an electronic digital computer by a method of multivariate

analysis, commonly called principal component analysis.³ The analysis has been based upon the total correlation matrix, given in Table 3.1, from which a set of linear combinations of the original variates was obtained.^{4, 5} These combinations—components—are calculated such that the first component has maximum variance. The second component is uncorrelated with the first, and also has as large a variance as possible, and similarly for the third and subsequent components. The object is to describe the original variation in terms of the minimum number of uncorrelated components. The values of the principal components were calculated for each estate in the investigation, and these were then examined to see whether there were any clear groupings, and whether there was any close relationship between the values of the components and other classifications of the estates.⁶

TABLE 3.1
CORRELATION MATRIX (HALF ONLY) OF THE NINE ORIGINAL VARIATES

Total Estate Area ..	(1)								
Total Agricultural Area ..	0.988*	(2)							
Agricultural Area in Hand ..	0.587*	0.591*	(3)						
Agricultural Area Let ..	0.959*	0.941*	0.298†	(4)					
Estimated Average Rental Value ..	-0.257†	-0.245†	-0.226	-0.225	(5)				
Total Woodland Area ..	0.592*	0.485*	0.274†	0.471*	-0.077	(6)			
Woodland Area in Hand ..	0.613*	0.518*	0.303*	0.500*	-0.024	0.921*	(7)		
Woodland Area Let ..	0.210	0.137	0.058	0.141	-0.142	0.589*	0.229	(8)	
Estate Woodland Staff ..	0.592*	0.523*	0.390*	0.470*	0.006	0.738*	0.821*	0.141	(9)

* Significant at the 1 per cent level of probability.

† Significant at the 5 per cent level of probability.

The sum of the values of the combinations obtained from the correlation matrix of the original variates is equal to the sum of the elements of the principal diagonal of the matrix, in this case nine. The values of the combinations are given in Table 3.2 to two decimal places.

The first five components account for 97.7 per cent of the total variability, while the first three

account for nearly 82 per cent. (It is probable that only the first three components are "significant", and only these have been used for the subsequent discussion.) In other words, it is likely that the original nine variables measured only five independent dimensions.

The next step was to identify each of the principal components. For this purpose, the coefficients of

¹ See Appendix A, page 70.

² As for the Preliminary Survey, this figure is the average maximum rent considered possible under the conditions on the estate (including personal factors). It is not necessarily the full market rental value. See Chapter 3, discussion on agricultural rents, page 17.

³ See Kendall, M.G.—*A Course in Multivariate Analysis*, 1957.

⁴ See, for an example, Jeffers, J. N. R.—*Principal Component Analysis of Designed Experiment*, Statistics Section Paper, Forestry Commission.

⁵ See also the additional explanatory note on the analysis in Appendix D, page 76.

⁶ See Appendix C, page 76.

TABLE 3.2
PRINCIPAL COMPONENTS

Component		Percentage of Total Variability
No.	Value	
I	4.79	53.3
II	1.48	16.4
III	1.10	12.2
IV	0.78	8.6
V	0.64	7.2
VI	0.20	2.2
VII	0.01	0.1
VIII	0.00	0.0
IX	-0.00	0.0
Total	9.00	100.0

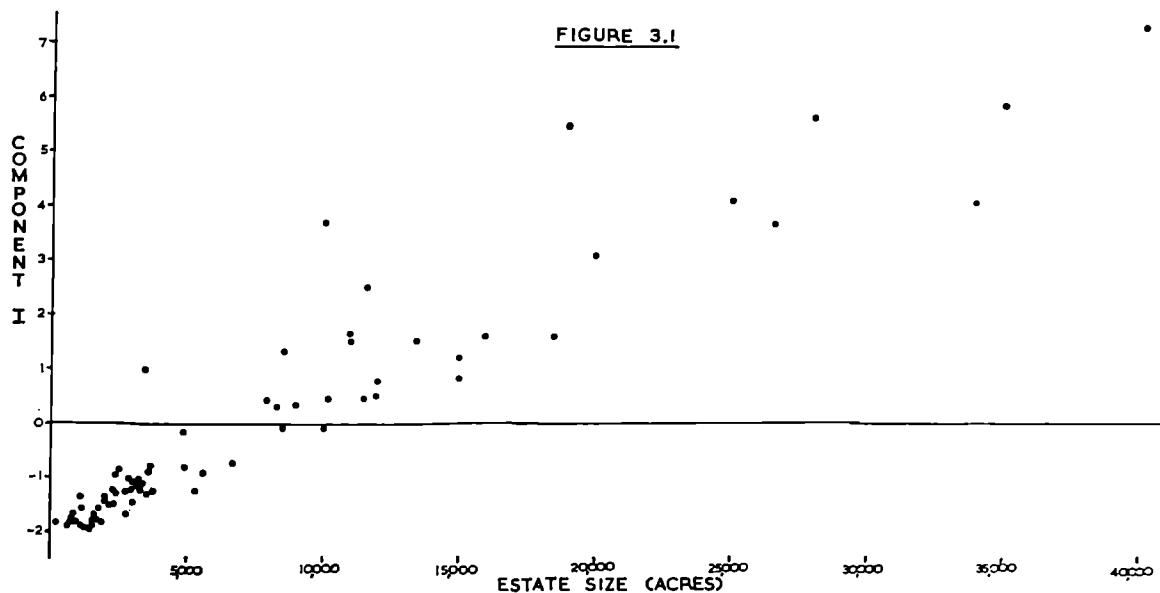
correlation between each component and the original variables were computed,¹ the most significant coefficient being given the value of 0.1. From an inspection of each new set of coefficients, the most important components were identified. For example, the first component is obviously a factor of estate size, since the value 0.1 is given to the coefficient of correlation between the component and estate size, while the values of the other coefficients are in very nearly the same relative proportions as the correlation coefficients of estate size and the other eight variables.²

From similar reasoning, the second component has been identified as a factor of woodland areas contrasted with the agricultural and total areas. The

third component gave rise to a much wider range of coefficients, but it may be seen to be a factor of woodland area let as against the estimated rental values of the agricultural parts of the estates. The second component divides the estates between those with a relatively large woodland area and those with a relatively large agricultural area.

The identification of the first component is illustrated by the graph of estate size against the computed values of this component for each estate (Figure 3.1), from which it will be seen that there is a very close correlation between them. The component values probably provide a more accurate indication of the relative importance of estate size than the acreages themselves, since they take into account the relationship between size and the other variables.

Having identified the principal components, one can say that 82 per cent of the total variance within the sample is due to three factors—one of estate size, one of the relation between the woodland and agricultural activities, and one linking the let woodlands with agricultural rental values (the third component being very difficult to identify precisely). If the estates are described in terms of these three components, only 18 per cent of the variability is unaccounted for, and any subsequent analysis, using these three components only, will be much simpler and sufficiently accurate for many purposes. Further, the magnitude of the components provides valuable evidence concerning their relative importance and the relative importance of the original variables.



¹ See Appendix B, page 72.

² See Table 3.1, page 12.

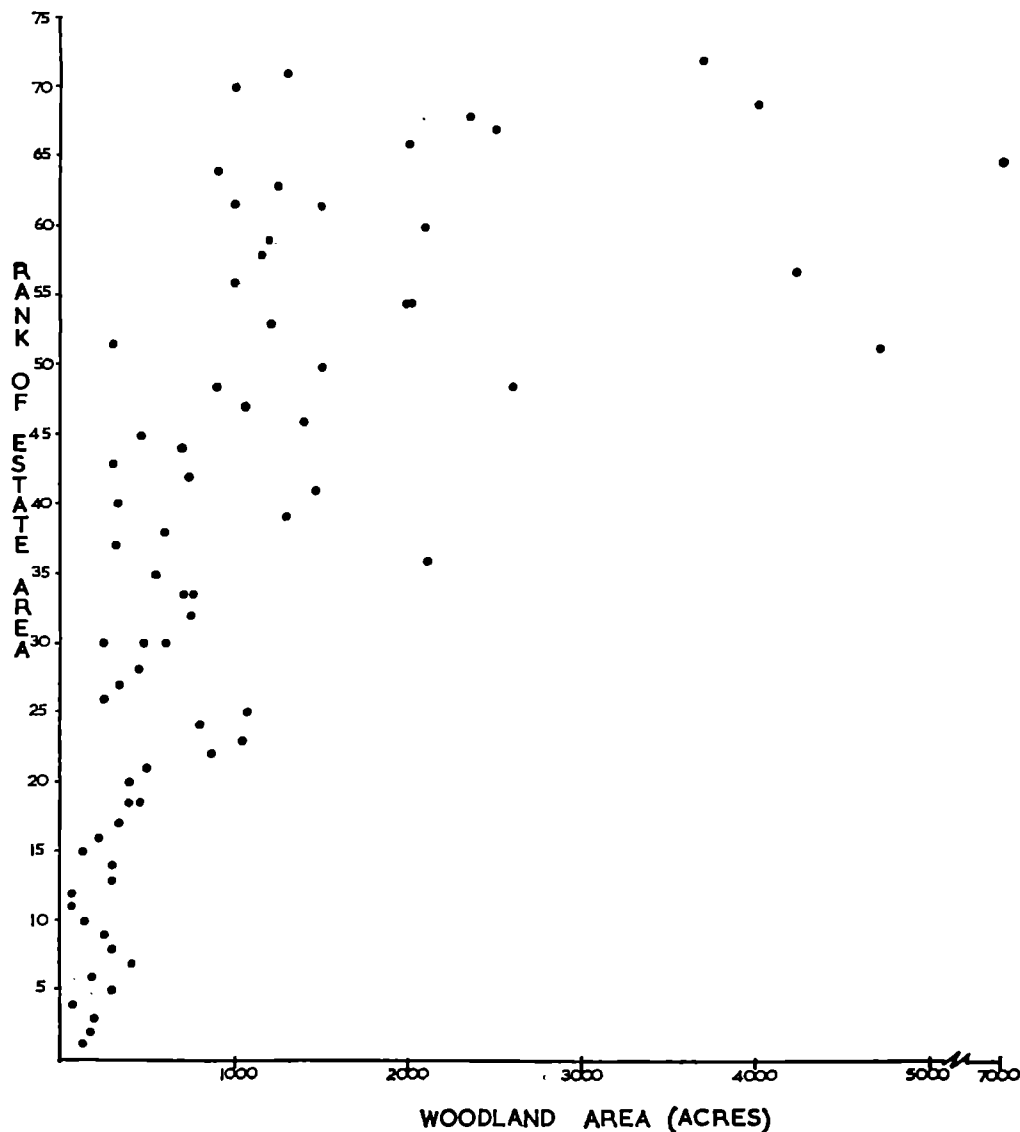
Estate and Woodland Areas

One of the interesting features of the land-use pattern on private estates, suggested by the preliminary enquiry, was some degree of correlation between the total estate acreage, and the percentage of the estate which was woodland.¹ This relationship has been examined in greater detail on the evidence of the Main Survey.

Figure 3.2 is a scatter diagram of woodland areas plotted against the rank number of the estates in ascending order of size. This diagram shows that for

estates in the lower part of the area scale, the woodland acreage increases very slowly with estate size, but for the upper part of the scale, the woodland area increases more quickly. Conversely, as the estate size is decreased, the woodland area decreases fairly rapidly to about 500 acres, and thence much more slowly. This suggests that the proprietors recognised (or, more probably that their predecessors had recognised) the desirability of retaining a certain area of woodlands to benefit from economies of scale. Only eight estates included a total woodland area

FIGURE 3.2



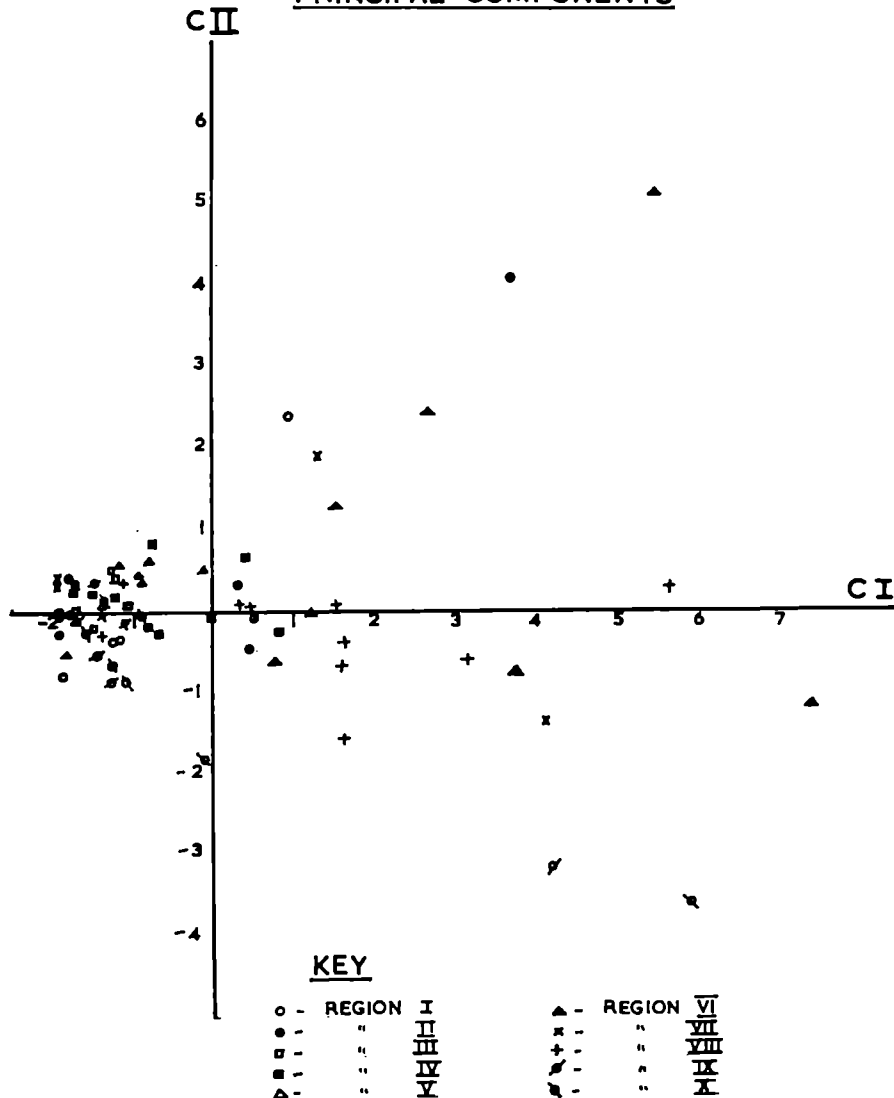
¹ See discussion, page 2 and related Figure 1.2, page 4.

of under 200 acres, while the six estates of less than 1,000 acres in all, comprised an aggregate total area of 4,060 acres, containing 1,070 acres of woodland—an average of 178 acres or 26 per cent. This compares with the overall average of 14 per cent.¹ The correlation coefficient between Woodland Area and Total Area² is 0.592, showing a marked correlation between them. One would naturally expect increases in woodland area to be broadly associated with

increases in the total area of the estate, but the relative rates of change differ according to a number of factors, as already indicated in Figure 3.2.

This relationship is further considered in terms of the first and second components, instead of the actual acreages. Figure 3.3 shows these components plotted against each other, the points being marked according to the regions in which the estates are situated. The overall relationship shows that the low values

FIGURE 3.3
PRINCIPAL COMPONENTS



¹ 78,395 acres of woodland out of a total area surveyed of 561,010 acres. See Chapter 2, page 8.

² See Table 3.1, page 12.

of Component I are associated with moderate values of Component II, while the high values of the former are associated with a wide range of the values of the latter, predominantly moderate to very low. In terms of the original variables, from the identity of the components, this means that on estates of comparatively small total area, the woodlands are moderately important in relation to the agricultural area, while

on the larger estates the woods are occasionally very important, but more commonly of lesser importance. This is in accordance with the relationship discussed in the previous paragraph.

A number of interesting regional patterns emerge from Figure 3.3 and from Table 3.3 which gives the average estate and woodland areas, and the average percentage of woodland on the estates in each region.

TABLE 3.3
ESTATE AND WOODLAND AREAS BY REGION

Region		No. of Estates	Average Estate Area (acres)	Average Woodland Area (acres)	Average Percentage of Woodland
Location	Ref. No.				
Far West	1	7	2,221	531	23.9*
Mid-West	2	8	5,883	1,074	18.3
South-East	3	8	3,394	575	17.0
West Midlands	4	6	7,224	759	10.5
Chilterns	5	8	2,343	833	35.5
East Midlands	6	7	19,336	3,136	16.2
East Anglia	7	6	7,075	1,068	15.1
North	8	10	13,234	1,596	12.0
South Wales	9	4	9,983	510	5.1*
North Wales	10	8	7,386	489	6.6*
Total		72	7,792	1,089	14.0

* These average figures are distorted by one large estate which appears to be untypical of the region.

Region 1, Far-West: Low values (within the range -2 to -1) of Component I are associated with low to moderate values (-1 to 0) of Component II. The estates were relatively small, having the lowest regional average size, and the woodland enterprise was of only moderate importance. Although the average woodland area was only 531 acres—one-half of the average area of all woods in the survey—this represented 23.9 per cent of the estate acreage, the second highest proportion. One exception to the above general regional pattern is responsible for this high figure. One estate, totalling over 3,000 acres, included a woodland block of 1,200 acres which was purchased in the inter-War years, giving a total woodland area covering 61 per cent of the estate. Excluding this estate, the regional average woodland area falls to 267 acres, or 13.2 per cent, which conforms to the pattern suggested by Figure 3.3 and is rather less than the overall average.

Region 2, Mid-West: The pattern is less well defined. With one exception, the values of Component I are low to moderate (-2 to +1) and are associated with moderate values of Component II (-1 to +1). The factor of estate size shows greater variation than for Region 1, and has a much higher mean value. Component II values are also slightly higher. The exception (higher values for both components) is an

estate from which more than 5,000 acres of agricultural land were sold to meet estate duty liabilities, and its percentage of woodland was thereby increased from 28 to 47 per cent. If allowance is made for this distortion, the regional woodland percentage falls slightly to 16.5 per cent.

Region 3, South-East: All the eight estates in this region are contained within a group which has low values (-2 to -0.5) of Component I and moderate values (-0.5 to +0.5) of Component II. The average area of these land units is less than one-half of the survey average, but the percentage of woodland is rather above average, and in five cases it was between 18 and 23 per cent.

Region 4, West Midlands: These six estates show a wider variation, although they all have moderate values (-0.5 to +1) of Component II. The Component I values range from -2 to +1, which is indicative of the diversity of estate sizes in the sample. The woodland percentage is uniformly low.

Region 5, Chilterns: Low to moderate values (-2 to 0) of Component I are in association with moderate values (-1 to +1) of Component II. A very high woodland percentage is general, with only one instance of under 30 per cent. It might appear rather surprising that the component values are

similar to those of Region 3, since the woodland percentages are so different, but a closer examination of the values of Component II reveals an appreciably higher average in the case of Region 5. An even greater difference between the average values of Component III provides further indication of the relatively greater importance of the woodland enterprises in Region 5.

Region 6, East Midlands: There is no well defined pattern in the component values. Component I, however, has only positive values, although varying from moderate to very high (+0.5 to +7.5). This is a reflection of the large estate areas, the smallest being 11,000 acres. The average of 19,336 acres is by far the largest regional average and is approximately $2\frac{1}{2}$ times the overall figure. The woodlands are of moderate importance relative to the agricultural enterprises, but the average acreage of woodland is nearly twice that of any other region: the scale of operation is much greater.

Region 7, East Anglia: The regional average figures are very close to the overall averages, but there is a wide variation within the regional sample. Component I values range from low to very high (-2 to +4.5) and those of Component II from low to moderately high (-1.5 to +2).

Region 8, North: This region has the second highest average figures for the estate and woodland areas, and the latter represents a below-average proportion of the total. Again, there is a wide range of values for Component I (-1.5 to +6.0) but the values of Component II are, with one exception, low to moderate (-1 to +0.5).

Region 9, South Wales: The sample was very small, and the low average percentage of woodland is due to the inclusion of one large proprietary unit of over 30,000 acres, having less than 3 per cent of woodland. There is thus no uniform pattern among the values of Components I and II.

Region 10, North Wales: Six of the eight estates in this region have low Component I values (-2 to -0.5). The Component II values of the other estates are among the lowest. These two estates are large, and have exceptionally small proportions of woodland. If these estates are excluded, the regional average estate area falls to 2,348 acres, with 385 acres or 16.4 per cent of woodland.

General Pattern

It is apparent from the estate and woodland acreages and from the relationship between the values of the first two components that the land use patterns of

proprietary units show wide variations according to their location in England and Wales. Not only does the ratio of woodland to agricultural land vary, but there are marked regional differences in the average areas of the estates and woodlands. Even allowing for the size of the sample from each region, there are clearly certain regional characteristics.

The largest land units were found in the East Midland and North Regions, the average sizes being 19,336 acres and 13,234 acres respectively. By contrast, the average unit area in the Far-West Region was 2,221 acres, and in the Chilterns it was 2,343 acres, compared with the overall average of 7,792 acres. The pattern in the North Region is probably more akin to that in Scotland—large, family estates which have remained intact for many generations, and which often contain a large area of moorland. In the East Midland Region too, many of the estates included some hundreds of acres of land of low agricultural quality, and where the land is unsuitable for intensive agriculture, the units are often of above average size. On the other hand, many of the estates surveyed in these regions included much land of a very high agricultural value, and clearly land quality is not the sole reason for the larger unit areas. If this were so, one might expect proprietary units in the Far-West and North Wales Regions to be of a similar large size.

The explanation is more probably to be found in the long-standing landownership traditions of the North, and the East Midlands.¹ In these regions the land units, with one exception, had been in the ownership of the present owner, or his forebears, for over 70 years, and in most cases for many centuries. By contrast, nearly one-third of the estates in East Anglia and the South East Region had been purchased in the present century, and there has perhaps been a greater tendency towards the "breaking up" of large proprietary units in these areas. This seems to be due, partly, to an increased demand for country residences and "recreational estates" from some of the more wealthy London business men (a demand which is enhanced because of the estate duty concessions applicable to real property in general and to agricultural land in particular²) and to the increasing pressures of urbanisation.

Agricultural Areas

The total area of agricultural land contained in the 72 estates in the main survey was 482,615 acres. The average area of farmland was 6,703 acres—that is, 86 per cent of the average size of the land units studied. Since agricultural land comprised such a large proportion of the total estate areas, the very

¹ See Chapter 3, discussion in second paragraph, page 11.

² See discussion of Estate Duty in Chapter 5, page 32.

marked correlation between estate area and agricultural area was to be expected.¹ The agricultural fractions of the estates varied from 39 to 97 per cent, and their distribution is summarised in Table 3.4.

TABLE 3.4

SUMMARY OF AGRICULTURAL PERCENTAGES (BY AREA)

Percentage of Estate under Agriculture	No. Estates
Over 90	19
81-90	27
71-80	11
61-70	10
Up to 60	5

The relationship between estate size and the land use pattern has been discussed above, in terms of the woodland areas. The corollary for the agricultural area is that as the estate size increases, the percentage of the estate devoted to agriculture tends to increase, and the importance of agriculture relative to forestry also increases. This may be seen from Figure 3.3² which shows that high values of Component I are more often associated with moderate to low values of Component II than with high values of the latter. Regional differences have also been discussed earlier in this chapter.

Some of the agricultural land was "in hand" on 52 out of the 72 estates. The area in hand averaged 1,720 acres, 22 per cent of the agricultural area, with a range of from 1 to 92 per cent of the agricultural area of the estates. The average size of these estates was 9,011 acres, with an average 86 per cent or 7,737 acres of agricultural land. By contrast, the average size of the 20 estates on which the farmland was wholly let was 4,621 acres, although the average proportion of agricultural land on the estate (87 per cent) was almost identical with the other group.

As a rough indication of the value of the agricultural lands, an estimate was made of the average rental value of the farms on each estate. The figures were arrived at after discussions with the owner and his agent, and represent the highest rents which the sitting tenants could reasonably be expected to pay under the prevailing circumstances. These circumstances might include a desire on the part of the landlord to preserve friendly relations with his tenants, and the assessed values may be taken as the rents which a reasonable landlord would be fully

justified in asking his tenants to pay. Consequently, the estimated rental values contained in the survey may differ widely from the rents which might be obtained from new lettings on the open market, but they represent a more realistic situation as regards the potential value of the estate to the present owner, as long as he continues as such. Of course, if he were to sell or otherwise dispose of his estate, then many other factors would affect the value of the land, but these are not germane to the present discussion.

Reference has been made to the difference between the average size of those estates with some agricultural land in hand, and that of those with none, although there was a similar percentage of farm land in each case. Another difference is in the average rental values of the two groups. For those estates with at least one "home farm" the estimated rental values gave an unweighted mean of 82s. per acre, while for estates in the other category, the figure was 94s. per acre. It may be observed from the table of the correlation coefficients of the original variates³ that there is a significant negative correlation between total estate area and estimated rental value (and between agricultural area and rental value). The difference between the values for the two groups of estates under discussion is probably a reflection of this correlation, rather than a direct consequence of land being retained in hand or otherwise.

There are distinct regional characteristics in the matter of farmland in hand. Eleven of the 23 estates from the southern part of England (Regions 1, 2 and 3) contained no "home farm", as compared with two out of the same number of estates in the Midlands and the North (Regions 4, 6 and 8). Again, this is almost certainly a consequence of estate size⁴ rather than of location. An interesting ownership feature was that only two of the five charity estates contained farm land in hand, while all the company estates included some. On the other hand, the main survey confirmed the evidence of the preliminary survey that farm rents were closest to the estimated value on the charity-owned estates.⁵ These two findings indicate the desire of the charity owner to maximise the financial return from its property, while lacking any personal incentive to run a home farm. Estate companies often retain a large measure of personal contact with the estate, and would be much more likely to farm some land directly (possibly a subsidiary company would be formed for this purpose) if the opportunity arose to increase the profitability of the estate in this way.

¹ Correlative coefficient 0.988. See Table 3.1, page 12.

² See Figure 3.3, page 15.

³ Table 3.1, page 12.

⁴ See Table 3.3, page 16.

⁵ See discussion of charity-owned estates in Chapter 1, page 5.

A rather more than proportionate number of estates lacking a commercial forestry tradition are among those estates with no agricultural land in hand—12 out of 37. The scale of forestry is quite different on the two groups of estates, but again, this is primarily a result of size differences. Thus it may be said that it is on the larger, "traditional" proprietary units found, in particular, in the Midlands and the North of England that a home farm is more likely to be in existence.

Woodlands Let and Woodland Staff

Some part of the woodlands was let on only seven out of 72 estates in the Main Survey sample. The average woodland area of these estates was 2,000 acres, of which 45 per cent was leased—in most cases to the Forestry Commission, but in one case, to a forestry syndicate and in another to a firm of forestry contractors. These average figures are somewhat distorted by the inclusion of one woodland estate of 7,000 acres, 4,000 acres being let. Excluding this example, the average woodland area let was 382 acres, or 33 per cent of the total woodland area. The main reason for letting woodlands—applicable in every case—was that the estate contained a large area of unproductive woodland, and to rehabilitate it, a substantial capital investment was needed, an investment of such a size as to be most unattractive to the owner, or even beyond his resources.

On the 66 estates where a full-time forestry staff was employed, the average ratio of full-time men to woodland area in hand, excluding those men permanently in sawmills, was approximately one man to 100 acres. However, on 23 estates, the estate staff was supplemented to a varying extent by contractors, and in a further nine cases, assistance was given in the woods at certain times of the year by farm staff, sawmill workers and casual labour. Three estate owners spent a great deal of time working in the woods. It is thus very difficult to arrive at a reasonably accurate estimate for the size of the "man-unit", but it would seem to be of the order of 90 acres. This figure is further reduced if sawmill staff, office staff and other ancillary workers are included. A frequently quoted "standard" is one man per 100 acres, while in a survey of 57 estates in England and Wales conducted by the Forestry Department of the University of Oxford, the average acreage per man in 1962 was 130 acres (based on the number of full-time forestry workers, or equivalent).¹ The same survey showed that in England and Wales, labour costs were over 70 per cent of the total woodland expenditure. Thus a vital factor in increasing the profitability of private forestry is the extent to which the size of the "man-unit" can be increased. Efficiency must increase alongside productivity.²

Other aspects of forest labour forces are dealt with in the next chapter, in relation to an association analysis.

¹ Universities of Aberdeen and Oxford—*Economic Survey of Private Forestry: First Report for Forest Years 1960–61 and 1961–62*.

² See also Chapters 7 and 11 pages 41 and 43.

Chapter 4

ANALYSIS OF INFORMATION

II. ASSOCIATION ANALYSIS

The Analysis

A computer was used to carry out an association analysis of the qualitative data, in addition to the principal component analysis discussed in the previous chapter. The object of the analysis was to select the variable which would divide the total population of proprietary units into two groups, each having the minimum variability.¹ In other words, when the division was made on the basis of the presence or absence of the selected characteristic, the resultant groups were more nearly homogeneous than the

groups arising from a division on any other basis. Each of the two groups was then sub-divided a number of times in a similar way, with a different variable forming the basis of each sub-division. The analysis also provided an indication of the degree of heterogeneity removed at each division.

The qualitative description of each estate was coded in terms of 51 variables. A full list of these variables, and the number of estates exhibiting each characteristic, is given below in Table 4.1.

TABLE 4.1
ESTATE CHARACTERISTICS FOR ASSOCIATION ANALYSIS

Characteristic		Code	No. of Estates
GENERAL			
Shape	.. Compact ..	1	50
Ownership Personality	.. Single person	2	50
	Company	3	10
	Charity	4	5
	Trustees	5	7
Duration	.. Established prior to 1900	6	62
	Established between 1901 and 1945	7	6
	Established between 1945 and 1965	8	4
Consociate Capital ..	.. Substantial	9	62
Management ..	.. Owner	10	12
	Resident Agent	11	39
	Firm of Agents	12	9
	Owner and Resident Agent ..	—	3
	Owner and Firm	—	9
Maintenance ..	.. Internal Estate Staff	13	51
Rainfall ..	.. Over 40 inches per year	14	16
	Under 25 inches per year	15	10
AGRICULTURE			
Farms	.. Definite Amalgamation Plans	16	34
Integration with forestry	Staff switched between farm and woods ..	17	2
FORESTRY			
Selection of Sites	.. Soil and Topography	18	31
	Shelter	19	0
	Amenity and Sport	20	4
	Soil, Topography and Shelter	—	4
	Soil, Topography, Amenity and Sport	—	24
	Shelter, Amenity and Sport	—	3
	Soil, Topography, Shelter, Amenity and Sport	—	6

¹ See Williams, W. T. and Lambert, J. L.—“Multivariate Methods in Plant Ecology,” *Journal of Ecology*, Vol. 48 (1960), page 689 ff.

TABLE 4.1 (continued)

Characteristic				Code	No. of Estates
1919-39	Consistent Management ..			21	24
1939-45 War	Heavy Fellings			22	30
Land use Changes (post-1945, over 10 acres)	To Forestry			23	31
	From Forestry			24	2
Tree species (over two-thirds by area)	Broad Leaved			25	37
	Coniferous			26	17
	Mixed—at least one-third of each ..			—	18
Age classes ..	Good Age Distribution			27	24
	All over 80 years old			28	0
	All under 20 years old			29	7
	Mainly over 80 years old or under 20 years old ..			—	30
	Otherwise			—	11
Labour ..	Contractors only			30	6
	Estate Staff only			31	43
	Contractors and Estate Staff ..			—	23
Sawmill ..	Produce for sale			32	25
	Produce for Estate use only ..			33	18
	No Estate Sawmill			—	29
Timber Sales ..	All through a co-operative			34	12
	All direct to Merchants			35	50
	Otherwise			—	10
Grant-aid Scheme ..	Dedicated Woodlands			36	51
	Approved Woodlands			37	13
	Neither			—	8
Taxation ..	All Schedule B			38	17
	All Schedule D			39	9
	Schedules B and D			—	41
	Untaxed			—	5
Accounts ..	Profit			40	34
	Loss			41	20
	Neither			—	18
Tradition ..	Commercial Forestry			42	35
	No such Tradition			—	37
Estate Duty ..	Important Factor			43	15
	Unimportant			—	57
Shelter ..	Special Importance			44	22
	Otherwise			—	50
Sporting Facilities ..	Important: conflict with forestry ..			45	11
	Important: no conflict			46	42
	Unimportant			—	19
Amenity ..	Important: conflict with forestry			47	27
	Important: no conflict			48	36
	Unimportant			—	9
Policy Objectives ..	Annual Profit only			49	0
	Indirect Economic Benefits only			50	13
	Sport and Amenity only			51	2
	Annual Profit and Ind. Econ. Benefits			—	18
	Ind. Econ. Benefits, Sport and Amenity			—	21
	Annual Profit, Ind. Econ. Benefits, Sport and Amenity ..			—	18

Notes on Table 4.1

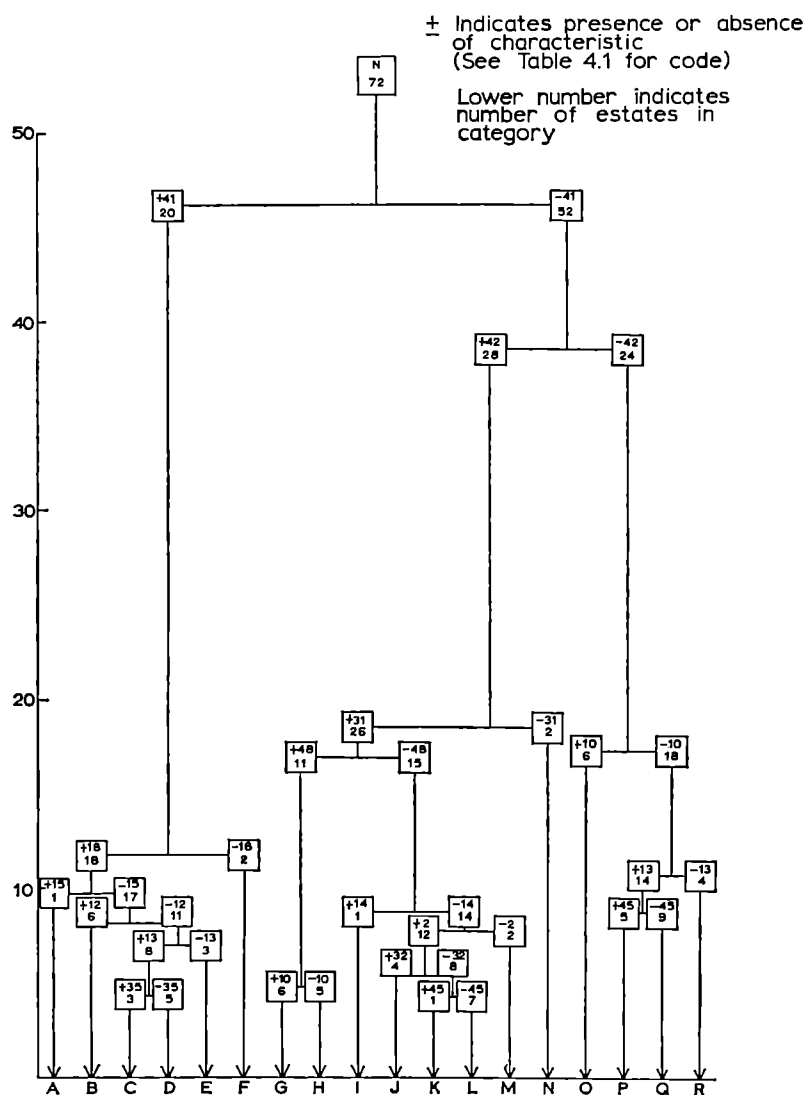
1. Where two characteristics are mutually exclusive (e.g. Shape—Compact or Scattered) only one is coded, since the presence of one indicates the absence of the other.
2. Where there are more than two alternatives under one heading, all the possibilities are given in the table, although only the minimum number was coded.
3. Many of the characteristics listed are defined in the text much more precisely than the space within the table permits.

4. The abstract attributes of proprietary units—ownership personality, duration and consociate capital—are defined in Chapter 1—see pages 1 and 2.

5. Some of the characteristics listed above were of little significance in the association analysis, and hence are not discussed in this chapter. Reference is made to them at various other places in the dissertation.

The results of the association analysis are presented in diagrammatic form in Figure 4.1. The first, and major, division is between those estates on which the woodlands were run at a loss (that is, there was

FIGURE 4.1
ASSOCIATION ANALYSIS



an excess of expenditure over income annually), and those where the forestry operations did not show an annual loss, where the expenditure was at least balanced by the income. (The variation in the methods of accounting used and the meaning of "loss" and "profit" in this context are discussed elsewhere.)¹ This primary division indicates that the profitability, or otherwise, of the woodlands was the factor chiefly responsible for the differences between the estates; that the two groups thus formed have the minimum heterogeneity.

This is a most important result since it confirms that estates with unprofitable woodlands have many other common characteristics, and similarly for the profitable woodland estates, but that there is less common ground between the two groups. This is just what would be expected in theory. The characteristics of each group will be examined later: meanwhile attention is given to the analysis itself.

The 20 estates where the forestry is run at a loss are divided again according to the selection of the woodland sites—on the basis of whether the sites were selected upon a consideration of the soils and topography of the estate, or by some other criterion. In the former case, the trees had usually been planted on the parts of the estate which were least suited to agriculture, although there may have been other factors too, such as shelter or the improvement of the view from the owner's house. However, this and subsequent divisions do not remove a significant degree of heterogeneity, and detailed consideration of them is therefore not justified. Within this group of estates there was no single characteristic which formed the basis for a division into two sub-groups which were significantly more homogeneous than the whole group of 20. Indicative of this is the fact that the first sub-division gave rise to groups of 18 and two estates, and the larger group was then divided into two groups of 17 estates and one estate.

There are significant sub-divisions of the estates where the woodlands did not make an annual loss—34 of these estates showed a profit on the woodlands, while on 18 expenditure and income were evenly balanced. The first sub-division is very important, and it was made according to whether or not there was a long-standing estate tradition of forest management. Twenty-eight of the 52 estates had such a tradition, while the other group of 24 had none. It may be noted from the diagram (Figure 4.1) that the degree of heterogeneity removed by this

sub-division is not much less than that removed by the primary division.

There are numerous further divisions of considerable lesser importance, and only three of these have any marked significance. The "traditional estates" are next divided to give a group of 26 estates which have a permanent woodland staff (in some cases supplemented by contractors), and two estates on which only contract labour is used in the woods. The former group is then divided on a matter of the amenity of the woods—in 11 cases amenity considerations were important, but did not conflict with commercial forestry, while on the remaining 15 estates either such a conflict was apparent (13 estates) or the appearance of the woods was unimportant (two estates). The other significant sub-division is of the 24 estates lacking a forestry tradition, and these were formed into a group of six estates, the owners of which took an active part in the day-to-day management of his property, and in another group containing 18 examples of estates where the owner was not regularly involved with routine management.

The association analysis determines the main difference between the main groups of estates, and shows the relative importance of the various characteristics selected as bases for division, by indicating the degree of heterogeneity removed at each stage. Having identified the dividing factors, each group needs to be examined in turn to determine wherein lies its relative homogeneity.

The Primary Division

Dealing firstly with the groups arising from the first division, on the basis of profitability, a difference in the composition of the two groups as regards the ownership personality traits of the estates may be observed. The 20 estates with woodlands showing an annual loss represent nearly 28 per cent of the survey sample. They include only 24 per cent of the estates owned by single persons, but three of the five charity owned estates. As is discussed elsewhere, a charity is exempt from income tax and hence unable to take advantage of the concessions in respect of forestry operations.² Furthermore, charity ownership is more impersonal, and the woodlands perhaps tend to be neglected slightly, even though they are managed under an approved scheme.³

It is interesting to note that six of the 10 estates whose durations date from after the beginning of the twentieth century have "unprofitable" woodlands.

¹ See opening discussion of Chapter 11, page 63. The proprietors' varied interpretations of profitability make it impossible to use one precise expression covering every case, and the terms "profit" and "loss", although somewhat ambiguous, are used as the most commonplace and least technical. "Annual Surplus" and "annual deficit" represent most nearly the interpretation of the majority of the owners, and may be read into the text where they make the meaning clearer.

² See opening paragraphs of Chapter 6, page 35.

³ See discussion of Preliminary Survey in Chapter 1, page 2.

Coupled with this is the fact that only seven of the estates with "unprofitable" woods have a long-standing tradition of commercial forestry, a much smaller proportion than in the other group. The estates lacking a forestry tradition, and those acquired relatively recently, were often especially deficient of mature timber of a reasonable quality. Hence the revenue from timber sales was very low, leading to an annual loss while the new plantations were established and old ones rehabilitated.

The estates showing a loss contained a lower proportion of estates managed by a resident agent than the other group, and a correspondingly higher percentage of instances where the management was carried out by a firm of land agents and surveyors. As with ownership personality, the less personal approach of a firm may be a significant factor.

There is an interesting paradox. These estates have unprofitable woodlands, yet in many cases the agricultural part of the estate seemed to be particularly well managed, and this group contained one-half of the estates for which the owner or agent had definite plans for the amalgamation of some of the holdings and the rationalisation of the farm boundaries. The two examples of estates on which staff was regularly interchanged between the farmland and the woodlands were included in this group of estates. There were a number of other instances where occasionally, for special operations, some labour would be switched from forestry to agriculture or vice versa, but there were only the two estates on which there appeared to be a serious attempt at the integration of the two enterprises. That all these estates, having a far-sighted policy for the agricultural sections, showed a loss on the woodlands does not necessarily mean that the forestry policy was any less far-sighted or was economically unsound. The explanation in most cases lies in the absence of a forestry tradition, and consequently there is a need for considerable investment in the woodlands, and the returns will be delayed. On only two of the group of estates had the woodlands been consistently managed in the inter-war years from 1919 to 1939, while more than one-half of the group suffered as a result of excessively heavy felling of timber during the Second World War. Yet another factor contributing to the current annual losses in the woodland accounts is that 11 of these 20 estates have increased the woodland acreage substantially since 1945, and the young plantations would hardly have begun to yield any saleable timber. On 15 of these estates at least one-third of the woodland area was comprised of plantations under 20 years of age, and in four cases the proportion was over two-thirds.

The current unprofitability of these woodlands is reflected in the high proportion of them, six out of 20, which was taxed under Schedule D; whereas only three of the remaining 52 estates were taxed entirely under this schedule.¹

The proprietors of 19 of the 20 estates gave as an important aim of their forest policies the creation of a capital asset of timber and the general enhancement of the value of the whole proprietary unit, by taking advantage of the taxation and estate duty concessions relating to woodlands to reduce the net cost of the investment. However, only two of the proprietors in this group stated that one of their aims was to build up a capital reserve expressly to meet estate duty liabilities.² Predictably, only four proprietors stated that an annual profit was their main aim. In nine cases, sporting and visual amenities were given special importance, and for eight of these estates it was admitted that there was some conflict (although usually slight) between the preservation of these amenities and maximum financial return from the woods. On the other hand, some proprietors regarded game as a "crop", and any income from sporting tenancies should properly be credited to the woodland account where the birds have had a detrimental effect on the woodlands. On one-fifth of the estates in this group of 20, amenity was said to be of no importance.

A further feature of those woodlands run at a loss was the importance of shelter. The provision of shelter for agricultural land was a major factor in the formulation of the forest policies of 10 out of the 20 estates, compared with 12 of the remaining 52 estates which had "profitable" woodlands. In some cases where shelter was important, the object of maximising the financial returns to the woodlands had been subordinated to the provision of the best possible wind-breaks for the farmland, and the consequent added agricultural revenue should properly have been credited to the woodlands to give a more accurate picture of the profitability of the forestry operations. By this means, some of the "losses" might have become "profits".³

Some of the distinctive characteristics of those estates where the woodlands do not show an annual loss have already been mentioned by way of contrast to those 20 estates with unprofitable woods. The group of 52 contains a relatively larger number of estates in the ownership of single persons, and only two of the charity-owned estates. Only four of the group were acquired during the twentieth century, compared with six out of the other 20. Of the 35 estates with a forestry tradition, 28 are among those having woodlands which do not have a deficit in the

¹ See Chapter 6, page 35, for a discussion of the taxation of woodlands.

² See Chapter 5, page 31.

³ See also opening paragraph of Chapter 11, page 63.

annual accounts, and represent 54 per cent of this group. In contrast, the traditional forestry estates comprised only 35 per cent of the "unprofitable cases". This emphasises the importance of consistent woodland management over a long period of time—mismanagement at any stage of the life of the plantation may result in a final crop of greatly reduced value.¹ Nearly one-half of the woods in the larger group were managed consistently between the two World Wars, and under 40 per cent were severely damaged as a result of fellings between 1939 and 1946.

Twenty-three of the 24 estates with woodlands including a wide distribution of age classes showed no loss on the woodland accounts—another indication of the systematic treatment of the woods. A further 19 of the 52 estates in the group were seriously deficient in trees aged between 20 and 80 years, and it is possible that in some cases the forestry will show an annual loss for a few years when the sales of mature timber inevitably decline until the post-war plantations are ready for felling. Nevertheless, on less than one-half of the estates in this group was the proportion of the woods under 20 years old as much as one-third of the total woodland area, as against three-quarters of the estates with unprofitable woods.

Another difference concerns the sources of labour for the woodlands. In the case of the 20 "unprofitable estates", on only eight were the woodland operations carried out entirely by the estate staff, and contract labour was used, to a varying extent on the remaining 12 (exclusively in three instances). On the other hand, the woods on 35 out of the other 52 estates were worked entirely by the regular estate staff, and contractors were employed by 17 proprietors, that is, by less than one-third of the proprietors in the group. Again, contractors were used exclusively in only three cases.

Sporting amenities (principally the shooting of game birds), were important on 22 of the 52 estates in the main group, and in 11 cases there was some conflict between the sporting and forestry interests: forestry was subordinated to game-keeping. There was no such conflict on any of the estates with unprofitable woodlands.

In each of the main groups into which the total sample of estates was first divided, all the proprietors except one, stated that an important policy factor was a desire to enhance the capital value of the estate. The main difference between the two groups was that 32 (62 per cent) of the proprietors in the group containing estates with profitable woodlands gave as another factor the intention for the woods to yield an excess of income over expenditure annually, whereas this factor applied to only 20 per cent of the

estates in the other group. Amenity was taken care of in the forest policy of 32 proprietors in the larger group, compared with nine, or less than 50 per cent, of the others.

The Secondary Divisions

The second most important division in the association analysis was on the basis of forestry tradition and split into two groups those estates on which the woodlands did not make an annual loss. Twenty-eight of these possessed a continuous tradition of commercial forestry stretching back over a number of decades at least, while on the other remaining 24 estates, the latest period of woodland management with a view to economic returns had commenced since 1945. The latter category includes a number of estates on which the woodlands had been well managed for a long period, say, up to the first World War, but had then been neglected for perhaps 30 years, or even longer.

On only four of the estates in this category had the woods been consistently managed between 1919 and 1939, while on 14 of these estates over one-third of the acreage was comprised of trees over 80 years old, and a similar proportion of plantations less than 20 years old. There was thus an appreciable gap in the forest rotation, with little timber to become mature before the end of the century. That such estates avoided a loss on the woodlands was due mainly to revenue gained from the sale of mature or over-mature timber from trees planted during former periods of management. It may well be that some of these woodlands will cease to be profitable, temporarily, during the next 20 years.

The most significant differences between these two groups formed on the basis of the possession or lack of a forestry tradition concern two abstract attributes of the proprietary units.² Firstly, the patterns of the ownership personalities are not at all similar. Twenty-four (86 per cent) of the 28 land units with a tradition of commercial forestry are owned by single persons, as against 14 (58 per cent) of the other group. The former group contains two company-owned estates, and two held by trustees, while the estates lacking a long-standing tradition of woodland management include five company-owned examples, three in the hands of trustees and two owned by charitable institutions—a total of 10 not owned by single persons. Secondly, there are differences as regards the duration of the ownership. The traditional forestry estates had all been in the same ownership, or the same "line" of ownership since the end of the nineteenth century at least, whereas four of the other group had been purchased in the present

¹ See also discussion of "The Secondary Divisions" following.

² See "Ownership Personality", Chapter 1, page 2, for definitions of the attributes discussed here.

century, one since 1945. (In the complete main survey sample, of the 10 estates in ownership dating from after 1900, only one had a forest tradition.)

The above-mentioned differences between these two groups of proprietary units are closely related. On the one hand, there were those units which have remained in the same families for many generations, and in respect of which a tradition of forest management has likewise been handed down. On the other hand, a change of ownership in this century would have given an opportunity for a company or other body to acquire the estate and might well have introduced a different attitude towards forestry so that where the estate woodlands had once been neglected, from then onwards due regard was paid to their management. The reasons why the previous owners disposed of their estates are not known, but it is interesting that all four (and nine out of 10 in the survey as a whole) had no forestry tradition, and this is discussed elsewhere.¹

Another difference lies in the proportion of the estates in each group on which the forest acreage had been increased by at least 10 acres since 1945. Such an increase had occurred on 46 per cent of the estates with a forestry tradition, and on only 29 per cent of the others. Many of the estates without a long tradition of woodland management were faced with a larger programme of rehabilitation, and naturally the owners were mostly pre-occupied with making the existing area fully productive rather than considering extensions to it. On only one estate in each group there had been a change of use from forestry to agriculture on more than 10 acres of land since 1945.

The absence of a forestry tradition, with the consequent relatively small proportion of prime timber at or nearing maturity, is reflected in the fact that only one-eighth of proprietors of such estates had allowed their woods to remain assessed for income tax under Schedule B,² whereas almost one-third of the estates in the other group were so taxed.

An effect of a family forestry tradition was seen in the priority given to amenity considerations. Thirteen of the proprietors of the traditional forestry estates allowed the maintenance of the "good appearance" of the whole or a part of their woodlands to conflict with a strictly commercial forest programme, although in most cases the conflict was not serious. Only six of the proprietors in the other group gave amenity priority over commercial forestry, but only three in this group attached no importance to the appearance of their woods—one more than in the "traditional" group.

Three further sub-divisions of the association analysis merit brief attention, although they are much less significant than the divisions already considered. Two groups were formed from the 28 estates with profitable woodlands and with forestry traditions—one group of 26 having an estate woodland staff (supplemented by forestry contractors in five cases) and a group of two estates relying exclusively on contractors for forestry work. The small size of the latter group precludes a detailed analysis of other contrasting features of the two groups, but the main differences are that, unlike the majority of the larger group, neither of the two estates worked solely by contractors has an estate sawmill, neither has an estate staff for the maintenance of estate buildings and on neither did sporting and amenity considerations play any significant part in determining the estate forest policy. The two estates in the minor group are both less than 350 acres in extent, their small size and the relative importance of forestry being indicated by the low values of the first and second components respectively.³ It seems probable that size—of the estate and of the woodlands—is the main cause of the differences between the two groups.

The 26 estates with the woodland staffs were next divided into a group of 11 estates on which amenity considerations were important, but where there was no conflict between amenity and maximum financial return, and a group of 15 estates, on 13 of which there were conflicts of varying importance between the appearance of the woodlands and a strictly commercial policy. On the other two estates in the latter group, amenity was of no consequence whatsoever. The other main contrast between the two groups concerns the profitability of the woodlands. While from the primary division of the analysis neither of the groups contain an estate on which the woodlands show an annual loss, in the group with no conflict between amenity and profitability, 10 out of the 11 estates show a yearly profit. The other group of 15 estates includes only seven which show a clear profit of the forestry enterprise: the woodland accounts of the remaining eight "break even". The acceptance of the conflict by many proprietors is shown by the fact that an annual profit was given as an important object of woodland management by only six of the 13 owners on whose estates such a conflict exists. In all six instances, a profit was already made in most years.

The remaining significant sub-division was of the 24 estates which have no forestry tradition but whose woodlands do not show an annual loss. The division was into a group of six estates whose owners

¹ See Chapter 3, page 11.

² See Chapter 6, page 35, for a discussion of forestry taxation.

³ Average Component Values for these two estates were: I—1·451; II—0·433.

took an active part in the routine estate management, particularly in the management of the woodlands, and a group of 18 estates managed entirely by either a resident agent or a firm of land agents. One effect of the personal interest taken by the owners of the first group is shown by the fact that on four out of these six estates, the forest acreage has been increased by at least 10 acres since 1945, whereas only three of the other 18 have shown similar increases. The other main differences between these groups are largely accounted for by the small sizes of the estates in the first group—a smaller proportion in that group had estate maintenance staffs, only one had a sawmill and that was used only to convert timber for use on the estate; and three of the first group use the agency of a forestry co-operative association for all sales of woodland produce, whereas only one of the 18 estates in the second group made use of such an organisation. The average size of the six estates in the first group was 2,060 acres, including, on average, 520 acres of woodland. Estate duty considerations¹ were an important factor in the forest policy of four of the six proprietors in the first group, and it is significant that three of these had increased their woodland acreage in recent years.

Regional Patterns

Figure 4.2 shows the distribution of the estates in each region according to the main categories of the association analysis. From this, a number of interesting regional features may be observed, especially the patterns within Regions 3, 4 and 8.

Eight estates were surveyed in Region 3, South-East England. On two of these the woodlands made an annual loss, while all of the remaining six, where the forestry was more profitable, lacked an unbroken tradition of commercial forest management. The absence of a forestry tradition among the estates in that part of the country is somewhat surprising in view of the many excellent hardwood plantations to be seen in the countryside, and the considerable number of post-War plantations which are evident. The findings of the survey probably reflect two important factors relating to the forestry in that region. Firstly, the great importance which was, and still is, attached to the preservation of amenity and the enhancement of the sporting value of the estate. Many of the fine stands of hardwoods were planted primarily for reasons associated with the shooting of game, or to improve the general appearance of the landscape. In many places therefore, the region is endowed with a strong forestry tradition, but not

with a tradition of *commercial* forestry—timber production has not been the main aim. Secondly, many of the proprietors in the region receive substantial incomes from sources other than rural estates—notably from the City. Such men, who would often be charged with surtax at a high rate, are thus able to gain the greatest benefits from the income tax concessions relating to forestry.² Consequently, the net cost to the proprietor of new or rehabilitated plantations is relatively low—sometimes almost negligible—and the comparative absence of strictly commercial stands of timber is less serious than when a high-cost re-planting programme has to be financed from timber sales. The wealthy proprietor can regard the production of timber from his woods as of secondary importance and still show a profit on his forest operations, while, at the same time, enjoying his sporting facilities.

To a lesser extent these factors apply to the East Midlands, Region 6, in which four of the seven estates chosen for study came within the category of “no loss on the woodlands, no commercial forestry tradition”. The estates in this region, averaging over 19,000 acres each, are well above the average size of the survey sample, and are in a wide variety of locations from the “London commuter belt” to the “Dukeries”, but in most parts of the region sport has played an important part in determining the pattern of the forestry, particularly before the first World War. It is this former predominance of sporting interests which on many estates has pushed into the background the purely commercial aspects of forestry.

In contrast, in Region 8, the North Region, the seven estates on which the woodlands were not unprofitable (in fact, an annual profit was made in each case) all have a long standing tradition of timber production with profit as the chief motive, and also a permanent forest staff was retained on each one. The effects of certain traditions upon estate forest policies has already been briefly discussed in general terms,³ and the north of England furnishes many examples of the importance of past woodland management to the success of present-day operations. Although shelter and amenity, in its broadest sense, are important on many estates in this region, and certain plantations may have been devoted almost entirely to one or other of these purposes, the commercial aspects of timber production have remained very much to the fore. Some of the woodlands estates in the north more closely approximated to “normal” forests than any estates inspected in any other part of the country. Moreover, the forestry

¹ See Chapter 5, page 31.

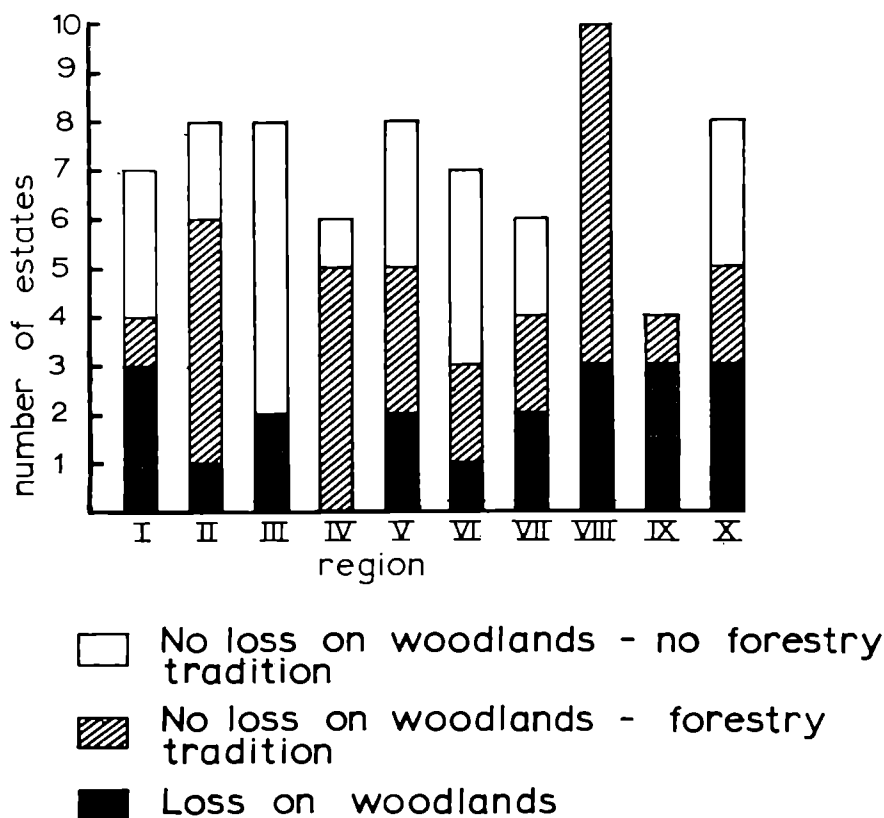
² See Chapter 6, page 35.

³ See Chapter 3, page 11.

FIGURE 4.2

ASSOCIATION ANALYSIS

REGIONAL DISTRIBUTION OF ESTATES



Region I = Far West.
 Region II = Mid-West.
 Region III = South-East.
 Region IV = West Midlands.
 Region V = Chilterns.

Note

Region VI = East Midlands.
 Region VII = East Anglia.
 Region VIII = North.
 Region IX = South Wales.
 Region X = North Wales.

tradition was being strengthened for the future, since on seven of the 10 estates the woodland acreage had been increased by an average of about 170 acres, and by 300 acres on two of them.

None of the estates in the West Midlands (Region 4) was contained in the group with unprofitable woodlands, and five out of the six in this region had forestry tradition. This region is one of

high agricultural value, and includes some of the best grassland in Britain. Most of the region is also well suited to the growing of high quality hardwoods, and broad-leaved species predominated in this region to a greater extent than in any other region apart from the adjoining Mid-West Region (2). Thus, although the forestry parts of the estates were relatively unimportant compared with the farmland,

soil and climatic conditions are very favourable to tree growth, which factor, allied to consistent management over the years in most cases, has resulted in regular profits in the woodland accounts. For reasons similar to those applicable to the West Midlands, forestry incurred annual losses on only one of the eight estates surveyed in the Mid-West region.

The two Welsh regions contained the highest proportions of estates with woodlands which are run at a loss. Taking these regions together (because of the very small sample from South Wales—Region 9), the proportion of such estates is 50 per cent. Further, only one-quarter of the Welsh estates had a tradition of commercial forest management. This is undoubtedly one of the main reasons for the lack of profit at the present time: there were many instances of current forestry programmes having to be based on foundations of neglect and dereliction. Another important factor is that although climatic conditions over most of that country are very favourable for the growth of conifers (except on exposed coasts and on the highest land), many plantations have been established at high costs on poor soils, and hence the growth rate has been reduced. However, when rehabilitation programmes have been carried through, and a reasonable rotation established, then there is no reason why the profitability should not markedly increase.

Apart from Region 3 (already discussed) the Far West had the least tradition of forestry. Only one of the seven estates surveyed came within the category of estates where the woodlands were not run at a loss and where there was a strong forestry tradition. This contributed to the region having the highest proportion of "unprofitable estates" of any English region. Another problem for the timber growers of this region is their remoteness from large markets, and most of the produce that is not of first quality is difficult to sell at prices which enable a

profit to be made. The establishment of a pulp mill in Devon would be of great assistance in the disposal of softwood thinnings which will be coming on to the market in increasing quantities over the next 20 to 40 years.¹

The Association Analysis and the Principal Components

An examination was made of the average values of the first, second and third components derived in the Principal Components Analysis described in the previous chapter, for the estates in each of the main groups arising from the association analysis.

The average values of the first component—a factor of estate size²—for each of the three main groupings did not differ significantly. Thus it may be said that the broad classification of the association analysis is unrelated to the size of the estates, and all the main groups covered a very wide range of estate areas. Some of the minor groups contained fairly uniform component values, but since these groups were formed by sub-divisions of doubtful significance, the individual final groups do not merit close attention.

Component II represented a factor of the woodland activities compared to the agricultural activities of the estate, and for this component there are significant differences between the major groups. Table 4.2 shows the range and the average of the values of the second component for the groups formed by the two most important divisions. From this table it may be seen that the average for those estates with woodlands run at a loss is appreciably lower than for the rest of the estates. As would be expected, the importance of forestry relative to the agricultural part of the estate was less where the forest operations showed an annual loss, than where the woodlands were not unprofitable. Profitability is certainly an incentive to a proprietor to intensify his activities in any particular department.

TABLE 4.2
COMPONENT II VALUES FOR THE MAIN GROUPS OF THE ASSOCIATION ANALYSIS

Group	Average Value	Range of Values	
Woodlands run at a loss ..	-0.625	-3.697 to +1.871	Very low—moderate
Woodlands not run at a loss	+0.256	-1.619 to +5.170	Moderate—very high
Forestry Tradition ..	+0.398	-1.619 to +5.170	Moderate—very high
No Tradition ..	+0.092	-1.425 to +2.407	Moderate—high
All Estates	+0.011	-3.697 to +5.170	Very low—very high

¹ See Chapter 8, page 46, for a discussion on timber marketing.

² See discussion following Table 3.2, page 13.

A further point which emerges from the above table is that the two categories of estates with woodlands not run at a loss have average values of Component II which are significantly different. The higher figure is for those estates with a tradition of commercial forestry, and the woodland activities are relatively more important on these estates than where such a forestry tradition is lacking, although the difference between the component values in this case is much less than between the values for the two main groups of the analysis.

There was no evidence of any relationship between

the values of the third component and the groupings of the association analysis. One reason for this is the small number of the estates which include woodlands let on a long lease.

These relationships between the major analyses performed on the survey data are very much as could have been predicted, but it is interesting and very important that these statistical analyses confirm personal impressions, since this is believed to be the first time that forestry data and information relating to the proprietary aspects of land use have been analysed in this way.

GOVERNMENT POLICY: I. GENERAL

Historical

Since the second World War, and in particular, under the Forestry Acts of 1947 and 1951,¹ the government has introduced various measures designed to provide positive encouragement to those private woodland owners who would manage their woods in accordance with the principles of good forestry on the one hand, and on the other hand, to impose restrictions where such principles would be violated. Various Acts of Parliament relating to the taxation of the income arising from woodlands, and to the levy of estate duty thereon, contain provisions which may have a considerable influence upon a proprietor's forest policy. Current legislation and its effects will be considered in some detail, but it should be noted here that British forestry has, for many centuries, been subjected to various statutory controls, and indirectly encouraged, or otherwise, by government policies.

Under Saxon Kings, certain tracts of woodland were designated as royal hunting grounds, and stringent regulations provided for the preservation of game therein. There is evidence, from as early as the seventh century, showing the importance of pannage of swine: penalties were imposed on the burning of trees.²

The first general code of forest laws, the Assize of Woodstock, came into force in 1184. This contained the most severe felling restrictions—a landowner could cut nothing but fuel in his own woods, and that “only in the view of the king's forester”. Subsequent legislation in the thirteenth and fourteenth centuries provided a certain amount of relief from this oppression, but the vexing uncertainty, as to what tracts of land the monarch might decide to “afforest” for a hunting ground, was not finally removed until the Act of Limitation of Forests in 1640.³ Minor Acts from time to time, related to the enclosure and planting of woods, and to the transformation of woodlands into arable and pasture lands. The overall pattern was one of a gradual destruction of the national forests, so that, by the beginning of the nineteenth century, there was an acute shortage of timber for the shipbuilding industry. In spite of the fluctuating fortunes of British

forestry, the Act of 1947⁴ was the first Forestry Act for many centuries which had a widespread effect on private woodlands.

Rating

However, British forestry and, especially, proprietary forest policies, were influenced not only by Acts of Parliament relating solely to forestry matters. Of equal, or even greater importance, have been certain fiscal measures, with a general application but containing clauses with a particular impact upon forest lands and timber growing thereon. In modern times the chief of such legislation is that relating to Income Tax and Estate Duty, but the first serious form of taxation on woodlands came with the imposition of rates under the Rating Act, 1874.⁵ This Act extended the Poor Relief Act of 1601 (“The Statute of Elizabeth”)⁶. Thus, for the first time, woodlands were rated, and this was a serious blow to woodland owners, since the annual tax was levied regardless of whether the land was producing an income or not. In some cases, there might be no income for the first 50 years after planting, and such a form of taxation was clearly most inappropriate. A Select Committee on Forestry, set up in 1885, heard evidence from a number of witnesses that the accumulation of rates was a most serious deterrent to afforestation, and was no doubt partly responsible for the decline of British forestry towards the end of the nineteenth century. A Departmental Committee of 1902 noted suggestions that the partial rating relief given to agricultural land in 1896 should be extended to woodlands, but the Committee made no such recommendation.

The rate burden was not removed until 1929 when, under the Local Government Act⁷ of that year, woodlands, as well as agricultural lands, were completely de-rated, although by this date, the influence of rating on forest policies had declined, relative to that of income tax and estate duty. The importance of this 55-year period of rating of woodlands to present-day forestry lies in the fact that it was a factor which contributed to the present shortage of good quality trees in the 50–90 years old age class. Further, it was a serious disincentive at precisely the

¹ Consolidated by the Forestry Act, 1967.

² See Nisbet, J.—*The Forester*, 1905, Vol. I, page 5 *et seq.*

³ Nisbet, J.—*op. cit.*

⁴ See second paragraph of Chapter 7, page 41.

⁵ 37 & 38 Vict., c. 54.

⁶ 43 Eliz., c. 2.

⁷ 19 Geo. 5, c. 17.

time when woodland owners needed to re-think their policies and to increase very substantially their production of softwoods. It may be argued, with justification, that most of the trees which might have been planted during the first half of this period would have been felled during the second World War, but some must have remained to encourage certain proprietors to pursue a more positive forest policy in recent years. The evidence of the surveys which form the basis of the dissertation is that relatively little planting was done in private woodlands in England and Wales in the second half of the last century, and the effects of this period of neglect are still present on many estates.

Succession Duty

However, the Rating Act, 1874, was not the only statute which operated to the detriment of private forestry at that time. The Succession Duty Act of 1853¹ imposed a duty on, among other things, real property passing by succession on the occasion of a death. Where the successor gained a limited interest in the property, the Succession Duty was levied only on the successor's life interest. Up to 1853, real property had been exempt from any succession duty² mainly on the grounds that it was already taxed through Poor Law and other rates, and woodlands shared this exemption in spite of enjoying relief from rates. This duty was not particularly onerous since the duty on timber was not payable until it was sold, and because the successor was most often "lineal issue of the predecessor", giving rise to the minimum rate of succession duty—1 per cent. The Act of 1853 nevertheless marked the turning point between a long period of preferential treatment for forestry and a period of increasing discouragement for woodland owners. Succession Duty was abolished in 1949.

A further burden was imposed before the end of the last century. A new Temporary Estate Duty was introduced under the Customs and Inland Revenue Act, 1889,³ the duty being at a rate of 1 per cent on successions exceeding £10,000 in value. This duty was payable in addition to Succession Duty.

Estate Duty

Five years later, the Finance Act, 1894,⁴ imposed Estate Duty, which replaced various charges including the Temporary Estate Duty. This Act

remains the basis of the present-day levy of estate duty. The duty is levied on all property passing or deemed to pass on the death (with certain exceptions and modifications) regardless of the manner of the disposition. Originally, the rate of duty, which depends generally on the aggregated total of all property, varied from 1 per cent on estates exceeding £100 to 8 per cent on those exceeding £1,000,000. Prior to 1909, woodlands were treated as agricultural property and the value of the timber was included in the estimate of the market value of the land, subject to the proviso that the total value of the agricultural land and woodlands should not exceed 25 times the net annual value as assessed for Income Tax purposes. This gave rise to considerable difficulty over the valuation of estates which included woodlands. The practice adopted at the turn of the century was that where the market value of agricultural land equalled or exceeded the maximum value laid down in the Act, then the woodlands bore no duty, but where the agricultural land was valued at less than the maximum, then duty was levied on woodlands, subject to the same overall limit. Paradoxically, forestry was thus most favoured in the best agricultural areas, and discouraged in poorer areas—the very areas which might have been the most suitable for woodlands from both national and proprietary points of view. Moreover, where timber represented a high proportion of the total value of the estate, the incidence of estate duty could often compel the realisation of immature timber, thus preventing the practice of sound forestry.

These anomalies were soon recognised and the law was amended by the Finance (1909–10) Act, 1910⁵ and the Finance Act, 1912.⁶ The value of any timber, trees, wood or underwood is now not taken into account in estimating the principal value of the estate for the purpose of determining the rate of duty. This exemption from aggregation can be very beneficial in that the estate may thereby be charged with duty at a lower rate. The value of the land on which timber, trees, wood or underwood are growing is not exempt from aggregation, but is treated as part of the agricultural value. Since 1925,⁷ the agricultural value of agricultural property (but not, for example, any development value) has been charged with duty at a rate lower than that for the remainder of the estate. Originally, the rates for agricultural values were

¹ 16 & 17 Vict., c. 51.

² Legacy Duty was already levied on the value of real property legacies: the Act of 1853 imposed a similar duty on inheritances.

³ 52 & 53 Vict., c. 7.

⁴ 57 & 58 Vict., c. 30.

⁵ 10 Edw. 7 & Geo. 5, c. 8.

⁶ 2 & 3 Geo. 5, c. 8.

⁷ Under the Finance Act, 1925, 15 & 16 Geo. 5, c. 36.

based on a different scale, but under the Finance Act, 1949,¹ duty is levied on the agricultural value at a rate which is 55 per cent of that in force on the normal scale. Further, estate duty on real property in Great Britain is not payable until one year after the death or sale and may be paid over a period of eight years.

Timber is not treated strictly as an "estate by itself". Although its value is disregarded in assessing the principal value of the estate, and the appropriate rate of duty, it bears duty at the same rate as the main part of the estate, and not at the rate which would be appropriate to its own value.² Underwood, windthrows and timber used on the estate are exempt from estate duty.

The duty on timber, trees and wood may be paid shortly after the death, but it will usually be advantageous to delay payment, as permitted by the Finance Acts of 1910 and 1912. When payment is delayed, and the timber, trees and wood are sold standing, estate duty is then payable, not on the proceeds of sale, but on the value of the timber, trees and wood as at the date of death. When the sale is of felled timber, duty is payable on the net moneys received, after deducting "necessary outgoings", including felling, extraction and clearing costs, and the net cost, after grant, of replanting the ground from which the timber has been taken. By concession the amount of sale moneys on which duty is charged is also limited to the value of all timber, trees and wood as at the date of death. Frequently, the "necessary outgoings" exceed the proceeds of sale, and no duty is paid. In both cases, duty is levied at the rate applicable to the principal value of the estate in which the timber was comprised without aggregating either the value of the timber or the proceeds of sale.

When estate duty becomes payable on any property on a death, and duty has been payable on the same property on an earlier death occurring within the preceding five years, the amount of duty payable on the property on the later death is reduced according to a statutory scale. This "Quick Succession Relief" applies to land, but where timber, trees or wood pass or are deemed to pass on successive deaths (separated by any number of years) without being sold meanwhile, duty is payable when sale occurs only in respect of the most recent death. This is one of the main reasons why it is usually advisable to delay payment of estate duty on timber until a sale is effected.

Of the 72 proprietary land units included in the Main Survey,³ 50 were in the ownership of single

persons—the category of proprietor able to take full advantage of the provisions relating to estate duty on woodland and timber—but considerations of estate duty formed an important factor in the forest policy for only 14 of these, and for only one proprietor was the future incidence of estate duty the primary factor. The usual effect upon the forestry practice was that the owner endeavoured to fell less than the annual increment, and thereby increase the volume of timber in the woods, and the capital value. In certain cases, the management was not wholly in accordance with the principles of good forestry, since much over-mature timber was being retained for the sole purpose of providing a reserve of capital with which to meet the levy of estate duty. Twelve of these 14 proprietors saw the creation of such a capital reserve as being not wholly for estate duty purposes, but also as a possible source of finance for farm or other capital improvements. The estate duty factor was important, but not paramount.

One interesting exception was found in the South of England. The owner of 250 acres of woodland (which was less than 10 per cent of the total area of the estate) had adopted the policy of selling annually much more than the annual increment. His aim was to maximise his income and reduce the liability for estate duty at the end of his life. At the same time, he was providing a growing asset for his heirs by replanting. Thus, in this instance, the impact of estate duty was a major factor in determining the owner's forest policy, but his attitude was directly opposite to that of most proprietors. To him, the estate duty concessions were insufficiently attractive; it was the levy of duty rather than the limited relief which was important. The area of woodland was relatively small—the average area of woodland on the estates where estate duty considerations were of some importance was 1,427 acres, averaging over 15 per cent of the total estate area—and the proprietor possessed larger rural estates with more woodland in other parts of the country. The combination of these factors may be the cause of the proprietor's attitude towards the forestry on the estate surveyed.

Estate duty was being kept in mind by eight other proprietors, but the management of the woodlands was not affected since each proprietor's intention was that his estate should be demised well before his decease would be expected. The aim was not to reduce the burden of estate duty, but to avoid it completely. There was no indication that, as an "insurance" against a sudden death, steps were being taken to increase the capital value of the woods.

¹ 12, 13 & 14 Geo. 6, c. 47.

² Finance Act, 1912.

³ See Chapter 2, page 8.

However, it must be remembered that the devastating effects of the World Wars upon British Woodlands¹ have given rise, generally, to a situation in which any reasonable forest policy will inevitably lead to an increased volume of standing timber, and hence an increased capital value! It may well be that this is one reason why 22 "single owners" appear to have given no weight to the question of estate duty. Fifteen of this group referred to "incidental" capital appreciation, when the matter was raised with them, while seven frankly admitted that they had not considered estate duty at all. If their woods had been in a state approaching "normality", then they might have considered aspects of forest policy other than bringing all their woodlands into full production. On the other hand, this reasoning cannot be applied in every instance, and often the explanation must be found elsewhere—either the proprietor is ignorant of the estate duty concessions or he does not deem them sufficiently important to modify his forest policy to take advantage of them.

There appeared to be no relationship between the proprietors' attitudes towards the estate duty concessions and their policies relating to the taxation of their woodlands,² except that in East Anglia, estate duty was not important on any of the six estates surveyed, and none of these were taxed under both Schedule B and Schedule D.²

One other point of regional significance emerged. Five of the proprietary units, for which estate duty was a determinant of the forest policy, were situated in North Wales. This is rather surprising, particularly because the average acreage of woodland on these estates, 512 acres, was considerably less than one-half of the average wooded area on all such estates, and little more than the average for all the Welsh estates included in the survey. On most of these five estates much of the agricultural land was of poor quality, while conditions were quite good for tree growth. Hence the forestry enterprise was relatively more important in the economy of the estate as a whole, and consequently the owner was more interested in all the financial aspects of his forest policy. Another contributory factor could be the activities of the Forestry Commission in the Welsh mountains. When landowners see large-scale forest operations in their own district, perhaps they are moved to think of their forestry more as a commercial enterprise and less as a hobby.

The following table (Table 5.1) illustrates the effect of the major estate duty concessions on various estates, each of a total value of £150,000, in the ownership of a single person.

The survey furnished no evidence of "death-bed" purchases, when an elderly person acquires agricultural or forest land in order to reduce the total

TABLE 5.1
ESTATE DUTY COMPARISONS

Investment	Value	Rate of Duty	Relief	Net Duty	Total Duty
	£	%		£	£
1. Ordinary	150,000	50	—	75,000	75,000
2. Agricultural	150,000	50	Less 45%	41,250	41,250
3. Forestry: Land	20,000	12	Less 45%	1,320	—
Growing Timber	130,000	12	Deferred payment	15,600	16,920
4. Ordinary	50,000	45	—	22,500	—
Agricultural	45,000		Less 45%	11,138	—
Forestry: Land	5,000		Less 45%	1,237	—
Growing Timber	50,000		Deferred Payment	22,500	57,375

* These three figures are aggregated to determine the rate of duty.

estate duty liability on his death. The nature of the sample³ would tend to exclude such proprietary units, and there were only four land units which had been acquired since 1945. However, discussions with a number of people provided confirmation of such purchases, but chiefly in respect of agricultural

estates, which might include some woodland, rather than specific purchases of woodland. It seems probable that the estate duty concessions on agricultural land and woodlands in this country will become more important, following the removal of estate duty exemption on immovable property abroad.⁴

¹ See Chapter 8, page 46.

² See Chapter 6, page 35.

³ See Chapter 2, page 22.

⁴ Finance Act, 1962, 10 & 11 Eliz. 2, c. 44.

GOVERNMENT POLICY: II INCOME TAX

Current legislation relating to the taxation of woodlands exerts a much more widespread influence on proprietary forest policies than estate duty provisions. The income tax concessions applicable to forestry undoubtedly comprise one of the greatest incentives for the pursuit of a positive forest policy. The main survey provided much evidence to support this, and confirmed the conclusion drawn from the preliminary survey concerning the forest policies of untaxed proprietors.¹ Of the five estates in this category, only one showed an annual excess of income over expenditure, and the average woodland area was 490 acres, which is only 45 per cent of the average for the whole survey—1,089 acres. The charity owner, being exempt from income tax² and immune to estate duty, is unable to take advantage of any of the concessions which are available and attractive to the single person.

It should be noted that the Income Tax Law in force at the time when most of the survey work was carried out has been somewhat modified by the Finance Act, 1963.³ The principal change which concerned real property taxation was the abolition of the tax on the ownership of land under Schedule A, but the effect on the taxation of woodlands has been slight. However, the summary of the law which follows gives the position up to April 1963, with references to the changes which have been made since that time.

Under the Income Tax Act, 1952, tax was charged in respect of "the property in all lands, tenements, hereditaments and heritages in the United Kingdom for every 20s. of the annual value thereof" under Schedule A.⁴ This was a tax upon the income arising from the ownership of the land,⁵ and any "excess rents" over and above the "annual value" were assessed for tax under Case VI of Schedule D. Various statutory deductions, including an allowance for repairs, were made before determining the "net annual value" upon which the Schedule A tax was levied. If the average cost of maintenance, repairs, insurance and management over the preceding five years was greater than the statutory repairs allowance,

the owner was entitled to claim a repayment of tax upon the excess.⁶ Generally, such repayment was limited to the amount of the Schedule A tax,⁷ but in the case of agricultural land and buildings the excess could be allowed against all other income, though primarily against agricultural income.⁸ Thus it was possible to obtain relief from tax on expenditure relating to such items as the maintenance of woodland fences and repairs to any buildings used wholly in connection with the working of the woodlands charged with the tax.

Tax under Schedule B was charged in respect of the occupation of "all lands, tenements, hereditaments and heritages in the United Kingdom chargeable to tax under Schedule A",⁹ except dwelling-houses and business premises. This exception also included land on which farming operations are carried out with a view to profit, the income from which is taxed under Case I of Schedule D. Therefore, Schedule B only applied to amenity lands, woodlands, sporting rights and land occupied for non-profit-making purposes*. Tax under Schedule B, which was payable in addition to Schedule A tax, was levied not on the occupier's actual income, but on the "assessable value" which was one-third of the annual value ascertained as for Schedule A. This annual value was of the order of 5s. per acre, and thus the Schedule B tax at standard rate on one-third of this would usually be less than 1s. per acre.

Where the occupation of land is for the purpose of carrying on a trade, the income arising from such occupation is normally compulsorily assessed under Schedule D. However, a most important provision relating to the occupation of woodlands was made under Section 125 of the Income Tax Act, 1952.¹⁰ If an occupier of woodlands proved to the satisfaction of the Commissioners of Inland Revenue that those woodlands were managed by him on a commercial basis and with a view to the realisation of profits, then he could elect to be assessed and charged to tax in respect of those woodlands under Schedule D instead of Schedule B. The commercial occupation of woodlands was an exception to the

* Originally Schedule B had also applied to a variety of small farming enterprises not readily assessable under Schedule D.

¹ See Chapter 1, paragraph 5, page 1.

² Under S.447, Income Tax Act, 1952, 15 & 16 Geo. 6 & Eliz. 2, c. 10.

³ 1963, c. 25.

⁴ S. 82.

⁵ Schedule A tax has not been levied since 1963.

⁶ S. 101.

⁷ See *Crompton v. Campbell* (1924) 9 T.C. 224.

⁸ S. 313.

⁹ Income Tax Act, 1952, s. 83.

¹⁰ Confirming arrangements dating back to the Finance Act, 1910.

general rule concerning the taxation of profits arising from a trade, and the position was that such woodlands would be assessed under Schedule B unless the owner chose otherwise. Normally such a choice would have to apply to all the commercial woodlands on the same estate, but new plantations or areas replanted could be treated as a separate estate if notice were given to the Commissioners within 10 years after planting.

These provisions were of the greatest importance to all proprietors of woodlands in this country. The payment of tax under Schedule A and B completely exhausted the liability to tax, and the whole of the income derived from woods might be exempt from tax under Schedule D. This exemption extended to the profits from an estate sawmill used for the conversion of timber grown on the estate,¹ although the point in conversion beyond which profits thereby made might be assessable under Schedule D has not been clearly defined. Thus, the profits arising from the sale of timber whether standing, felled or partially converted, were virtually tax free, which constituted a great incentive to owners of mature woodlands to fell some trees and keep the woods under an acceptable rotation.

If the woodland accounts showed an annual loss, the owner could elect to be assessed for tax under Schedule D, and such losses could then be offset against income from other sources charged under Schedule D² or the losses could be carried forward to be set against income in succeeding years.³ This rule was intended to provide an inducement to owners of derelict woodlands, upon which a great deal of money would need to be spent to make them fully productive to bring their woods into such a condition. Further, it was an encouragement to proprietors who might be considering new afforestation projects, provided of course, in both cases, that the proprietors had sufficient income from other sources against which the forestry losses could be offset. If a proprietor were paying the highest rates of income tax and surtax on some part of his income, then in effect, every pound of the net investment in new plantations could qualify for a repayment of tax of 17s. 9d., at the 1963 rates of tax, and the effective cost of afforestation would be less than one-eighth of the actual cost.

The right of a woodland owner to treat new plantations as separate from the rest of his estate, and elect to have them assessed under Schedule D, while

his other, more mature woods remained charged under Schedule B, provided the opportunity for the respective advantages of the methods of taxation to be enjoyed at the same time by any one owner. Those woods producing an income, and requiring little expenditure, could be taxed under Schedule B, and the income produced would be virtually tax-free, while the large annual expenditure incurred on young plantations could qualify for relief of tax under Schedule D.

The situation following the abolition of all Schedule A assessments in 1963, referred to above, was at first confused. An automatic consequence of this step would have been the abolition of all Schedule B "assessable values" which were based on Schedule A assessments. This left many doubts as to the assessment of woodlands—"amenity woodlands" were obviously exempt from tax, but the Chancellor of the Exchequer said in his Budget speech that he was considering new methods for the taxation of commercial woodlands.⁴ This evoked immediate concern among woodland owners, who feared that all commercial woodlands might be taxed under Schedule D. Many individuals and organisations made representations to the Chancellor, pointing out the extreme importance to forest proprietors of the former system of taxation. In the event, the Finance Act, 1963, left the taxation of commercial woodlands substantially unaltered: they continue to be assessed under Schedule B or Schedule D, according to the choice of the proprietor. The right to treat new plantations separately remains, and, as before, on a change of occupation all the woodlands involved automatically become assessable under Schedule B, unless the new occupier elects otherwise.

The present basis of assessment under Schedule B is one-third of the annual value of the land in its natural and unimproved state—the "prairie" value. The "prairie value" may be taken as the old Gross Assessment for Schedule A, or a new value can be negotiated with the Inspector of Taxes. No relief can be obtained for any expenditure on "Schedule B" woodlands although the Earned Income Allowance on two-ninths of the presumed income can be claimed.⁵

The assessment under Schedule D is based on the difference between the annual receipts and expenditure—no valuation of capital or stock-in-trade is required. All forestry grants must be included in the receipts as taxable income, and the Earned Income Allowance⁵ may be claimed on any profits.

¹ See *Christie v. Davies* (1945), 26 T.C. 398 and *C.I.R. v. Williamson Bros.* (1949), 31 T.C. 370.

² Income Tax Act, 1952, s. 341.

³ S. 342.

⁴ See *House of Commons Debates*, Vol. 675, col. 458.

⁵ This allowance is only made where the owner can show that he is personally engaged on the management of the woodlands.

Where an estate is partly let and partly owner-occupied, the owner may, if he wishes, elect for his estate to be assessed on its annual rental value (or the "prairie" value in the case of woodlands).¹ The election must include the whole estate including *all* the woodlands, whether they are taxed under Schedule B or D, or untaxed "Amenity" woods. The advantage of such election is that tax relief may be obtained on the cost of repairs and maintenance of all the woods, but whether it would be worth while will obviously depend upon the composition of the estate and the financial circumstances of the owner. In any case, maintenance expenditure incurred on "Schedule D" woodlands may be set off against income, or included in the "loss", under Case I, or it may be included in a Case VIII claim.^{2, 3}

Under the Income Tax Act, 1952, section 314, the occupier of woodlands assessed under Schedule D is entitled to an allowance against tax of one-tenth of certain capital expenditure in each of 10 years of assessment.⁴ Expenditure which qualifies is that incurred on the construction, adaptation or extension of "forestry buildings, cottages, fences or other works", provided the expenditure is not such as can be or could have been taken into account for the purpose of maintenance relief. Where expenditure is incurred on an asset used partly for forestry and partly for other purposes, an apportionment must be made. Expenditure on new assets qualifies for an additional 15 per cent Investment Allowance in the first year, while there are similar allowances for new machinery and plant. All Crown and public or local authority subsidies must be deducted to arrive at the qualifying expenditure.

The main survey included 67 estates liable for income tax, and the woodlands on these were assessed for tax as follows:

All under Schedule B	17
All under Schedule D	9
Part under Schedule B, part under Schedule D	41
	—
	67
	—

There was an interesting and significant regional pattern, illustrated in Figure 6.1. It may be observed

that four of the nine examples of taxation under Schedule D were situated in Region I, the Far West. Furthermore, in this Region, none of the estates surveyed was taxed wholly under Schedule B. These facts are indicative of the state of private forestry in that area. With some notable exceptions, the general pattern was of poor quality, over-mature or scrub hardwoods, with areas of young, predominantly coniferous plantations which represent the first stages of an attempt to make the woodlands fully productive. The proprietors wished to retain the woodlands, but frequently the programme of rehabilitation was hampered because of a shortage of available capital. The discontinuance of the Scrub Clearance Grant⁵ has further handicapped the progress with such work. Proprietors with little or no income from any of their woodlands would usually be unwise to choose to be taxed under Schedule B, especially when they are incurring considerable expenditure annually on the re-forestation of areas which are unlikely to yield a large income during the proprietor's lifetime. Thus one would expect the large proportion of "Schedule D woodlands" found in the Far West Region, a region lacking a strong forestry tradition.

Another regional characteristic of special significance was to be found in Region VII—East Anglia. None of the estate woodlands included in the survey was taxed *partly* under Schedule B and *partly* under Schedule D. Woodlands in this Region appeared to fall into two main categories: those showing an annual profit, and those incurring substantial losses. The latter type would tend to be assessed wholly under Schedule D, while the former category was taxed under Schedule B, not only because of the annual profit, but also in many cases, because some type of selective forestry was practised. The selection unit might be a single tree, or a small group of trees, and the system was practised chiefly on account of amenity, shelter and shooting requirements. Under this system, where clear felling is not the rule and where the forest enterprise is profitable, it is obviously better to remain taxed under Schedule B.⁶

In the North Region (VIII), woodland estates which were taxed partly under each schedule, represented a large proportion of the total—seven out of

¹ Finance Act, 1963. See also Hart, C.E.—*Taxation of Woodlands in England and Wales, 1964*.

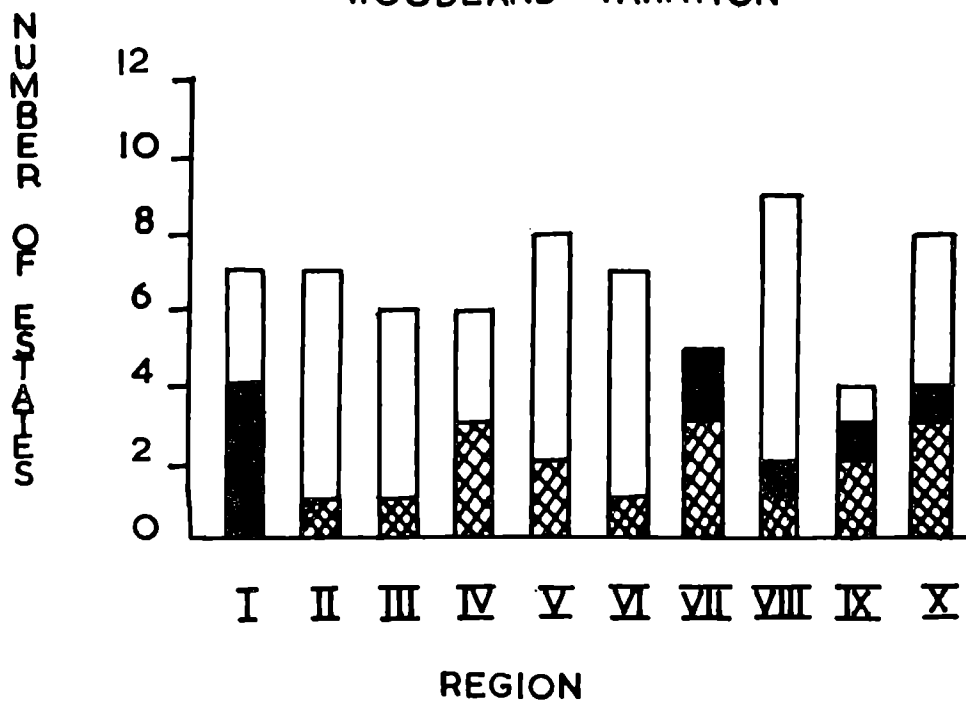
² Finance Act, 1963. The Case VIII claim has been introduced to replace the "Maintenance Claim" under the Income Tax, 1952, s. 101. See second paragraph of Chapter 6, page 35.

³ By concession, the Inland Revenue agree to treat Schedule D woodlands as trade premises for the purpose of this "election", and thus no hypothetical rent need be brought in for tax. See also *C.I.R. v. Holker Estates Ltd.* (1961) 40 T.C. 275.

⁴ There is a similar allowance for agricultural expenditure.

⁵ See discussion of this Grant in Chapter 7, page 41.

⁶ In one case, it was found that the local Inspector of Taxes was prepared to allow a proportion of an under-planted area to be transferred from Schedule B to Schedule D. The proportion of the area was the same as the percentage of the planting grant paid by the Forestry Commission.

FIGURE 6.1**REGIONAL DISTRIBUTION OF
WOODLAND TAXATION****WOODS TAXED UNDER B****WOODS TAXED UNDER D****WOODS TAXED UNDER B & D***Note:*

Region I = Far West.

Region II = Mid-West.

Region III = South East.

Region IV = West Midlands.

Region V = Chilterns.

Region VI = East Midlands.

Region VII = East Anglia.

Region VIII = North.

Region IX = South Wales.

Region X = North Wales.

the nine taxable estates. This is probably a consequence of the strong forestry tradition in that Region which has resulted in the woodlands generally being in a much better state than in many parts of the country. The proprietors took a keener interest in commercial forestry, and were more anxious to maximise the financial returns. The older woodlands are retained under Schedule B, but each area to be afforested or re-afforested in switched to Schedule D just prior to planting.

Regions II to VI, covering the Midlands and the South of England (apart from the extreme South-West and East Anglia) included no case where the woodlands were assessed wholly under Schedule D. This fact is no doubt related to the proportionately low number of estates in this area of which the woodland accounts showed annual losses.¹ It is generally found that profitable woodlands are associated with taxation under Schedule B, at least in part.

The relationship between the various modes of taxation and the area of the woodlands in each group is summarised in Table 6.1.

TABLE 6.1
WOODLAND AREAS AND TAXATION

Taxation Group	No. of Estates	Total Woodland Area (acres)	Average Woodland Area (acres)
1. Schedule B ..	17	22,775	1,340
2. Schedule D ..	9	7,495	833
3. Schedule Band D	41	45,675	1,114
4. Untaxed ..	5	2,450	490
Total	72	78,395	1,089

It is probable that the above-average woodland areas in Groups 1 and 3 arise because of stronger forestry traditions, leading to better and more profitable woodlands.² The appropriate method of taxation then follows from this, rather than being directly related to woodland acreage. Only one-third of the "Schedule D woodlands" had a strong tradition behind them, whereas over one-half of the "Schedule B woods" reaped the benefits of the efforts and experience of previous generations. There appears to be no significant relationship between the type of owner and the income tax policy. For each of the three categories of owner which are liable to tax, the ratio of the three tax groups was approximately constant and equal to the ratio of the total number of

estates in each ownership category. Similarly, the importance of estate duty as a factor in forest policy was not associated with any particular taxation group.

Twenty-five estates contained sawmills which converted timber for sale off the estate, as well as supplying material for estate fencing and maintenance.³ These were often the most profitable sawmills and, surprisingly, four of them were associated with woodlands taxed wholly under Schedule D, and all the profits of the sawmilling operations were subject to tax under this Schedule.⁴ A further two estates in this group had sawmills which dealt solely with produce for estate purposes, giving a total of six estates with sawmills out of the nine with "Schedule D woods" only. This proportion is greater than for the other groups, as shown in Table 6.2 but the sample is small.

TABLE 6.2
WOODLAND TAXATION AND DISTRIBUTION OF SAWMILLS

Sawmill	TAXATION GROUP (No. of Estates)				
	(1) Sch. B	(2) Sch. D	(3) Sch. B and D	(4) Untaxed	Total
Sales off	5	4	14	2	25
Estate only	5	2	10	1	18
No sawmill	7	3	17	2	29

Two factors provide the main explanation of the proportionately large number of sawmills in the second taxation group. Firstly, two proprietors stated that they believed their taxation policy to be wrong: that there was a lack of appreciation of the situation when the "election" for Schedule D was made and if the choice could have been made at the time of the survey, they would have undoubtedly retained some of their woods under Schedule B, since both estates show an annual profit from the woods and sawmill. Secondly, most of the estate sawmills had been in existence for many years, erected when the outlook for the sale of converted timber on a small scale was more propitious. Proprietors have shown a great reluctance to close such mills, and many remain in use even though a loss may be incurred on their working. Very few sawmills have been constructed since 1945 on estates where there were none previously.

¹ More detailed comments on this feature are given in the paragraph preceding "Regional Patterns" in Chapter 4, page 20.

² The influence of a forestry tradition is discussed at length elsewhere. See opening paragraphs of Chapter 4, page 20.

³ See discussion of sawmills in Chapter 3, page 11.

⁴ These four sawmills were among the most profitable of the mills surveyed.

Where the overall age-class distribution was good, with a reasonable balance between all-age classes, the proportion assessed under Schedule D was relatively small. Similarly, there was a greater proportion assessed partly under each Schedule among those woodlands described as "mainly over 80 years old or less than 20 years old". Related to this was the association between dominant species and taxation. Where broad-leaved species predominated, on 37 estates, more than two-thirds of these woodlands were taxed partly under each schedule, while mainly coniferous woodlands tended to be taxed either under Schedule B or Schedule D. This is probably because the mainly coniferous woodlands were often either nearing maturity or they contained many Christmas trees, when Schedule B would be the obvious choice; or they included many plantations made in the last decade as a result of a state of dereliction in the immediate post-war years. Mixed woodlands were proportionately distributed among all the tax groups.

It was frequently stated by woodland proprietors that they felt they would be able to continue a "positive" forest policy, only as long as the current income tax law remained in force; that forestry was economically worth while only because income could be virtually tax-free under Schedule B and losses could be set off against other income under Schedule D. Although "tax avoidance" was not the main aim of forest policies, the ability to avoid tax was the main enabling factor. This was the reason for the widespread concern among woodland owners at the possible effects of the abolition of Schedule A and hence of Schedule B. A system of taxation wholly under Schedule D would still be beneficial to those

owners concerned primarily with the rehabilitation of derelict woodlands or with the creation of new plantations, but a tax levied on the profits from the sale of mature timber could prevent a plantation showing anything but a meagre financial yield taken over the whole rotation. Certainly, the wealthy business man might well cease to inject useful capital into the forestry industry.¹

However, in certain cases, one was left with the inescapable impression that the main influence of the income tax concessions upon proprietors' forest policies was largely psychological, especially where the woodlands showed an annual loss and were assessed under Schedule D. Frequently, there was no information available concerning the actual worth of the tax relief, but the owner found great satisfaction in "getting something out of the Government". Indeed the owner of one estate covered in the preliminary survey was convinced that because each year's loss on the woodlands account was set against income from other sources, the woodlands were in fact yielding an annual profit!

There is no doubt that, for financial or psychological reasons—perhaps usually a combination of the two—the income tax concessions provide a far greater encouragement to woodland proprietors than either estate duty reliefs discussed above or the Government grants to which attention is now to be given. The grants system is a short-term measure, due to come to an end in about 20 years, and in any case, grants are taxable and those paying the higher rates of surtax, to whom the income tax concessions are the most valuable, would receive the least benefit from grants and subsidies.

¹ See Chapter 11 for a discussion of forestry syndicates, page 63.

GOVERNMENT POLICY: III FORESTRY GRANTS AND DIRECT RESTRICTIONS; FUTURE POLICY

Forestry Grants and Direct Restrictions

The Act of Parliament under which the Forestry Commission was established, empowered the Commission to make advances, by way of grant or loan, to persons in respect of the afforestation of land.¹ In November 1921, the Government permitted the Forestry Commission to make such grants to woodland owners only on conditions that unemployed labour should be utilised.² The first grants were at £2 per acre for conifers and £4 per acre for hardwoods. In the forest year ended 30th September 1922, over 10,000 acres of private woodlands were planted, and ground was prepared for a further 12,000 acres. Grants payable in respect of that year amounted to more than £50,000.³ In the inter-war years, 130,000 acres were planted with the aid of grants, totalling £336,420, although some people believe that most of this work would have been done if there had been no financial assistance from the Government.

The structure of grant-aid for private forestry was changed under the Forestry Act, 1947,⁴ the outstanding feature of which was the introduction of the Dedication Scheme. This was a scheme to encourage proprietors to practise sound forestry and make all their woodlands fully productive. In return for undertaking to manage his woodlands under a plan of operations approved by the Forestry Commission and for "dedicating" the land for the purpose of growing timber, in perpetuity, a proprietor was given various monetary grants together with some freedom from restrictions.⁵ The scheme was introduced to assist private woodland owners to achieve a target of 2 million acres of productive woodlands by the end of the century.⁶ The offer of grants combined with the threat of compulsory purchase (very seldom used, in fact) "encouraged" people to dedicate.

The undertaking to manage the woodlands under an approved plan is binding only upon the proprietor for the duration of his ownership of the woodlands, but the dedication covenant is normally binding upon his successors in title. This latter covenant "runs with the land" under the conditions

given in *Tulk v. Moxhay* (1848)⁷ since it is a negative covenant, and the 1947 Act states that the Forestry Commission shall be deemed to own land adjacent to every area of private woodlands. When the ownership of dedicated woodland changes, the Forestry Commission has to agree a new Plan of Operations with the new owner, and if agreement cannot be reached, the Commission may withhold further grants, claim back any grants paid in the past, or even resort to the use of compulsory purchase powers.

Financial assistance is given under one of two systems. Under Basis I, the grant is 25 per cent of the approved net annual expenditure—when the woods become self-supporting, the grant ceases. Basis II, which is by far the more popular, provides for certain fixed amounts to be paid, irrespective of the actual cost of the operations. The grants under Basis II are subject to a periodic review and the amounts currently⁸ payable in respect of dedicated woodlands are:

Planting Grant:

£22 12s. 0d. per acre.

Annual Management Grant:

20s. 3d. per acre for the first 100 acres.

13s. 9d. per acre for the next 100 acres.

8s. 9d. per acre for the balance.

The full Management Grant is paid only in respect of productive areas. Free advice and assistance in compiling plans of operations, and on all forestry matters, is available from officers of the Forestry Commission, while grant-aided woodlands are subject to periodic inspections.

Two other schemes were introduced under the 1947 Act. The Approved Woodlands Scheme was designed to help those owners who managed their woodlands well, but who did not want to enter into a dedication covenant. Owners managing their woods under an approved plan, but with no restrictive covenant concerning the use of the land in perpetuity, were originally entitled to receive grants at

¹ Forestry Act, 1919 (9 & 10 Geo. 5, c. 58). See s. 3 (3) (d).

² See Willson, F. M. G.—Unpublished D.Phil. Thesis, Nuffield College, Oxford.

³ Forestry Commissioners—*Third Annual Report of the Forestry Commission*.

⁴ 10 & 11 Geo. 6, c. 21.

⁵ In particular some of the restrictions of the Forestry Act, 1951, do not now apply to dedicated woodlands. See discussion of felling licences later, page 42.

⁶ Forestry Commissioners—*Post-War Forest Policy, 1943 and Supplement, 1944*.

⁷ 2 Ph. 774.

⁸ 1965 rates, revised as from 1st October, 1967, see page 45.

one-half of the rates applicable to Dedicated Woodlands. Since the Timber Growers' Organisation achieved its independence in 1960,¹ the full *planting* grants have been payable, but no *management* grant is given. The Small Woodlands Scheme provides for the payment of full planting grants to properly managed woodland areas which are too small or scattered to warrant dedication. Approximately one million acres of private woodlands are considered to be eligible for inclusion in this latter scheme. In brief, this scheme is open to any woodland estate not exceeding 150 acres, providing that it does not include any block of good shape which is 35 acres or more in extent. Otherwise, the scheme is confined to various small detached blocks or narrow strips and belts. Under both of these schemes, 75 per cent of the planting grant is payable immediately after planting, and the balance after five years, subject to satisfactory maintenance in the intervening period.

Originally, for woodlands under any of the three schemes outlined above, where the preparation of the ground for planting entailed the removal of scrub of various kinds, a Scrub Clearance Grant was obtainable in addition to the Planting Grant. This grant was based on the estimated cost of clearance, subject to a maximum grant of £13 10s. 0d. per acre. Three-quarters of the grant was payable on the completion of clearance and planting, the balance being paid after five years if the maintenance of the crop was satisfactory. This grant, payable only in respect of scrub which had arisen before 1948, was discontinued as from 30th September 1963. This has been a severe blow to many woodland owners with large areas of derelict woodland, and the survey revealed that a number of proprietors had expanded their planting programmes for two or three years before that date, in order to maximise the financial aid received for the rehabilitation of their woods.

After the devastation of woodlands during the Second World War, felling was restricted to prevent excessive exploitation of the remaining woodlands while timber prices were high, even though they were controlled. One of the attractions of the Dedication Scheme was that applications for fellings in dedicated woodlands were given priority over others.

The restrictions upon the felling of trees were considerably tightened by the Forestry Act of 1951,² under which no trees could be felled without a licence from the Forestry Commission, apart from the following:

- (i) Trees in a garden, and fruit trees.

- (ii) *Bona fide* thinnings up to 4 inches in diameter, underwood below 6 inches in diameter and *any* trees below 3 inches in diameter, all measured at 5 feet from the ground.

- (iii) Dangerous trees.

- (iv) Up to 825 cubic feet every three months for estate purposes only.³

The Commission were empowered, on granting a licence, to insist on the replanting of the area to be felled or the planting of an equivalent area on another part of the estate. Further, the Commission can compel owners to fell trees against the owners' wishes, but two years must be allowed for the work to be carried out.⁴

The Acts of 1947 and 1951 can thus be seen to give the Government, through the Forestry Commission, fairly complete control over all woodlands in this country. Even though the owners of dedicated woodlands do not need felling licences, this only applies when the proposed fellings are in accordance with the plan of operations which, in any case, has to be approved by the Commission. However, this limited freedom does facilitate the negotiations of sales of standing timber, since prospective buyers know they will not have the problem of obtaining a licence.

Further restrictions may be imposed by local authorities which may put a Tree Preservation Order on individual trees or blocks of woodland, under Town and Country Planning legislation. Dedicated woodlands, however, are immune from such Orders.

On balance, because of the freedom from felling restrictions and the substantial financial aid, dedication would seem to be a wise act when the owner wishes to practise sound forestry, unless there is a prospect that the land may become suitable for, say, developing purposes, and the owner might then wish to change the use. In that case, it might be more prudent not to enter into the binding restrictive covenant, although there is provision for the ending of the obligations in special circumstances. In recent years, the Commission has shown a more flexible attitude over such matters than at first.

In addition to the grants under the 1947 Forestry Act, Government contributions towards the establishment of farm shelterbelts, beneficial to the agricultural land, are obtainable under other statutes. The Hill Farming and Livestock Rearing Acts, 1946-56, provide for a grant of up to 50 per cent of the approved cost of planting shelterbelts on holdings qualifying for aid under the Acts. This grant may well be a better alternative than planting grants under the

¹ See discussion of Watson Committee's recommendation in Chapter 8, page 48.

² 14 & 15 Geo. 6, c. 61. This Act continued restrictions on felling in force since 1939, but in modified form.

³ Limited sales are permitted, subject to prior approval.

⁴ In practice, these powers have rarely been used.

Small Woods Scheme where the costs of establishment are high. A Farm Improvement Scheme under the Agriculture Act, 1957, may include shelterbelts among the farm improvements which qualify for a grant of up to one-third of the approved cost.¹

As an additional encouragement to forest proprietors, loans were made available at current Government borrowing rates under the Forestry Act, 1919. These loans achieved little popularity for three main reasons: the terms of the loans were unattractive; there was some difficulty in keeping the necessary complicated accounts; and it was believed that there

was not "the slightest possibility" of any profits accruing on a forestry enterprise.² After 1947, loans were available for dedicated woods only, and were granted for up to 30 years at about 6½ per cent, but again, little use was made of them and such loans were discontinued in 1961.

The total woodland area covered by the main survey was 78,395 acres, of which 74,985 acres were either Dedicated or Approved.³ The breakdown of the total acreage and number of estates in each category, and of those in neither, is given in Table 7.1.

TABLE 7.1
WOODLANDS AND GRANT-AID SCHEMES

Category	No. of estates	Woodland Area (acres)	Average Woodland Area (acres)	Ownership category ⁴ (No. of estates)			
				1	2	3	4
1. Dedicated	55	62,490	1,136	41	4	3	7
2. Approved	13	12,395	953	8	5	—	—
3. No Grants	4	3,510	878	1	1	2	—
Total	72	78,395	1,089	50	10	5	7

More than three-quarters of the proprietors had dedicated their woods, many of them in the early years of the scheme. They were quite happy to dedicate the use of the land for forestry in perpetuity, and thus sought to obtain the maximum financial benefits. No owner expressed regret at having entered into the dedication covenant.

Approved Woods were found on 13 estates—eight in the ownership of single persons and five owned by companies. In every case the reason given for not dedicating was that it was considered undesirable to relinquish the right to change the use of the land. The retention of a measure of flexibility in the land-use pattern was emphasised particularly by the representatives of the five companies concerned. It is significant that the woodlands on one-half of the company-owned estates were approved, and those on another were neither dedicated nor approved, making a total of six which were not dedicated, out of 10 estates altogether. This fact is indicative of the more commercial attitude of the estate company, compared with the amenity- and tradition-conscious views of many private owners. The companies were more willing to consider

possible changes of use if economic considerations warranted them. Some of the single persons whose woods were approved also spoke of possible changes of use in the future, but more often the dominant motive appeared to be a desire to retain all possible rights over their possessions—an unwillingness to part with any control over their lands. Three out of the eight stated that they might well dedicate in the near future; that having seen the scheme in operation for a number of years, they were more amenable to entering it than at its inception.

Out of the 13 estates with approved woodlands, only one exhibited a recent example of the use of the flexibility which was retained. An estate in the South of England had reclaimed nearly 200 acres of woodland for agricultural use, partly to obtain a greater income from the land, and also to improve the shooting facilities by breaking up a very large woodland block into four or five smaller blocks.

Only one example of woodlands neither dedicated nor approved, in the ownership of a single person, was found. The owner was a wealthy, "independent" gentleman who was determined to avoid outside interference as far as possible, and to retain full

¹ Under the Agriculture Act 1967 this is reduced to one-quarter. Shelterbelts are discussed elsewhere—see "Multi-purpose Land Use" in Chapter 11, page 66.

² Willson, F. M. G.—*op. cit.*

³ See discussion following Table 2.1, page 8.

⁴ These are: 1 Single person 2. Company 3. Charity 4. Trustees.

control of his forest policy. In fact, the management of the woodlands on this estate was quite good, and the practical effect of "Approval" would probably have been very small.

One of the charity-owned estates was not dedicated because the area planted or felled each year was too small to qualify—in many years the woods were untouched. The other charity estate and the company-owned estate which received no financial assistance were nevertheless managed in accordance with approved plans. One of the estates was in an area of outstanding beauty, and agreements had been made with the local authority concerning Tree Preservation Orders.

Future Policy

Private forestry has always been very sensitive to changes in Government policy, and probably more sensitive to legislation relating to proprietors' wealth and income in general than to new forest laws. This would seem to be because woodlands usually represent only a part, and very often a minor part, of a proprietor's total wealth. The forestry investment must be fitted into the overall pattern of the proprietor's investment policy. The investor may require primarily income, or capital appreciation, or a combination of the two, and his choice of investments will vary according to changes in the general state of the national economy, to variations in the Bank Rate and interest rates generally, and to changes in monetary and fiscal policies. A recent illustration of the effect that any such change can have upon forest policies arose after the amount of earned income which is free from surtax was effectively raised from £2,000 to £5,000 per annum.¹ It was reported that a number of the members of forestry syndicates² whose incomes fell within this range withdrew from the syndicates, since the taxation concessions available in respect of their forest investments became less important to them, and other types of investment were then considered to be more suitable.

The "traditional" landowner is normally rather less moved by changes in Government economic or taxation policy. The survey has shown that broad considerations of amenity are very often the main influence on the forest policy of such a proprietor,³ who regards his forestry as a hobby, to some extent. That is not to say that most proprietors are not seek-

ing some financial rewards from their forestry enterprise, but variations in taxation and interest rates will be counted of lesser importance. There may be a desire to maximise profits, but only in so far as this is consistent with the preservation of shooting facilities or other amenities. Even if the capital being invested in the woodlands could give a far greater financial yield if invested elsewhere, the proprietor may not wish to allow his woods to fall into a state of dereliction and may be prepared to sustain a financial loss in preventing this. It is impossible to judge to what extent this would still be true if the present income tax concessions were withdrawn. As already indicated,⁴ many owners would wish to reconsider their forestry programme even if they did not want to abandon it completely, and it is highly probable that most of the estate companies would desire to pursue this course. On the other hand, dedication covenants would impose considerable restraint upon those who would neglect dedicated woodlands, and the threat of compulsory purchase remains, even if only in the background. It may be questioned whether the Government, having exhorted woodland owners to dedicate their woodlands in perpetuity, should then withdraw the concessions which appear to make a forest enterprise economically viable.

The position may be quite different by the end of the century, when it is hoped that most derelict woodlands, legacies of two wars and of the neglect of past generations, will have been rehabilitated and that private forests will be approaching "normality". The tax and estate duty concessions, as well as the various grants, have been given primarily to accelerate the rehabilitation work, or to make it possible at all, and to build up a national reserve of timber as quickly as possible.⁵ Such assistance may be fully justified, since the nation has stripped so many wooded areas in times of emergency, and prices after the Second War were held at an artificially low level for several years, that the woodland owners surely merited some aid to recovery. When the recovery is complete, or as complete as it is likely to be, there will be raised the question of how much assistance should continue to be given, if any.

It is with this situation in mind that grants under the 1947 Forestry Act are scheduled to come to an end before the end of the century.⁶ It was thought by some experts that the latest quinquennial review⁷

¹ Finance Act, 1961.

² See discussion of syndicates in Chapter 11, page 65.

³ See Chapter 4, page 20.

⁴ See closing paragraphs of Chapter 6, page 40.

⁵ See Forestry Commissioners—*Post-War Forest Policy, 1943 and Supplement, 1944*.

⁶ See Statement by Minister of Agriculture, 1958. *House of Commons Debates*, Vol. 592, cols. 684–5.

⁷ See third paragraph of Chapter 7, page 41. This refers to the 1962 review. Rates were again increased in 1967 (see page 45).

would have led to a reduction in the amounts paid, rather than to an increase. Presumably the Forestry Commission hopes that the majority of the woodland areas designated in the census of 1947-49 as "suitable for economic management" will have been dedicated within the next 20 or 30 years, as it is difficult to envisage the continuance of the restrictive covenant part of the scheme in the absence of financial incentives, but if forestry is profitable, then it will be continued irrespective of any covenant to that end.

Now that the process of recovery in private woodlands is progressing fairly satisfactory,¹ the attention of the Government must surely be devoted increasingly towards promoting and encouraging greater efficiency at all stages in the forest industry—production, marketing, distribution and utilisation. There is a strong case for the introduction of a Forest Roads Grant Scheme to encourage the making of adequate lengths of all-weather roads which could considerably reduce the costs of extraction. The nearer the timber wagon which goes to the sawmill can be taken to the tree stump the better, and it is desirable to be able to do this all through the winter. Tax relief on capital expenditure incurred on the construction of roads may be claimed under

Section 314 of the Income Tax Act, 1952² but the cost of a mile of road may vary from say £150 ("dry weather" road) to £2,500 or more, according to such factors as sub-soil, topography and drainage, and the nature and volume of the traffic likely to use it. Relief against tax at standard rate still leaves a large sum of money to be found. The Commission's standard is 1 mile of all-weather road for every 80 acres of woods³, but there may well be a need for a relatively greater mileage for private woods of poor shape and remote from existing roads. Good access to woods is important to both grower and merchant, and a Road Grant which led to improved access could bring encouragement to both sides of the industry. Further, such a grant would appear to be a logical successor to the Scrub Clearance Grant.⁴

Ultimately, however, private forestry must stand on its own feet—or fall.⁵ It must not be permanently carried upon a cushion of Government support. There is no substitute for skilful, sound forest management, ever alert to possible improvements and economies in every direction. Efficiency must be increased all round, perhaps especially in the field of timber marketing, and it is to this that attention is given in the following chapter.

Addendum to Note 7, page 41.

Rates of Grant were revised as from 1st October 1967 to:

Planting Grant

£23 3s. 6d. per acre

Annual Management Grant

£1 1s. 3d. per acre for first 100 acres.

14s. 3d. per acre for next 100 acres.

8s. 9d. per acre for remainder.

¹ 35,485 acres were either Dedicated or Approved during the Forest year 1962-63, and an estimated total of 31,881 acres were planted by private owners during that period. See Forestry Commission—*Forty-fourth Annual Report of the Forestry Commissioners*.

² See Chapter 6, discussion of capital expenditure allowances, page 37.

³ In 1965—since reduced owing to the development of cable-way extraction.

⁴ See discussion of Scrub Clearance Grant, Chapter 7, page 42.

⁵ The role of private forestry in the national land-use pattern is considered in Chapter 10, page 56.

MARKETING AND THE HOME TIMBER TRADE

Present Situation

One of the most important problems confronting many woodland owners is how to dispose of their produce at a satisfactory price. This problem is especially acute for the smaller estates from which the best timber was removed during and just after the Second World War. On 30 estates surveyed, the war-time fellings were very extensive and these estates were denuded of most timber of good quality and of a marketable age, which was often far short of maturity. The result is that on such estates the quality of most of the timber felled since 1945, and available for felling for at least the next decade, is poor to moderate. There remain but a few individual trees or small stands of valuable mature timber, and the prospect of any increase in revenue from timber sales in the next few years is dim.

This situation is not confined to woods which were devastated during the last war. A similar problem confronts owners of many estates on which the woodlands were largely neglected during the first half of the present century, or for even longer. On 30 estates in the sample, the age structure could be described as "mainly over 80 or under 20 years old". In other words, the woods largely consist of mature or over-mature timber, and of plantations which have yet to reach the revenue-producing stage in their development. Again, there are exceptions within this general pattern, but on many of these estates the chief problem is how to dispose of poor quality, over-mature timber. Indeed, the obvious reason why many of these estates did not experience the ravages of war-time fellings is that they held little timber of commercial value. On the other hand, some estate woodlands, although of an unbalanced age structure overall, contain many very fine stands of mature hardwoods, notably among the beechwoods in the Chilterns.

In many cases the rehabilitation of derelict and semi-derelict woodlands depends upon the annual income from fellings being sufficient to cover the net establishment costs incurred each year. Thus in two ways, the marketing of woodland produce has an important bearing on the future of private woodlands. Firstly, in the short term, any planting may depend entirely upon sales revenue, and secondly, in the long term, current level of prices will encourage or discourage investment in young plantations—if forestry can be seen to have the possibility of being remunerative now, an owner is more likely to invest money in it with the hope that it will prove to be equally or more remunerative at the end of the rotation.

In contrast to the situations described above, there are some large estates, with perhaps over 1,000 acres

of productive, fully-stocked woodland with a balanced age-class structure. There may be an efficient estate sawmill, and the location may be near to expanding markets for many types of produce. A few foresters stated that demand for their products exceeded supply in every category, and the sawmill showed a substantial profit. In other cases there may be no sawmill, but the estate is situated near to a pulp or chipboard mill to which thinnings may be profitably sold, as well as being near to markets for mature timber. Although the margin on sales of pulpwood is small, it is better to make a small profit than none at all, and it is the small-size thinnings, both hardwood and softwood, which on many estates present a marketing problem as acute as the poor quality, mature timber.

For many owners, the root of the problem seems to lie in the fact that all the timber sold off the estate in a year is sold in one lot to one timber merchant. Timber of many sizes, ages, and qualities is often sold standing at an overall price per cube. If the quality of the main parcel is poor, the owner may have to include some better trees in order to induce a merchant to make any offer. The consequence is that the owner is dissatisfied with a low price and feels that he has had to "give away" some of his few good mature trees, while the merchant is equally dissatisfied at having to take such a mixed lot, including many grades which he does not want and which he may be incapable of converting in his own sawmill. If a resale, prior to conversion, is involved, then clearly the return to the grower will be reduced.

This points to the most unsatisfactory position within the home-grown timber trade at the present time. With a few notable exceptions, the general pattern is a profusion of small, inefficient sawmills, often family businesses, which are not very cost-conscious, and overhead and handling costs are very high compared to those of a large, efficient, integrated mill. Since timber prices are largely determined by the price of imported timber, it follows that the extra overheads have to be met by a reduction in the price offered to the producer. Further, such small sawmills have not the capacity or intake to turn out, regularly, substantial quantities of timber of any one specification, and consequently many of the large timber users, preferring to purchase bulk quantities, will not deal with the small merchant: uniform, regular supplies can be more readily obtained from the very large mills or from the timber importers.

Historical Survey

The problems associated with the marketing of woodland produce are not new. For many centuries up to the Industrial Revolution, most home-grown

timber was used locally and for mainly rural purposes (the chief exception being oak for shipbuilding industry). However, the second half of the nineteenth century witnessed a great transformation in the pattern of timber consumption. Iron ships replaced wooden ones, coal superseded underwood as a fuel both for domestic and industrial purposes, iron fencing and wire netting ousted wooden hurdles for many agricultural uses, to mention but three of the changes. At the same time, increasing amounts of easily workable timber were required for many new industrial uses. As a result, the importation of softwoods expanded rapidly, since home woodlands contained neither the quantity nor quality of conifers to meet this demand. The produce from the traditional oak woods met a shrinking demand, prices slumped, and many of such woods were coppiced (any saleable trees may have been sold at any price) or largely neglected. The turn of the century found many private woods stocked with unmarketable trees. The problem was how to dispose of second quality, small-size or over-mature timber. John Nisbet, writing in 1905, states "Oak woods of the copse and coppice classes, and highwoods grown from coppice shoots, are no longer remunerative, and are never again likely to become profitable".¹ Referring to many of the oak woods of Ireland, which he knew well, he comments: "unless the present poor crops can be disposed of advantageously, the landowners can have neither means nor desire to form any new plantations, which would tie up capital without giving any tangible return for many years to come. There are many thousands of acres of poor scrubby Oak woods . . . once sources of considerable profit, which have now long since failed to yield any annual revenue, owing to there being no local industries requiring such wood as its raw material".² Nisbet might well have been writing half a century later, and his remarks may be applied equally to Great Britain as to Ireland. Further, such problems have been accentuated by the relative absence of organisation in the home-grown timber trade.

The First World War brought large-scale exploitation of British woodlands, and after the war felling continued to be heavy until the industrial slump, when the home-timber trade again fell upon bad times. In the inter-war years, "On the whole the marketing was haphazard and there was no certainty of continuity of supplies",³ stated the Forestry

Commissioners in their report on Post-War Forest Policy, in 1943. The report adds that there were numerous small and mostly portable sawmills and during the Second World War their number had been greatly increased. The Commissioners envisaged a drastic reduction in the size of the home-timber trade in the immediate post-war years and called for its subsequent regrowth, as timber supplies increased, in a new direction "calling for initiative, new methods and new plant".⁴ They stated, "Clearly there will have to be better co-ordination between the owners of standing timber (both State and private) and timber traders".⁵

The Commissioners also mentioned that "it will be an important function of the Forest Authority to foster new industries, and we are confident that, provided the problems are approached in a scientific and business-like way, the pre-war reproaches as to the unsaleability of British timber can be completely removed, with corresponding benefits to forestry and the countryside".⁶ The "pre-war reproaches as to the unsaleability of British timber" may be traced from the failure of woodland owners to respond to the changing pattern of demand in the latter part of the last century by growing a large proportion of softwoods which would have been better suited to the requirements of the new industries than the traditional hardwoods. Instead, hardwoods continued to predominate, right into the twentieth century, and by 1914, only 7 per cent of the country's total timber requirements were being met from home sources. The war then forced home production to the other extreme: many estates lost far too much of their good timber, and were thus unable to sustain production through the '20s and '30s, even if the desire had been present in the owner. By the mid-twenties imports had regained the majority of the market, and there was an apparently unlimited supply of uniform, high-quality, cheap timber available from overseas. By contrast, at home, the "haphazard" marketing with little attention to grading and little care in presentation, mainly in small lots, coupled with the fact that too large a proportion of the good timber had been used during and immediately after the war, gave rise to a strong prejudice against the home-grown product. It was thought to be inherently inferior for most purposes, it was difficult to get a large, uniform parcel, and it tended to be dearer, rather than cheaper, than imported timber. Thus from every point of view

¹ Nisbet, John—*The Forester*, Vol. 1, Part 1, page 50.

² *Ibid.* page 51.

³ Forestry Commission—*Post-War Forest Policy*, 1943, paragraph 323.

⁴ *Ibid.* paragraph 327.

⁵ *Ibid.* paragraph 331.

⁶ *Ibid.* paragraph 328.

home-grown timber was "unsaleable"—the producers, the trade and the consumers were all unable to make a reasonable profit: in the case of the producer, a heavy loss was more common.

The task of the post-second war marketing organisation was not only to direct home-grown timber to the most appropriate markets, but to present it in such a way that the consumer was willing to consider it on its merits on equal terms with imported supplies, and not with a heavy initial bias in favour of the latter.

In 1954, nine years after the end of the war, and 11 years after the Forestry Commission's report on Post-War Forest Policy, a committee was set up by the Minister of Agriculture and Fisheries and the Secretary of State for Scotland, under the chairmanship of Mr. (afterwards, Sir) Hugh Watson, and known as the Watson Committee (on Marketing of Woodland Produce). The terms of reference were: "With the object of promoting confidence and stability, and bearing in mind both the output from Forestry Commission woodlands and the need to develop markets, to consider what measures might be taken within the home timber industry to improve the arrangements for marketing produce from privately owned woodlands; and to report".¹ The Committee's report, which was submitted to the Forestry Commissioners in 1956; reviewed successively the "development of a national forest policy; the production and supply of timber in this country; the market for timber and the problems of utilisation; the organisation of the home timber industry; the processes involved in the marketing of home-grown timber; and the financial position of private timber growers".²

The Committee diagnosed a twofold problem "to integrate the produce from privately-owned woodlands with the rapidly growing output from the State woodlands, and to integrate the total output from British woodlands into the total pattern of British timber consumption".³ The solution of the problem was considered to demand two things: "(a) a strong and effective association of private woodland owners; (b) a central consultative body representative of all the principal interests concerned in the marketing of home-grown timber".⁴

The report stressed the unco-ordinated nature of private forestry and stated that there was a pressing need for an organisation of private growers which

would have full information about its members' business, to ensure that private forest land were utilised to the maximum productive capacity, and that the marketing of produce from it would be planned and regulated efficiently.⁵ It was envisaged that the concern of such an association would cover the whole field of forestry: membership was to be voluntary, but the success of the organisation would depend upon full co-operation from every private woodland owner.

The central consultative body's main objectives were seen as planning the fullest utilisation of the country's timber resources, and ensuring the financial health and stability of the home timber industry.⁶ The Watson Committee recommended that these functions should be fulfilled by a newly constituted Home-Grown Timber Advisory Committee—an existing advisory committee linked with the Forestry Commissioners. In the summer of 1962, a Working Party was appointed by the Forestry Commission to examine this recommendation and in 1963 the proposal was put into effect. The main change in the Committee's constitution was the appointment of an independent chairman, Professor H. M. Steven, and two independent members, in addition to the representatives of the Forestry Commission, the private woodland owners, the timber trade, certain research organisations and the Board of Trade.⁷ In 1964, the representatives of the Commission (and of other Government departments) relinquished their membership since it was obviously anomalous for them to be members of a Committee appointed to advise the Commissioners. The Government representatives now attend meetings on an informal basis only.

The Watson Committee's other recommendation was implemented much more rapidly, partly due to Government pressure. In 1958, the Timber Growers' Organisation was formed by the Country Landowners' Association, as an organisation of private woodland owners in England and Wales (In Scotland the Scottish Woodland Owners Association operates). The Organisation became independent in November 1960, with substantial financial assistance from the Country Landowners' Association. Financial support from the Treasury ceased in October 1962, but the Organisation is still some way short of achieving the target of a membership covering 600,000 acres of woodland, and producing a subscription income of £30,000 per annum.⁸ Such an income is deemed to be

¹ *Report of the Committee on Marketing of Woodland Produce*, paragraph 1 (H.M.S.O., 1956).

² *Ibid.* paragraph 126.

³ *Ibid.* paragraph 149.

⁴ *Ibid.* paragraph 150.

⁵ *Ibid.* paragraphs 137, 150.

⁶ *Ibid.* paragraph 159.

⁷ See Forestry Commission—*Forty-fourth Annual Report of the Forestry Commissioners, 1963*, page 19.

⁸ Present (1965) membership covers approximately 500,000 acres.

necessary for the T.G.O. to fulfil adequately its various roles and at the same time create a Reserve Fund which is essential for the Organisation's financial security. The target would appear to be reasonable, since it is slightly less than the area of woodlands now either Dedicated or Approved,¹ and well below the total area under systematic management.

In the field of marketing the Timber Growers' Organisation operates on both national and regional levels. Nationally, the Organisation is in frequent consultation with the Forestry Commission and the Timber Trade, and there is increasingly close co-operation between the three partners in the home timber industry, as evidenced by the establishment in 1963 of Area Marketing Liaison Committees. The Organisation is also concerned with matters such as the collection of statistics of production, the investigation of possible future markets and trends in demand and the provision of advice to woodland owners on a wide variety of subjects.

The individual owner's contact with the T.G.O. is largely through the Regional Committees and their secretaries. England and Wales are divided into 12 regions. In some regions the secretary is an officer of a woodland owners co-operative association, the association acting as local agents of the T.G.O., while in other areas, the post is held by an independent person. The non-uniform relationships between co-operatives and the T.G.O. leads to a certain amount of confusion in the minds of private woodland owners.

Co-operative Marketing and Log Grading

One of the main functions of the regional secretaries is to assist members to market their woodland produce to the best advantage. The form of such assistance varies according to the regional organisation. Where there is a co-operative association, this body will undertake marketing of timber on behalf of woodland owners, and efforts are made to direct supplies to those markets where the demand is greatest. In most regions, the Organisation attempts to collect statistics of production to aid the planning of markets in the future, and sometimes records of recent sales are published for members' guidance. The distribution of these regional price statistics on a national scale is of doubtful value, since there are important variations in demand, and therefore price, for different species between one region and another. Consequently, figures of prices obtained for, say, oak in an area where local demand is good, can induce a false optimism among owners elsewhere and subsequent failure to obtain a comparable price can bring an unjust criticism of the T.G.O. or a

marketing organisation. Meaningful comparisons of prices are made the more difficult by the absence of a precise system of grading, acceptable to both owner and merchant. Owners naturally tend to upgrade their own produce, and there are many problems in formulating a series of grading rules which can be easily understood and uniformly applied. Such a system would, however, be of great benefit to both grower and merchant—the merchant could avoid many wasted journeys to inspect unsuitable material, and the owner would be in a much stronger position to negotiate the price for produce in a particular, recognised category. The organisation is continuing in its efforts to devise satisfactory grading regulations, acceptable to the timber trade, and regards this as a vital step towards the ideal situation in which, through non-profit-making co-operative associations of woodland owners, it acts as a specialist agent to arrange the sale and delivery of graded logs to a small number of efficient, integrated mills. Only then can every part of every tree be sold where demand is greatest. Greater efficiency in the sawmilling industry, coupled with the economies of large-scale operation, will lead to reduced wastage and lower overhead charges, and if the merchant can also get the raw material he wants, without large quantities of unwanted lumber, then the home timber trade's position in the world market will be greatly strengthened.

There are many obstacles in the path which leads to the ultimate goal of fully co-operative marketing. Not least of these is the conservatism of many woodland owners who rigidly adhere to their individual marketing methods, refuse to co-operate by joining the T.G.O. and produce no details of future production. The main survey revealed that of the 72 estates only 12 made use of a co-operative organisation for the marketing of all their woodland produce, while 50 were found to sell all their own produce direct to the trade. The balance of 10 estates is comprised of those estates with no timber sales at the present time—all the produce being required for estate purposes, or there being an absence of any mature trees—and those from which timber was sold in both ways. In this latter category it was often found that the high-priced, best-quality material was sold direct, leaving the second and lower grades for the selling agency!

One can appreciate why certain estates, particularly the larger ones with profitable estate sawmills, prefer to continue to organise the marketing of their own produce because of their past successes, but in view of the many indirect benefits which accrue to all woodland owners through the activities of the T.G.O., one would hope that all owners would at

¹ See discussion following Table 2.1, page 8.

least be willing to join the organisation and assist its work as far as possible. It will be quite impossible, for instance, to supply the timber trade with accurate information as to the quantities and specifications of timber likely to be for sale in the near future unless all producers assist by supplying production forecasts. There have been suggestions in some quarters that such forecasts should be made compulsory by requiring woodland owners to make an annual return, similar to the compulsory agricultural "June 4th Returns". It must be remembered that forecasts of timber sales will always remain subject to considerable error since, unlike agricultural crops, a tree crop may be retained for many years beyond the date originally fixed for its removal, if the owner so desires. For example, he may consider that the current price is lower than anticipated but there is a prospect of an increase in a few years, or the death of the owner may completely alter an estate's forest policy.

The available evidence suggests that many owners are now finding that co-operative marketing and log grading are worth while, and that the Timber Growers' Organisation is taking many steps in the right direction.¹ But this is only a small beginning: much remains to be done, and many difficulties have to be faced and overcome. It will take a few years and it may be that there will have to be a slump in the timber trade both to force many small sawmills out of business and to bring home to the majority of owners that their present, traditional marketing "methods" are very inadequate. It will take time, but there is every reason to hope that in the not too distant future, order may arise out of the present chaos, and one might go so far as to say that if it does not, private forestry, with the exception of a few of the largest estates, can never be an economically stable enterprise.

¹ One small but important example comes from the Isle of Wight. Following a drop in prices offered by the merchant on the island, 12 owners pooled their supplies, totalling 50,000 cube. These were sold through the T.G.O., the butts and second logs to various merchants on the mainland (certain veneer butts went as far as Reading) while the tops were disposed of locally. The overall net return was far in excess of the local merchant's original offer.

Chapter 9

FUTURE DEMAND FOR TIMBER PRODUCTS

Imported Timber Supplies

One of the main criticisms of the work of the Watson Committee on Marketing of Woodland Produce, whose report was briefly reviewed in the previous chapter, was that the terms of reference were too narrowly interpreted when any consideration of import policy was omitted.¹ At a time when home produce supplied less than 10 per cent of the total national requirements surely some attention might have been devoted to an examination of the effects on the home timber trade of current import policies and imported supplies. The official policy at the time when the Committee sat was to build up the national forest resources to provide about one-third of domestic requirements,² which would entail a reduction in the proportion of imports of at least 25 per cent. Consequently, competition between the home and imported products would intensify, and as MacGregor points out, "it is difficult to conceive of measures to promote 'confidence and stability' which do not give weight to the overwhelming influence of external supplies".³ It is not within the scope and purpose of this dissertation to give a detailed appraisal of current trends in the world timber markets and to assess probable future demands for various types of timber products, but it is felt that some consideration should be given to a general examination of likely developments which will be of particular importance to the British timber grower. However successfully the home marketing machinery may be organised, and however efficient the timber trade may become, these improvements will be of little avail if the demand for the home-grown product declines or remains static, instead of increasing three- or four-fold as envisaged in planning for the increase of the forest area of Britain to 5 million acres.⁴

The dramatic increase in supplies of imported softwoods, following the Industrial Revolution, has already been mentioned.⁵ Britain became Europe's principal importer of softwoods. Not until the first World War was it appreciated how vulnerable was

our position when relying on supplies from abroad to meet the overwhelming majority of our timber needs. The acute shortage of shipping space drastically curtailed imports of such a bulky cargo, and at one stage the stocks of timber were almost exhausted. This situation was repeated within the next 25 years, and Government policy statements at the end of each War stressed the strategic importance of expanding the forest area of this country. It was primarily this consideration which led to the target of 5 million acres of productive woodland by the end of the century.⁶ This policy was somewhat modified in 1958,⁷ and the emphasis in Forestry Commission operations has been switched from increasing the woodland areas as rapidly as possible to economic timber production, consistent with other objectives such as the provision of employment in rural areas, amenity and recreational facilities. Nevertheless, the rate of planting in the five years since 1958 has averaged 59,612 acres per annum as against 62,204 acres per annum during the preceding five years.⁸ During recent years, private woodland owners have been planting at a rate approximately one-half of the Commission's.⁹ However, these massive post-war plantings are not yet exerting a large influence on the timber market—the recent increases in home-grown supplies have come largely from areas afforested or replanted in the inter-war years. Consequently imports still represent about 90 per cent of all timber and timber products consumed in the United Kingdom, the annual value of imports being in the region of £450 million. The values of the principal imports for 1962 and 1963 are given in Table 9.1, based on figures extracted from the United Kingdom Trade and Navigation Accounts for December 1963.¹⁰

With a timber import bill approaching £500 million, many people have considered that import-saving must be one of the most important objects of forest policy, replacing the strategic value which is now largely discounted in the present state of international defence strategies. However, as Grayson

¹ MacGregor, J. J.—"Woodland Marketing and the Watson Committee's Report". *Journal of R.A.S.E.*, Vol. 118, 1957.

² Forestry Commissioners—*Post-War Forest Policy*, 1943, H.M.S.O., 1943.

³ MacGregor, J. J., *op. cit.*

⁴ Forestry Commissioners—*op. cit.*

⁵ See Historical Survey in Chapter 8, page 46.

⁶ Forestry Commissioners—*op. cit.*

⁷ See Minister of Agriculture's statement in the House of Commons, 24th July 1958—*Hansard*, Vol. 592, cols. 684–5.

⁸ Forestry Commission—*Forty-Fourth Annual Report of the Forestry Commission*, 1963. Figures calculated from Table 14.

⁹ *Ibid.* paragraph 17.

¹⁰ H.M.S.O., 1964.

TABLE 9.1
UNITED KINGDOM IMPORTS OF TIMBER AND
TIMBER PRODUCTS

Description	1962	1963
	£'000	£'000
Wood and lumber	155,903	169,590
Woodpulp	104,389	114,238
Wooden manufactured articles (excluding furniture) ..	48,395	50,596
Paper and paperboard ..	105,038	113,887
Total	413,725	448,311

Note: 1. This table includes the principal items only: minor categories such as furniture bring the total for 1963 to over £450 million.

2. Figures are given to the nearest thousand.

has pointed out, "the desire for import substitution—so uncritically voiced in the immediate post-war years—is now not viewed so sympathetically".¹ On the other hand, whilst the consideration may not be of paramount importance, import-saving would be a useful incidental benefit if an increase in forestry were desirable on other grounds. Clearly there is great scope for an enlarged home timber industry to capture much more than its present share of the home market. Figures for 1960–62 indicate that this share is already beginning to increase (see Table 9.2.)²

TABLE 9.2
HOME GROWN TIMBER COMPARED WITH IMPORTS

Year	Home Grown Timber as Percentage of Imports	
	By Quantity	By Value
1960	15.0	10
1961	15.6	10
1962	16.3	11

If there is scope for a substantial increase in production at the current level of demand, one must then consider probable trends in demand and supply, to determine whether such scope will increase or decrease. It is most important that the timber grower

should be able to feel reasonably confident at the time of making an investment in a plantation that there is a high probability of a suitable market for the mature end-product after 50 or may be 100 years. Such is the long-term nature of forestry investment, that one must look beyond the immediate future.

European Outlook

An examination of European timber trends and prospects for the second half of the present century was undertaken in 1963 by the United Nations Food and Agriculture Organisation and the Economic Commission for Europe.³ The joint committee looked most closely at the period up to 1975, and estimated that the trend in consumption of wood and wood products would continue as shown in Table 9.3.⁴ Actual figures for earlier years are included for comparison.

TABLE 9.3
ESTIMATED APPARENT CONSUMPTION OF WOOD AND
WOOD PRODUCTS IN EUROPE IN 1913–75
(Million cubic metres of round wood requirements—
solid measure without bark)

	1913	1925–29	1935–38	1950	1960	1975
Industrial wood	138	153	173	169	233	340
Fuel wood	136	144	129	118	107	93
Total	274	297	302	287	340	433

Note: Figures prior to 1950 taken from "European Timber Statistics, 1913–50", U.N./F.A.O., 1953.

The fundamental change in the rate of growth in Europe's wood needs has stemmed from a basic shift in the manner of utilisation, and the F.A.O./E.C.E. study report points out that the recent upsurge in consumption reflects the growing share of all Europe's industrial wood which is now consumed as wood pulp products and wood-base panel products. This is shown in Table 9.4⁵ which gives alternative estimates for 1975, based on two rates of growth in Europe's gross national product, the lower growth-rate giving a gross product in 1975 about 10 per cent less than aimed at, at the higher level of growth.

¹ Grayson, A. J.—"Forestry Claims and Land Use in Great Britain; Institutional features". Report on Land Use Course for Forestry and Agriculture, 1963, Commonwealth Forestry Institute, Oxford, 1964.

² See *The Timber Grower*, April 1963 (No. 8), page 24.

³ F.A.O./E.C.E.—*European Timber Trends and Prospects: A New Appraisal, 1950–75*, U.N., 1964.

⁴ F.A.O./E.C.E.—op. cit., Chapter 24, Table 1.

⁵ F.A.O./E.C.E.—op. cit., Table 4 of Chapter 12, and unpublished F.A.O. paper.

TABLE 9.4

TOTAL USE OF INDUSTRIAL WOOD IN EUROPE IN 1950 AND 1960 AND ESTIMATES FOR 1975, BY GROUPS OF PRODUCTS
(WOOD RAW MATERIAL EQUIVALENT VOLUMES IN MILLION CUBIC METRES)

	Quantity				Percentage			
	1950	1960	1975		1950	1960	1975	
			Higher	Lower			Higher	Lower
Sawnwood	98.3	126.9	148	140	57	52	41	42
Woodpulp	33.2	64.6	150	135	19	26	41	40
Wood-based panel products ..	5.8	15.9	43	37	3	6	12	11
Other industrial roundwood (a) ..	36.5	38.1	24	24	21	16	6	7
Total equivalent volume of wood raw material	174	245	365	336	100	100	100	100
Total roundwood requirement (b) ..	169	233	340	313	97	95	93	93

(a) Used in unprocessed form (pitprops, poles, posts, etc.).

(b) Arrived at by deducting industrial wood residues from the total wood raw material.

It will be observed from Table 9.4 that even at the lower level of economic growth, demand would rise by more than 80 per cent between 1950 and 1975. There is the possibility for many reasons, that Europe's timber requirements could increase more or less rapidly than the above forecasts, but the study group stressed that it is extremely unlikely that the growth in requirements will be other than very large indeed.

The committee then turned to a consideration of the supply situation, reviewing firstly Europe's output of roundwood and likely rates of expansion, and secondly, supplies from overseas. The conclusion was that, by 1975, it is to be expected that Europe "will come to draw upon overseas supplies from other parts of the world to a growing extent:"¹ that while there is, potentially, scope for considerable increases in production from existing forests within the continent, the increases in domestic supplies will be subject to economic limitations such as high logging and processing costs.

Looking beyond 1975 to the end of the century, the report states that there is serious reason to doubt whether the supply pattern which can be expected to develop in the period to 1975 will suffice for the longer period. There are physical and economic limits to the additional volume which can be obtained from the existing forest resources of Europe, and any substantial increases in output must come from increases in the forest area. It is suggested that land would become available for such forest expansion, since it has been estimated that by 1975, up to 6.5 million hectares of agricultural land

will have become surplus to Europe's needs for agricultural products. There will, of course, be counter-demands from other uses, notably urban development and recreation, but at least a part should be made available for growing trees.

At the same time, the domestic requirements of Europe's overseas suppliers are rising fast—for example, the United States could well become a wood deficit area by the end of the century.² It is thus important that Europe should broaden the base of supply to help meet her future requirements, at the same time as increasing domestic production.

The F.A.O./E.C.E. report concludes by reiterating that the long-term growth in Europe's requirements points to the need for a fundamental shift in the supply pattern, and continues—"Given the magnitude of Europe's expected requirements there would seem to be need for development in both directions"—as stated in the previous paragraph. The report gives a reminder that plantations must be established before 1975 if they are to make a contribution to supplies by the end of the century.

Changing Demand and Supply Patterns in Britain

These trends and prospects refer to Europe, but a breakdown of the statistics into various groups of countries reveals that the British Isles' pattern is typical of the continent as a whole: that at the higher assumed economic growth rate, the net deficit in 1975 will be double that of 1950 even allowing for an increase of over 60 per cent in home production. Detailed figures for various parts of Europe are given in Table 9.5.³

¹ F.A.O./E.C.E.—op. cit.

² See Landsberg, H. H., et al.—*Resources in America's Future*, 1963.

³ F.A.O./E.C.E. op. cit. from Table 6 of Chapter 24.

TABLE 9.5

CONSUMPTION OF WOOD PRODUCTS AND REMOVALS OF INDUSTRIAL ROUNDWOOD IN EUROPE IN 1949-51 AND 1959-61 AND ESTIMATES FOR 1975, BY REGIONS
(MILLION CUBIC METRES)

	Consumption in W.R.M.E. (a)			Removals without bark			Surplus or deficit		
	1949-51	1959-61	1975	1949-51	1960	1975	1949-51	1959-61	1975
Northern Europe	18.5	23.4	30	61.3	79.5	96.5	+42.8	+56.1	+67.5
European Economic Community	64.1	98.4	153	42.1	51.2	64.5	-22.0	-47.2	-88.5
British Isles	27.3	36.4	56	3.1	3.0	5.0	-24.2	-33.4	-51.0
Total Europe roundwood requirement (b)	171	233	340	—	—	—	+ 5.0	-21.0	-70.0

Note: 1975 figures show only the upper level of estimated requirements.

(a) Wood raw material equivalent.

(b) Arrived at by deducting use of industrial wood residue from total wood raw material.

It is apparent that the forest industry of this country can plan for the future on the basis that the total demand for timber products will steadily increase for at least the next half-century. It is also probable that by the end of the century, abundant supplies of timber imports will be rather less easy to obtain. That is not to say that there is a likelihood of a world timber shortage in the foreseeable future. A F.A.O. study of the world timber situation concluded that there can be no doubt of the capacity of the world's forests to furnish the total world requirement at the end of the century and beyond.¹ Grayson asserts that "the argument that world 'shortages' of wood are either imminent or foreseeable is, of course, economically very naive".² He goes on to point out, however, that the rising pressure of demand on supply has resulted in a long-term tendency for the real price of wood and its products to rise. The following figures, relating to "real price changes 'standardised' for their histories over the last 50 years", provide evidence of this trend. They represent the average rates of rise in price (per cent compound per year) for softwoods:

Paper	0	Sawnwood	1½ to 2
Pulp	about 1	Sawlogs	1 to 3
Pulpwood	about 1½	Stumpage	1 to 4

"If similar rises—or indeed any rise—in the real price of stumpage can be foreseen in the future then this constitutes a measure of the degree of 'shortage' obtaining".³

While the total demand in Britain for timber and timber products may increase, with accompanying price improvement, there will be important changes in the pattern of that demand. One important feature of such change concerns the use of timber in the mines. In recent years, about one-third of the total forest production of Great Britain has been taken by the National Coal Board⁴ and the percentage of all pitwood which was home grown increased from 10 per cent in 1958 to 60 per cent in 1961.⁵ However, although the N.C.B. is willing to increase this proportion still further, provided the home product can compete on an even basis with imports, the total consumption of pitwood is declining, and it cannot be expected that the mines will absorb a large part of the anticipated increases in home production.

The diminishing importance of pitwood is being counterbalanced by increasing demand for pulpwood, particularly softwoods. Consumption of home-grown pulpwood of all kinds has trebled since 1958.⁶ The supply of pulpwood, particularly from the Forestry Commission forests, will increase even

¹ F.A.O.—"The Growth of Forest Industries and their Impact on the World's Forests". *The State of Food and Agriculture, 1958*.

² Grayson, A. J., op. cit.

³ Grayson, A. J., op. cit., page 53.

⁴ Forestry Commission—op. cit.

⁵ The Timber Growers' Organisation Ltd.—*The Timber Grower*, April 1963 (No. 8), page 23.

⁶ See Richards, E. G.—"Timber: Britain's Home Resources"—*Financial Times*, 19th November 1962.

more rapidly as the post-war plantations reach the thinning stages. An encouraging sign for producers has been the establishment of a softboard (insulation board) mill at Thetford, in East Anglia, and a large integrated pulp and paper mill at Fort William, in the Highlands of Scotland, with Government assistance in the form of grants and loans. In each case, the Forestry Commission was able to guarantee a minimum level of supplies, and clearly the private woodland owners in the respective areas will benefit considerably. A chipboard mill has been opened at Hexham, Northumberland, and the question of a further mill at Okehampton in Devon has been under discussion. Again, success or failure in getting such mills established will depend largely upon the largest timber producer in each area—the Forestry Commission.

The development of new methods of wood preservation, fire retardant treatments and the use of adhesives to join short lengths of timber together, has opened up a wide range of possibilities for the use of timber in the building industry. Such new techniques have led to glued laminated arches of clear spans up to 300 feet; to thin domes in timber, formed of a number of layers of boarding, glued and screwed together; to long roof truss frameworks of short lengths of timber and to many types of external and internal cladding and surface finishes.^{1, 2} The dual role of wood—structure and cladding—offers many interesting alternatives to the designer and builder; alternatives which could well be exploited much more fully to make a more important contribu-

tion towards the provision of the domestic, industrial and public buildings which Britain urgently requires. Here too, there appears to be an expanding market, although for types of timber different from those used in the past in traditional forms of building.

It is an important task of all parties connected with the home timber industry, including the Government, to encourage the development of a wide range of wood-using industries based on home-grown timber. Only in this way will the home producers find expanding markets for their potential production. The total demand for timber and timber products will undoubtedly increase: whether this demand is satisfied by an increasing proportion of home-grown material is, to a large extent, in the hands of the woodland owners and the home timber trade. It is essential for the consumer to be satisfied that the home product is at least as good in every respect as potential imports, and is available at a comparable price. To meet these requirements, a radical reorganisation of the home timber industry is necessary, and some aspects of this were discussed in the previous chapter. The consumer demands large quantities of timber of a uniform specification and high quality. Such produce must be marketed and delivered with maximum efficiency and there must be accurate advance knowledge of supplies, with guaranteed minimum quantities. In short, the growers must collaborate with the consumers in producing the right material at the right time and in the right place. If this can be done, the future of the home timber industry should be bright.

¹ See Murtagh, J. A.—“Wood—its uses and its future”, *The Guardian*, 3rd April 1964.

² See Meyer, P. B., *et al.*—“Timber Industry”, *Financial Times*, 19th November 1962.

Chapter 10

BRITISH FORESTRY

State and Private Woodlands

Of the 561,010 acres of agricultural and forest land covered by the main survey, 78,395 acres were woodland,¹ that is 14 per cent. There were wide variations of the land use pattern among the estates, which have already been discussed,² and it must be remembered that the overall pattern of the survey is by no means typical of Britain as a whole. Unfortunately, no Scottish estates could be included in the study, and the estates surveyed were chosen deliberately on account of their known "positive" forest policies. Not surprisingly, the percentage of woodlands included in these estates is considerably in excess of the national average. The following table, Table 10.1, shows the woodland area of Great Britain at various times from 1892 to the forest year ended 30th September 1963, and the percentage of the total land area occupied by woodlands.

TABLE 10.1
WOODLAND AREA OF GREAT BRITAIN

Year	Total Woodland (million acres)	Percentage of Land Area	Source of Data
1892	3.00(a)	4.0(a)	Agricultural returns
1924	2.96	5.3	Census of Woodlands, 1924
1947	3.63	6.4	Census of Woodlands, 1947-49
1957	4.01	7.1	Forestry Commission Estimates(b)
1963	4.25	7.5	Forestry Commission Estimates(b)

(a) These figures relate to the United Kingdom.³ The percentage for Great Britain at the turn of the century was approximately 5 per cent.

(b) Unpublished Forestry Commission papers.

These figures show that over the last 40 years, there has been an increase in the wooded area of Great Britain of more than 1½ million acres, representing about 2.2 per cent of the total land area. In terms of forest area, the increase between 1924 and 1963 was 43 per cent. In spite of this considerable

achievement, Great Britain remains one of the most poorly wooded countries of Europe, as is evident from Table 10.2.⁴

TABLE 10.2
FOREST AREAS OF EUROPEAN COUNTRIES

Country	Year	Total Woodland Area (million acres)	Percentage of Total Land Area
Great Britain ..	1963	4.25	7.5
United Kingdom	1957	4.09	6.9
Belgium	1950	1.49	19.8
Denmark	1950	1.10	10.5
Eire	1958	0.36	2.1
Germany	1958	17.39	28.9
Finland	1958	54.20	71.7
France	1951-53	28.85	21.1
Netherlands ..	1958	0.62	7.4
Norway	1958	18.52	24.4
Spain	1958	39.18	31.8
Sweden	1953	56.75	56.0
Europe		348.30	29.9

With the exception of Eire (and also of Iceland) the Netherlands is the only European country with as low a percentage of forest land as Great Britain, and only the Netherlands has a smaller forest area per head of population, the figure for Great Britain being 0.07 acres per head.⁵

Table 10.3 gives the distribution of British woodlands between those in private ownership, and those owned by the State. Prior to the formation of the Forestry Commission in 1919, woods included in the latter category were the former Crown woodlands, while after that date State woodlands are solely comprised of Forestry Commission property. In fact, a certain amount of woods are still vested in the Crown, but these, together with woods held by various public bodies, are now included in "private woodlands". Most of the ancient Crown forests, notably the New Forest and the Forest of Dean, were transferred to the Forestry Commission in 1923.⁶

¹ See discussion following Table 2.1, page 8.

² See especially Chapter 3, page 11.

³ See Brown, J. and Nisbet, J.—*The Forester*, 1894, page 66.

⁴ Extracted from F.A.O.—*World Forest Inventory 1958*, 1960, and Forestry Commission estimates.

⁵ See F.A.O.—*World Forest Resources*, 1955.

⁶ Transfer of Woods Act, 1923.

TABLE 10.3
WOODLAND OWNERSHIP OF GREAT BRITAIN

Year	Private Woodlands		State Woodlands		Total Woodland Area (million acres)
	Area (million acres)	Percentage of Total Woodland Area	Area (million acres)	Percentage of Total Woodland Area	
1892	2.94	98	0.06	2	3.00
1924	2.76	93	0.20	7	2.96
1947	3.01	83	0.62	17	3.63
1957	2.76	69	1.25	31	4.01
1963	2.70	64	1.55	36	4.25

Sources: As Table 10.1.

The significant feature here is the absolute fall in the acreage of private woodland, as well as its decrease relative to State-owned forests. The main reason for the decline is the acquisition by the Forestry Commission of more than 259,000 acres of woodland from private owners during the 10-year period to 1957.¹ The majority of this area was composed of old coppice and unproductive woodlands, most of the latter having now been rehabilitated. The surveys provided a few examples of woodland either recently sold to the Commission or let on a 99- or 999-year lease. The explanation given in most instances was that the resources of the proprietor

were insufficient for the proper management of the woodlands, and it was deemed more desirable to sell them at a low price or to receive a nominal rent,² than to allow such woods to deteriorate further and to become a liability rather than an asset.³

The relative importance of privately owned and Forestry Commission woodlands is more clearly seen from a comparison of areas of *productive*⁴ forests (Table 10.4), rather than total areas classified as woodland.

This table shows that the productive Forestry Commission woodlands now cover an area which is nearly equal to the acreage of productive woodlands

TABLE 10.4
WOODLAND AREAS OF GREAT BRITAIN BY PRODUCTIVITY
(AREAS IN THOUSANDS OF ACRES)

Year	Productivity	Private Woodlands		Forestry Commission Woodlands		All Woodlands	
		Area	%	Area	%	Area	%
1958	Productive ..	1,653	60	1,172	90	2,825	70
	Unproductive..	1,093	40	124	10	1,217	30
	Total ..	2,746	100	1,296	100	4,042	100
1963	Productive ..	1,737	64	1,475	95	3,212	76
	Unproductive..	963	36	71	5	1,034	24
	Total ..	2,700	100	1,546	100	4,246	100

Source: Forestry Commission—unpublished papers.

¹ Forestry Commission—unpublished paper.

² A common rent was 2s. 6d. per acre.

³ See closing paragraphs of Chapter 3, page 19.

⁴ Woodlands other than scrub, devastated and felled areas. See Forestry Commission—*Census of Woodlands, 1947–49*, page 35.

in private ownership. In the five years to 1963, the Commission's productive forest area increased by 300,000 acres, largely as a result of new plantings on bare land. In the same period the productive area of private woodlands increased by 84,000 acres and the unproductive area decreased by 130,000 acres. The difference between these two figures is accounted for by sales to the Forestry Commission and the clearance of small areas for building purposes and for agricultural use. The surveys revealed few examples of a significant change of land use between forestry and agriculture, and it seems probable that a reluctance to make such changes is widespread among land proprietors.¹

It is thus unlikely that, in the present circumstances, the total area of private woodlands will change significantly. However, Table 10.4 indicates the potential increase in output from private woodlands if the land so designated were brought into full production. Twenty-four per cent of the woodland area of Britain is unproductive, and most of the one million acres in this category are in private ownership. The rehabilitation of the majority of this acreage could ultimately increase the output from private forests by as much as 50 per cent. Some of this area no doubt represents woodlands which are not suitable for economic management, while some of the unproductive areas should perhaps be reclaimed for agricultural or other use, but there is clearly considerable scope for increasing productivity. As far as private woodlands are concerned, it is mainly as a result of improved management of existing woods that additional output is likely to come.

By contrast, the output from the Forestry Commission forests is increasing and will continue to do so for some considerable period as the existing plantations gradually approach "normality" and a sustained yield. Further increases will arise as the Commission continues to add to the area of the State forest.

Relations between the Forestry Commission and the Private Owner

Reference has already been made to the desirability of close co-operation between the Forestry Commission and private woodland owners in the field of timber marketing, and to the benefits which can accrue to private forestry in areas where the Commission is able to guarantee large supplies for wood processing industries.² At the present time, the Commission's output of softwoods is about four-fifths of that of private woodlands, and the outputs

are expected to be equal by 1970. Hardwood production is almost entirely from private forestry. By 1980 it is estimated that the Commission will be producing 50 per cent more softwoods than private forests, and nearly four times its present output.³ Thus even if all private owners were to form themselves into efficient co-operative organisations (The Timber Growers' Organisation of England and Wales, and the Scottish Woodland Owners' Association) which enabled private owners to speak with a single voice, or with one voice on each side of the Border, the Commission would still dominate the softwood market, and to an increasing extent. Up to the present, relations between the Forestry Commission and the private grower have been good, and there is no reason why they should not continue to be so. However, the fact remains that competition between the two sides will increase considerably as the Commission devotes more and more of its energies to marketing. This competitive spur could do much to sharpen the keenness of those concerned with timber sales from private estates, while the Commission's efforts are likely to open up new outlets for woodland produce, from which all timber growers will benefit.

Up to 1964, forestry matters were the responsibility of the Minister of Agriculture and the Secretary of State for Scotland. This function of the Minister of Agriculture has been taken over by the Minister of Land and Natural Resources,⁴ and the Secretary of State for Wales is now a third Forestry Minister. The custom has been for questions relating to forestry—both the State and private sectors—to be referred to the Forestry Commission for advice and comment. Thus private forestry matters have been dealt with largely on the advice of private forestry's chief competitor! Perhaps the time has come to put the two sectors of the industry on a more equal footing as regards access to the Ministers, so that even though the Commission may not have misused its special relationship, justice may also be seen to be done. An important advisory role could be filled by the Home-Grown Timber Advisory Committee.

National Forest Policy

Any consideration of the future of forestry in Britain raises questions concerning our national forest policy. What is the forest policy of this country, and on what grounds can it be justified?

The circumstances which obtained in 1919 when the Forestry Commission was set up were repeated at the end of the Second World War. Before each

¹ See third paragraph of Chapter 3, page 11.

² See Chapter 9, page 51.

³ See Wallace, A. F., of Candacraig—"Britain's Future in Forestry", *The Times*, 5th January 1963.

⁴ Responsibility for forestry policy in England was restored to the Minister of Agriculture on 16th February 1967. S.I. 1967, No. 156.

war, Britain had been dependent upon imports for over 90 per cent of the timber and timber products required. During each war imports were drastically reduced or cut off altogether, and British woodlands were plundered and often completely devastated in order to provide sufficient timber for the nation's use. Practically the whole of these ravages fell on to private woodlands, since even by 1945, most of the State plantations were far too young to yield useful material. "Only 3 per cent to 4 per cent of the total volume of utilisable timber standing in the country at the beginning of the war (1939) was due to direct State planting".¹

The Forestry Commission's main report on "Post-War Forest Policy"² recommended an ultimate objective of 5 million acres of *effective* forest. It was considered that such an area would eventually provide annually for about one-third of the nation's requirements, and would constitute a reasonable reserve in the event of any future national emergency: the strategic importance of a sound national forest programme was stressed. The target of five million acres by the end of the century remained the official objective for many years after the War. Subsequent reviews of forest policy have led to certain modifications in the Commission's planting programmes, partly owing to the difficulty of maintaining an adequate reserve of plantable land in the ownership of the Commission. Further, there has been a considerable shift of emphasis among the considerations basic to British forest policy, and the Minister of Land and Natural Resources announced in mid-1965 that a "major review of the nation's forest programme" had begun.³

A detailed analysis of British forest policy is not within the scope of this dissertation but a brief review of national policy considerations is desirable before turning to the place of private forestry within the national forestry plans.

The strategic value of a productive national forest may now be largely discounted. Modern weapons of war suggest that any future major conflict is likely to be of short duration. In any case, wooden pit props, for instance, which were a vital necessity 50 years ago are less important now—steel props are being used increasingly and the industry of the country is no longer dependent upon coal. A short-term cessation of timber imports due to hostilities would not be disastrous, and the idea of long-term shortages in world timber supplies has already been dismissed.⁴

Thus the emphasis which was placed on the strategic weaknesses of an over-dependence on imported supplies of timber is no longer justified.

The saving of foreign exchange has long been advanced as an important reason for raising the output of Britain's forests. However, as mentioned in the previous chapter, this argument now carries little weight, for it appears that it would not be to the country's advantage to reduce substantially the timber import bill. Nevertheless, in view of the increasing demand for timber and timber products, there is scope for increased home production which would cause the annual import bill to rise more slowly, even if the present level of imports should not be cut.

The need to provide increased employment opportunities in rural areas is one of the main reasons advanced by the Government and the Forestry Commission for the extension of the forest area, especially in parts of Wales and Scotland. The Minister of Agriculture stated in the House of Commons in 1958, "In deciding where planting shall take place, special attention will be paid to the upland areas . . . where expansion of forestry would provide diversification of employment and important social benefits".⁵ There is no doubt that the Commission's forests have provided jobs for a considerable number of people who might otherwise have left their native villages to seek employment in urban areas. Along with the increased employment have come some of the advantages of more viable village communities—better transport services and public utilities, more schools, more shops, better recreational facilities, and so on. All those things can have a revitalising effect on the social life of an area, and in some cases completely new villages have been built. However, these benefits must be seen in perspective—life in remote villages does not become idyllic overnight, and the number of people who have benefited is relatively small compared with the total rural population of Britain.

This aspect of national forest policy raises questions as to why it is considered desirable to maintain the rural population at its present level, and why efforts should be made to stop people "leaving the land". Apart from the obvious advantages for the ageing population which would be left if the younger section of the working population moved to the towns, why is official policy directed towards inducing more people to take employment in the

¹ Forestry Commission—*Post-War Forest Policy: Private Woodlands*, 1944, Cmd. 6500.

² 1943, Cmd. 6447.

³ See *Estates Gazette*, Vol. 194, page 829, 5th June 1965.

⁴ See Chapter 9, page 51.

⁵ *House of Commons Debates*, Vol. 592, cols. 684, 685, 24th July 1958. This policy was re-emphasised in a Ministerial statement made in Parliament on 24th July 1963. See *Hansard*, cols. 1467–1472.

countryside? The paramount need of both agriculture and forestry is increased efficiency, particularly in terms of output per man. If a contraction of the labour force in these industries were to take place "naturally", there would be no problems arising because of redundant workers. Indeed, one of agriculture's pressing problems is the large number of small farmers still endeavouring to make a living off an area of land which is no longer large enough to support them. In many cases, these small holdings could be absorbed into adjacent farms without involving any increase in the staff or capital equipment of the latter, thus opening the way for increased efficiency. Why, then, is there such a concern for "preserving the rural population?" Undoubtedly, the social consequences of an ageing and diminishing population can be most unfortunate, and obviously something must be done to reduce hardship to a minimum, but to do this by inducing more people to stay in scattered villages is surely to be in danger of merely postponing the next phase of the "drift to the towns". A village can never hope to offer, unaided, the wide range of social amenities which can be provided for an urban population and which increasing numbers of people are demanding.

These social problems embrace more than merely one aspect of forest policy: they are of crucial importance to any policy for rural Britain. If scattered hamlets and villages are to be preserved—not as museum pieces, but as integral parts of the contemporary rural scene—some form of permanent assistance or subsidy is necessary. There is a strong case for arguing that such preservation should be undertaken as an important contribution to the maintenance and enhancement of the general amenity value of the countryside. It is often asserted that the main justification for many of the current agricultural subsidies is that without them, much "marginal" land would go out of production, many villages would gradually lose their inhabitants and large areas of the countryside would assume an appearance of semi-dereliction.

The preservation, or, to use a more positive and dynamic phrase, the *conservation* of the countryside is of particular importance in Britain for two reasons, apart from the direct social and economic effects for the rural population. Firstly, Britain's tourist industry is largely dependent upon the infinite variety and natural beauty of the landscape. The total holiday expenditure in Britain (including visitors from overseas) now amounts to over £500 million and although Britons spend more abroad than do overseas tourists in this country, tourism remains the principal dollar earner.¹ Secondly, increased living standards and greater mobility have resulted in rapidly

increasing pressure upon the countryside from urban centres of population. Clearly it is important that an attractive, well-kept countryside shall be presented to the visitor, whether he be on a "day-trip" from the nearest town, or whether he may be on a tour from the other side of the globe. The provision of increased employment opportunities in rural areas can be a useful means toward that end.

Perhaps even more important are the direct effects of forests on the appearance of the countryside and on the availability of land for public recreational use. Discussions on amenity matters are usually charged with emotion: in any event, judgements on such matters are highly subjective. Opinions will always differ as to the relative beauties of deciduous and coniferous plantations. Those who would dismiss the whole of the activities of the Forestry Commission as "the covering of beautiful hills with ugly, dark green blankets of conifers" and who would extol "the stately oak woods" of parts of lowland Britain, often ignore the fact that they are comparing very young coniferous plantations with stands of hardwoods, perhaps over 100 years old. There is surely as much grandeur in a mature Douglas Fir as in an ash or beech tree of a comparable age. A number of ill-founded prejudices will tend to disappear as the public becomes more familiar with the appearance of mature conifers. Each generation naturally wishes to preserve the landscape appearance to which it was born and to which it has grown accustomed. In some parts of the world, people strongly object to the replacement of conifers by broadleaved species. The Forestry Commission, and private woodland owners, have made some mistakes in the past—for example, in creating coniferous plantations with bold straight edges which cut right across natural contours—but much more regard is now being paid to amenity considerations and there seems to be no reason why the forester should not achieve his major objectives without seriously conflicting with the beauty of the countryside. It must always be remembered that nearly all the so-called "natural" beauty of the landscape is, in fact, man-made. The many magnificent parklands and "the stately oakwoods" are the product of the foresight and labour of past generations. The countryside is continuously changing under the impact of mankind's activities, and it must surely remain a dynamic environment: to be static in the realms of nature is to be dead.

The seeker of recreation does not always wish merely to stand or to sit in his car and gaze at the surrounding countryside. There is a rapidly increasing demand for land whereon he may walk, play, ride, camp, picnic or engage in a widening variety of other outdoor pursuits, within an attractive,

¹ See *Westminster Bank Review*, May 1964—"The Tide of Tourism".

"natural" environment. The Forestry Commission has created a number of Forest Parks, specially planned to provide facilities for the enjoyment of the public, and the numbers using the Commission's camping sites are increasing annually. There is, of course, always a serious fire risk in forests to which the public are allowed access, but forestry is much more compatible with "active" outdoor recreation than is intensive agriculture. This is why there is good reason for afforesting certain lands within "green belts" and other areas near to centres of population, to provide for a much greater range of recreational activities than would be possible if the land were under agricultural use. Similarly, some agriculturalists advocate the adoption of less intensive methods of farming on land "near the margin" in order that the public may be granted much freer access without undue harm to the farming enterprise. Clearly, British woodlands will be called upon to an increasing extent to provide a suitable medium for recreation, and a big responsibility for this falls on the Forestry Commission. It is encouraging to note that much progress is being made in this direction.

There remains one important criterion by which forest policies may be assessed—profitability. It may be that other objectives are more important than the realisation of profits (however defined)¹ but the economics of the operations should never be ignored since it will normally be desirable to minimise the cost of achieving other objectives, even if no direct financial gain can be achieved. The economics of forestry will be discussed in some detail in the following chapter, but there are some general remarks to be made in relation to national forest policy. The nation's investment in forestry is likely to be of the order of £300 million,² and clearly attention must be given to the net return on this capital, even though, as has just been discussed, forestry can lead to many social benefits.

Up to 1958 the state forestry programme was designed to increase the national forest acreage as rapidly as possible, using land which would cause the least upheaval to agriculture. It is clear that much hill land was afforested by the Commission without a full, prior investigation of the economic potentialities of the land involved. This has been demonstrated by Walker³ following a study of the methods of providing land for the Forestry Commission. The only principles which emerged were those of "least sacrifice" and "maximum benefit" to agriculture, while the method used could only be described as

"intuitive". Walker suggests that if the supply of land for the Commission were to be based solely on economic criteria, much more hill land would be afforested, while some that has been planted would have been left bare. The crucial factor is the rate of return on capital invested which is considered desirable, but Walker's calculations indicated that at moderate interest rates—4 to 5 per cent—forestry was likely to be the more profitable use of land in most of the hill areas of Scotland and Wales which he studied.

Since 1958⁴ the government has required a "commercial" return from forestry, so far as this is not inconsistent with other policy objectives. While the planks in the national forest policy remain more or less the same, their relative importance has changed considerably since about 1955. One result is that the Commission's planting programme is no longer tied to a specific target forest area by the end of the century. It is ultimately a political decision whether profitability shall be the dominant criterion, and opinions will differ widely as to the optimum balance between the aims of the country's forestry policy. Undoubtedly, potential costs and returns must be examined much more closely than in the past, since those concerned with land use planning must be aware of the main economic variables involved.

The Role of Private Forestry

How far can private forestry contribute to the achievement of the principal aims of national forest policy, as outlined above?

In the first part of this chapter it was shown that although in the reasonably near future the Forestry Commission's timber production will exceed that from private woodlands, nevertheless, woodlands in private ownership will continue to make a most important contribution to the total home output of forest produce. Thus, so far as any element of strategic value still attaches to the national forest, private woods are of some importance, although this importance will decrease as more of the Commission's forests approach maturity. Similarly, it has been demonstrated that there is considerable scope for increased production from private woodlands which could be of value in increasing the share of Britain's timber needs which are met by the home trade, thus helping to stabilise the timber import bill.

In many upland areas, private owners are following the example of the Forestry Commission and planting large acreages of bare land which hitherto has

¹ See also Chapter 11, page 63.

² See Wallace, A. F., of Candacraig—op. cit.

³ Walker, K. R.—"The Forestry Commission and the Use of Hill Land: The Government Planning Approach Considered", *Scottish Journal of Political Economy*, Vol. VII, No. 1, February 1960.

⁴ See *House of Commons Debates*, 1958, Vol. 592, cols. 684, 685.

been used for livestock grazing, and stocked at a very low density. In many places this procedure has resulted in extra employment opportunities, although careful integration of forestry and agriculture within one proprietary land unit may mean that the number of new jobs created is relatively few, compared with afforestation by a new employer, such as the Commission.

As regards amenity, the private woodland owners are making a large contribution to the beauty of the countryside. The bulk of the country's hardwoods are in private ownership, including much parkland and hedgerow timber, and although the trend is towards softwood species, private owners are planting a much greater proportion of hardwoods than the Commission. The Main Survey showed that amenity considerations were very important for a large proportion of the estates in the sample,¹ and the enhancement of the appearance of woodlands

primarily for the benefit of the owners results in the enhancement of the appearance of the countryside to the general public. Public access to private woodland is generally restricted but, as has been discussed, the potential of woods to provide recreational opportunities is greater than in the case of intensively used agricultural land.

The 2.7 million acres of British woodlands in private ownership at the present time clearly have an important role in the fulfilment of the aims of the national forest policy. The economic aspects of private forestry, and the extent to which economic factors form the basic criteria for decisions relating to forestry within proprietary land units, are now to be discussed in the next chapter. As with the State-owned forests, if forestry is not financially profitable, then decisions must be made as to the values of the other benefits of woodland management, and whether these benefits are costing too much.

¹ See Chapter 4, page 20.

FORESTRY WITHIN THE PROPRIETARY LAND UNIT

Forest Economics

Twenty of the 72 estates in the main survey included woodlands which showed an annual loss. The characteristics of these estates, and how they differed from the estates with woodlands which were not unprofitable, have been discussed in detail elsewhere in this volume.¹ The terms "profit" and "loss" were, inevitably, loosely defined, since there were considerable variations among the accounting systems used by the proprietors. In some cases, due allowance was made for items such as the depreciation of buildings and equipment, and capital was distinguished from income and maintenance expenditure. In other instances, the criterion of profitability was whether the total receipts during the year exceeded the total amount spent in the same period: capital investments and allowances for interest thereon were ignored. It was impossible to arrive at a uniform definition of profit—sometimes detailed woodland accounts were apparently not kept, while in some other cases, they were not available for inspection. In the circumstances, the most useful measure of profitability was annual income compared with annual expenditure, although this is unsatisfactory in many ways. Owing to the obscurity surrounding the woodland accounts of some estates, it was felt desirable to classify the estates into three groups—one where the woodlands clearly showed a profit; another in which a loss was equally definite, and a third category where expenditure was approximately balanced by income. Woodlands in this latter group could at least be made "profitable" by small increases in efficiency, but it was not possible to determine with accuracy which way the balance was weighted at the time of the survey.

Some proprietors had made some calculations to arrive at a figure which represented the rate of return on their capital investment in their woodlands. Usually these calculations were confined to new plantations and areas which had recently been replanted, and some proprietors used the figures as a basis for decisions relating to any increase in their woodland area or the rate of rehabilitation of derelict woods. The calculated interest rates differed widely not only because of different conditions on each estate but also because the proprietors had made different assumptions concerning tree growth rates and future timber prices. Such is the length of forest rotations that these assumptions may bear little relation to the ultimate reality, but they are necessary for calculating the likely yields on woodland investments.

Another reason for the different estimates of returns was the omission by some proprietors of an allowance for the value of the land occupied by the trees. One proprietor had made his calculations on the basis of simple interest rather than compound: another had subtracted the total establishment cost from the anticipated net income when the plantation would be felled and divided the difference by the number of years in the rotation. In other words, no attempt was made to discount either costs or revenue.

The search for a suitable methodology for woodland profitability estimates has long engaged the attention of forest economists, and more particularly in recent years, the members of a Forestry Subcommittee of the Natural Resources (Technical) Committee. A number of methods have been suggested.² The Zuckerman report on *Forestry, Agriculture and Marginal Land*,³ used a measure of profitability known as the Internal Rate of Return—that rate of interest, which, when used to discount items of expenditure and receipts, yields a "present worth", or Net Discounted Revenue, of zero. This measure was an attempt to overcome the difficulties raised by the different lengths of production cycles of forestry and agriculture. Net Discounted Revenue (N.D.R.) is the difference between the discounted cash receipts and the discounted cash expenditures (including initial investment) over a given period, namely, the length of the forest rotation. The concept of internal rate of return involves the "impossible" assumption that all intermediate income can be re-invested at the particular internal rates or that these rates happen to coincide for all investments. An alternative is to use the N.D.R., the measure of present worth. In this way, a given interest rate is applied throughout, although the choice of the appropriate interest rate is in itself a major problem.

Assuming that efficiency of capital use should determine the relative values of investments, perhaps the most useful measure of profitability is the ratio of net discounted revenue to discounted expenditure (D.E.). It seems to be most appropriate to include in D.E. that expenditure which is incurred up to the time when income from sales of produce is sufficient to finance expenses. This method gives an indication of the financial yield of the investment although the rate of interest at which revenue and expenditure are discounted is pre-selected. Thus the most useful purpose for this measure is in comparing the yields

¹ See Chapter 4, page 20.

² The following outline of measures of profitability is based on unpublished papers by Grayson, A. J. and James, P. G.

³ H.M.S.O., 1957.

of two investments: if deemed appropriate, different interest rates could be used for each investment.

It is clear that further research is necessary on this subject, and a detailed analysis of the different measures is not germane to the purpose of this dissertation. It is unlikely that any methodology will be entirely satisfactory, owing to the problems of intermittent income and the length of the forestry rotation. In any event, it will always be necessary to make assumptions concerning the future movement of timber prices and forestry costs. Small errors in these assumptions may not be very important if the comparison is between forestry investments, but for comparisons between forestry and other investments, these errors could lead to false conclusions.

Thus estate proprietors would have great difficulty in obtaining an accurate picture of the relative profitabilities of agriculture and forestry within their land units. On the other hand, there is clearly scope for an economic appraisal (even if somewhat inaccurate) of alternative land uses and the fact that few attempts have been made is due as much to the impact of tradition as to the inherent difficulties of such an appraisal. Most proprietors are content to accept the pattern of land use which obtained at the commencement of their proprietorship.

One example of a situation when it might be particularly useful for a proprietor to assess the economic worth of land under different uses concerns small, isolated blocks of derelict woodland. An investigation of the costs of reclaiming a number of derelict woodland sites in Hampshire, and the likely returns from farming the reclaimed land was carried out by the Agricultural Land Service Research Group, in collaboration with Wye College, University of London.¹ For the 57 cases in that survey, the average net return from the reclaimed land represented over 24 per cent of the gross cost of reclamation—that is, before any grants were deducted. When allowance was made for the available grant aid, the net return was about 42 per cent. This represents a return considerably in excess of that which might be expected from the rehabilitation of small areas of derelict woodland. It was apparent both from the Preliminary and Main Surveys that many proprietors are ignorant of the economic factors involved in such decisions as whether to reclaim or rehabilitate such woodland areas.²

Another instance of tradition overriding economic arguments was provided by the sawmills on many estates surveyed.³

Yet economic considerations are obviously of great importance to forest proprietors. Only two proprietors claimed not to be interested in either an annual profit from, or an increase in the capital value of their woodlands: their policy objectives were directed solely towards the improvement of the amenities and sporting facilities of their estates. The remaining 70 proprietors all aimed to get some economic benefit from their woodlands. Thirteen gave as their objective the enhancement of the capital value of their estates, with the attendant estate duty advantages⁴ and the ability to take advantage of income tax concessions.⁵ These owners saw no real possibility of an annual excess of income over expenditure, at least within their life-times, but they still believed that forestry was a sound investment. Eighteen proprietors were looking both for an annual profit and the indirect economic benefits, while 21 sought to achieve both capital appreciation and an improvement in the general amenity of their estates. The remaining 18 owners were managing their woodlands with a view to benefits under all three headings—profit, capital appreciation and amenity.

The 70 proprietors in the Main Survey who were seeking some form of economic benefit from their woodlands had not calculated the likely returns in terms of Net Discounted Revenue or Internal Rate of Return but, on the other hand, they were most anxious that their woodland management should be "profitable", that the woods should not be an "economic liability". The State, through the Forestry Commission, is able to take a very long-term view and consider the income from forest operations spread over the whole length of the production cycle. It is unreasonable to expect the private sector of the forestry industry to take a similar view. In many cases, such a view would require an estate proprietor to look well beyond his life-time, even to the second or third generations. For forestry to be accepted as "profitable" there must be the prospect of an excess of income over expenditure if not within the life-time of one owner, then within the span of his successor in title. The more remote the likelihood of any such return, then the lower is the capital expenditure which a proprietor is prepared to incur.

Viewed as investors, forest proprietors may perhaps be divided into three broad categories, although there are obviously many intermediate types. Firstly, there are those with relatively small amounts of capital available for investment in forestry. Any planting undertaken by such owners has to be

¹ See M.A.F.F.—A.L.S.—*The Reclamation of Derelict Woodland for Agricultural Use, 1957*.

² See third paragraph of Chapter 3, page 11.

³ See fourth paragraph of Chapter 3, page 11.

⁴ See Chapter 5, page 31.

⁵ See Chapter 6, page 36.

financed very largely out of revenue from the woodlands. If the proceeds from the sale of timber from an area of woods, plus the amount of any planting grants available, would be insufficient to cover the costs of replanting, then owners in this category are very likely to allow the area to become derelict. Although a condition of grant-aid is an approved plan of operations, the need to transfer further capital to the woodlands may well cause some forest proprietors to remain outside any Government Scheme. To owners of this type, the abolition of the Scrub Clearance Grant¹ dealt a severe blow to their plans for the rehabilitation of poor quality woodlands. To these owners, forest economics consists almost entirely of annual income compared with annual expenditure.

The second main type of forest proprietor is the owner who possesses appreciable amounts of consociate capital and who is prepared to transfer some of this to his woodlands. Immediate returns are of lesser consequence and although he would not wish to subsidise permanently the amenity benefits from his woods, he is willing and able to wait many years for the yield from his forest investments. Sixty-two of the land units in the Main Survey were associated with substantial amounts of consociate capital, but in some cases either this could not be released for re-investment in woodlands or the owner was unwilling to invest further sums in forestry. In these cases, the situation was more akin to that of estates in the first category—the forest operations were required to yield an annual return sufficient to cover each year's expenditure.

The third, and rather special type of proprietor is represented by the members of forestry syndicates. These syndicates are associations of wealthy business men who regard forestry as a sound investment. Its attractiveness arises largely out of the income tax and estate duty concessions which are available to woodland owners.² The basic arrangements to take maximum advantage of these concessions are quite straightforward. A number of surtax payers each acquire by purchase or lease one or more blocks of woodlands. On acquisition, these woods automatically fall to be assessed under Schedule B unless the new owner elects otherwise. Thus woods yielding a net income will be retained under Schedule B, giving income which is virtually tax free, while woodlands which have not reached the revenue producing stage, and land which is to be planted with trees, would be transferred to Schedule D. The net cost to the proprietor of work in woods of the latter type will thus be a small fraction of the actual expenditure. When a plantation is about to begin yielding a net annual

income, it may be transferred to another member of the syndicate and then it will automatically be assessed under Schedule B. The net effect of such changes is that the costs of establishment can be offset against taxable income, while later, the income from the plantations is enjoyed almost free of tax.

Similarly, a more elderly member of a syndicate, who is in possession of an area of mature woods, may "exchange" this for young plantations of another, younger member. Thus, on the death of the first person, although the young plantations may be of a value equal to the mature woods, since duty does not become payable on the timber until it is sold, his heirs may not have to pay any duty until the second generation, and thus a considerable saving is achieved. Similarly, the younger man who received the mature woods can fell the timber and the income produced will be taxed only under Schedule B, a nominal tax.

These methods of reducing or avoiding liability for income tax and estate duty have long been practised by prudent landowners. In recent years, they have been used very skilfully by wealthy men, many of whom never see their woodlands. Forestry syndicates are often heavily criticised on the grounds that the Exchequer is subsidising the activities of people who have little or no interest in forestry; that the concessions and grants were intended to assist forest proprietors who would otherwise find it very difficult to bring all their woods into a state of full productivity. However, these arguments ignore the fact that the members of forestry syndicates have invested large sums of money in forestry, without which many thousands of acres of derelict woodland would never have been rehabilitated and large areas of bare land would never have been planted. In some areas syndicate ownership is as important, in terms of acreage, as the Forestry Commission, and can bring comparable benefits to other woodland proprietors, such as attracting new markets and opening up fresh outlets for timber produce, and can provide new employment opportunities in remote areas. One valid criticism in some areas may be that syndicate woodlands reveal little concern for amenity and the appearance of the countryside.

Critics of such legitimate avoidance of tax must remember that if timber, when felled, becomes liable for income tax, surtax and estate duty, the total liability may far exceed the value of the timber. The large syndicates are well aware that their activities are scrutinised by the government, and are careful not to take their methods too far, lest the concessions be removed, or drastically cut. Provided the concessions are not misused, it is difficult to see why the

¹ See sixth paragraph of Chapter 7, page 41.

² See Chapters 5 and 6, page 31 on, for a detailed description of these concessions and their effects.

activities of forestry syndicates should not be allowed to continue. If it is in the national interest that derelict woods should be rehabilitated, and the forest area of the country increased, then surely syndicates have a useful part to play and represent a useful means of channelling capital into the forest industry.

The economics of forestry are thus important to all types of woodland owner, and, apart from the Commission, very few find it necessary or meaningful to discount costs and returns in estimating the "profitability" of their woodlands—in so many cases, the experienced forester is able to arrive direct at a figure for the costs and returns per acre of each plantation, and the owner is chiefly interested in the net return from his woodlands as a whole. The syndicate member is usually content with this figure also, as long as it can be seen that he will get a "reasonable" return on his capital: he does not wish to know the exact yield in advance. In any case, the prediction of the financial yield to such a person is rendered especially difficult by possible variations in the rates of tax, and in the estate duty levy.

Multi-purpose Land Use

The economics of forestry may be important to the majority of woodland owners but, as shown by both surveys, many other factors influence proprietary forest policies. The portion of a land unit which is occupied by trees is often not used only to produce timber to provide an annual income. A number of references have been made to some of the other aims of forest policies, including the enhancement of the capital value of an estate, the provision of sporting facilities and the improvement of the general appearance of the estate. The provision of shelter is an important function of woodlands on many estates, and in many cases, certain plantations are sited so as to give maximum protection from strong winds and with little regard to other factors.

Shelter was a factor of special importance on 22 of the 72 estates in the Main Survey. Although this naturally tended to be true of estates which included a certain amount of hill land, these 22 estates were distributed fairly evenly throughout the country. There were examples of shelterbelts a few chains in width: in other cases the shelter was provided by large blocks of woodland. The former type of plantation would be of less value as a source of timber, since the "edge effect" of trees growing around the perimeter of the belt would be relatively large compared with, say, a square woodland block. Further, the relative costs of brashing, pruning and weeding might also be greater in the case of the narrow strip of trees. A wider shelter block facilitates the systematic regeneration of the plantation with no temporary reduction in the degree of protection provided. Shelterbelts provide a good example of the primary

use of woodlands for purposes other than the production of timber, and of an instance where the proprietor should consider whether, by planting an area larger than the minimum requirement for the fulfilment of the primary function, he can increase the profitability of his estate as a whole. Very often, a proprietor appears not to have thought beyond providing shelter.

Another such example may be found in the growing of trees in association with recreational facilities, especially camping sites. Trees can be valuable in and around such areas to provide shelter, shade and camouflage, as well as dead branches for camp fires. The Forestry Commission camp sites are extremely attractive, largely because they are placed in a wooded setting. This also applies to many camp and caravan sites abroad. The proprietors of these facilities might do well to consider whether the trees required to improve a camp site should be the fringe of an "economic" plantation, and thus an integral part of the woodlands of the estate. Small, isolated clumps of trees may have a lower timber value than groups which are really the extensions of larger plantations.

These considerations of maximising returns through the multiple usage of forest land apply with equal force to the State and to private woodland owners. A good example on a very large scale is the afforestation of the catchment area round the Lake Vyrnwy reservoir in Wales, which was undertaken jointly by the water authority and the Forestry Commission. At least one major grower of poplar trees in Britain uses the wide spaces between the rows of trees for the growing of cereal crops during the early part of the life of the plantations. Occasionally, soft fruit bushes are planted between poplars.

In a country such as Britain, with ever-increasing pressures upon land, it is important that all opportunities for the multiple use of land should be taken. Timber production is clearly one of the most suitable complementary uses for many other purposes. There is a tendency to regard all benefits, other than the primary land use, as "incidental", but very often careful planning and a slight re-allocation of resources can lead to complementary benefits of great worth, with no diminution in the value of the primary benefit. The development of certain parts of private woodland estates along multi-purpose lines could play a significant part in increasing the economic viability of these estates. Whenever the primary purpose of afforested land is not the production of timber, every opportunity should be taken to maximise the value of the timber produced and to use the land to full capacity. There was a great deal of evidence from the surveys and other sources to suggest that objectives such as shelter, sporting facilities and amenity, need not conflict with a commercial forestry programme.

The Future of Private Forestry

It has been established that woodlands in private ownership have an important role to play in the achievement of the aims of the national forest policy of Britain.¹ This role will be played to the full only if private forestry can become, and remain, "profitable" and it is thus in the national interest that private forestry should be established on a sound financial basis. The main problems since 1945 have been the rehabilitation of areas devastated in one or both World Wars and the establishment of price stability and confidence in the industry. In the absence of confidence, forest proprietors will be reluctant to invest large sums of money on which there is no prospect of a return in their lifetime. The production of timber must be seen to be economically worth while, and to have every likelihood of continuing so to be.

The grants under the Forestry Act of 1947² have done much to assist the rehabilitation of plantations, although it has been argued that the assistance should have been even greater because much of the war-time exploitation was in the national interest but against the interests of the proprietors concerned. The abolition of the Scrub Clearance Grant³ came too soon—some proprietors have not yet completed their rehabilitation programmes. It remains to be seen whether the grants which remain will be sufficient to encourage proprietors to replant all the areas considered suitable for economic management. There is a case for extra assistance for such rehabilitation work. Emphasis could also be placed upon possibilities for those areas which are now considered unsuitable for economic management on account of their small size—a new plantation could often be sited adjacent to such an area and the whole could be formed into an "economic" block. This may be more attractive to some proprietors than the reclamation of the small woodland site for agricultural or other use.

The forestry grants are scheduled to come to an end before the end of this century.⁴ It is thus vital that private forestry as a whole should be self-supporting by that time. If this is to be achieved, efficiency must be increased in many respects,

especially in the use of manpower⁵ and in the marketing of timber produce.⁶ The case has already been stated for the introduction of a Roads Grant,⁷ or at least for a realistic scheme for loans for expenditure incurred on the construction of forest roads. The quality of well-grown British timber is fully comparable with that of imported supplies: all sides of the timber industry must endeavour to ensure that its production costs are equally competitive. There seems to be no reason why this should not be brought about, but, as already discussed, drastic reorganisation of the home timber trade is necessary.⁸

Tradition has clearly emerged as the most important factor which has determined the present pattern of forestry within proprietary land units. Obviously, it is impossible to create a tradition of commercial forestry from outside the proprietary unit: government policy must continue to provide suitable conditions in which forest proprietors can build up their own traditions. Of the government's economic incentives, the income tax concessions were usually dominant in the minds of the proprietors interviewed in the surveys. It is important that the government should give clear, long-term assurances that the taxation of commercial woodlands will be continued under the present system, or one which is at least as favourable to forestry. These concessions are often more important than the planting and management grants and there is no justification for ending the tax concessions until, at the earliest, the cessation of grant-aid.

If, with the government aid, which is fully justified, private woodlands can achieve a state of near "normality" by the end of the century, then there seems to be no reason why, given the likely trends in demand for timber and timber products,⁹ forestry should not be a most profitable enterprise within the proprietary land unit. Timber production may not be as profitable as food production, but if the other benefits of forestry are properly credited to the woodland accounts, then private forestry will be established on a sound economic basis, to the advantage not only of the individual proprietors, but also of the whole nation.

¹ See Chapter 10, page 56.

² See Chapter 7, page 41.

³ See Chapter 7.

⁴ See Chapter 7.

⁵ See last paragraph of Chapter 3, page 19.

⁶ See Chapter 8, page 46.

⁷ See Chapter 7.

⁸ See Chapters 8 and 9, page 51.

⁹ See Chapter 9.

SUMMARY OF MAIN PRACTICAL CONSIDERATIONS FOR FOREST POLICIES

(1) The surveys revealed very few examples of a significant change of land use between agriculture and forestry. Three possible reasons are apparent:

- (a) The proprietor and/or his agent may be unaware of the likely costs of and returns from a change of use in either direction.
- (b) Traditional land use patterns are frequently accepted unquestioningly and consequently there is no incentive to explore the possible benefits of a change of use.
- (c) Once an area of woodland has been dedicated under the Forestry Act, 1947,¹ it is difficult to gain release from the restrictive covenant. This is probably less true now than during the early years of the scheme.

It is clearly desirable that there should be far more flexibility in the land use pattern on proprietary units, and hence in the national pattern. Many proprietors would gain by changing the use of certain parts of their land, and if it is in the national interest that more (or less) timber should be grown, then it is important that proprietors should not feel restricted concerning the use of their land.

The surveys showed a need for a less rigid approach towards a request for release from a dedication covenant. In many cases it would be reasonable to insist upon the afforestation of an area equivalent to that which is to be felled: in other cases there will be good grounds for making no such proviso. There is also a need for wider dissemination of information concerning the economics of a change of use between agriculture and forestry. It is necessary to convince proprietors that such a change merits consideration, for any change depends ultimately on decisions made in the mind of the proprietor.

(2) The Association Analysis was based on the qualitative characteristics of the estates, as seen through the eyes of the owner. This data therefore represents the main factors which form the background to the owners' decisions. The analysis showed that "profitability" accounted for the greatest variation between estates. Different proprietors had different ideas on the assessment of profitability, but it was the proprietor's notion of profit or loss which was important, and not whether the forestry accounts showed a net return according to an economist's or accountant's definition. As mentioned above, it is a matter of convincing the proprietor that a profit may be realised from his woodlands.

(3) By far the most important factor in this connection is the current income tax concession on commercial woods. There is no doubt that many proprietors would cease serious timber production if the tax concessions were removed, on the grounds that it would no longer be possible to make a profit from their woodlands. In many cases this would be true, but in others the psychological value of the concessions is greater than the financial value, and income tax has an undue influence upon the proprietor's assessment of profitability.

If private forestry is to be encouraged, clearly it is vital that the tax concessions are neither removed nor significantly reduced: they seem to be more important than the various forestry grants. The question of the rating of woodlands was not raised in the surveys, but it appears likely that if this were done, the effect on private forestry could be very serious. Any form of annual levy on woodlands would be viewed with grave suspicion.

(4) Estate Duty concessions, on the other hand, have been overrated as a determinant of forest policy. They may well be of some importance in regard to rural land in general, but as far as the day-to-day management of the woods is concerned, the extra concessions applicable to timber appear to have a minimal effect. However, since the financial gain to the Exchequer from the removal of these extra concessions would be relatively very small, their retention is probably justifiable for the effect which they have in a few cases.

(5) The various forestry grants are of great importance to the majority of woodland owners, and clearly some form of direct financial assistance is necessary. At first, grants were rightly directed towards assisting replanting and rehabilitation after the ravages of the second war and the lean years of the 1920s and 1930s. The present need is to improve the efficiency of the operations from the tree nursery to the finished wood product. The Scrub Clearance Grant has been abolished, but it has not been replaced by any financial aid for increasing efficiency in the woods. Even though it is intended that grant-aid should be progressively reduced to zero over the next 30 years, at this stage a change of emphasis might be most valuable. A Roads Grant is one possibility which merits serious consideration.

(6) In the field of marketing, it is essential that timber producers achieve far closer co-operation

¹ Now consolidated by the Forestry Act, 1967.

than at present. The benefits of properly organised, co-operative marketing could be considerable. However, in order to change traditional methods of selling timber, it is first necessary to convince the proprietor that the proposed methods would result in financial gain.

(7) Finally, two points of particular interest arising from the analysis of the quantitative data should be mentioned. They have some significance in view of the trends towards the "breaking-up" of large estates and the increase of owner-occupation on the one hand, and the amalgamation of holdings on the other.

Firstly, as the total area of estate increases, the percentage of the estate under forestry decreases, although the area of woods will increase. Thus, in most instances, the fragmentation of the estate, or even the sale of a single farm, will give rise to units with different ratios of farmland to woodland. In some cases there will be a very low percentage of

woodland, while in others the proportion may be abnormally high. Either situation could have an adverse effect on the management of the woodlands.

Secondly, there is a negative correlation between the estimated rental value of the agricultural land and all the areal measurements, but there is a significant positive correlation between rental value and Component II, a factor of woodland activities contrasted with the agricultural areas. It is generally true that the greater the size of the estate, or the larger the individual agricultural holdings, the lower the average rent per acre, and thus one would expect the negative correlation. The positive correlation suggests that this general tendency may be paralleled to some extent by a consequence of a more active interest in forestry. Where the woodlands represent a more significant part of the estate, even on the larger estates, the rental levels may be higher as a result of a greater emphasis on profitability over all aspects of estate management.

Appendices

APPENDIX A QUANTITATIVE DATA FROM ESTATES IN MAIN SURVEY - BY REGION

CODE		Total Area	Agric.Area	Agric.- In hand	Agric.- Let	Est.Av. RV	Woodland Area	Woods- In hand	Woods- Let	Woodland Staff
Region	Estate	(acres) (1)	(acres) (2)	(acres) (3)	(acres) (4)	(sh./ acre) (5)	(acres) (6)	(acres) (7)	(acres) (8)	(number of full-time men) (9)
1	01	3,000	2,520	-	2,520	60	480	480	-	4
1	02	2,760	2,510	-	2,510	100	250	250	-	-
1	03	770	700	50	650	40	70	70	-	-
1	04	700	500	250	250	70	200	200	-	-
1	05	3,450	1,330	15	1,315	100	2,120	2,120	-	50
1	06	1,480	1,420	-	1,420	100	60	60	-	-
1	07	3,390	2,850	-	2,850	60	540	540	-	3
2	01	11,500	10,500	2,000	8,500	90	1,000	1,000	-	8
2	02	8,260	7,200	1,500	5,700	100	1,060	1,060	-	20
2	03	1,550	1,250	-	1,250	120	300	300	-	3
2	04	1,500	1,440	770	670	90	60	60	-	-
2	05	10,000	5,300	-	5,300	110	4,700	4,700	-	60
2	06	1,700	1,570	-	1,570	100	130	130	-	2
2	07	11,960	10,800	1,400	9,400	110	1,160	1,090	70	8
2	08	590	410	-	410	90	180	180	-	2
3	01	3,300	2,600	150	2,450	80	700	545	155	5
3	02	2,400	1,600	775	825	110	800	800	-	2
3	03	2,140	1,740	1,200	740	80	400	400	-	-
3	04	6,660	6,200	250	5,950	90	460	460	-	5
3	05	3,300	2,550	-	2,550	110	750	750	-	2
3	06	2,150	1,660	-	1,660	100	490	490	-	3
3	07	1,630	1,330	-	1,330	100	300	300	-	2
3	08	5,570	4,870	695	4,175	90	700	700	-	-
4	01	8,500	7,600	1,250	6,350	100	890	890	-	8
4	02	15,000	14,000	1,000	13,000	130	1,000	1,000	-	9
4	03	4,900	4,170	750	3,420	140	730	730	-	12
4	04	5,300	5,000	-	5,000	130	300	300	-	4
4	05	1,745	1,520	280	1,240	120	225	225	-	2
4	06	7,900	6,500	500	6,000	100	1,400	1,400	-	20
5	01	250	110	-	110	50	140	140	-	1
5	02	2,350	1,300	200	1,100	80	1,050	1,050	-	8
5	03	2,480	1,400	900	500	80	1,080	1,080	-	8
5	04	4,840	3,370	910	2,460	80	1,470	1,470	-	12
5	05	850	550	-	550	75	300	300	-	3
5	06	2,300	1,430	650	780	100	870	870	-	3
5	07	2,000	1,550	550	1,000	90	450	450	-	5
5	08	3,670	2,370	460	1,910	100	1,300	1,300	-	3

APPENDIX A (Contd.)

CODE		Total Area	Agric. Area	Agric. - In hand	Agric. - Let	Est. Av. RV	Woodland Area	Woods - In hand	Woods - Let	Woodland Staff
Region	Estate	(acres)	(acres)	(acres)	(acres)	(sh./ acre)	(acres)	(acres)	(acres)	(number of full-time men)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6	01	15,000	13,500	1,500	12,000	120	1,500	1,500	-	10
6	02	11,000	9,000	1,300	7,700	120	2,000	2,000	-	32
6	03	26,600	24,250	4,250	20,000	80	2,350	1,400	950	11
6	04	40,180	36,500	2,500	34,000	60	3,680	3,680	-	38
6	05	12,000	10,800	2,150	0,650	60	1,200	800	400	8
6	06	11,575	7,350	1,500	5,850	90	4,225	4,225	-	16
6	07	19,000	12,000	2,000	10,000	60	7,000	3,000	4,000	26
7	01	25,000	22,500	10,000	12,500	60	2,500	2,500	-	20
7	02	8,500	5,900	2,000	3,900	120	2,600	2,600	-	26
7	03	1,250	1,110	-	1,110	120	140	95	45	3
7	04	3,000	2,400	1,200	1,200	70	600	600	-	5
7	05	3,500	3,180	680	2,500	100	320	320	-	5
7	06	1,200	950	-	950	120	250	250	-	2
8	01	10,190	8,980	1,700	7,280	100	1,210	1,210	-	12
8	02	18,500	17,600	440	17,160	60	900	900	-	10
8	03	3,200	2,450	200	2,250	100	750	750	-	6
8	04	9,000	7,500	600	6,900	60	1,500	830	670	6
8	05	16,000	14,750	-	14,750	70	1,250	1,250	-	18
8	06	28,000	24,000	5,000	19,000	75	4,000	4,000	-	35
8	07	13,450	11,350	440	10,910	70	2,100	2,100	-	12
8	08	11,000	9,000	8,300	700	50	2,000	2,000	-	17
8	09	20,000	18,000	1,150	16,850	50	2,000	2,000	-	30
8	10	3,000	2,755	450	2,305	85	245	245	-	3
9	01	34,000	33,000	-	33,000	50	1,000	1,000	-	14
9	02	1,130	830	220	610	100	300	300	-	10
9	03	2,800	2,460	440	2,020	35	340	340	-	1
9	04	2,000	1,600	140	1,460	50	400	400	-	1
0	01	3,600	3,000	600	2,400	70	600	600	-	10
0	02	2,900	2,450	1,854	596	30	450	450	-	4
0	03	1,120	710	-	710	75	410	410	-	12
0	04	1,790	1,450	650	800	70	340	340	-	1
0	05	3,780	3,450	650	2,800	60	330	330	-	-
0	06	10,000	9,700	1,150	8,550	25	300	300	-	2
0	07	900	720	-	720	140	180	180	-	1
0	08	35,000	33,700	20,000	13,700	60	1,300	1,300	-	38

APPENDIX B

CORRELATION BETWEEN COMPONENTS AND ORIGINAL VARIABLES

Component Number	Correlation Co-efficients with nine variables ¹ (to 3 decimal places)	Percentage of variability accounted for by component	Identification of component
I	+0.100 +0.095 +0.061 +0.088 -0.025 +0.086 +0.087 +0.036 +0.083	53.3% of variability	A factor of estate size
II	-0.054 -0.073 -0.064 -0.060 +0.080 +0.100 +0.080 +0.085 +0.059	16.4% of variability	Woodland activities contrasted with estate size and agricultural activities
III	-0.004 -0.009 -0.005 -0.006 -0.095 +0.019 -0.025 +0.100 -0.041	12.2% of variability	Woods let, contrasted with estimated Rental Value
IV	-0.024 -0.029 +0.100 -0.072 -0.043 +0.006 +0.019 -0.025 +0.037	8.6% of variability	Agricultural area in hand contrasted with area let and estimated Rental Value
V	+0.016 +0.023 +0.087 -0.013 +0.100 -0.010 -0.049 +0.076 -0.036	7.2% of variability	Estimated Rental Value associated with agricultural area in hand and with woods let

¹ The nine variables are here used in the order indicated in Appendix A, page 70, and on page 12 in the text.

APPENDIX B (contd.)

Component Number	Correlation Coefficients with nine variables (to 3 decimal places)	Percentage of variability accounted for by component	Identification of component
VI	-0.005	2.2%	Component of little significance
	+0.000		
	-0.015		
	+0.007		
	-0.005		
	-0.039		
	-0.061		
	+0.029		
	+0.100		
VII	-0.045	0.1%	Component of little significance
	+0.100		
	-0.021		
	-0.050		
	-0.003		
	+0.003		
	+0.003		
	+0.001		
	+0.001		
VIII	+0.100	0.0%	Component of little significance
	-0.000		
	-0.032		
	-0.078		
	-0.000		
	-0.011		
	-0.003		
	-0.001		
	-0.000		
IX	-0.012	0.0%	Component of little significance
	-0.000		
	+0.004		
	+0.009		
	+0.000		
	+0.100		
	-0.082		
	-0.039		
	+0.000		

APPENDIX C

COMPUTED VALUES OF FIRST THREE PRINCIPAL COMPONENTS FOR EACH ESTATE

Coding		Component Value		
Region	Estate	I	II	III
1.	01	-1.199	-0.404	0.727
	02	-1.646	-0.108	-0.133
	03	-1.805	-0.856	1.356
	04	-1.857	-0.351	0.626
	05	0.974	2.407	-1.373
	06	-1.949	-0.124	-0.103
	07	-1.134	-0.420	0.741
2.	01	0.469	-0.529	-0.264
	02	0.296	0.295	-0.727
	03	-1.797	0.398	-0.666
	04	-1.876	-0.311	0.133
	05	3.685	4.127	-2.064
	06	-1.818	-0.047	-0.156
	07	0.522	-0.111	-0.649
	08	-1.919	-0.024	0.102
3.	01	-1.083	0.089	0.446
	02	-1.343	0.500	-0.443
	03	-1.517	-0.278	0.345
	04	-0.733	-0.398	-0.081
	05	-1.263	0.413	-0.451
	06	-1.516	0.214	-0.202
	07	-1.732	0.096	-0.162
	08	-0.893	-0.228	0.038
4.	01	-0.124	-0.113	-0.446
	02	0.833	-0.274	-1.304
	03	-0.831	0.804	-1.434
	04	-1.234	0.155	-0.993
	05	-1.828	0.277	-0.645
	06	0.394	0.669	-0.730
5.	01	-1.859	-0.584	1.097
	02	-0.934	0.467	0.137
	03	-0.870	0.432	0.130
	04	-0.171	0.579	-0.018
	05	-1.721	-0.138	0.431
	06	-1.253	0.461	-0.225
	07	-1.441	0.072	-0.006
	08	-0.808	0.671	-0.265
6.	01	1.205	-0.020	-1.111
	02	1.507	1.301	-1.570
	03	3.712	-0.867	1.059
	04	7.396	-1.227	-0.822
	05	0.766	-0.667	1.062
	06	2.516	2.249	-0.586
	07	5.446	5.170	5.857

APPENDIX C (contd.)

Coding		Component Value		
Region	Estate	I	II	III
7.	01	4·166	-1·425	-0·150
	02	1·315	1·871	-1·421
	03	-1·936	0·321	-0·585
	04	-1·097	-0·228	0·450
	05	-1·321	-0·065	-0·267
	06	-1·908	0·373	-0·636
8.	01	0·451	0·021	-0·583
	02	1·607	-1·619	0·312
	03	-1·113	0·363	-0·301
	04	0·344	0·064	1·571
	05	1·596	-0·733	-0·084
	06	5·657	0·306	-0·942
	07	1·528	0·059	0·056
	08	1·625	-0·424	0·424
	09	3·109	-0·642	0·017
	010	-1·446	-0·304	0·154
9.	01	4·180	-3·212	0·203
	02	-1·567	0·310	-0·339
	03	-1·277	-0·928	1·406
	04	-1·439	-0·572	1·056
10.	01	-0·882	-0·144	0·329
	02	-1·037	-0·943	1·443
	03	-1·355	0·118	0·215
	04	-1·567	-0·359	0·577
	05	-1·255	-0·737	0·808
	06	-0·098	-1·887	1·503
	07	-1·782	0·339	-1·135
	08	5·931	-3·697	-0·733

APPENDIX D

ADDITIONAL NOTE ON PRINCIPAL COMPONENT ANALYSIS

Many of the conclusions arising from the Principal Component Analysis could have been reached using the correlation coefficients, together with various ratios calculated directly from the original data. However, such methods would in any case have involved large numbers of calculations and since a computer was available, a principal component analysis was used. This is appropriate to the data, and the relationships between the original variables are probably expressed with greater subtlety by the component analysis than by straight-forward ratios, such as woodland area expressed as a percentage of agricultural area. The computer analysis is a useful refinement, although by no means the only possible method of treating the data.

The object of a component analysis is to represent a k -dimensional variation as due to a number of orthogonal components, that is, components which are statistically independent. If possible, the number of components should be less than k , but if this cannot be arranged, then as much of the variation as possible should be accounted for by few components. Those components which account for significant amounts of the total variation are termed principal components.

In the original form of the data, set out in full in Appendix A, the sample of proprietary land units is described in terms of nine related variables. The precise relationships between these variables are shown in the correlation matrix in Table 3.1, page 12. The purpose of the principal component analysis is to describe the sample of estates in terms of less than nine components to facilitate further handling of the data and to shed new light on the inter-relationship between the original variables.

An orthogonal set of linear functions of the original variates is derived from the correlation matrix. The first of these linear functions has maximum variance, subject to the restraint of statistical independence. The second linear function is uncorrelated with the first, and has as large a variance as possible, and so on (see page 13). Thus the original data may now be described in terms of a number of uncorrelated linear functions. The sum of the values of these functions equals the sum of the elements of the principal diagonal of the correlation matrix, in this case, nine (see pages 15–22).

Some confusion may have been introduced into the text by the use of the word “combinations” in some places

and “components” in others, when referring to the same factors. The “linear functions” discussed above may also be called “linear combinations”, since they are combinations of the original variables, and these functions or combinations represent the new “components” which may be used to describe the original variation. It is necessary to describe the first part of the analysis in terms of “functions” or “combinations”, but now “components” will be used in the description and interpretation.

Table 3.2, page 13, gives the values of the new nine components, the sum of which is nine, as mentioned above. The purpose of this table is to show the percentage of the total variation which is accounted for by each of the components. In other words, this table shows the relative importance of the components. Clearly, the first component is by far the most important, and only the first three components are considered to be significant. These account for nearly 82 per cent of the total variability. The first five components account for 97.7 per cent of the variability, and thus it is likely that the original nine variables measured only five independent factors.

The procedure for identifying the principal components is described on pages 12–13. For this purpose the coefficients of correlation between each component and the original nine variables are computed, and these coefficients are set out in Appendix B. For convenience, the most significant coefficient is assigned the value 0.1, the others being given the appropriate values relative to that. These figures are intended merely to indicate the relative significance of the correlations and are not to be taken as absolute coefficients. Each component may be identified roughly by inspection of these relative figures, as described in the text.

The three principal components account for nearly 82 per cent of the total variation of the original sample of estates. Thus the sample may be discussed in terms of three independent factors, instead of the original nine related variables.

Appendix C contains the values of the three principal components for each estate in the sample. These were computed by inserting the appropriate values of the original nine variables into the first three linear functions derived from the correlation matrix, as discussed above. These component values are used in the interpretation of the survey data in various parts of Chapters 3 and 4.

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