Management of Broadleaved Woodland in Britain

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INTRODUCTION

On my last visit to Dublin in October 1985 I was privileged to listen to the internationally esteemed statesman, Mr. Sean MacBride, urging that Ireland should "increase substantially the plantation targets for afforestation". He lamented the fact that "we have never fulfilled the plantation target of 10,000 ha per year" (MacBride, 1985). It is encouraging to hear that now not only is there a groundswell of opinion to see more trees planted but that the case for broadleaves is being seriously argued. Britain has gone through a similar reappraisal and today in the mid-1980s the interests and policies in the limelight are very different from those of a decade ago.

This paper covers five points which reflect current trends in broadleaved management. Much of what is covered will be found in detail in Evans (1984) — Sulivculture of Broadleaved Woodland, Forestry Commission Bulletin No. 62.

BROADLEAVED WOODLAND IN BRITAIN

Broadleaved trees and woodland are a dominant feature of much of Britain's landscape. In the past they were the principal source of building material, fencing, and fuel and today continue to supply half the country's consumption of hardwood. Their value for amenity, sporting, and conservation is inestimable. These many roles bring to broadleaved woodland both interest and complexity in management.

The broadleaved resource

In 1980 broadleaved woodland of all types accounted for 37.5 per cent of all forest in Britain. Of the total growing stock of timber broadleaves account for a larger proportion of the total volume (51.5 per cent) because the average age of broadleaved woodlands

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is greater than coniferous forest and because most isolated trees and small clumps outside the forest areas are broadleaved. The analysis of the broadleaved resource by countries and woodland types are given in Table 1.

Table 1: Broadleaved resources in Britain

Woodland areas (000 ha)	England	Wales	Scotland	Great Britain
Broadleaved high forest	429	59	76	564
Coppice with standards	11			12
Coppice	26	2		28
Scrub	80	8	61	148
Volume of growing stock (million m^3)				
Woodland	68	10	13	91
Non-woodland trees	19	3	3	25

Source: Forestry Commission Census of Woodlands and Trees, 1979-82.

In addition to the areas shown in Table 1 there are some 202,000 ha of clumps and lines of broadleaved trees not formerly classified as woodland.

Age-class and species in broadleaved woodland

Figures 1 and 2 show age classes and species present in high forest.

Fig. 1: Age-class distribution of broadleaved high forest.

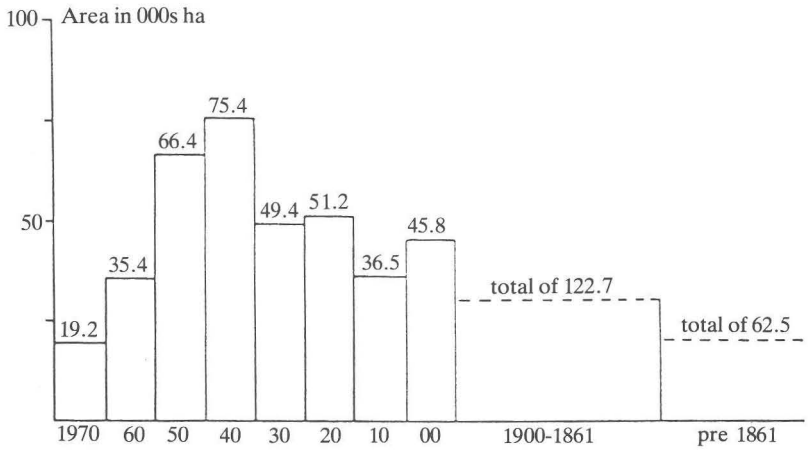

Fig. 2: Analysis of broadleaved high forest by principal species.

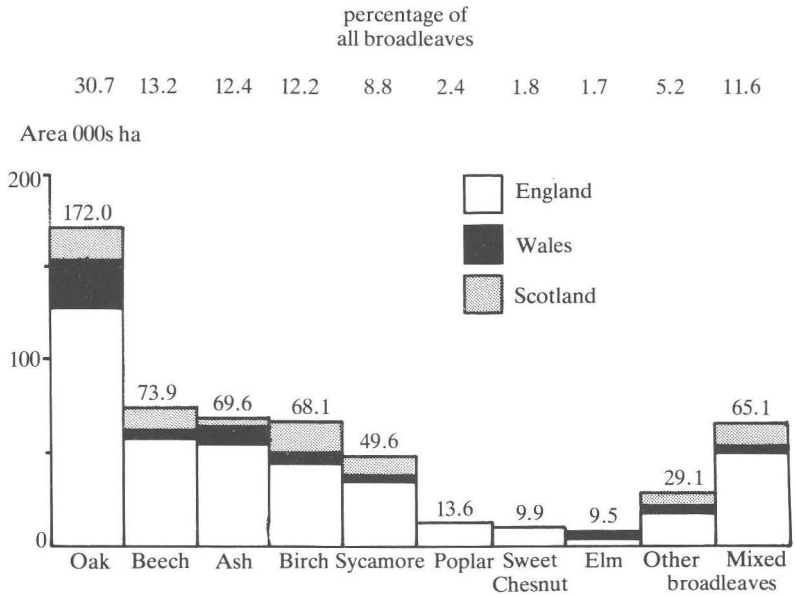

Table 2 shows the ownership pattern of high forest and the predominance of the private sector controlling some 90 per cent of the broadleaved estate.

Table 2: Distribution and Ownership of Broadleaved High Forest.

000 ha	Forestry Commission	Private Woodland Dedicated and Approved	Other*	Total
England	44.0	86.5	298.8	429.3
Wales	6.1	3.9	49.3	59.3
Scotland	4.0	10.9	60.8	75.7
Great Britain	54.1	101.3	408.9	564.3

*Includes some stands of coppice origin amounting to 61,000 ha of Great Britain in total.

Production of wood

At current levels of consumption half of Britain's demand for hardwood is satisfied by home-grown production as shown in Table 3.

Table 3: Hardwood Supply and Demand in Britain.

	000 m^3(r)			
	1955	1960	1970	1980
Home grown production	1455	1580	1326	1210
Import of logs	556	587	279	114
Import of sawnwood and veneers(1)	1407	1517	1337	1057
Total supply	3418	3684	2942	2381
Domestic consumption of identifiable hardwood	ca(3400)	(3660)	2918	2332
Exports	—	—	24	49

Note: (1) converted from m^3(sawnwood) by dividing by 0.6.
(r) roundwood volume equivalent.

Other important features

Woodland size

Thirty-nine per cent (295,000 ha) of all broadleaved woodland consists of small, predominantly farm woods of less than 10 ha. Small size tends to magnify costs and depress returns in growing timber but, if anything, enhance environmental importance as a landscape feature.

Farm woods and hedgerow trees

According to the Peart report (MAFF 1985) about one farm in five has woodlands. The total area amounts to 276,000 ha of which 216,000 ha are in England and Wales. For farms with woodland the average area is about 6 ha/farm but not often all in one block.

Hedgerow trees are an important non-woodland source of hardwood timber which, along with small woods less than 2 ha, contribute about 20 per cent of the total output in Britain. The total resource of non-woodland trees, clumps < 0.25 ha and hedgerow trees amounts to 25 million m^3 (Table 1).

Relative neglect

A substantial proportion of broadleaved woodlands as well as the area of scrub (Table 1) are a neglected asset. This is particularly true of many farm woodlands. Neglect arises more from not knowing how to manage and not knowing the potential value of woodland rather than inherently poor quality; indeed very few areas looking like woodland have no utilisable value.

Environmental importance

Britain's broadleaved woodlands are an immensely important environmental asset as a landscape feature, for amenity, in wildlife conservation and in providing cover for country sports notably hunting and shooting. These factors, though often curtailing the maximising of economic timber production potential are features which must be accepted but which, with care, can be turned to advantage of both the woodland owner and the public.

Two important texts dealing with conservation and traditional woodland management in Britain of great relevance to broadleaves are Rackham (1980) and Peterken (1981).

Use of Exotic Species

Coniferous afforestation in the last 70 years has been dominated by use of exotic species — spruces, pines and larches — but in broadleaved forestry introduced species have found limited usefulness, as Figure 2 illustrated, apart from the long naturalised sycamore and sweet chestnut. Red oak (*Quercus rubra*) and Norway maple (*Acer platanoides*) have been planted intermittently but never to the extent found elsewhere in NW Europe. Exotic alders (grey, Italian and red) all have a minor place on industrial wastes, calcareous soils and in upland forestry respectively. Use of poplars and willows is restricted to certain clones for disease control reasons.

Southern beeches (*Nothofagus*)

This genus has been evaluated extensively in the last ten years because of the potential of *N. procera* and *N. obliqua* for very fast growth, up to Yield Class 20, attractive appearance and value for wildlife — more insect species have been found associated with these species, despite their recent introduction (early 1900s), than most native broadleaves except the oaks.

The main obstacle to more extensive use of southern beech is proneness to winter cold damage when temperatures fall below –15°C for long periods. There is evidence of some variation in hardiness and vigour among provenances (Potter 1987): Cautin and southern Malleco for *N. procera* and *Llanquihue* for *N. obliqua* appear the

best Chilean sources but for both species collections from stands just inside Argentina are also promising. Home collected seed from earlier introductions generally performs well.

Eucalypts

This very large genus has also recently been evaluated systematically (Evans, 1986) and, apart from the favoured western seaboard only two species' groups are hardy enough to survive British winters — *E. gunnii* ssp *gunnii* from central Tasmania and *E. pauciflora* ssp niphophila and ssp *debeuzvillei* from above about 1400m altitude in SE Australia. The 'gunnii' group exhibit fast growth and tolerance of a wide range of sites and may have some biomass or pulpwood potential in the long term.

ESTABLISHMENT

Natural regeneration

Most broadleaved stands are regenerated by planting but opportunity is taken to use natural regeneration when present — most notably sycamore, ash and birch. Oak and beech will regenerate naturally but the infrequency of good mast years has deterred widespread use of this system. The new broadleaves policy and the opportunities afforded by tree shelters should lead to greater use of natural regeneration.

Coppice

Coppice was once an almost dominant regeneration system but its practice is now largely confined to sweet chestnut. About 19,000 hectares are commercially cultivated in SE England, and some small areas of mixed coppices, hazel and hornbeam. The practice is seeing something of a revival for wildlife conservation, resurrection of traditional management and for firewood production.

Treeshelters

Without doubt an important recent advance in broadleaved silviculture is the development of treeshelters (Tuley, 1985). From an experiment with just 40 in 1979 many millions are now used every year to aid establishment.

The treeshelter, a transparent or translucent plastic tube generally 1.2m tall, fully protects the newly planted tree (or naturally regenerated seedling) from small mammals, livestock and deer. Taller treeshelters are needed for protection against fallow and red deer, and especially strong ones in fields with cattle. The tree's planting position is clearly identified for easy inspection and weeding. Weeding can be with herbicide without risk of harm to broadleaves because the tree is fully enclosed.

Improved initial growth, especially in height, is frequently observed typically a doubling in the first two or three years. It is not uncommon for oak to produce annual increments of 40-60cm while in a treeshelter.

Some problems have developed as treeshelter designs have evolved but most now are overcome and the current recommendation is that they are suitable for establishment of all species and should be left around the tree until they disintegrate naturally (Evans and Shanks, 1986). The cost of the treeshelter technique, about £1 in total for treeshelter, stake and plant, limit their use in conventional forestry to establishment of areas less than about two hectares. For larger areas at spacings of 3m or less, it will generally be cheaper per hectare to protect by fencing.

Good weed control

The other significant advance in establishment is the recognition, especially for broadleaves, that good weed control means killing competing weeds not just preventing them overtopping the young trees. Competition for moisture and nutrients, especially by grasses in early summer, can severely restrict growth. Rigorous weed control by mulch or herbicide, to a distance of at least 60cm around newly established trees, repays handsomely in improved survival and growth — the mown lawn environment appears to be one of the most stressful for young trees!

Emphasis on Quality

Unlike coniferous forestry maximising volume production is less important than growing highest possible quality of crop; so many features of broadleaves can downgrade quality — stem form, branchiness, timber defects, pests and diseases. Ensuring top quality has many aspects and only brief comment can be made of the main ones.

Site selection

Sheltered sites, of moderate fertility to encourage good stem form, are ideal for most broadleaves but it is now clear that many wood defects, shake in oak and possibly discolouration in ash and beech and mineral streak in wild cherry are at least partially site related. One current recommendation is to avoid planting oak for timber production on light, freely-draining soils where risk of shake is now known to be high.

Seed sources

In addition to what was mentioned under exotics, it should be noted that seed for oak and beech to be grown for timber

production should, under EEC regulations, come from registered stands of pure species and good form. Unfortunately there has been little progeny testing of such stands or, indeed, evaluation of different provenances of these species. What has been done suggests that for oak a good local seed source is likely to be amongst the best that can be used and that for beech many continental origins are better than local stands with Forêt de Soigne, Belgium being markedly superior.

Adequate stocking

The new broadleaves policy insists that to attract full grant support broadleaves are not planted at spacings greater than 3m apart when establishing a timber crop. This blanket requirement has two silvicultural reasons. First, most broadleaved stands show notorious variation in stem form with only a few trees being straight and light-branched: initial stockings in excess of 1,000 per hectare provide some degree of choice and selection to achieve a reasonably good final crop though this number is far below the many thousands per hectare from which our best crops have traditionally been grown. Secondly, some species, but most notably oak, benefit from side shelter to help upward growth and suppress heavy branch development. Very wide spacing leads to open, rounded crowns and generally a less well developed central axis.

This 3m rule is essential in establishing bare ground but on former woodland sites other regrowth, from coppice, or in-growth of willows, birches, elder etc., can provide the necessary side shelter though obviously it will not substitute for adequate numbers for three crop selection unless desirable species such as sycamore or perhaps lime come up in the regrowth.

Cleaning and protection

The forester's job is to intervene in the life of his crop to ensure that the best trees are favoured and not harmed. Cleaning woody regrowth and climbers remains essential on some sites, especially former woodland and on calcareous soils and heavy clays.

Protection of broadleaved woodlands after establishment concentrates on preventing damage from squirrels and rabbits and from damage by farm livestock. Squirrels are especially damaging to thin-barked species such as beech, sycamore and oak; control is quite practicable by a number of means but does require concerted effort in a locality by all woodland owners.

Early final crop selection

Thinning is a powerful tool to manipulate stand composition. In broadleaved silviculture it should always be directed to favouring

the best formed stems of desirable species. An aid to this is to mark such stems in advance, perhaps choosing 300-400 per hectare just prior to first or second thinning, and then favouring these in a selective, partial crown thinning. Thinning intensity has been the subject of much research, in particular the use of free growth where a few well-formed trees are given complete crown freedom to accelerate diameter increment. Such thinning achieves this benefit at the expense of some lost volume per hectare but the silviculture is not yet widely advocated for oak, the main species under investigation, owing to continuing problems over controlling epicormic branches. Regular selection thinning is the key to developing a fine broadleaved stand.

Pruning

Singling of stems in the immediate post-establishment phase, and pruning of side branches up to about 5m is still fairly widely practised on private estates. Both operations encourage good stem form. Control of epicormics on oak is under active research (Evans, 1987) but so far no readily applied control method is available though there is a suggestion that season of thinning does influence epicormic emergence (Wignall *et al.*, 1987). The conventional silviculture of very long rotations, light, infrequent thinning and encouragement of an understorey will, of course, limit the problem.

Felling

Having taken pains to grow a fine stand it unfortunately remains much easier to inflict severe damage to broadleaves by bad felling practices than to conifers with their much tighter crowns. Care is needed to avoid felling in a way which stresses the stem causing it to crack as it hits the ground: typical faults are for the trunk to fall across an already felled log, a rock or stream/gully or for one of the tree's large limbs to hit the ground first.

Policies and Grants

In October 1985, in recognition of the many values of broadleaved woodland and the need to encourage further planting and better management of woodland, the British government announced a new Broadleaved Woodland Grant Scheme. The scheme, with attractive rates of grant support for both planting and natural regeneration, is only for establishing pure broadleaved crops and conduct of operations in accordance with Management Guidelines for Broadleaved Woods. These guidelines and the scheme were the result of five years of increasingly greater political interest in broadleaves — House of Lords Select Committee report (1980) Broadleaves in Britain symposium (1982) Broadleaves in

Britain discussion paper (1984) — and were finally hammered out between the timber industry, the Forestry Commission, professional foresters, and countryside and conservation interests to achieve compromises and balance between the sometimes competing objectives, and the attendant silviculture, of production, conservation and amenity. The guidelines and operation of the grant scheme are currently under review but in their first two years have been successful in encouraging more planting of broadleaves.

Grant support for broadleaved establishment varies according to size of area, as with other forestry support grants, but currently ranges from £600 to £1,200 per hectare paid in instalments over the first 10 years.

Concluding Remarks

This paper has skated over a large subject, has tended to concentrate on silviculture, and necessarily omitted many topics such as selection and improvement of broadleaves, the possible benefits of nitrogen fertilising of ash or of phosphate on sweet chestnut coppice; silvicultural systems to encourage natural regeneration and whole subjects such as ancient woodlands, landscape conservation, and farm woodlands and agroforestry. Nevertheless, it is hoped that the above will indicate not only what British foresters believe important in good management of broadleaves but that once again, after neglect during the upland afforestation era, broadleaved forestry is itself important.

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