

Chapter 8 - PLANTING RATE AND RESUMPTION OF LAND(a) Planting

The progress of planting has been erratic reflecting the uneven rate of acquisition of land; this particularly applies to Culloden where the bulk of the work has been confined to two distinct periods of activity.

The areas planted by Planting Year are as follows:-

<u>P. Year</u>	<u>Culloden</u> <u>acres</u>	<u>Craigphadrig</u> <u>acres</u>	<u>Assich</u> <u>acres</u>
Acquired	212.5	45.0	5.0
23	25.5	-	-
24	-	-	-
25	105.0	7.0	-
26	65.0	53.0	-
27	47.5	43.0	-
28	65.0	41.0	-
29	46.5	6.0	-
30	4.0	-	-
31	-	-	-
32	-	-	-
33	4.0	-	-
34	109.0	-	-
40	-	-	55.0
41	-	-	50.0
42	-	-	51.0
43	-	-	32.0
44	39.5	-	16.0
45	-	-	-
46	-	-	-
47	5.0	2.0	36.0
48	3.0	-	83.0
49	11.0	-	60.0
50	144.0	-	107.0
51	328.0	-	107.0
52	247.0	-	81.0
53	377.5	-	62.0
54	303.0	-	32.0
55	136.5	-	30.0
56	39.0	-	6.0
57	31.5	1.0	-
58	9.0	-	58.0
59	-	-	55.0
60	-	2.0	50.0
61	3.0	1.0	50.0
62	10.0	-	50.0
Totals	2371.0	201.0	1076.0

At Assich the acres planted agrees with the acres shown as stocked but at Craigphadrig and Culloden there is a difference of 1 acre and 47 acres respectively. This is partly accounted for by blown areas being written off and replanted and partly by the failure of interplanted areas.

The rate of planting was as planned, although at Culloden we were committed to plant 90% of the plantable area in the 10 years immediately following entry.

Further/

Further expansion in the Craigphadrig area is most unlikely: at Culloden and Assich there is little prospect of ground becoming available due to the fact that they are situated in a predominantly agricultural area and are surrounded by private estates with woodland schemes of their own. However, approaches are made from time to time to all the surrounding land owners in an effort to get ground, but so far this has met with no success. As the estates in the vicinity of the forests rarely change hands few opportunities present themselves even to compete for land in the open market.

(b) Resumption

In 1958 the plantable land in hand at Culloden, Craigphadrig and Assich was 91.5, 3, and 270 acres respectively. Between 1958 and the end of F.Y.62 the land in hand has been reduced at Assich and Craigphadrig by planting to .65 and 1 acre respectively but has risen at Culloden from 91.5 to 100 acres due to the addition of windblown areas.

Method of Resumption

To date no resumption action has been necessary as the land acquired has always been in hand to the Forestry Commission. In the event of future acquisitions requiring resumption action this would be in accordance with a Directorate Instruction dated March, 1958. The procedure is detailed below:-

Land is acquired by the Secretary of State for Scotland and is paid for out of the Forestry Fund. Where the whole area of an acquisition has been cleared for planting by the D.O.A.F.S. and there are no agricultural tenancies, the Director obtains from the Secretary of State for Scotland a certificate placing the whole area at the disposal of the Forestry Commission with effect from the legal date of entry. This is done immediately the Titles are delivered.

Where agricultural interests are involved a provisional allocation of the land for forestry is agreed with the D.O.A.F.S. All standing timber and untenanted plantable land is placed at the Commission's disposal and the Director obtains the necessary certificate to effect that. The remainder of the land is managed by the D.O.A.F.S. whose Lands Officers visit the tenants concerned to find out how the planting proposals affect them and to collect information on which to base their recommendations for resumption.

Once the boundaries of the land to be planted are agreed, they are accurately surveyed and mapped. The District Officer notifies the Estate Officer who in turn notifies the D.O.A.F.S. when land is to be resumed, so that the agricultural department can issue notices of resumption to the tenants. A tenant has to be given twelve months' notice, the twelve months to run from his term of entry under the lease. In practice, the Estate Officer needs about fifteen months' notice before work can start on ground preparation.

Chapter 9 - SILVICULTURE

- (a) The choice of species at the three forests has been related to site without any deliberate attempt to produce a crop of any one species or any other consideration. A large part of Craigphadrig and the bulk of the up to P34 plantations at Culloden are now in the production stage. This consists of more or less regular, even aged stands and to these normal thinning techniques have been applied. So far, all thinnings have been entirely silvicultural in character and no optimum size or rotation has been prescribed.

Three areas in Culloden have, however, received special attention.

(i) Acquired Douglas Fir Wood: P06

This plantation, extending to some 30 acres, was about 20 years old at the time of acquisition in 1925 and was seen to be in need of immediate attention, no serious thinning having been carried out previously. By 1931 it had been thinned twice lightly and once fairly heavily and thinnings were prescribed to continue at 2-3 year intervals thereafter. In 1936 it was considered that the wood was windfirm and that normal thinnings could safely be applied. The first serious attempt to break the canopy was to be made in 1939 but it appears that this was never carried out and by 1943 a rescue operation was again required to bring the crop under control. After the war the stand was taken in hand once more in 1948 and since then thinning has continued in some part of the wood every year. Despite this intensive treatment, however, the crop has suffered damage by windblow on several occasions but it would appear that this is due to the inherent instability of the site rather than to lack of attention.

(ii) Station area

This area was part of the original acquisition in 1925 and at that time carried a scattered crop of Scots pine on about 100 acres which was giving rise to groups of natural regeneration. It was hoped that the area would stock itself with the minimum of attention and this was confined to a little selective felling and some thinning out of the denser and larger groups together with the introduction of a few patches of Tsuga heterophylla between 1925 and 1933. Hopes of successful natural regeneration of the area were not fulfilled even when seedlings appeared they died off within the first year. The Tsuga groups, however, flourished.

When ploughing techniques came into current practice after the war it was decided to disturb the ground surface with a disc plough on the assumption that it was the impervious conditions which were inimical to the continued growth of the seedlings and in 1948 part of the area was tackled. The rough trees were felled out and the stumps creosoted and the brush and heather burned off before discing began. By 1953 it was obvious that success was not going to attend these efforts and the blame was shifted to rabbits which were found to be on the ground. The subsequent demise of the rabbit demonstrated, however, that the damage done by it was only incidental and that while a limited amount of natural regeneration could be sustained, the area would have to be regenerated artificially. Since then further felling has been carried out to allow extensive ploughing of the ground and inter-planting on a small scale has been done throughout the area.

(iii)/

(iii) Sitka spruce P.12

When it was found that Sitka spruce was regenerating freely on the leeward side of the P.12 stand, trees were removed gradually from this side in order to extend the naturally regenerated area. This was done very successfully until the severe gale in January 1953 when a large hole was blown in the stand. The extra light now provided stimulated vegetation growth so that some preparation of the surface had to be done. This took the form of "screefs" at the normal planting distance.

(b) Thinning

Due to wartime delays, thinning of young plantations at Culloden did not get under way until 1947 by which time many stands - particularly of Douglas fir - were badly overstocked. Since 1947 thinning has continued on a 3-4 year cycle resulting in an average output of 100 hoppus feet per acre per annum, the higher yield from Douglas fir areas - up to 200 hoppus feet per acre per annum - being offset by early inroads into Scots pine stands which have yielded as little as 30 hoppus feet per acre per annum.

The first post-war thinnings were concerned to remove offending wolf trees wherever this would not endanger the stability of the crop and this operation was carried through very successfully. At present normal low thinning techniques are employed and the crop on the whole has been brought into an acceptable condition.

There has been a tendency in the past to spread the thinning in any one year over all the older plantations thus giving rise to very dispersed working. Now that past neglect has been largely redressed it is possible to deal with the thinning area in a more orderly manner.

In the acquired woods at Craigphadrig thinning was carried out for the first time in 1939 and 1940. This was described as a moderate thinning. During the war years (1939-45) thinning was neglected and does not appear to have been resumed until 1948. In 1949 there was a standing sale of thinnings. Since then the thinnings have been light and often until something approaching normal density has now been reached. Output per acre per annum for Douglas fir and Scots pine which are the main species is similar to Culloden.

The Thuja plicata stand received rather different treatment; it was kept heavily stocked until 1953 when 560 hoppus feet per acre were removed. Again in 1955, 680 hoppus feet per acre were taken out. The stand was next thinned in 1959 when 300 hoppus feet per acre were removed. The intention at present is to reduce the density of the crop gradually until there is sufficient light for an undercrop of silver fir to develop. This stand has been made available to Research Branch in connection with their investigation into the spread of Fomes annosus.

At Assich, apart from the acquired wood extending to 5 acres very little of the Forestry Commission planted woods have reached the thinning stage. Up to the present only rough mis-shapen stems have been removed from the Scots pine crop and diseased and suppressed trees from the larch stands.

(c) Felling

At Culloden felling has been confined to the removal of rough trees from the Station area over a long period of time and to the commercial cutting by the Timber Production Department in 1941 of 30 acres in the acquired Larch wood (P.12).

No clear-felling has been done at either Craigphadrig or Assich.

Chapter 10 - CROP ESTABLISHMENT

(a) Choice of Species

The wide variety of species present in the acquired plantations and in the surrounding privately owned woods provided a good guide to the selection of species. The main species found in these woods, in order of quantity, were Scots pine, European larch, Douglas fir and Norway spruce and it is therefore not surprising, in view of the fact that all four species had grown well, to find that 70% of the Working Plan area has been stocked with these four species.

At the time of acquisition the species growing at Culloden were Douglas fir planted in P06 and Scots pine, European larch and Sitka spruce planted in P12. All these species have grown well but the volume production of the Douglas fir has been outstanding. At the time of survey (1958) the average quality class of the Douglas fir was II, the Scots pine III, the European larch II and Sitka spruce IV.

On the Creep Soils

In view of the outstanding performance of Douglas fir this species was largely used on the deeper fertile soils at both Culloden and Craighadrig and has grown very well. On shallower soils of this type Scots pine was the species mostly used, while the moister soils were stocked with Norway spruce. Both species have grown moderately well. European larch and Sitka spruce, however, were not greatly used in the early years. Pinus ponderosa and Corsican pine were tried on a small scale, but cannot be said to have been highly successful. Thuja plicata, tried on the lower slopes at Craighadrig, has grown well but has suffered severely from Fomes attack. At Assich the old arable land was stocked mainly with European larch and Norway spruce. The European larch rate of growth has been satisfactory, but stem form is rather twisted and there are indications that Fomes is present in the stand. The Norway spruce has also grown at a satisfactory rate and the crop is vigorous looking and uniform with, as yet, no sign of Fomes attack.

On the Podsoles

The upper slopes and higher ground which account for the bulk of the post war acquisitions at Culloden and Assich falls within this category.

On these less fertile soil types the species chiefly used have been Scots pine, Pinus contorta, Japanese larch and Sitka spruce, either pure or in mixture on the wetter and deeper peats.

Scots pine, which was planted on the more peat free soils of the upper slopes and higher ground has grown satisfactorily except where planting has strayed onto deep moist peats; these more slowly developing areas are not, however, extensive. The species used for stocking the wetter and more fibrous peats has been Pinus contorta which, even in the poorest conditions, has managed to maintain a satisfactory rate of growth. Sitka spruce was introduced where peats were deep, moist and of a more amorphous nature; it was also used in mixture with Pinus contorta on moist sites where peat was shallower and slightly more fibrous. On all sites growth of Sitka has suffered as the result of frost damage. Planting/

Planting of this species has not been extensive and over the whole working plan area, including acquired plantations, is less than 8%. Japanese larch has been planted mainly as a fire protective species around the perimeter of the forest blocks and in belts throughout the forest. Growth has varied with the fertility of the site, but generally it has succeeded in its purpose; it has certainly shown its ability to grow under a wide variety of conditions.

Current Practice

Species selection today differs little from that adopted in the past, except in that European larch has almost ceased to be planted and is replaced by Douglas fir if the site is comparatively unexposed and with either spruce or pine on more exposed sites depending on the vegetation. The use of Sitka spruce on marginal sites in mixture with either Scots pine or Pinus contorta has been largely discontinued and is replaced by planting either of the pines pure or in mixture together. Sitka spruce is now only planted on the more amorphous type peats where the vegetation is other than heather. Scots pine and Pinus contorta continue to form the main species for the stocking of the upland heath areas and Japanese larch continues to be planted for fire protection purposes.

Provenances

There are no records to indicate definitely the provenance of the various species planted between the wars, but it is believed that Douglas fir came from the lower reaches of the Fraser River in British Columbia; European larch are suspected to be of Central European origin. Some of the mixtures and transplants used in the earliest planting of Scots pine were received from Beaufort and Seaton nurseries and may be of Scottish origin. One small lot was received from Viborg, Finland and was planted in the Cullernie Section of Culloden. Post war Scots pine have almost entirely been of British origin and from 1953 onwards Scottish stock has invariably been used.

(b) Preparation of Ground

(1) Treatment of Birch Scrub

Of the three forests only Culloden carried scrub which required treatment prior to planting and this together with the burning of lop and top which covered part of the ground was accomplished entirely by forest labour. From 1934 onwards, however, most of the clearing has been undertaken by firewood merchants. In most cases the scrub was completely cleared, but a small area of approximately 2 acres of dense birch was treated on the "drift" system in which an 8' wide strip was left standing alternating with a 4' wide lane cleared. The remains of this method, which was not very successful, can still be detected although the remaining scrub is now entirely suppressed.

(2) Draining and Turf Spreading

Ground preparation for the early plantings consisted entirely of hand drainage and unfortunately on the impeded soils of the higher ground this was dangerously skimped and had to be reinforced substantially in later years. Even so, the tackling of this type of ground would have been better left to the era of ploughing could it have been envisaged.

The spreading of mounds or turves was introduced in 1928 and was progressively extended thereafter, much of the P34 area being prepared in this way. Preference was strongly expressed for a good thick sod to obviate risks of drying out during the planting season. Hand draining and turf spreading was continued until 1948 when ploughing on a large scale was started.

In the preparation of old woodland sites where stumps were still sound, a disc plough was operated which broke up the surface effectively but did not go deep enough to break the compacted subsoil.

On open ground the first plough used was the Begg and this operated on old arable land at Assich in 1948, 1949 and 1950 and on this type of land it did a good job. On tougher moorland types it was not so effective and was followed in 1951 by the double and single mould board Cuthbertson ploughs. The double was used mainly for the supply of turf on which to plant and the single for both drainage purposes and turf supply. Neither of these, however, penetrated the hard compacted subsoil and it was not until the introduction of the tine plough in 1953 that really effective cultivation work was possible. Present practice is to use the Cuthbertson for draining the deep peat and wet soils and the tine plough on the drier shallow peat overlying mineral soils.

(c) Planting methods

Up till 1929, all the Douglas fir was pit-planted but the normal method at this time was by notching into screefed patches using a Mansfield spade. When mounding was introduced, the semi-circular spade was brought into use to remove a plug from the mound.

Since the introduction of ploughing, planting is usually carried out on the top or on the side of the furrow, worn down garden spades being the implement now most favoured for this purpose.

(d) Weeding

In the early plantations extensive weeding of grass, bracken, broom and whins was necessary on the more fertile sites, but the heathland areas generally called for little attention as most of the vegetation was burned off prior to planting.

The introduction of ploughing further reduced the need for weeding, but extensive beat-ups in recent years caused weeding to be considerably protracted. There is no evidence of inability to cope with the weeding problem at any period and no significant losses have been incurred thereby.

(e) Beating Up

Beating-up of the early Douglas fir plantings at Culloden was extensive, due apparently to oversized plants and a succession of dry seasons, but otherwise the amount of work necessary in the early plantations was not abnormal.

The extensive use of seedlings on ploughed ground from 1950-1953 unfortunately coincided with a series of spring droughts and the death rate was particularly high; 25%-30% beat-up of much of the area was required during this period. Species chiefly affected were Scots pine and Japanese larch.

Losses at both Assich and Culloden were abnormally high in the very dry year of 1955 which not only affected the P55 plantings but also those of P53 and P54.

(a) Fencing

Fencing against stock and rabbits has been standard practice at all three forests from the outset and, despite the ravages of myxomatosis, rabbit netting still cannot be dispensed with. The presence in the forests of a number of roe deer has not been considered sufficient to warrant deer fencing, although this would have precluded to some extent the occasional winter visitations of mountain hares on the higher ground. Fences are all maintained in a stock proof condition.

At Assich a small area (6 acres) in Compartment 7 has been planted in 1955 and 1956 without any protection, as the cost of fencing was considered to be uneconomical. Since planting there has not been much interference by rabbits or stock.

(b) Cleaning

Cleaning of the early plantations at Culloden has been carried out systematically since 1927 and has kept ahead of the thinning programme. The removal of advance growth of natural Scots pine of a poor, stunted nature, has been necessary on both the Dundavie and Dalcross sections.

At Craigphadrig the only cleaning done has been confined to the removal of birch which competed with Scots pine during the establishment stage.

At Assich badly formed and stunted natural Scots pine growing throughout the plantations were removed while in post war years pre-thinning has been done in Scots pine and European larch plantations formed between P40 and P44. In P48 plantations where an alternate line mixture of Scots pine and Norway spruce was planted, the cutting back of pine branches has been found necessary to free the slower growing Norway spruce.

(c) Draining

At Culloden and Assich only a limited amount of hand drainage has been required since the introduction of ploughing, but considerable attempts have been made to deal with an insufficiency of drains in the earlier plantations, particularly where their absence appears to be retarding growth. This has involved both the deepening of existing drains, and the provision of many new ones and at least in some instances an appreciable effect has been achieved.

Attention to drains after thinning operations is of paramount importance in an area where the water table can rise so close to the surface and a real attempt has been made to keep this work up to date.

Because of its topography little drain maintenance has been found necessary at Craigphadrig apart from the cleaning out of drains on the moist rich flushes following thinning.

(d) Racking

Racking has not been required at Culloden or Assich due to the practice of carrying out early brashing, but at Craigphadrig some racking was done alongside the railway in 1928 and 1929 with a view to allowing quick access in the event of fire.

(e)/

(e) Brashing

Brashing started on an extensive scale at Culloden in 1943 and has gone on continuously since then, the programme now being fully up to date. Originally 100% brashing was carried out, but this has now been reduced to something like 60% although in practice this figure is generally exceeded.

At Craighadrig and Assich brashing has also kept well ahead of thinning, the intensity being about 80% for pines but higher for larch and Douglas fir. All trees are brashed to a height of 6'.

(f) Pruning

Pruning up to 12 ft. was carried out on some 70% of the stems in the acquired Douglas fir wood in 1929 and in 1932 this was extended to 18 ft. In the post war period selected stems in the more promising stands have been pruned to 13 ft. and a regular programme of this work is in force. Pruning of live branches is confined to the dormant season.

(g) Other Maintenance Operations1. Manuring

The application of mineral fertilisers after planting was introduced on a very limited scale in 1929 when slag was applied to some areas of Sitka spruce. In the post war era it has been the general practice to apply some form of fertiliser to Sitka spruce, Japanese larch, Lodgepole pine and Scots pine on the poor ground after planting, at the rate of one ounce per plant for the Pine and Larch and two ounces for the Spruce. Latterly ground mineral phosphate and Triple phosphatic manures have been applied, but in 1949 recourse was had to potato fertiliser.

2. Re-manuring

Manuring with slag of some of the P34 areas was carried out in 1938 but this practice lapsed until 1950 when a programme of treatment with ground mineral phosphate - mainly of Japanese larch, Sitka spruce, Scots pine - was initiated: it continues on a limited scale. A more satisfactory rate of growth has resulted.

Chapter 12 - ENRICHMENT AND REHABILITATION(a) Enrichment

The only enrichment carried out at Culloden in pre-war years consisted of the filling up of blanks in the rough old pines on the station area with Tsuga heterophylla and to a lesser extent Sitka spruce, between 1928 and 1933. This work was continued after the war mainly in 1953 and 1956 but only on a very limited scale. Development has been patchy and rather disappointing.

Since 1951 sporadic enrichment has also taken place in the acquired Douglas fir plantation, mainly in windblown gaps. The growth of the Douglas fir and Tsuga heterophylla used has been satisfactory.

At Assich Sitka spruce, Thuja plicata and Lawson Cypress were introduced in 1960 into 10 acres of P40-41 European larch where the stocking had been greatly reduced by the removal of unhealthy and badly twisted stems.

Apart from the introduction of Abies procera and grandis to fill gaps in C.1 and C.3 no other enrichment work has been done at Craighadrig.

(b) Rehabilitation

At Culloden 6 acres of P48 Scots pine acquired from Dalcross estate were showing so little promise that they were ploughed, drained and replanted in P57. The resultant take was good and early growth is quite satisfactory and certainly more promising than the original crop.

Record of Past Yields from Thinning and Felling
NORMAL AND WINDBLOWVolumes in 000's h. ft. over bar
Areas in acres

Working Plan Area Culloden Group

* Complete as
necessary

* Section Composite

* Working Circle

* Felling Series

Species and Species Groups																	
Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
				Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)
58	Total	48.4		13.6		11.0		2.9		20.9							
	2 1/2"-6"	15.9		9.8		3.8		1.2		1.1							
	6 1/2"-9"	32.5		3.8		7.2		1.7		19.8							
	Over 9"	-		-		-		-		-							
59	Total	46.1		24.8		4.2		6.2		8.4		2.5					
	2 1/2"-6"	19.1		12.8		1.6		3.7		.9		.1					
	6 1/2"-9"	14.8		7.9		1.7		1.1		2.4		1.7					
	Over 9"	12.2		4.1		.9		1.4		5.1		.7					
60	Total	52.4		14.2		7.9		2.8		27.4		.1					
	2 1/2"-6"	12.8		5.3		3.2		.3		4.0		-					
	6 1/2"-9"	20.3		3.1		4.4		1.2		11.6		-					
	Over 9"	19.3		5.8		.3		1.3		11.8		.1					
61	Total	87.9		18.8		15.0		8.2		44.4		1.2					
	2 1/2"-6"	16.5		5.8		4.1		.6		5.3		.4					
	6 1/2"-9"	36.7		7.3		7.2		3.2		18.4		.6					
	Over 9"	34.7		5.7		3.7		4.4		20.7		.2					
62	Total	100.0		23.6		26.7		10.8		38.7		.2					
	2 1/2"-6"	20.0		10.9		6.3		.9		1.9		-					
	6 1/2"-9"	41.7		8.2		13.8		3.9		15.7		.1					
	Over 9"	38.3		4.5		6.6		6.0		21.1		.1					

Working Plan Area Culloden Group

Record of Past Yields from Thinning/Felling

NORMAL & WINDBLOW

Volumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary

* Section

Culloden

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
58	Total	40.5	75	8.6	32	10.9	19	1.9	2	19.1	22						
	2 1/2"-6"	10.8		6.2		3.8		.4		.4							
	6 1/2"-9"	29.7		2.4		7.1		1.5		18.7							
	Over 9"	-		-		-		-		-							
59	Total	34.9	98	18.3	53	3.8	9	6.2	25	6.6	11						
	2 1/2"-6"	15.2		9.4		1.6		3.7		.5							
	6 1/2"-9"	9.4		5.3		1.5		1.1		1.5							
	Over 9"	10.3		3.6		.7		1.4		4.6							
60	Total	42.1	72	6.2	6.0	7.6	14	2.1	2	26.2	50						
	2 1/2"-6"	7.4		.2		3.2		-		4.0							
	6 1/2"-9"	16.0		.3		4.2		1.0		10.5							
	Over 9"	18.7		5.7		.2		1.1		11.7							
61	Total	74.7	49	12.8	13	14.9	12	8.2	1	38.8	23						
	2 1/2"-6"	11.7		1.9		4.1		.6		5.1							
	6 1/2"-9"	32.3		5.6		7.2		3.2		16.3							
	Over 9"	30.7		5.3		3.6		4.4		17.4							
62	Total	86.4	26	17.8	10	26.5	5	10.2	5	31.9	6						
	2 1/2"-6"	15.2		6.8		6.3		.8		1.3							
	6 1/2"-9"	36.2		6.7		13.8		3.6		12.1							
	Over 9"	35.0		4.3		6.4		5.8		18.5							

Record of Past Yields from Thinning/Felling AND WINDBLOW

Volumes in 000's h. ft. over bark

Areas in acres

Working Plan Area **Culloden Group**

* Complete as
necessary

* Section

Culloden

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
58	Total	14.2	-	.8	-	4.8	-	1.6	-	7.0	-						
	2 1/2"-6"	1.3		.8		.3		.1		.1							
	6 1/2"-9"	12.9		-		4.5		1.5		6.9							
	Over 9"	-		-		-		-		-							
59	Total	2.9	-	.1	-	.1	-	.8	-	1.9	-						
	2 1/2"-6"	-		-		-		-		-							
	6 1/2"-9"	.8		.1		.1		.4		.2							
	Over 9"	2.1		-		-		.4		1.7							
60	Total	3.6	-	.3	-	1.8	-	.8	-	.7	-						
	2 1/2"-6"	.3		-		.3		-		-							
	6 1/2"-9"	2.2		.2		1.4		.5		.1							
	Over 9"	1.1		.1		.1		.3		.6							
61	Total	45.8	13.75	6.6	5.0	12.3	7.0	2.6	.25	24.3	1.5						
	2 1/2"-6"	5.6		.6		2.9		-		2.1							
	6 1/2"-9"	19.6		3.2		5.9		.7		9.8							
	Over 9"	20.6		2.8		3.5		1.9		12.4							
62	Total	68.6	8.45	8.5	-	26.5	4.6	6.5	.5	27.1	4.25						
	2 1/2"-6"	11.3		2.9		6.3		.8		1.3							
	6 1/2"-9"	32.2		4.5		13.8		2.5		11.4							
	Over 9"	25.1		1.1		6.4		3.2		14.4							

Record of Past Yields from ~~Estimating~~/Felling NORMALWorking Plan Area Culloden GroupVolumes in 000's h. ft. over bar
Areas in acres* Complete as
necessary

* Section

Culloden

* Working Circle

* Felling Series

Species and Species Groups																	
Year (1)	B.H.Q.G. Classes (2)	Total (3) (4)		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
				Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
58	Total																
	2 1/4"-6"																
	6 1/4"-9"																
	Over 9"																
59	Total	5.1	4.0	5.1	4.0												
	2 1/4"-6"	-		-													
	6 1/4"-9"	3.4		3.4													
	Over 9"	1.7		1.7													
60	Total	1.7	1.0	1.7	1.0												
	2 1/4"-6"	-		-													
	6 1/4"-9"	-		-													
	Over 9"	1.7	1.0	1.7													
61	Total	10.6	3.0	2.6	1.0	.1	-	4.9	1.0	3.0	1.0						
	2 1/4"-6"	1.0		.5		-		.5		-							
	6 1/4"-9"	4.3		1.0		.1		2.5		.7							
	Over 9"	5.3		1.1		-		1.9		2.3							
62	Total																
	2 1/4"-6"																
	6 1/4"-9"																
	Over 9"																

Record of Past Yields from Thinning/~~Estimating~~ **NORMAL**Working Plan Area **Culloden Group**Volumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary* Section **Culloden**

* Working Circle

* Felling Series

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
58	Total	26.3	75	7.8	32	6.1	19	.3	2	12.1	22						
	2 1/4"-6"	9.5		5.4		3.5		.3		.3							
	6 1/4"-9"	16.8		2.4		2.6		-		11.8							
	Over 9"	-		-		-		-		-							
59	Total	26.9	94	13.1	49	3.7	9	5.4	25	4.7	11						
	2 1/4"-6"	15.2		9.4		1.6		3.7		.5							
	6 1/4"-9"	5.2		1.8		1.4		.7		1.3							
	Over 9"	6.5		1.9		.7		1.		2.9							
60	Total	36.8	71	4.2	5	5.8	14	1.3	2	25.5	50						
	2 1/4"-6"	7.1		.2		2.9		-		4.0							
	6 1/4"-9"	13.8		.1		2.8		.5		10.4							
	Over 9"	15.9		3.9		.1		.8		11.1							
61	Total	18.3	32.5	3.6	6.5	2.5	5.5	.7	.25	11.5	20.25						
	2 1/4"-6"	5.1		.8		1.2		.1		3.0							
	6 1/4"-9"	8.4		1.4		1.2		-		5.8							
	Over 9"	4.8		1.4		.1		.6		2.7							
62	Total	17.8	17.4	9.3	10.0	-	-	3.7	4.8	4.8	2.6						
	2 1/4"-6"	3.9		3.9		-		-		-							
	6 1/4"-9"	4.0		2.2				1.1		.7							
	Over 9"	9.9		3.2				2.6		4.1							

Working Plan Area Culloden GroupRecord of Past Yields from Thinning/Felling
AND
NORMAL AND WINDFELLVolumes in 000's h. ft. over ba
Areas in acres• Complete as
necessary• Section Assidh

• Working Circle

• Felling Series

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
58	Total	.7	7.3					.7	7.3								
	2 1/4" - 6"	.7						.7									
	6 1/4" - 9"																
	Over 9"																
59	Total																
	2 1/4" - 6"																
	6 1/4" - 9"																
	Over 9"																
60	Total	3.5	25.0	3.1	21.0	.1		.3	4.0								
	2 1/4" - 6"	2.7		2.4		-		.3									
	6 1/4" - 9"	.7		.7		-											
	Over 9"	.1		-		.1											
61	Total	2.8	17.5	2.5	17.0							.3	.5				
	2 1/4" - 6"	2.2		1.9								.3					
	6 1/4" - 9"	.5		.5								-					
	Over 9"	.1		.1								-					
62	Total	2.9	16.0	2.8	16.0			.1	-								
	2 1/4" - 6"	2.9		2.8				.1									
	6 1/4" - 9"	-		-				-									
	Over 9"	-		-				-									

AND Record of Past Yields from Thinning/Felling

WINDBLOW

Volumes in 000's h. ft. over bark

Working Plan Area Culloden Group

* Complete as necessary

* Section Assich

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
58	Total																
	2 1/2"-6"																
	6 1/2"-9"																
	Over 9"																
59	Total																
	2 1/2"-6"																
	6 1/2"-9"																
	Over 9"																
60	Total	.4	2.0	.4	2.0												
	2 1/2"-6"	.2		.2													
	6 1/2"-9"	.2		.2													
	Over 9"	-		-													
61	Total	.7	2.0	.7	2.0												
	2 1/2"-6"	.1		.1													
	6 1/2"-9"	.5		.5													
	Over 9"	.1		.1													
62	Total																
	2 1/2"-6"																
	6 1/2"-9"																
	Over 9"																

Working Plan Area **Culloden Group**Volumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary* Section **Assich**

* Working Circle

* Felling Series

Species and Species Groups

Species and Species Groups																		
Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech		
				Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)
58	Total																	
	2 1/4"-6"																	
	6 1/4"-9"																	
	Over 9"																	
59	Total																	
	2 1/4"-6"																	
	6 1/4"-9"																	
	Over 9"																	
60	Total																	
	2 1/4"-6"																	
	6 1/4"-9"																	
	Over 9"																	
61	Total	.3	.5									.3	.5					
	2 1/4"-6"	.3	.5									.3	.5					
	6 1/4"-9"	-	-									-	-					
	Over 9"	-	-									-	-					
62	Total	.2	1	.1	1			.1										
	2 1/4"-6"	.2	1	.1	1			.1										
	6 1/4"-9"	-	-	-	-			-				-	-					
	Over 9"	-	-	-	-			-				-	-					

Record of Past Yields from Thinning/~~Resting~~

NORMAL

Working Plan Area Culloden Group

Volumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary

* Section Assich

* Working Circle

* Felling Series

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
58	Total	.7	7.3					.7	7.3								
	2 1/2"-6"	.7						.7									
	6 1/2"-9"	-						-									
	Over 9"	-						-									
59	Total																
	2 1/2"-6"																
	6 1/2"-9"																
	Over 9"																
60	Total	3.1	23.0	2.7	19.0	.1		.3	4.0								
	2 1/2"-6"	2.5		2.2		-		.3									
	6 1/2"-9"	.5		.5		-		-									
	Over 9"	.1		-		.1		-									
61	Total	1.8	15.0	1.8	15.0												
	2 1/2"-6"	1.8		1.8													
	6 1/2"-9"	-		-													
	Over 9"	-		-													
62	Total	2.7	15.0	2.7	15.0												
	2 1/2"-6"	2.7		2.7													
	6 1/2"-9"	-		-													
	Over 9"	-		-													

Record of Past Yields from Thinning/Felling AND

NORMAL AND WINDELOW

Volumes in 000's h. ft. over bark
Areas in acres

Working Plan Area Culloden Group

• Complete as necessary

• Section Cred Gphedrl 8

• Working Circle

• Felling Series No felling 1956-60

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
58	Total	7.2	57.0	5.0	45.4	.1	-	.3	2.6	1.8	9.0						
	2 1/2"-6"	4.4		3.6		-		.1		.7							
	6 1/2"-9"	2.8		1.4		.1		.2		1.1							
	Over 9"	-		-		-		-		-							
59	Total	11.2	57.0	6.5	36.0	.4	1.5			1.8	10.0	2.5	9.5				
	2 1/2"-6"	3.9		3.4		-				.4		.1					
	6 1/2"-9"	5.4		2.6		.2				.9		1.7					
	Over 9"	1.9		.5		.2				.5		.7					
60	Total	6.8	50.0	4.9	41.0	.2	-	.4	3.0	1.2	6.0	.1	-				
	2 1/2"-6"	2.7		2.7		-		-		-		-					
	6 1/2"-9"	3.6		2.1		.2		.2		1.1		-					
	Over 9"	.5		.1		-		.2		.1		.1					
61	Total	10.4	29.0	3.5	17.0	.1	-		-	5.6	7.0	1.2	5.0				
	2 1/2"-6"	2.6		2.0		-				.2		.4					
	6 1/2"-9"	3.9		1.2		-				2.1		.6					
	Over 9"	3.9		.3		.1				3.3		.2					
62	Total	10.7	28.25	3.0	21.0	.2	-	.5	-	6.8	7.25	.2	-				
	2 1/2"-6"	1.9		1.3		-		-		.6		-					
	6 1/2"-9"	5.5		1.5		-		.3		3.6		.1					
	Over 9"	3.3		.2		.2		.2		2.6		.1					

Working Plan Area Culloden GroupAND
Record of Past Yields from Thinning/Felling
WINDBLOWVolumes in 000's h. ft. over bar
Areas in acres* Complete as
necessary

* Section

Craigphadrig

* Working Circle

* Felling Series No felling whatever 1956-60

Species and Species Groups

Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)	Volume (17)	Area (18)
58	Total	.1	-	-	-	.1	-										
	2 1/4"-6"	-		-		-											
	6 1/4"-9"	.1		-		.1											
	Over 9"	-				-											
59	Total																
	2 1/4"-6"																
	6 1/4"-9"																
	Over 9"																
60	Total	.2	-	-	-	.2	-										
	2 1/4"-6"	-				-											
	6 1/4"-9"	.2				.2											
	Over 9"	-				-											
61	Total	4.9	1.0	.2	-	.1	-	-	-	4.5	1.0	.1					
	2 1/4"-6"	.3		.1		-				.2		-					
	6 1/4"-9"	1.4		.1		-				1.3		-					
	Over 9"	3.2		-		.1				3.0		.1					
62	Total	4.3	-	-	-	.2	-	.5	-	3.4	-	.2					
	2 1/4"-6"	.2		-		-		-		.2		-					
	6 1/4"-9"	1.9		-		-		.3		1.5		.1					
	Over 9"	2.2		-		.2		.2		1.7		.1					

Record of Past Yields from ~~Thinning~~/Felling

NORMAL

Working Plan Area Culloden GroupVolumes in 000's h. ft. over bark
Areas in acres* Complete as
necessary

* Section

Craigphadrig

* Working Circle

* Felling Series

Year (1)	B.H.Q.G. Classes (2)	Total		Species and Species Groups							
				Pines		Spruces		Larches		D.F.	
		Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)
58	Total										
	2 1/4" - 6"										
	6 1/4" - 9"										
	Over 9"										
59	Total										
	2 1/4" - 6"										
	6 1/4" - 9"										
	Over 9"										
60	Total										
	2 1/4" - 6"										
	6 1/4" - 9"										
	Over 9"										
61	Total										
	2 1/4" - 6"										
	6 1/4" - 9"										
	Over 9"										
62	Total	.8	.25	-	-	-	-	-	-	.8	.25
	2 1/4" - 6"	-								-	
	6 1/4" - 9"	.7								.7	
	Over 9"	.1								.1	

Working Plan Area Culloden GroupRecord of Past Yields from Thinning/~~Felling~~
NORMALVolumes in 000's h. ft. over bar
Areas in acres* Complete as
necessary* Section Craigphadrig

* Working Circle

* Felling Series No felling whatever 1956-60

Species and Species Groups																	
Year (1)	B.H.Q.G. Classes (2)	Total		Pines		Spruces		Larches		D.F.		Other Conifers		Oaks		Beech	
				Volume (3)	Area (4)	Volume (5)	Area (6)	Volume (7)	Area (8)	Volume (9)	Area (10)	Volume (11)	Area (12)	Volume (13)	Area (14)	Volume (15)	Area (16)
58	Total	7.1	57.0	5.0	45.4	-	-	.3	2.6	1.8	9.0	-	-				
	2½"-6"	4.4		3.6				.1		.7							
	6½"-9"	2.7		1.4				.2		1.1							
	Over 9"	-		-				-		-							
59	Total	11.2	57.0	6.5	36.0	.4	1.5	-	-	1.8	10.0	2.5	9.5				
	2½"-6"	3.9		3.4		-				.4		.1					
	6½"-9"	5.4		2.6		.2				.9		1.7					
	Over 9"	1.9		.5		.2				.5		.7					
60	Total	6.6	50.0	4.9	41.0	-	-	.4	3.0	1.2	6.0	.1	-				
	2½"-6"	2.7		2.7				-		-		-					
	6½"-9"	3.4		2.1				.2		1.1		-					
	Over 9"	.5		.1				.2		.1		.1					
61	Total	5.5	28.0	3.3	17.0	-	-	-	-	1.1	6.0	1.1	5.0				
	2½"-6"	2.3		1.9						-		.4					
	6½"-9"	2.5		1.1						.8		.6					
	Over 9"	.7		.3						.3		.1					
62	Total	5.6	28.0	3.0	21.0	-	-	-	-	2.6	7.0	-	-				
	2½"-6"	1.7		1.3						.4							
	6½"-9"	2.9		1.5						1.4							
	Over 9"	1.0		.2						.8							

Chapter 13 - REGULATION OF YIELD

(a) Forms W.P.13.

(b) Methods of Yield Regulation

At Cullogen no deliberate regulation of the yield has been practised, although during the last ten years reasonably accurate forecasts of the volume of production have been made and used as a basis for financial and utilisation estimates.

There are some 475 acres in normal thinning production together with a further 100 acres or so of mature Scots pine timber which provide a sporadic out-turn. Production has fluctuated somewhat but has built up during the last ten years from about 30,000 hoppus feet per annum in 1948 to just over 40,000 hoppus feet in 1960. As the current measurement of the growing stock reveals a C.A.I. of some 90,000 hoppus feet per annum, it would appear that a satisfactory intensity of yield regulation has emerged.

It would also appear that the occurrence of windblow is always to be present at Cullogen and in any forecast of production an allowance should be made for this contingency. In the last five years - F.Y.58-F.Y.62 inclusive - the volume of blown timber worked at Cullogen has been 135,100 hoppus feet out of a total production of 261,200 hoppus feet. The bulk of the blown timber fell in the F.Y.61-62 gales when 45,800 and 68,600 hoppus feet respectively were blown. Damage occurred chiefly in the older plantations - P.06 and P.25 - but there was also sporadic windfall in the younger P. years.

Like Cullogen no deliberate attempt was made at yield regulation at Craighadrig and there has been some variation in yields ranging between 5,000 and 11,000 hoppus feet annually over the past five years. First thinnings were somewhat delayed and only started in F.Y.48 when a total of 1,895 hoppus feet were removed. During the next few years thinnings were much heavier, the greatest volume being removed in F.Y.50 when 19,876 hoppus feet were removed. There was then a gradual reduction in volume as arrears were worked off. The current annual increment is 29,900 hoppus feet and if we accept that some 40% of this be removed in thinnings the annual volume removed should be in the region of 12,000 hoppus feet. Future annual volumes will be around this figure. The only severe wind damage suffered at the forest was as a result of the February gale in 1957 when some 9,000 hoppus feet were blown; damage in F.Y.61 and F.Y.62 was less severe and amounted to 4,900 and 4,300 hoppus feet respectively.

At Assich the plantations, apart from a small area of European larch and a few patches of older Scots pine, are not yet ready for thinning.

Chapter 14 - FOREST ROADS AND ACCESS(a) Construction

It is estimated that the total mileage of roads required to serve the area of 3,800 acres of plantations will be approximately 33 miles, of which some 16.8 are already in existence and are classified into their various categories as under:-

<u>Forest</u>	<u>County</u>	<u>Existing Roads</u>		<u>Total</u>	<u>Future Requirements</u>
		<u>Shared</u>	<u>F.C.</u>		
Craigphadrig	.75	.65	1.0	2.4	.25
Assich	.50	1.20	1.7	3.4	6.0
Culloden	4.0	-	7.0	11.0	10.0
Total	5.25	1.85	9.7	16.8	16.25

The outstanding mileage at Craigphadrig is to serve an area in the vicinity of the vitrified fort which has already been bulldozed but requires metalling.

At Assich the 6 miles still required are all interior forest roads - existing roads being, apart from the road serving the Forester's house at Carnoch, located around the edge of the forest; these, however, are not as yet urgently required for extraction purposes and requirements are phased thus: by 1970 - 3 miles; 1970-1980 - 2 miles and the balance of 1 mile by 1985.

The outstanding mileage at Culloden is 10 miles, of which 6 miles are required by 1975 and the balance of 4 miles early in the following decade.

All new roads will require to conform to the specifications in force at the time of construction. At present these specifications are:-

- (i) Width of carriageway - 10 feet with widening on bends.
- (ii) Maximum gradient 1' in 10'. In special cases over short lengths the gradient may be increased to 1' in 8'.
- (iii) Minimum radius of curvature - 35'.
- (iv) Passing places - approximately 10 to 1 mile.

The cost of construction of the roads made by Forestry Commission in the early post war years - 1947-48 - was approximately £2,000 per mile. These were formed on level terrain in the lower and older part of the Culloden plantations. A later road formed in the Westhill section of Culloden in 1958 over a flat, wet, peaty site cost around £4,000.

Road making materials for the first roads at Culloden were obtained from Leanach Quarry, which is situated within a mile of the southern forest boundary and consisted of quarry spoil being a mixture of broken rock and quarry dust which was had for the taking. In the road constructed in 1958 the material used was a heavy gravel quarried at Achbain in the Nairn valley. In both cases the materials used have, so far, proved satisfactory.

At/

At Craighadrig the crushed stone and gravel used in the construction of the road made in 1946 were obtained from a quarry within the acquisition boundary. The single mile at Assich shown under Forestry Commission was acquired and no construction has been undertaken by the Commission so far.

(b) Maintenance

Regular maintenance of all forest roads is the responsibility of the forest staff and consists mainly of the cleaning of side drains and attention to culverts.

(c) Access

There are no access problems.

Chapter 15 - POWERED VEHICLES AND MACHINES1. Transport

Transport is available at Culloden Forest but is at present unnecessary at Craighadrig and Assich where workers live in close proximity to their forests.

At Culloden, where many of the forest workers are resident in Inverness, transport is provided in the form of a 7 ton Bedford lorry; the lorry's prime purpose is, however, the transporting of timber to and from the sawmill and for the collection and transfer of other forest stores necessary to the running of the three forests. Failing availability of the Culloden lorry, which is unusual, a vehicle may be hired locally.

For supervisory purposes the Forester at Culloden uses his own private car for which he is paid the appropriate car allowance.

2. Other Mechanical Equipment

There are two Fordson Major tractors employed at Culloden on timber haulage and production work. One, a Fordson Major Diesel tractor, is used in conjunction with pole wagon to move timber from forest to sawmill and on occasion to carry produce from the sawmill to the railway station at Culloden Moor. The other, a petrol driven Fordson, is used on similar work to the above but in addition is required to drive the single bench sawmill to meet rush demands for sawn timber, mainly fencing timbers. There are also two sawmills at Culloden, one of which operates full time, and the other part time. The full time sawmill, erected in 1953, is comprised of a double Graham bench with two 14' slides and is powered by an Albion engine, the other is a short single bench portable mill powered by the petrol driven tractor mentioned above. There are two portable cross-cut benches, a MacConnel and a Liner used in the preparation of mining timber, and a Gorwood debarking machine is available for the peeling of pitprops. Fencing materials are creosoted by the hot-cold open tank method, the necessary equipment being located in the vicinity of the sawmill stacking yard.

The above mentioned equipment has proved to be adequate for present needs.

In addition to the above there is an electrically driven Elliott Woodworking Machine capable of rip-sawing, cross-cutting, thicknessing, edging, planing, tonguing and grooving, and the manufacture of weather boarding. This machine is housed in the joiners' workshop near the sawmill and its products are used in the construction of forest office buildings, garages, tool sheds etc. all for Commission use.

3. Availability of Equipment from Other Sources

Crawler tractor and plough requirements for use in preparation of ground are available from the Conservancy pool. Highland Haulage are engaged to deliver mining timber to those collieries where there is no rail connection. On the odd occasion when transport is required outwith our resources hiring is permitted.

4. Maintenance and Repair

A Conservancy Inspection Mechanist makes regular inspections of all mechanical equipment held at the forests. Inspection reports are forwarded to the Conservancy Mechanical Engineer for action where necessary. Breakdown in the interval between inspections are recorded on a defect report which is submitted by the Forester to the Conservancy Mechanical Engineer whose action

depending on the nature and extent of the repair is:-

- (i) For small repairs a mechanic is sent from a Conservancy Workshop to effect the repair.
- (ii) For repairs costing up to about £5 which cannot be undertaken at the forest the vehicle may be towed or driven to the local garage.
- (iii) If the repair is a relatively big and expensive one involving crawlers or diggers the repair is carried out in the Directorate Workshops at Chapelhall unless overhauled replacement parts are available, e.g. engines and track assemblies in which case the Conservancy Workshops fit these.

Major repairs to other mechanical equipment are carried out in Conservancy Workshops and so far as possible the balance, if any, is sent to the Ministry of Supply Workshop in Inverness. If repairs are likely to take more than a week, a replacement machine is normally available from Directorate Workshops in the case of crawlers and from Conservancy Workshops in the case of lorries or vans.

The forests in this area are served by the Workshop at Longman, Inverness.

- (iv) The present holding of equipment is adequate and suitable for present commitments.

Chapter 16 - MARKETING AND EXPLOITATION(a) Marketing1. Standing Sales

The emphasis within the group has been on Commission working and standing sales have been the exception. One was made at Craigphadrig in 1950 when 12,000 hoppus feet fetched between 5d. and 8d. per hoppus foot according to species and quality. More recently a sale was made of windblown timber at Culloden to hasten clearance, for which 1/8d. was received for 14 hoppus feet Douglas fir.

2. Commission Working

In 1930 a sawmill was installed at Culloden and since then both round and sawn produce have been prepared at the forest.

Initially the emphasis was on pitprop production but latterly, with the increase in tree size, the production of sawn fencing materials and boarding for home use has been the main objective. Of secondary importance has been the production of sawn mining timber.

Prices received for the various products have fluctuated considerably: the round props and sawn mining timber being tied to prices agreed by the National Coal Board and the Home Timber Merchants Association. These price agreements are reviewed annually and are invariably changed at each meeting. The prices agreed for 1962/64 and for which produce was sold were on an average 5/5 per hoppus foot for round props and 5/- per cubic foot for sawn mining timber, both prices being the delivered price. The production of pitprops ceased in 1960 and small roundwood has been sold in length at roadside fetching between 1/9 and 2/- per hoppus foot.

Practically no sales of boards or battens have been made, these being used mainly for Conservancy purposes. Small demands by local joiners were, however, sometimes met and prices ranged from 7/- to 8/6 for 1" boarding and from 5/6 to 8/3 per cubic foot for battens. Longer lengths and broader widths attracted the higher prices and in both cases 1/- per cubic foot above these prices was charged if the order was supplied in larch. Like boards and battens, fencing posts were produced mainly for home consumption, but small lots were sold, the average price obtained for mixed conifer creosoted posts 5'6" x 3" x 3" and for uncreosoted European larch of the same size being 2/10 per piece or 8/6 per cubic foot.

All slabwood, ends, pointings etc. are saleable and go mostly to local farmers at 25/- per tractor trailer load - approximately 20-25 cwts. - ex sawmill. All waste to date - other than that required to fire the creosote tank - has been disposed of in this way.

Costs of production vary with species and wage rates but the following were costs incurred in preparing 1 hoppus foot during F.Y.62 - labour charge plus P.V. & M.

Average Tree	4.0 h.ft.
Fell and sned	4.45 pence per h. ft.
Extract	5.09 " " "

Sawmill Costs/

Sawmill Costs

Sawmilling	9.0 pence per cubic foot
Crosscut and trim	3.5 " " " "
Grade and stack	5.25 " " " "
Creosote - fencing posts labour only	3.0 " " " "

At Craigphadrig felling, snedding, extraction and crosscutting is done by Forestry Commission labour the mill logs being converted at Culloden and the topwood sold in length at roadside. The cost of production plus loading of logs onto lorry is approximately 1/- per hoppus foot exclusive of overheads.

No thinning was done at Assich until after the 1939-1945 war. As the acquired wood is just 5 acres in extent only small quantities have been produced from this source. The timber was either sold after extraction to a timber merchant or taken to Culloden sawmill for conversion.

(b) Exploitation1. Standing Sales

The policy to date has been to work the timber with Forestry Commission labour and only small sales to assist in the clearance of windblow and late thinnings have been made.

2. Commission working

With the above exception all working at Culloden and Craigphadrig has been carried out by Forestry Commission labour. Thinnings are generally marked and measured by the Assistant Forester - 100% felled measurement being employed until the introduction of the Tariff method. Felling is by axe and cross-cut saw and extraction to the Forest road is by horse. Movement of timber from roadside to sawmill is completed by either tractor and polewaggon or by lorry.

Pre-war the sawmill only ran a few days each month and output rarely exceeded 5,000 cubic feet annually but once the post war thinning programme got under way this figure was increased to nearer 30,000 cubic feet. With the installation of the double bench mill in 1953 a further increase in production resulted and this now runs at just under 60,000 cubic feet per annum. To achieve this output an intake of some 90,000 hoppus feet is required: about one third of this is supplied from the Forest and the remainder brought in from other Forestry Commission units.

Joinering work has been carried out at the mill since pre-war days but only on a restricted scale until 1954 when the wood working machine was installed in the newly erected joiners' shop. The main work undertaken is the construction of wooden buildings for use in all parts of the Conservancy and the repair of lorry platforms. Exhibits are also prepared for various Agricultural Shows from time to time and on several occasions constructional timbers have been prepared for the erection of wooden houses for Forestry Commission workers.

(a) Animals

Damage from this source has never been serious.

Squirrel

Damage was obvious among the acquired old Scots pine at Culloden and considerable numbers of red squirrels were shot during the early years, but they are practically non-existent now.

Rabbits

Recurring attacks of Myxomatosis have kept the rabbit population well under control.

Hares are plentiful on the high ground and can be troublesome during heavy winter snowfalls when drives have frequently to be organised to despatch them.

Roe deer have been present in the Forests over a period of years although little damage is recorded.

(b) Birds

Capercaillie and black game are generally to be found in the Forests but are only troublesome from time to time, outbreaks of damage being recorded at Culloden in 1933 and 1952.

(c) Insects

Adelges cooleyi appeared in 1927 in P.06 Douglas fir stands at Culloden and spread from there to the younger plantations of this species in 1929. Growth of the young stands was not greatly affected and the older trees showed signs of recovery by 1933 when the attack died down.

Pine Weevil populations built up as a result of the post 1914 war fellings precluded planting between 1930 and 1933 when the infestation reached a peak. During this period extensive trapping was carried out, the best 'bag' being 78,000 weevils between the end of May and mid August 1931.

Apart from these two outbreaks there have been no serious insect invasions although sporadic damage occurs from time to time due to Pine Sawfly, Pine shoot beetle and Neomyzaphis abietina.

(d) Weeds

On the higher ground, and particularly at the east end of Culloden Forest, there is a danger of invasion of bare land by whin and broom which has to be thoroughly weeded to prevent the rapid smothering of young plants. Fortunately invasion has only occurred on a limited scale and has been kept in check by prompt attention to affected areas.

(e) Fungi

The only fungus causing significant damage is Fomes annosus. This was first noted as early as 1927 when the first thinnings were removed from the acquired Douglas fir plantations: it has also been recorded in subsequent thinnings and windblow there. It is present also, but to a much lesser extent, throughout the younger Douglas fir stands where it occurs sporadically. Only rarely are more than the first five feet of the tree affected. Fomes annosus has also made considerable inroads into the Thuja plicata crop at Craighadrig and in some of the young larch stands at Assich.

Peridermium pini/

Peridermium pini causes some losses in pine crops and seems to be becoming slightly more prevalent.

As a protective measure against the spread of Fomes annosus the stumps of all felled trees are treated with creosote.

European larch at all forests has suffered to some extent from larch canker attack but most severely in the plantations formed on the old arable at Assich in P40 and P41.

(f) Climate

Considerable damage, particularly to young spruces and larches, has been caused by late frosts, those of May 1927 and 1935 being particularly severe. In periods of exceptional summer drought, such as 1955, some adverse effects may also be produced: in this respect Japanese larch seems to be the most susceptible species.

Windthrow is a recurrent source of damage - exposure to the wind often being aggravated by a seasonally high water table inducing considerable temporary instability. The period of incidence seems to be generally from December to March and there are few years when some damage does not occur during this time. Within recent years exceptional windblows have been recorded in 1951, 1953 and 1957 when 20,000 hoppus feet, 60,000 hoppus feet and 40,000 hoppus feet respectively came down.

(g) Trespass

This is not a serious problem although there are a few short cuts through various parts of Culloden and Craigphadrig forests used regularly by school children, crofters and other members of the public.

On the first Sunday in May the annual pilgrimage to the "Cloutie Well", situated in the midst of the early Culloden plantings, is well regulated and apart from festooning the branches of the surrounding trees with pieces of rag according to superstitious custom, the pilgrims occasion little damage to the woods.

(h) Atmospheric pollution

There are no industries within the vicinity of the Forests to cause any damage in this way, neither is there any noticeable effect produced by salt laden winds blowing in from the Moray Firth.

(i) Fire

Despite the proximity of Culloden and Craigphadrig Forests to the town of Inverness and the consequent use by members of the public of forest roads and paths, plus the fact that the railway passes through Culloden and along the eastern boundary of Craigphadrig, damage by fire has been comparatively slight. The only fire doing damage at Craigphadrig from 1926 to date occurred in 1946 when 1.5 acres was burnt in the middle of the forest. The origin of the fire is unknown, but is believed to have been caused by a member of the public.

To date, Culloden has lost some 50 acres by fire, the largest single outbreak occurring in 1942 when, as a result of a railway fire, 14 acres were burned.

Outbreaks of fire originating from steam engines at both Craigphadrig and Culloden vary from year to year and average around 50 but have been as high as 230, the number which was recorded in 1955.

The only fire occurring at Assich was in 1955 when a fire originating on the railwayside at Daviot travelled over some 5 miles of moorland and destroyed 4.5 acres of plantations. At one period during this fire the entire plantations were seriously threatened.

With the ever growing use of diesel powered engines by British Railways the danger from the railways is decreasing leaving fires spreading from muirburning operations and carelessness by the public as the main sources of danger and based on past fire history these cannot be considered as very high.

Protective measures taken include the planting of Japanese larch belts around the perimeter of the forests, the formation of fire traces by burning, bulldozing, ploughing and by patrolling action.

Chapter 18 - NUPSERIES

Nil.

Chapter 19 - STAFF AND LABOUR

(a) Staff

The following officers have been in charge of the forests:-

<u>Year</u>	<u>District Officer</u>	<u>Divisional Officer</u>	<u>Conservator</u>
1925	L. A. Newton	F. Scott	
1926	J. K. Leven		
1927	F. Oliver		
1931		J. Fraser	
1938	T. A. Robbie		
1940	W. Denman		
1946	A. M. Fraser		J. Fraser
1947	J. A. Dickson*		
1948		J. T. Fitzherbert	
1949	E. G. Richards*	J. A. Dickson	
1951	T. D. Cotter-Craig*		
1956	A. M. Fraser	J. Chrystall	J. A. Dickson
1962	J. Y. Ogilvie		
1963			H. A. Maxwell

* Craighadrig Forest only.

Foresters and Foremen in charge

<u>Year</u>	<u>Culloden</u>	<u>Craighadrig</u>	<u>Assich</u>
1925	A. Rose (F)		
1926		P. Stewart (F)	
1931	A. Mackintosh (F)		
1939			A. Mackintosh (F)
1939			D. M. MacLeod (F)
1940	S. MacMillan (F.I.C.)		
1941	A. Campbell (F)		A. Campbell (F)
1945	R. S. Brown (F)		R. S. Brown (F)
1946			D. M. MacLeod (F)
1947	D. MacDonald (F)	A. C. Gray (F.I.C.)	
1948		D. Murray (F)	
1949	D. MacLeod (F)		
1949	W. Mackay (F)		
1950			M. MacRae (F)
1956		W. Mackay (F)	
1957			A. MacKenzie (F)

Abbreviations. F = Forester
F.I.C. = Foreman in charge

Present Staff

Conservator	-	H. A. Maxwell
Divisional Officer	-	J. Chrystall
District Officer	-	J. Y. Ogilvie
Foresters:		
Culloden	-	W. Mackay
Assich	-	A. Mackenzie
Craighadrig	-	W. Mackay
Assistant Foresters:		
Culloden	-	J. MacKinnon
		H. Thom
Foremen:		
Craighadrig	-	S. Fraser

The present arrangement is that each forest is run as an independent unit with the above named foresters in charge. The three forests form part of the District managed by the District Officer. These/

These arrangements have proved adequate. Two Assistant Foresters are stationed at Culloden, one being employed mainly on supervision of production work in the forest, while the other is engaged in the supervision of sawmilling operations. The Foreman at Craigphadrig is supervised by the Culloden Forester.

(b) Labour

The following table gives the numbers of workers by forest, age group and grade:-

Forest	Age Group Years	Total		Ganger	G.I	G.II	G.III	Other
		Male	Female					
<u>Culloden</u>	Under 20	7						7
	21-30	6			1	3	2	
	31-40	3			1		1	1
	41-50	4		1		1		2
	51-60	6			1	1		4
	Over 60	6			2	2		2
<u>Assich</u>		32		1	5	7	3	16
	Under 20	1						1
	21-30	1				1		
	31-40							
	41-50	3			1	1		1
	51-60	1					1	
<u>Craigphadrig</u>	Over 60							
		6			1	2	1	2
	41-50	1				1		
	51-60	1			1			
		2			1	1		
Grand Total		40		1	7	10	4	18

Of the total staff employed nine or 25% are established.

Wastage

The labour force at Assich and Craigphadrig have remained fairly steady and there has been little turnover in recent years and present workers will suffice for the next few years.

At Culloden the labour requirement has fluctuated considerably. After the initial plantings were completed in 1934 the squad was allowed to run down and for many years consisted only of a trapper and one other man. In 1943 it was built up again although women and boys figured largely at that time: immediately after the war European Voluntary Workers were employed, but the use of this type of labour resulted in high costs and by 1950 their services had been dispensed with and a more stable local force established.

Half the squad has been recruited in the last five years while another third have been there for 10 years or more, including three men with over 20 years' service.

Turnover has been mainly confined to the younger members of the squad and over recent years has been in the region of 3-4 per annum.

Quality of Labour/

Quality of Labour

The quality of the labour is on the whole satisfactory, locally recruited men being on the whole better than those recruited from the towns. It is in the latter category that turnover is greatest.

Recruitment Possibilities

Recruitment has not proved to be very difficult except at Assich where the forest is situated on the fringe of a rather sparsely populated agricultural area, making recruitment of the right type of man less easy. To date we have managed to keep the squad up to strength.

Recruitment for Culloden is through the Inverness Labour Exchange.

Alternative employment within the district is very considerable due to the existence of a large agricultural industry and the proximity of Inverness which can offer a diversity of employment.

There were no recognised training schemes in existence prior to 1962, each newcomer learning the job in the course of normal forest operations. It was customary, however, to employ for a short time prospective Forest School candidates at Culloden to let them see something of thinning, extraction and conversion of produce. In F.Y.62 a Forest Workers Training Scheme was initiated and so far two courses have been held at Culloden.

Recruitment of Gangers

Gangers are normally recruited from the local squads.

Piecework and Bonus Schemes

There is little keenness at any of the three forests to work on piecework. The workers at Assich and Craighadrig have no desire for this form of employment. At Culloden there is a core of workers who prefer the piecework system of payment and these men are normally employed on thinning and extraction work.

No bonus schemes have been or are in operation.

Existing Houses and Transport

Of the 40 workers employed in the working plan area 12 are tenants of Forestry Commission houses: 3 of these are at Assich and 9 at Culloden. The balance of the Assich men are housed locally, while at Culloden the number in this category averages 8.

The Culloden balance is transported by Forestry vehicle from Inverness. At Assich and Craighadrig the men find their own way to work, no Commission transport being used.

All available houses are tenanted by forest workers and at both Assich and Culloden these are situated a short distance from the forest office.

As a rule the reporting point is the administrative centre but if the place of work is nearer the home of the worker then this point becomes the temporary reporting point. Travelling beyond the reporting centre is done in Commission time.

Chapter 20 - HOUSES AND HOLDINGS, OTHER BUILDINGS AND SPECIAL
INSTALLATIONS

Each of the three forests has its own houses, offices and other buildings and these are described below.

(a) Houses and Holdings

Houses - At Culloden six semi-detached (three blocks) traditional type houses for forest workers and one detached house for the Forester were erected near Balloch in 1947. Two wooden houses were also erected in the same locality, one of which is occupied by a Ganger and the other by the District Officer. In 1955 two semi-detached wooden houses for forest workers were erected in the Dalcross section, largely with timber from Commission forests.

At Craigphadrig the only house is occupied by the Foreman. It is a stone and lime built cottage with slated roof and was acquired with the land.

The house occupied by the Forester at Assich was also acquired with the land. It is an old farmhouse and is stone built with a slated roof.

There are also three wooden houses which were erected near Assich in 1946 for tenancy by forest workers. These are built on brick foundations and have shingled outside walls and corrugated asbestos roofs. At Dalcharn, on the south side of the forest, there is a traditional type farm cottage also occupied by a forest worker.

There are no Forest Workers' Holdings within the Working Plan area.

(b) Other Buildings

The other buildings on the forests are:-

Culloden

- 1 Office building for Forester, Assistant Engineer and District Officer.
- 1 Garage for Forestry Commission vehicles.
- 1 Stable.
- 1 Timber store and drying shed.
- 1 Small shed covering petrol pump.
- 1 Large shed used as joiners' workshop.
- 1 Shed used as fire equipment and tool store.
- 1 Building - open sided - covering sawmill.
- 1 Building - open sided - covering creosote tank.

The above buildings, all of wooden construction, are situated at the administrative centre and those in daily use are equipped with electricity.

Craigphadrig

- 1 Forest Office - wooden.
- 1 Tool store - wooden.

Assich

- 1 Farm steading at Carnoch - used as tool store and workshop in wet weather.
- 1 Wooden shed - tool shed.

The Forest Office is a room in the Forester's house.

(c) Special Installations

The disposal of the initial thinnings from the acquired plantations presented some difficulty and in 1930 the single bench sawmill at Smithton belonging to Culloden Estate was hired and the heavier timber converted to fencing material.

In 1935 a small hot and cold creosote tank was installed - previously the points of the fencing material had hot tar applied with a brush. The original creosote tank, which in most years was unable to cope with the full flow of fencing material was replaced in 1959 by a larger and better equipped tank capable of very near doubling the previous output and dealing with our full requirement of fencing timbers. The heating tank of the new installation measures 17' x 4' x 3'. Within a safe distance of the creosoting plant is located the creosote storage tank - a large cylindrical iron tank - with a capacity of 2,000 gallons.

In 1952 the sawmill yard was extended and a new two-bench mill was installed in a more convenient position on this extension and started production in 1953.

Most of the converted produce is seasoned in the open although part of the old sawmill building is used for this purpose and there is also a drying shed of very limited capacity mainly used for the storage of the joiners' timber. This arrangement is inadequate and the provision of a large well designed drying shed is soon to be made.

Sawdust disposal was always something of a problem before 1953, reliance being placed on various people who removed quantities from time to time. Even so, a large deposit of this refuse accumulated in the yard: it has now been bulldozed flat to provide useful additional stacking space. A sawdust burner fed by underground conveyor belt direct from the bench was built at the same time as the new mill, but it has recently become unsafe and has been replaced by another of more advanced design.

The woodworking machine installed in the joiners' shop is a Super Elliot Woodworker which is capable of doing a multitude of operations including rip sawing, cross-cutting, surfacing and thicknessing, trenching, tenoning, moulding, mitreing and boring. It is used in the performance of all these tasks, but mainly in the preparation of weather boarding and flooring of which large quantities are required in the construction of offices, garages, tool sheds etc. on which the joiners are mainly employed.

Chapter 21 - RESEARCH AND EXPERIMENT CULLODEN

(a) Research Branch Work

In December 1926 two permanent sample plots, numbers 79 and 80, were established in the acquired P.06 Douglas fir plantation. Plot number 79 has been thinned to a heavy low D grade at intervals of 5 years and for comparative purposes plot number 80 has been given a light low B grade thinning at similar intervals.

The severe gale of 1953 devastated plot number 79 so severely that it was later abandoned. Gaps were blown in plot number 80, but periodic thinning is still carried out. In 1954 the crop yield of number 80 was 8,958 hoppus feet over bark and volume per acre 4,960 hoppus feet over bark.

Another plot, number 191, was established in 1949 in a Forestry Commission planted stand (P25) of quality class I Norway spruce. Though a vigorous stand the lower part of the stems are badly deformed by fluting. In 1954 volume per acre amounted to 3,458 hoppus feet over bark and the total crop yield to this date was 5,323 hoppus feet over bark.

During the past decade elite trees of all the principal species have been selected and marked by a permanent yellow band. These are reserved for vegetative propagation, specimens being collected from time to time.

Craigphadrig

The Research Branch in connection with the spread of butt rot in Thuja and larch is continuing. The treatment of stumps with creosote is for the present the main form of protection. Heavy thinning of Thuja and underplanting with a more Fomes resistant species is being carried out.

(b) Investigation by Local Staff

Indicator Plots were laid down in 1958 in C.25 and C.27, the species being Douglas fir and Tsuga heterophylla.

At Craigphadrig one Indicator Plot was formed in Thuja plicata in compartment 1.

Chapter 22 - OTHER FACTORS - CULLODEN, CRAIGPHADRIG AND ASSICH

There are no other factors.

Working Plan area: Culloden Group - Assich Section

Operation (1)	Unit of Measurement (2)	F.Y.		F.Y.		F.Y.		F.Y. 59		F.Y. 60	
		Programme (3)	Actual (4)	Programme (5)	Actual (6)	Programme (7)	Actual (8)	Programme (9)	Actual (10)	Programme (11)	Actual (12)
101 Prep Ground	acs.							45	50	50	50
101 Ploughing	"							2	2	2	2
105 Planting	"							50	55	50	50
110 Drains New	chs.							750	612	750	520
112 Fences New	"							-	-	34*	40
130 Beating Up	1,000							6	7	7	2.5
134 Weeding	acs.							221	353	226	237
134 Brashing	"							40	56	60	50
134 Cleaning	"							20	23	16	12
140 Drains Maint.	chs.							600	196	540	312
144 Fences "	"							160	64	80	98
146 Enrichment	acs.							6	-	10	10
150 Roads Maint.	mls.							.75	.75	1	1
150 Tracks "	"							.25	.26	.5	-
160 Fire Brooms	pcs.							240	240	240	240
160 Const. Water Tanks	"							2	2	2	2

* Dismantling Fence

Working Plan area: Culloden Group - Culloden Forest

Operation (1)	Unit of Measurement (2)	F.Y.		F.Y.		F.Y.		F.Y. 59		F.Y. 60	
		Programme (3)	Actual (4)	Programme (5)	Actual (6)	Programme (7)	Actual (8)	Programme (9)	Actual (10)	Programme (11)	Actual (12)
101 Prep. Ground	ac.							-	9		
105 Planting	"										
105 Slagging	"							40	69		
110 Drains New	ch.							540	80	500	46
130 Beating Up	ac.							35	81	50	111
134 Weeding	"							160	322	145	168
134 Brushing	"							14	35	35	37
140 Upkeep Drains	ch.							1,700	749	800	759
144 " Fences	"							200	190	100	121
150 " Roads	mls.							7.5	3.19	5.38	2.3
160 Fire Brooms	nos.							600	600	600	600
160 incl. Grading	ch.							1,200	311	-	-
160 Fire Traces (Hand)	"									1,200	268
160 " " (Mech.)	"									-	142
169 Manuring	ac.									114	114

Annual Control Summary

Working Plan area: Culloden Group - Craigphadrig Section

[illegible]

Annual Control Summary

Working Plan area: Culloden Group - Assyeh Section

[illegible]

Part from cleanings,
windblow and widening
fire trace.

Forestry Commission

Annual Control Summary

Working Plan area: Culloden Group - Culloden Forest

Operation (1)	Unit of Measurement (2)	F.Y. 61		F.Y. 62		F.Y. 63		F.Y. 64		F.Y. Program (11)
		Programme (3)	Actual (4)	Programme (5)	Actual (6)	Programme (7)	Actual (8)	Programme (9)	Actual (10)	
101 Prep. Ground	ac.	10	7.5	15	13					
101 Ploughing	"	-	-	5	7					
105 Planting	"	3	3	10	10					
105 Slagging	"	-	-	10	15					
110 Drains New	ch.	184	36	200	147					
130 Beating Up	ac.	12	19	5	5					
134 Weeding	"	140	127	50	47					
135 Brushing	"	35	20	50	20					
135 Cleaning	"	40	45	20	37					
140 Upkeep Drains	ch.	800	678	1,500	976					
144 " Fences	"	160	174	250	86					
150 " Roads	mls.	3	4.1	5	2.5					
160 Fire Brooms	nos.	600	600	600	600					
160 New Fire Traces	ch.	20	16	-	-					
160 Fire Traces (Hand)	"	160	177	190	200					
160 " " (Mech)	"	300	537	300	260					
169 Manuring	ac.	-	-	40	7					

Annual Control Summary

Working Plan area: Culloden Group - Culloden Forest

[illegible]

Chapter 23 - WORKING PLAN ANNUAL REPORTS

a) Forms W.P. 20.

b) A Brief Account of Year's Work - F.Y. 60.

I. General

This was a normal year in most respects, the weather following the expected pattern with rather heavier rainfalls in the late summer and autumn. Fire danger was limited to April, May and June, and the increasing number of diesel engines running on the Highland Line resulted in fewer embankment fires than normal.

Agency work consisted of maintenance work for Craig Dunain Hospital and 25 acres of planting for Kilravock Estate. In addition Culloden supplied a planting squad to Strathdearn Forest to assist with the large programme undertaken at Meallmore.

Overall expenditure continued at the expected level although the purchase and erection of a hot and cold creosote plant increased capital expenditure at Culloden considerably. This installation has more than doubled the creosoting potential of the sawmill.

The turnover of the Culloden labour force continued at a high level and a final loss of two men was incurred. The level of the force is, however, considered to be about right since much of the forest is now established and passed into the maintenance phase. At Assich and Craighadrig labour remained static.

The supervisory staff at Culloden increased by the addition of one Assistant Forester, Mr. H. Thom, on transfer from Inchnacardoch.

II. Forest Operations

1. Establishment Planting was confined to Assich where 50 acres were completed consisting of 84% Scots pine, 8% Pinus contorta and 8% Sitka spruce. Most of the ground was prepared with a Clark tine plough and a small area by S/F Cuthbertson plough. The take has been good on this severely burnt area, and there is no doubt that the application of $1\frac{1}{2}$ ozs. ground mineral phosphate to the whole planting areas has had a strong beneficial effect. The extra beating up at Culloden was again made possible by surplus plants from the nursery.
2. Maintenance Normal maintenance work was carried out.
3. Improvements A considerable remanuring programme was undertaken at Culloden where 114 acres, mostly Sitka spruce and Scots pine/Sitka spruce mixtures in Dundavie and Dalcross were treated because of evidence of checking.

At Assich 10 acres of P40 and 41 European larch were heavily thinned due to poor form and severe infection of Fomes annosus and this area was enriched with Sitka spruce and a few Lawson Cypress and Thuya. A similar 2 acres at Craighadrig was enriched.

4. Production Normal thinning and felling operations were resumed at all three forests. Apart from 2,700 hoppus feet in P06 Culloden no windblow occurred. Sawmill production kept up to Conservancy requirements and the new creosoting plant has obviated the necessity of sending posts to Walkers of Inverness for the purpose. Fewer pit props were prepared as again much of the smaller sizes of timber were sold as tonnage wood to Gibb & Austine of Grangemouth.

III./

III. Review of Work Achieved in Relation to Forecast Programmes

Little comment is required here as programmes were adequately met with the exception of sawmill production for which the estimate was too high. Again the mobile single bench was rarely brought into use and can be dispensed with or transferred at some date in the future.

Chapter 23 - WORKING PLAN ANNUAL REPORTS

- a) Forms W.P. 20.
- b) A Brief Account of Year's Work - F.Y. 59.

I. General

Good growing conditions existed throughout the year and forest operations went on unhindered by bad weather. The spring months were rather dry and this was followed by a very fine summer. Fire danger persisted well into the summer months and two small fires, which caused no damage, required attention at Culloden. 51 railway embankment fires were also reported at Culloden.

The Deputy Director General and later the Forestry Commission Technical Committee visited Culloden Section and in particular the sawmill. The principal comment on both tours was that the antiquated creosote plant should be replaced as soon as funds would permit.

Agency planting of 10 acres on behalf of Craig Dunain Hospital was undertaken by Craigphadrig; similarly Culloden undertook to plant 50 acres for Daviot Estate and a small area on Dalcross Estate.

Expenditure was much as forecast, while labour was static at Assich and Craigphadrig but not at Culloden where there was a fair wastage of labour, the year ending with four less than the estimated staffing requirements.

II. Forest Operations

1. Establishment 55 acres were planted at Assich and the proportion of species used was Scots pine 60%; European larch 19%; Japanese larch 5%; Sitka spruce 16%. Most of the ground was ploughed using a Clark tine plough. Culloden took the opportunity of surplus plants from the nursery to increase the beating up replacement percentage in Dundavie and Dalcross. Weeding of grass areas was increased due to heavy summer growth.
2. Maintenance Normal work proceeded and no arrears were incurred. Nearly 10 acres of high pruning of Scots pine was done at Craigphadrig but it is considered now that the trees were too old, P28, to benefit much from it.
3. Improvements Apart from the remanuring with ground mineral phosphate of 70 acres of backward areas at Culloden no improvements were carried out.
4. Production The normal thinning and felling programmes were embarked upon but due to the depressed state of the timber trade work was halted at Culloden about two-thirds of the way through. This was to enable other forests in the Conservancy to unload their unsold logs at the sawmill. At Assich the small thinning programme was held over for a year because of the difficulty of selling small thinnings. Much of the small sized timber was sold as tonnage wood rather than converted to pit props. Sawn mining timber to English markets was also difficult to get away.

This was the first year of regular felling with a power saw - the Jobu Junior - and its use should certainly increase efficiency in the future.

III. Review of Work Achieved in Relation to Forecast Programme

At Assich and Craigphadrig work proceeded much according to programme but the extra weeding at the former permitted less drain maintenance to be done. This is true of Culloden as well, but it is also true to say that there is a tendency to overestimate drain maintenance requirements. More accurate forecasting is necessary here.

At Culloden the slack due to less drain maintenance was taken up in extra beating up and cleaning and weeding. Because of the dry summer less road maintenance was required than was forecast.

In the sawmill the required production was seriously overestimated and it is evident that the small portable single bench will not be used much in the future unless Conservancy requirements exceed 55,000 cubic feet per annum. For differences in the forest production programmes see Paragraph II, 4.

Chapter 23 - WORKING PLAN ANNUAL REPORTSa) Forms W.P. 20b) A Brief Account of Year's Work - F.Y. 61I. General

The year was notable for two exceptional climatic occurrences. The first was a series of gales on 27th January and again on 26th and 27th February which blew down some 60,000 hoppus feet at Culloden and 5,000 hoppus feet at Craighadrig over 14 acres in P06, P25 and P27 at both forests. On the night of 26th/27th May a severe late frost occurred causing considerable damage to spruces and larches, depriving them of one year's growth and in the case of Japanese larch sometimes more. Pines were not affected and gave normal growth.

Fire danger was not excessive and it is worthy of note that there were no railway embankment fires due to the damper conditions and increasing use of diesel engines. Considerable expenditure was incurred in the making and maintenance of bulldozed fire traces of both perimeter and internal categories in the post war planting areas.

Apart from the maintenance work at Craig Dunain Hospital no agency work was undertaken, but a planting squad from Culloden was again sent to assist Strathdearn.

The labour force at Culloden remained much steadier this year with an overall increase of five, three of whom are candidates for the Forestry School.

The extension of the District Office to accommodate the District Engineer and Clerk of Works was completed.

II. Forest Operations

1. Establishment At Assich 50 acres were planted on ground prepared by the Clark tine plough, the range of species being Scots pine 68%, Pinus contorta 2%, European larch 2%, Hybrid larch 8%, and Sitka spruce 20%. At Culloden 3 acres were planted, mostly filling in blown gaps and Sitka spruce was the major species. A good take occurred, nor were there any ill effects of the late frost. The beating up programme completed the establishment of the major Culloden plantings up to P57.
2. Maintenance Normal maintenance work was done.
3. Improvements At Assich a further 17 acres of heavily thinned P42 European larch were enriched with principally Douglas fir and some Norway spruce and Sitka spruce. Small areas of backward growth were manured with ground mineral phosphate at both Culloden and Assich.
4. Production Normal thinning and felling were in progress up to the time of the windblow and thereafter work was fully concentrated on the clearance of blown timber. To assist in this work a standing sale for 5,400 hoppus feet was negotiated with J. MacDonald of Inverness in the Westhill area of Culloden and negotiation with A. Tulloch of Nairn resulted in that firm taking sawlogs and small sized points etc. as they became available at roadside. The preparation of pit props ceased although the quantity of sawn mining timber increased in order to help clear the forest area and to fulfil orders from England.

III. Review of Work Achieved in Relation to Forecast Programmes

Work concerning establishment, maintenance, improvement and protection operations proceeded according to programme. At Assich minor windblows were removed in the thinning which accounts for the high yield per acre. At Culloeden the thinning programme was thrown into arrears by fully a year but the effect of the windblow on the programme at Craigphadrig was not so serious. It is evident that more standing sales will have to be made to clear land for replanting both in the blown and Westhill areas. Again sawmill production was overestimated at 62,000 cubic feet and 50-55,000 cubic feet would be more realistic.

Chapter 23 - WORKING PLAN ANNUAL REPORTSa) Forms W.P. 20b) A Brief Account of Year's Work - F.Y. 62

- I. General Weather conditions throughout the year were poor with a long cold winter and wet sunless summer. Several gales, in January, February, and March caused extensions to the blown areas which were incurred in 1961, 1957, and 1953, Culloden suffering to the extent of 60,000 hoppus feet and Craighadrig 5,000 hoppus feet. This brings the total of windblown timber since the inception of the plan to 132,000 hoppus feet over an area of 19 acres. Despite the short summer growth was slightly better than normal with particularly good colour on the pines in the late summer.

Fire danger was at a minimum and no fires occurred. The dieselisation of the Highland line was completed and this should have beneficial effects by reducing fire protection expenditure.

Planting squads from Culloden and Assich were sent to assist at Strathearn but no agency work was undertaken. The labour situation at Culloden seems to have more or less stabilised, due perhaps to the local high level of unemployment, and a reasonable level was achieved taking into account the necessity of taking on trainees for the Forestry School.

The following staff changes occurred:-

Mr. R. Stewart, Foreman - retired. Sawmill supervision now by Mr. H. Thom.

Mr. A. M. Fraser, District Officer - retired. District supervision now by Mr. J. Y. Ogilvie.

The reorganisation of administrative and other buildings at Culloden sawmill has been completed by the building of a block of sheds containing Training Forester's tool shed, forest tool shed, fire shed, tractor shed, Engineer's store and a double stable. Replaced or useless buildings have been demolished.

II. Forest Operations

1. Establishment 50 acres were again afforested at Assich where the species used consisted of 60% Scots pine, 19% European larch, 5% Japanese larch, and 16% Sitka spruce. At Culloden 10 acres were planted, filling in small blocks at Dalcross, Westhill and blown areas in P06. Despite the late planting the take was good. No unjustified beating up was done.
2. Maintenance Normal maintenance work was done and a start was made in high pruning P44 Douglas fir at Culloden where the height of clear stem was taken to about 12 feet. A further pruning in four years' time to take the height to 17/18 feet will be required.
3. Improvements The enrichment of heavily thinned larch areas of poor form at Assich was completed by planting 15 acres of P42 European larch with Norway spruce, Sitka spruce, and Lawson Cypress, no Douglas fir being available. Apart from a small area at Culloden no remanuring was done.

4. Production The thinning programme at Culloden and Craighadrig fell further into arrears due to the extension of windblows, and at Culloden the programme is now two years in arrears. The schedules of both Culloden and Craighadrig will have to be rearranged to give priority to delayed thinnings in Douglas fir and larch stands. At Assich the programme was cut because of the difficulty of selling first thinnings but about half the acreage was done using a D grade intensity.

The clearance of blown timber at Craighadrig was soon accomplished, but at Culloden assistance from merchants was utilised to speed up the work and to help keep abreast of the scheduled programme.

A. Tulloch of Nairn took 5,400 hoppus feet of blown timber as a standing sale, 6,400 hoppus feet of small sized thinnings at stump, about 10,000 hoppus feet of sawlogs, plus all the available tonnage wood derived from blown timber.

In order to clear a portion of Westhill for planting, 12,900 hoppus feet of natural Scots pine was sold to J. MacDonald of Inverness.

By the end of the year the clearance work was nearing completion.

In the sawmill normal production work was in hand, but outturn of sawn mining timber was reduced as much as possible since this article hardly breaks even financially. The sawmill policy should continue to be that no mining timber be produced unless other markets or Conservancy usage falls. The single bench saw has been transferred elsewhere.

III. Review of Work Achieved in Relation to Forecast Programmes

Some work suffered as a result of the windblow and at Culloden and Assich fence maintenance fell below the programme. There would still appear to be a tendency to overestimate drain maintenance requirements. The short fall of drains new at Culloden was due to a late change in the designated planting areas, while the excess of cleaning resulted from the necessity of cutting whins in established areas. Differences in the production programmes are explained in Paragraph II Section 4.

PART IIChapter 24 - SUMMARY OF FACTS ON WHICH TO BASE PROPOSALS(a) Forest Conditions and Potential

The three forests comprising the working plan area are situated along the southern shores of the Moray Firth, which, to some extent, has a moderating influence on the temperature, but on the other hand offers little shelter to the forests from east, north and north west winds which, on occasion, can be of great strength and distinctly harmful. The rainfall varies between 25" and 35" - average 30": distribution of fall is irregular and the months from March to June are often very dry. Late frosts are quite common.

Practically the whole of the forest area lies on the Middle Old Red Sandstone and although much of it is overlain with drift it undoubtedly has some effect on the fertility of the soil particularly on the slopes and lower ground where deposition of the drift has been shallower.

Soils on these lower slopes, at all three forests, are well drained, deep and fertile creep soils and are capable of producing a high volume of the more commonly grown conifers and particularly Douglas fir.

On the higher ground where the drift layer is deeper the Sandstone has little or no influence on the soil and consequently the quality is much poorer; generally it consists of a compacted drift soil overlain with peat of varying depths. Deep peat occurs only in small patches and is mainly fibrous on the flat ground but is of a more amorphous nature when located in the depressions and flushes.

The species planted on the fertile lower slopes have been Scots pine, European larch, Japanese larch, Douglas fir, Norway spruce and Sitka spruce; most of these have grown well but none can compare with Douglas fir for volume production.

The species most suited to the upland sites are the pines - Scots pine and Pinus contorta - while spruces are best for the flush amorphous type peats. The most successful species on the fibrous peats has undoubtedly been Pinus contorta.

(b) Existing Crops and Increments

The principal species used in stocking the area has been Scots pine which covers 1,991.5 acres or 57% of the total planted area of 3,600 acres. Of this total 1,432 acres have been planted in post war years. Next to Scots pine in area is Japanese larch with 423.5 acres, of which 382 acres are post war plantings. Sitka spruce - 304 acres, Pinus contorta - 208 acres, Douglas fir - 250 acres and Norway spruce with 194.5 come next in order.

So far as volume production is concerned the outstanding species has been Douglas fir.

Volume and increment details for all species are shown in Table II.

Scots pine

The average quality class at time of assessment was II/III due to the better class sites chosen for this species in the early years; average of post war planting is not expected to be better than Quality Class III. All of the Quality Class I and II stands are located on the lower creep soil areas where stem form is also best.

European larch/

European larch

Volume production has been disappointing, the average Quality Class being IV; quality of stem too has only been moderate due mainly to wind sweep and canker.

Japanese larch

Planted mainly for protective purposes in post war years. Quality Classes I, II and III are all to be found on the creep soils at low elevation. Stem form in the older stands is satisfactory.

Douglas fir

The average Quality Class is III. Again the Quality Class I and II stands are to be found on the deeper and more fertile soils at the foot of slopes and on the small flats. Girth would undoubtedly have been greater if present day grades of thinning had been applied timeously. Stem form is good but the older stands lack girth due to delayed thinning. This is by far the most promising species in the Working Plan area as will be seen from the tables.

Norway spruce

The average Quality Class is IV. The better stands of Quality Class I, II and III are all to be found on the moister of the creep soil areas and in the narrow depressions which occur throughout the area. Quality of older trees is slightly marred by fluting of the lower part of the stem.

Sitka spruce

Like Norway spruce the average Quality Class is IV and stands better than Quality Class IV are all to be found on the moistest of the deep creep soil areas. Stem form is satisfactory.

(c) Choice of Species and Techniques

The selection of species in pre-war formed plantations followed closely on the pattern found in the acquired plantations at Culloden and on the evidence of what was seen growing on similar sites on nearby private estates.

The soils on the areas planted at both Craighadrig and Culloden between P23 and P34 contained a fair proportion of creep soils and were vastly more fertile than the soils planted in the post war years.

Generally Douglas fir was allocated to the best sites where soils were free and deep; larches were planted on steep banks and on the drier middle convex slopes; spruces were chosen for the flatter moister sites and the narrow flushes running between ridges. Thuja plicata, all of which is growing at Craighadrig, was planted on the lower southern facing slopes where the soil is deep and rich, while Tsuga heterophylla was planted on sites similar to those stocked with larch. Scots pine, which occupied the greater part of this early planted area, was used to stock the more exposed sites where soils were shallower and fertility somewhat reduced when compared with the deep fertile creep soils but still of good average quality by present day standards.

Plantations formed during the war and in post war years on all three forests were established on much poorer sites both as regards soil and exposure. In the main the soils consist of compacted drift with generally a fairly thin peat cover, but interspersed here and there with small areas of deeper peat.

The species selected to stock these areas were chiefly Scots pine, Pinus contorta, Japanese larch - used mainly in the formation of protective belts - and Sitka spruce.

Present day choice of species does not differ greatly on either of the sites except that undoubtedly Douglas fir would now be planted on much of the land stocked with Scots pine in the P23-34 areas.

On the poorer soils greater use would now be made of Pinus contorta.

Little preparation of ground on the free creep soils is required and is confined to leading off excess moisture by hand drainage. On the upland sites time ploughing for cultivation together with drainage ploughing is necessary if planting is to be successful. An application of ground mineral phosphate is made at the time of or soon after planting on the poor sites in this soil category.

(d) Reserves of Plantable Land

The reserve of plantable land at the end of F.Y.62 was 166 acres compared with the 364.5 on hand at the end of F.Y.58.

The possibility of acquiring further land is not great at this juncture.

(e) Produce and Markets

The current annual increment for the working plan area is 126,000 hoppus feet, of which it is estimated some 60,000 hoppus feet should be removed annually in thinnings.

Practically all felling and extraction work is accomplished by direct labour and the bulk of the volume is processed at Culloden for Conservancy use, only small quantities of small round-wood and sawn mining timber being exported. Marketing is, therefore, at present not a problem.

(f) Staff and Employment

The staff position for the present is satisfactory although the age structure could be better since 14 of the 40 employed are in the over 51 age group. Wastage over the past few years has been mainly in the lower age groups and particularly in the under 20 group. Staffing, however, is not ever likely to be a grave problem in so far as numbers are concerned.

CULLODEN GROUPTABLE 1 LAND UTILISATION

Classification	Area acres	Age Class Areas					
		1-10	11-20	21-30	31-40	Over 41	Post 1900 Uneven
High Forest	3600	2065.5	643.5	168	494.5	137.5	91
Mixed	-						
Total	3600	2065.5	643.5	168	494.5	137.5	91
Plantable Reserve	166						
Other	218						
	3984						

TABLE II

Species	Area	Classified Areas - Acres				Volume and Increments			Classification & Volume		
		Quality Classes I-V	Under Q.C.V	Not Classified	Checked	Average Q.C.	Measurable Volume 000's h.ft.	C.A.I. 000's h.ft.	B.H.Q.C. Inches	Volume 000's h.ft.	% of Volume
S.P.	1991.5	496	28	1467.5	-	2/3	530.3	50.2	2 1/2-6 6 1/4-9 9 1/4-12 12 1/4-15	356.5 137.9 34.6 1.3	67 26 6 1
C.P.	21.0	10	8	3	-	4	23.8	2.4	2 1/2-6 6 1/4-9	13.3 10.5	56 44
P.C.	268.0	No tables	-	268	-	-	0.4	-	2 1/2-6	0.4	100
E.L.	93.5	86.5	-	7	-	4	82.5	5.9	2 1/2-6 6 1/4-9 9 1/4-12	18.2 27.4 36.9	22 33 45
J.L.	423.5	41.5	-	382	-	3	76.4	5.7	2 1/2-6 6 1/4-9 9 1/4-12	47.1 27.0 2.3	62 35 3
H.L.	38.0	No tables	-	38	-	-	-	-	-	-	-
D.F.	250.0	227	-	23	-	3	671.9	46.7	2 1/2-6 6 1/4-9 9 1/4-12 12 1/4-15	- 85.3 337.9 186.0 62.7	- 13 50 28 9
N.S.	194.5	96	36	62.5	-	4	87.8	5.3	2 1/2-6 6 1/4-9	64.5 23.3	73 27
S.S.	304.0	38.5	18	247.5	-	4/5	72.8	5.9	2 1/2-6 6 1/4-9 9 1/4-12	29.3 32.9 10.6	40 45 15
Ts.	2.0	No tables	-	2	-	-	4.8	0.5	2 1/2-6 6 1/4-9	2.1 2.7	44 56
Th.	14.0	No tables	-	14	-	-	39.0	3.4	2 1/2-6 6 1/4-9 9 1/4-12	6.2 28.9 3.9	16 74 10
Totals	3600.0	995.5	90	2514.5	-	-	1589.7	126.0	-	1589.7	-

CULLODEN GROUP

TABLE III

VOLUMES AND INCREMENTS OF MAIN SPECIES

Species	Total Area	Area of Measurable Timber	Total Volume 000's h.ft.	Av. Volume per measurable acre h.ft.	Total C.A.I.	C.A.I. per Measurable acre h.ft.
S.P.	1991.5	496	530.3	1070	50.2	101
B.L.	93.5	86	82.5	960	5.9	68
J.L.	423.5	41.5	76.4	1840	5.7	137
D.F.	250	227	671.9	2960	46.7	205
N.S.	194.5	96	87.8	915	5.3	55
S.S.	304	38.5	72.8	1865	5.9	150

CHAPTER 25

A. Objects of Management

Alternative courses of action on management at the three forests in this group are severely restricted by rainfall and soil conditions. Basically one cannot grow spruce to any extent on the forests and while there is no doubt about the desirability of growing this species its extent would require to be limited to odd pockets on the moister creep soils. Slightly more extensive use of this species could be made than has been the case in the past.

The soil limitations are such therefore that the choice lies on the creep soils between the heavy volume producer Douglas fir and the smaller volume producers amongst the pines or to a lesser extent larch and the evidence is there to show that good quality Scots pine can be grown on Culloden creep soils. On these soils if one considers economics there is no doubt, as can be seen in the appendices, of the necessity to grow as much Douglas fir as possible compatible with soil conditions. Unfortunately only a small percentage of the land is suited for Douglas fir growing but it is evident that careful evaluation of the site is necessary when selecting species for planting so as to see that Douglas fir is pushed to the limit as even low Quality Class Douglas fir gives a better N.D.R. than Quality Class III Scots pine.

The calculations of N.D.R. of Scots pine and Douglas fir grown on varying rotations are included on appendices to the plan.

These show that at current prices the greatest N.D.R. results for growing Douglas fir and a rotation of between 55 and 65 years which (on account of past thinning standards) would yield trees of 11½" B.H.Q.G. of average volume of 30 hoppus feet.

It is doubtful, however, if current prices are an entirely satisfactory guide. When Douglas fir is available in quantity and of adequate size it is not unreasonable to expect a higher price. If a price of 3/- per hoppus foot is taken for sawlogs instead of 2/4d. which represents current prices, a profitability calculation indicates that we should grow our Douglas fir to a size of about 13" B.H.Q.G. in a rotation from 55 to 65 years. This large size agrees with the strongly held conviction of local timber merchants that this species must be about 13" B.H.Q.G. if it is to be handled profitably.

As a considerable area, 1,829 acres, has been planted with Scots pine careful thought to rotations for this species is necessary. At best this species leaves a considerable minus N.D.R. and it would appear from the appendices that the N.D.R. remains relatively constant over a long period. Future prices may, however, be better than those at present obtainable in view of the improved quality of the timber which will result from high pruning and this in turn will have an effect on the N.D.R. It is also expected that the N.D.R. of the second crop will be favourably influenced by the possibility of establishing the crop by means of natural regeneration and thereby reducing establishment costs.

As there is no Pinus contorta of a classifiable size there is nothing to indicate the potentialities of this species but as regards the replacement of Scots pine on typical Scots pine sites the decision on species could be left to a later revision of the plan as practically all the Scots pine on the upland heath sites are located in post war plantings.

With/

With a minus N.D.R. for Scots pine as opposed to a plus N.D.R. for Douglas fir the problem arises as to when one should replace Scots pine by Douglas fir on sites capable of growing Douglas fir. It would appear that subject to other contingencies steps should be taken to carry this out as soon as possible so long as the plantations of pine are of a size to yield utilisable timber. With a pulp mill commitment on these forests which necessitates clear felling, the task of replacement is not too difficult.

Most of the Japanese larch planted on these forests is in the form of firetraces and it will be necessary to treat these along with the adjoining species. There are, however, some minor areas of this species in solid blocks where treatment can, if desired, be different. No satisfactory market exists at this time for this species and in our opinion while the proposed Fort William pulp mill will accept it we are fairly certain that it will accept this species for only so long as there is a supply difficulty. In consequence these solid blocks should be clear felled at the earliest possible moment after the pulp mill starts.

The general thinning grades in the past management of this forest have been more of a B/C grade than of a C/D grade although in the last year or two heavier thinnings have been applied entailing the removal of about 40% of the C.A.I. In this forest the difficulties of markets have not seriously impeded thinning. Subject to market availability heavier thinnings of a D grade would yield ultimate better results in the form of faster diameter development and heavier intermediate yields and particularly essential is this in the case of Scots pine where heavier thinnings will lead to quicker girth development and therefore higher prices at an earlier date.

There is a good distribution of age classes in these forests although the various blocks are individually even aged. There seems no good reason to undo this. Natural regeneration will require to be watched to see that the most economic species is favoured whenever regeneration occurs.

The Douglas fir P.06 area should be retained for a period beyond the economic rotation. This area contains many elite seed trees and it is of interest for volume production purposes. Extraction is easy and heavy timber should provide no obstacle to utilisation.

B. General Objects of Management

1. (1) Within the limits set by other policy objectives, to manage the Working Plan area for the production of timber as a commercial enterprise and to earn the highest possible net discounted revenue (calculated with an interest rate of $3\frac{1}{2}\%$).
- (2) To expand the area of productive forest but to avoid investments in unprofitable plantations except where it is necessary to provide other benefits such as the provision of employment, protection and amenity.

Considerable areas surrounding these forests are upland heaths of moderate quality and while perfectly plantable are only capable of yielding a crop with a minus N.D.R. Considerable emphasis will necessarily have to be laid on social benefits if these are to be planted.

- (3) To achieve and maintain a minimum permanent skilled labour force, not necessarily paid by the Forestry Commission, to meet the requirements of the Working Plan, bearing in mind the Forestry Commission's policy of maintaining a healthy home timber trade.
- (4) To pay regard to amenity, recreation, sporting, scientific interest and the protective role of the forest and to maintain or improve the fertility of the soil.
- (5) To be a good landlord and neighbour.

Local Objects of Management

B.2.(a) Short term

To provide a minimum quantity of 55,000 hoppus feet per annum of pulp wood (timber under 8" diameter) from thinnings and clear felling of acquired, unsatisfactory and unprofitable species and to replace them with a more productive species.

(b) Long term

- (1) To produce utility saw timber of Douglas fir and spruce around 13" B.H.Q.G. average on a rotation of 55-65 years. The rotation for pine on upland heath sites to be decided later.
- (2) To retain the present even age system of management of the forest.
- (3) To work towards a sustained yield from the forests.

Chapter 26

(a) Amenity

Amenity will be preserved by practising good forest management. Sawmill sites, conversion depots and workers' accommodation buildings will be kept in a clean and tidy condition.

Culloden Forest and Craigphadrig Forest both contain sites of public interest. The vitrified fort at Craigphadrig is visited by large numbers of the public and trees will not be planted too close to it, whilst paths will require to be kept open. At Culloden some of the Clan graves are within the forest. Paths to these and to the Keppoch Stone will be kept clear at all times. Part of the forest is also growing on the site of the battlefield. The National Trust has a responsibility for all these and close liaison with this body will be necessary.

When replanting, the regulations regarding the proximity of trees to public roadsides will be observed.

(b) Organisation

1. Administration

Initially the three forests will continue to be staffed as at present but as retirements take place the whole of the working plan area will be placed under the responsibility of one Forester based at Culloden.

2. Management

The whole of the area will form one working circle and one felling series.

(c) Planting Rate

The rate of planting at Assich will continue at 50 acres per annum until the bare land is completed, while at Culloden the restocking of windblown areas and the planting of the numerous small blank areas will proceed at 10 acres per annum.

When clear felling begins in F.Y.66 every effort will be made to restock the cleared area in the year following felling except where the area has been previously underplanted. The replanting area will be approximately 20 acres annually.

(d) Silvicultural Operations

1. Silvicultural System

The formation of even aged stands will be maintained: this will be mainly achieved by planting but restocking by natural regeneration will be encouraged, provided the regeneration is of a species giving the largest N.D.R. compatible with soil conditions.

2. Preparation of Ground

Preparation of ground will be carried out by the most modern and approved methods. Attention to drainage, despite the low rainfall, is of great importance since experience has shown that sudden heavy rainstorms can cause severe soil erosion and do damage to culverts, roads and bridges; this must be borne in mind when laying out the drainage system.

Species selection will be in accordance with the Objects of Management which specifies the planting of Douglas fir as extensively as possible on the creep soils with Sitka spruce in the wet hollows. On the dry upland heaths planting will for the most part be restricted to the pines.

Japanese larch will continue to be used for formation of fire traces only.

4. Maintenance of Plantations

Conservancy instructions about beating up will be followed.

Weeding will be carried out as and when necessary. Drain maintenance following thinnings will be continued and close attention will be paid to drains in the as yet unproductive post-war plantations. Leader drains must be kept clear of debris especially where these pass through culverts or bridges.

Whilst brashing at 5 feet to 6 feet will continue to be carried out this operation must always be limited to the minimum necessary.

To obtain good quality saw timber high pruning will be carried out in accordance with the instruction and guidance given in S.M. 113 and F.C. Bulletin No. 35. These state that the number of trees pruned should be about 125 per acre and should be vigorous and dominant trees of good form. Pruning will start when the breast height diameter is 4 inches and will be continued at about 4 year intervals until a length of 20 feet of clean timber has been ensured. At no time will more than two live whorls be removed at one operation.

Normally only Quality Classes I-III inclusive will be treated but in exceptional cases the pruning of lower Quality Class stands may be done where this would favourably affect the N.D.R.

Full records of date, core diameter and height pruned will be kept in respect of each pruned stand.

Only in the event of further instruction on pruning being issued will the above instructions be superseded.

5. Thinning

The present C-D grade of thinning practised on the faster growing crops on the creep soils will gradually be increased in intensity to a D grade. A crown type of thinning will be favoured. Crop conditions during the transition period must be carefully watched to ensure that the full site potential is being realised.

The bulk of the pines planted on the upland heath soils will not reach the thinning stage for some 15-20 years; the decision as to the grade of thinning to be practised can be decided more realistically then.

Thinning of the areas to be clear felled in the 1965-70 era will not again take place.

6. Fellings

Fellings of the main crop are timed to begin in F.Y.66 to provide supplies of timber for the pulp mill to be built at Port William. In the interval, F.Y.59 to F.Y.65, the fellings of remnants of old Scots pine woods amounting to 10,000 to 15,000 hoppus feet annually will be made to maintain the supply of logs to the Culloden sawmill.

In the period F.Y.66-F.Y.77 inclusive, the felling of approximately 360,000 hoppus feet of mixed conifers - Scots pine, European larch, Japanese larch, Norway spruce and Sitka spruce - growing on good quality creep soil sites will be made to clear the way for restocking with more productive Douglas fir and to a lesser extent Sitka spruce. The annual rate of felling will be approximately 30,000 hoppus feet.

In the event of windblow taking place the clearing of this will have priority over clear felling and the clear felling volume will be abated by the volume of timber blown.

(e) Regulation of Yield

Until F.Y.65 the yield will be obtained from thinnings and from the felling of remnants of old Scots pine plantations. The C.A.I. is at present 126,000 hoppus feet and the slightly heavier thinning to be undertaken will yield approximately 60,000 hoppus feet per annum. The annual volume from clear fellings will be approximately 15,000 hoppus feet and the combined thinning and felling figure will be in the region of 75,000 hoppus feet annually.

In F.Y.66 the felling will commence and in the period F.Y.66 to F.Y.77 inclusive 360,000 hoppus feet will be removed in annual lots of approximately 30,000 hoppus feet. The combined yield from thinnings and fellings during this period will rise from around 75,000 in F.Y.65 to approximately 105,000 hoppus feet in F.Y.77.

(f) Roads

It is estimated that some 33 miles of roads will be required to serve the 3,800 acres of plantations. Already in existence and serving the older plantations now in the thinning stage are 16.8 miles of which 9.7 miles were constructed by the Commission. The outstanding mileage is therefore 16.25 miles but as this mileage is almost entirely required to tap the post war plantations formed on the upland heath soils only 3 miles are required before 1970, a further 6 miles by 1975 and the balance of 7 miles early in the following decade.

Roading density will be on a reduced scale in the upland heath areas because of the proximity of public roads and the flat nature of the ground and the distinct possibility of extracting by mechanical means and is estimated at 1 mile of F.C. construction per 200 acres.

The maintenance of roads will be the responsibility of the forest staff who may call for advice from the Engineering staff when required.

(g) Marketing

When the pulp mill at Fort William goes into production in F.Y.66, the small round production from this group of forests amounting to not less than 55,000 hoppus feet per annum will be sold as pulpwood. Until the pulp mill is ready to accept timber the small sized timber will be sold to Timber Merchants as poles at roadside.

The sawlogs will continue to be consigned to the Culloden Sawmill, but the economics of running this mill will be kept constantly under review. In the event of the mill being closed, the sawlogs will be sold on the open market.

(h) Protection1. Fences

Fencing liabilities imposed under the various dispositions and feu charters will continue to receive the necessary attention.

2. Animals

Rabbits and hares will continue to be kept under control by conventional methods. Roe deer will be checked by the selective method of control as soon as trappers become experienced in this system.

The destruction of foxes on Commission land will be vigorously pursued and we will take part with our agricultural and grazing neighbours in joint drives aimed at fox destruction.

3. Insects

In replanting it will be necessary to use Didimac or other recommended insecticide to protect the young plants against possible Pine Weevil attack. The use of an insecticide for the control of Megastigmus in Douglas fir plantations will assist in increasing seed production and make restocking by natural regeneration a greater possibility.

4. Fungi

The stumps of all felled trees will be brushed over with creosote or other approved substance within 20 minutes of felling as a deterrent to the spread of Fomes annosus.

5. Fire

Until the group is unified for management purposes each forest will have its individual fire plan which will prescribe for fire prevention, fire fighting and patrolling.

(i) Staff and Labour1. Staff

The staffing at the present time is adequate but with the conclusion of planting at Assich and the retiral of the present forester in late 1963 or early 1964 the opportunity will be taken to amalgamate the forests and place the whole under the charge of one forester. He will be assisted by two Assistant Foresters.

2. The existing labour force is adequate but owing to the proximity of the forest areas to Inverness there has always been a fair turnover of workers particularly in the younger age groups. Every effort must be made to build up a skilled labour force by training and by incentive schemes.

Recruitment will, as at present, be through the Inverness Labour exchange.

(j) Housing

No additional forest workers' houses are required within the period of the plan but one of the existing British Timber Houses will be replaced by a traditional type house in the near future.

Two supervisors' houses will be built in F.Y.64.

(k) Miscellaneous

Nothing to prescribe.

(l) List of Priorities

In the event of either money or labour being unavailable for the carrying out of the prescribed programme that available will be directed to the following operations listed in the order of priority.

- (a) Up to the date of the Fort William Pulp Mill accepting supplies (estimated 1966)

Protection - fire and vermin

Weeding

Drain Maintenance

Beating up

Planting and preparation of ground including fencing

High pruning

*Thinning

*Clear felling

Brashing

- (b) After the start of the Fort William Pulp Mill

Protection

*Thinning

*Felling - to meet balance of pulpwood requirement

Replanting of felled areas

Weeding

Drain maintenance

Beating up

High pruning

Brashing

Planting new ground

*Thinning and felling prescriptions will always be carried out. If either money or labour is not available the trees will be sold standing.

PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	Yield Table Data	N.a.i. at chosen rotation	Price level
(a) Conservancy N(S)	(c) Species S.P.	(g) Rotation 35	(m) Thinnings -
	(d) Yield Table F.C. Rev.	(h) Y.T. m.a.i. 48	
(b) Location Culloden Group	(e) Q.G. III	(j) Reduction factor .8	(n) Main crop Av.vol.1.5h.ft
	(f) Max. m.a.i. 86 at 75 yrs.	(k) Net m.a.i. 38.4	8d.

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5.0									5
(b) Establishment	68.0									68
(c) Brashing, cleaning			8							8
(d) Roads				40						40
(e) Protection, forest & road maintenance	2	10	12	6						30
(f) Other										
(g) Sums (a) to (f) = total expenditure	75	10	20	46						151 £/acre
IV Expected volume yield by periods and standing values										Net Yield
(a) Thinnings, H.ft.			-	-						
(b) Main crop fellings, H.ft.				1670						
(c) Net volume of thinnings ((a) x reduction factor) H.ft.	.8									
(d) Net volume main crop ((b) x reduction factor) H.ft.				1336						1336
(e) Price standing per H.ft. thinnings £			-	-						1336 H.ft./acre
(f) " " " " main crop £				.033						38 = m.a.i. at 35 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)				-						
(b) " " main crop: IV(d) x IV(f)				44.0						44.0
(c) Other income										
(d) End rotation value of land, roads, etc.				45.0						45.0
(e) Sum: (a) + (b) + (c) + (d) = total income				89.0						89.0 £/acre
VI Balance of income and expenditure				43.0						Total
(a) Net income (+)										43.0
(b) Net expenditure (-)	-75	-10	-20							105.0
(c) Net result for rotation (a)-(b) =										62.0
Grand total of V - grand total of III										62.0
(d) Net annual income = (c) + rotation (35)										1.8 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	50	60	70	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.334	1.013	.718	.429						
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income				18.4						18.4
Multiply entries in VI(b) to give discounted net expenditure	100.	10.1	14.3							134.4
VIII Net discounted revenue per £100 of initial establishment expenditure										£
(a) NDR on rotation of 35 years										- 116.0 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70 per acre
(c) = 100 (a)÷(b) = NDR per £100 of initial establishment expenditure =										- 165 per £100

IX Assumptions

- (a) Rotation: **Maximum N.D.R. at 3½% to be assessed.**
(Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then
 (b) Expenditure **£0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre.**
(Road maintenance at £40 per mile or £0.35 ac/yr.
 (c) Price-size evidence:
Local markets.
 (d) Other:
No thinning.

Signature **J. Chrystall**Date of Compilation **29/1/63**

PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	Yield Table Data	M.a.i. at chosen rotation	Price level
(a) Conservancy N(S)	(c) Species S.P.	(g) Rotation 45	(m) Thinnings 7a.
(b) Location Culloden Group	(d) Yield Table F.C.Rev.	(h) Y.T. m.a.i. 67	(n) Main crop Av. tree-3.2
	(e) Q.G. III	(j) Reduction factor .8	1/3
	(f) Max. m.a.i. 86 at 75 yrs.	(k) Net m.a.i. 53.6	

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5.0									5.0
(b) Establishment	68.0									68.0
(c) Brashing, cleaning			12							12.0
(d) Roads				40						40.0
(e) Protection, forest & road maintenance	2.	10	12	12	10					46.0
(f) Other										
(g) Sums (a) to (f) = total expenditure	75	10	24	52	10					171.0 £/acre
IV Expected volume yield by periods and standing values										Net Yield
(a) Thinnings, H.ft.				440	290					
(b) Main crop fellings, H.ft.					2280					
(c) Net volume of thinnings ((a) x reduction factor) H.ft. .8				352.0	232.0					584
(d) Net volume main crop ((b) x reduction factor) H.ft.					1824.0					1824
(e) Price standing per H.ft. thinnings £				.029	.029					2408 H.ft./acre
(f) " " " " main crop £					.062					53 = m.a.i. at 45 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)				10.2	8.4					18.6
(b) " " main crop: IV(d) x IV(f)					-	113.				113.0
(c) Other income										
(d) End rotation value of land, roads, etc.					45.0					45.0
(e) Sum: (a) + (b) + (c) + (d) = total income				10.2	53.4	113.				176.6 £/acre
VI Balance of income and expenditure										Total
(a) Net income (+)					43.4	113.				156.4
(b) Net expenditure (-)	-75	-10	-24	-41.8						150.8
(c) Net result for rotation (a)-(b) =										5.6
Grand total of V - grand total of III									+	5.6
(d) Net annual income = (c) + rotation (45)									+	.12 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	50	60	70	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.186	.900	.638	.453	.321	.270				
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income					13.9	30.5				44.4
Multiply entries in VI(b) to give discounted net expenditure	88.9	9.0	15.3	18.9						132.1
VIII Net discounted revenue per £100 of initial establishment expenditure										£
(a) NDR on rotation of 45 years										- 87.7 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70.0 per acre
(c) = 100 (a)÷(b) = NDR per £100 of initial establishment expenditure =										- 125.0 per £100

IX Assumptions

- (a) Rotation: **Maximum N.D.R. at 3½% to be assessed.**
(Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then
£0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre.
(Road maintenance at £40 per mile or £0.35 ac/yr.
- (c) Price-size evidence:
Local markets.
- (d) Other:
No thinning after 40 yrs.

Signature

J. Chrystall

Date of Compilation

29/1/63

PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	(a) Conservancy N(S)	Yield Table Data	M.a.i. at chosen rotation	Price level
		(c) Species S.P.	(g) Rotation 55	(m) Thinnings -2h.ft.-7d.
	(b) Location Culloden Group	(d) Yield Table F.C.(Rev.)	(h) Y.T. m.a.i. 78	(n) Main crop Av.vol.6h.ft. 1/6
		(e) Q.G. III	(j) Reduction factor .8	
		(f) Max. m.a.i. 86 at 75 yrs.	(k) Net m.a.i. 62.4	

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5.0									5
(b) Establishment	68.0									68
(c) Brushing, cleaning			12							12
(d) Roads				40						40
(e) Protection, forest & road maintenance	2.0	10	12	12	10	10				56
(f) Other										
(g) Sum (a) to (f) = total expenditure	75.0	10	24	52	10	10				181 £/acre
IV Expected volume yield by periods and standing values										Net Yield
(a) Thinnings, H.ft.				440	600	-				
(b) Main crop fellings, H.ft.						3230				
(c) Net volume of thinnings ((a) x reduction factor) H.ft. .8				352	480					832
(d) Net volume main crop ((b) x reduction factor) H.ft.						2584				2584
(e) Price standing per H.ft. thinnings £				.029	.029					3416 H.ft./acre
(f) " " " " main crop £						.075				62 = m.a.i. at 55 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)				10.2	13.9					24.1
(b) " " main crop: IV(d) x IV(f)						193.8				193.8
(c) Other income										
(d) End rotation value of land, roads, etc.						45.				45.
(e) Sum: (a) + (b) + (c) + (d) = total income				10.2	13.9	238.8				262.9 £/acre
VI Balance of income and expenditure										Total
(a) Net Income (+)					3.9	228.8				232.7
(b) Net expenditure (-)	-75	-10	-24	-41.8						150.8
(c) Net result for rotation (a)-(b) =										81.9
Grand total of V - grand total of III										81.9
(d) Net annual income = (c) ÷ rotation (55)										1.4 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	55	60	70	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.099	.835	.592	.420	.297	.178				
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income					1.1	40.7				41.8
Multiply entries in VI(b) to give discounted net expenditure	72.4	8.3	14.2	17.5						112.4
VIII Net discounted revenue per £100 of initial establishment expenditure										£
(a) NDR on rotation of 55 years										- 70.6 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70.0 per acre
(c) = 100 (a)÷(b) = NDR per £100 of initial establishment expenditure =										-100.8 per £100

IX Bases for assumptions

- (a) Rotation: **Maximum N.D.R. at 3½% to be assessed.**
- (b) Expenditure: **{ Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then £0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre. Road maintenance at £40 per mile or £0.35 ac/yr.**
- (c) Price-size evidence: **Local markets.**
- (d) Other: **No thinning after 45 yrs.**

Signature **J. Chrystall**Date of Compilation **29/1/63**

PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	Yield Table Data	N.a.i. at chosen rotation	Price level
(a) Conservancy N(S)	(c) Species S.P.	(g) Rotation 65	(m) Thinning 2h.ft.-7d.
	(d) Yield Table F.C.(Rev.)	(h) Y.T. m.a.i. 83	2-4h.ft.-1/-d. 5-7h.ft.-1/3d.
(b) Location	(e) Q.G. III	(j) Reduction factor .8	(n) Main crop Av.vol.10h.ft.
Culloden Group	(f) Max. m.a.i. 86 at 75 yrs.	(k) Net m.a.i. 66.4	Est.value - 1/10

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5									5
(b) Establishment	68									68
(c) Brushing, cleaning			12							12
(d) Roads				40						40
(e) Protection, forest & road maintenance	2	10	12	12	10	10	10			66
(f) Other										
(g) Sums (a) to (f) = total expenditure	75	10	24	52	10	10	10			191 £/acre
IV Expected volume yield by periods and standing values										Net Yield
(a) Thinnings, H.ft.				440	600	650	-			
(b) Main crop fellings, H.ft.							3730			
(c) Net volume of thinnings ((a) x reduction factor) H.ft. .8				352	480	520				1352
(d) Net volume main crop ((b) x reduction factor) H.ft.							2984			2984
(e) Price standing per H.ft. thinnings £				.029	.029	.050	.092			4336 = £/acre
(f) " " " " main crop £										66 = m.a.i. at 65 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)				10.2	13.9	26.0				50.1
(b) " " main crop: IV(d) x IV(f)							274.5			274.5
(c) Other income							45.0			45.0
(d) End rotation value of land, roads, etc.										
(e) Sum: (a) + (b) + (c) + (d) = total income				10.2	13.9	26.0	319.5			369.6 £/acre
VI Balance of income and expenditure										Total
(a) Net Income (+)					3.9	16.0	309.5			329.4
(b) Net expenditure (-)	-75	-10	-24	-41.8						150.8
(c) Net result for rotation (a)-(b) =										178.6
Grand total of V - grand total of III										178.6
(d) Net annual income = (c) ÷ rotation (65)										2.7 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	50	65	70	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.045	.794	.563	.399	.283	.200	.120			
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income					1.1	3.2	37.1			41.4
(d) Multiply entries in VI(b) to give discounted net expenditure	78.3	7.9	13.5	16.6						116.3
VIII Net discounted revenue per £100 of initial establishment expenditure										E
(a) NDR on rotation of 65 years										- 74.9 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70.0 per acre
(c) = 100 (a)÷(b) = NDR per £100 of initial establishment expenditure =										- 107.0 per £100

IX Bases for assumptions

- (a) Rotation: **Maximum N.D.R. at 3½% to be assessed.**
(Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then
 (b) Expenditure **£0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre.**
(Road maintenance at £40 per mile or £0.35 ac/yr.
 (c) Price-size evidence:
Local markets.
 (d) Other:
No thinning after 55 yrs.

PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	Yield Table Data	M.a.i. at chosen rotation	Price level
(a) Conservancy N(S)	(c) Species S.P.	(g) Rotation 75	(m) Thinnings 2h.ft.-7d. 2-4h.ft.-1/2-5h.ft.-1/3d. 8-11h.ft.-1/6d.
(b) Location	(d) Yield Table F.C.(Rev.)	(h) Y.T. m.a.i. 86	(n) Main crop Av.vol.14h.ft. 2/-
Culloden Group	(e) Q.G. III	(j) Reduction factor .8	
	(f) Max. m.a.i. 86 at 75 yrs.	(k) Net m.a.i. 69	

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5.0									5.0
(b) Establishment	68.0									68.0
(c) Brashing, cleaning			12							12.0
(d) Roads				40						40.0
(e) Protection, forest & road maintenance	2.0	10	12	12	10	10	10	10		76.0
(f) Other										
(g) Sum (a) to (f) = total expenditure	75	10	24	52	10	10	10	10		201.0 £/acre
IV Expected volume yield by periods and standing values										
(a) Thinnings, H.ft.				440	600	650	660	-		Net
(b) Main crop fellings, H.ft.								4100		Yield
(c) Net volume of thinnings ((a) x reduction factor) H.ft.	.8			352	480	520	528			1880
(d) Net volume main crop ((b) x reduction factor) H.ft.								3280		3280
(e) Price standing per H.ft. thinnings £				.029	.029	.050	.062	.100		5160 £/acre
(f) " " " " main crop £										69 = m.a.i. at 75 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)				10.2	13.9	26.0	32.7			82.8
(b) " " main crop: IV(d) x IV(f)								328.		328.
(c) Other income								45.		45.
(d) End rotation value of land, roads, etc.										
(e) Sum: (a) + (b) + (c) + (d) = total income				10.2	13.9	26.0	32.7	373.		455.8 £/acre
VI Balance of income and expenditure										Total
(a) Net income (+)					3.9	16.0	22.7	363.		405.6
(b) Net expenditure (-)	-75	-10	-24	-41.8						150.8
(c) Net result for rotation (a)-(b) =										254.8
Grand total of V - grand total of III										254.8
(d) Net annual income = (c) + rotation (75)										3.4 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	50	60	75	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.000	.767	.544	.385	.273	.194	.137	.082		
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income					1.0	3.1	3.1	29.7		36.9
(d) Multiply entries in VI(b) to give discounted net expenditure	75.7	7.6	13.0	16.0						112.3
VIII Net discounted revenue per £100 of initial establishment expenditure										£
(a) NDR on rotation of 75 years										- 75.4 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70.0 per acre
(c) = 100 (a)+(b) = NDR per £100 of initial establishment expenditure =										- 107.7 per £100

IX Cases for assumptions

- (a) Rotation: **Maximum N.D.R. at 3½% to be assessed.**
(Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then
 (b) Expenditure: **£0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre.**
(Road maintenance at £40 per mile or £0.35 ac/yr.
 (c) Price-size evidence:
 (d) Other: **Local markets.**

No thinning after 65 yrs.

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PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	Yield Table Data	M.a.i. at chosen rotation	Price level
(a) Conservancy N(S)	(c) Species S.P.	(g) Rotation 85	(m) Thinnings -2 ft. - 7d.
	(d) Yield Table F.C. (Revised)	(h) Y.T. m.a.i. 85	2-4 ft. - 1/4 d. 5-7 ft. - 1/3 d.
(b) Location Culloden Group	(e) Q.G. III	(j) Reduction factor .8	(n) Main crop Av. vol. 16h.ft.
	(f) Max. m.a.i. 86 at 75 yrs.	(k) Net m.a.i. 68	2/2

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5.0									5.0
(b) Establishment	68.0									68.0
(c) Brushing, cleaning			12.0							12.0
(d) Roads				40.0						40.0
(e) Protection, forest & road maintenance	2.0	10	12	12	10	10	10	10	10	86.0
(f) Other										
(g) Sum (a) to (f) = total expenditure	75	10	24	52	10	10	10	10	10	211 £/acre
Expected volume yield by periods and standing values										
(a) Thinnings, H.ft.				440	600	650	660	620	-	Net
(b) Main crop felling, H.ft.									4410	Yield
(c) Net volume of thinnings ((a) x reduction factor) H.ft. .8				352	480	520	528	496		2376
(d) Net volume main crop ((b) x reduction factor) H.ft.									3528	3528
(e) Price standing per H.ft. thinnings £				.029	.029	.050	.062	.075	.108	5904 H.ft./acre
(f) " " " " main crop £										69 = m.a.i. at 85 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)				10.2	13.9	26.0	32.7	37.2		120.0
(b) " " main crop: IV(d) x IV(f)									381.0	381.0
(c) Other income										
(d) End rotation value of land, roads, etc.									45.0	45.0
(e) Sum: (a) + (b) + (c) + (d) = total income				10.2	13.9	26.0	32.7	37.2	426.0	546.0 £/acre
VI Balance of income and expenditure										Total
(a) Net income (+)					3.9	16.0	22.7	27.2	416.0	485.8
(b) Net expenditure (-)	-75	-10	-24	-41.8						150.8
(c) Net result for rotation (a)-(b) =										335.0
Grand total of V - grand total of III										335.0
(d) Net annual income = (c) + rotation (85)										3.9 £ per acre
VII Discounted income (+) and expenditure (-)									85	Total
(a) Years from planting	2	10	20	30	40	50	60	70	85	
(b) Discount net income or expenditure (from VI(a) and VI(b))	.986	.749	.531	.377	.267	.189	.134	.095	.057	
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income					1.0	3.0	3.0	2.5	23.7	32.2
(d) Multiply entries in VI(b) to give discounted net expenditure	-74	-7.4	-12.7	-15.7					-	109.8
VIII Net discounted revenue per £100 of initial establishment expenditure										£
(a) NDR on rotation of 85 years										- 76.6 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70.0 per acre
(c) = 100 (a)+(b) = NDR per £100 of initial establishment expenditure =										- 109.4 per £100

IX Asses for assumptions

- (a) Rotation: **Maximum N.D.R. at 3½% to be assessed.**
- (b) Expenditure: **Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then £0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre. Road maintenance at £40 per mile or £0.35 ac/yr.**
- (c) Price-size evidence: **Local markets.**
- (d) Other: **No thinning after 75 yrs.**

Signature **J. Chrystall**Date of Compilation **29/1/63**

PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I		Yield Table Data	N.a.i. at chosen rotation	Price level
(a) Conservancy N(S)	(c) Species D.F.	(g) Rotation 40	(m) Thinnings -1h.ft.-5d.	
(b) Location Culloden Group	(d) Yield Table F.C. Rev.	(h) Y.T. m.a.i. 168	(n) Main crop Av.vol.17h.ft.	
	(e) Q.G. III	(j) Reduction factor .8		1/11
	(f) Max. m.a.i. 176 at 50 yrs.	(k) Net m.a.i. 134.4		

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5									5
(b) Establishment	68									68
(c) Brashing, cleaning			12							12
(d) Roads			40							40
(e) Protection, forest & road maintenance	2	10	12	12	5					41
(f) Other										
(g) Sum (a) to (f) = total expenditure	75	10	64	12	5					166 £/acre
IV Expected volume yield by periods and standing values										Net Yield
(a) Thinnings, H.ft.		60	650	1290	-					
(b) Main crop fellings, H.ft.					4720					
(c) Net volume of thinnings ((a) x reduction factor) H.ft. .8		48	520	1032	-					1600
(d) Net volume main crop ((b) x reduction factor) H.ft.					3776					3776
(e) Price standing per H.ft. thinnings £		.021	.029	.046	-					5376 H.ft./acre
(f) " " " " main crop £					.96					134 = m.a.i. at 40 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)		1.0	15.0	47.4						63.4
(b) " " main crop: IV(d) x IV(f)					362.4					362.4
(c) Other income										-
(d) End rotation value of land, roads, etc.					45.0					45
(e) Sum: (a) + (b) + (c) + (d) = total income		1.0	15.0	47.4	407.4					470.8 £/acre
VI Balance of income and expenditure										Total
(a) Net income (+)				35.4	402.4					437.8
(b) Net expenditure (-)	-75	-9	-49							133.0
(c) Net result for rotation (a)-(b) =										304.8
Grand total of V - grand total of III										304.8
(d) Net annual income = (c) + rotation (40)										7.6 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	50	60	70	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.249	.948	.672	.477	.338					
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income				16.8	136.0					152.8
(d) Multiply entries in VI(b) to give discounted net expenditure	93.6	8.5	33.1							135.2
VIII Net discounted revenue per £100 of initial establishment expenditure										£
(a) NDR on rotation of 40 years										+ 17.6 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70 per acre
(c) = 100 (a)÷(b) = NDR per £100 of initial establishment expenditure =										+ 25.1 per £100

IX Bases for assumptions

- (a) Rotation: Maximum N.D.R. at 3½% to be assessed.
(Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then
- (b) Expenditure: £0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre.
(Road maintenance at £40 per mile or £0.35 ac/yr.
- (c) Price-size evidence:
Local markets.
- (d) Other:
No thinning after 35 yrs.

PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	Yield Table Data	M.a.i. at chosen rotation	Price level
(a) Conservancy N (S)	(c) Species D.F.	(g) Rotation 45	(m) Thinnings 1h.ft.-5d. 1-2h.ft.-7d. 3-10h.ft.- 11d. 11-15h.ft.-1/4
(b) Location	(d) Yield Table F.C. Rev.	(h) Y.T. m.a.i. 174	(n) Main crop Av.vol.23h.ft. 2/-
Culloden Group	(e) Q.G. III	(j) Reduction factor .8	
	(f) Max. m.a.i. 176 at 50 yrs.	(k) Net m.a.i. 139	

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5									5
(b) Establishment	68									68
(c) Brushing, cleaning			12							12
(d) Roads			40							40
(e) Protection, forest & road maintenance	2	10	12	12	10					46
(f) Other										
(g) Sum (a) to (f) = total expenditure	75	10	64	12	10					171 £/acre
IV Expected volume yield by periods and standing values										Net Yield
(a) Thinnings, H.ft.		60	650	1290	500					
(b) Main crop felling, H.ft.					5320					
(c) Net volume of thinnings										
((a) x reduction factor) H.ft. .8		48	520	1032	400					2000
(d) Net volume main crop					4256					4256
((b) x reduction factor) H.ft.										6256 = ft./acre
(e) Price standing per H.ft. thinnings £		.021	.029	.046	.066					
(f) " " " " main crop £					.100					139 = m.a.i. at 45 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)		1.0	15.0	47.4	26.4					89.8
(b) " " main crop: IV(d) x IV(f)					-	425.6				425.6
(c) Other income										
(d) End rotation value of land, roads, etc.						- 45.				45.0
(e) Sum: (a) + (b) + (c) + (d) = total income		1.0	15.0	47.4	26.4	470.6				560.4 £/acre
VI Balance of income and expenditure										Total
(a) Net income (+)				35.4	16.4	470.6				522.4
(b) Net expenditure (-)	-75	-9	-49							133.0
(c) Net result for rotation (a)-(b) =										389.4
Grand total of V - grand total of III										389.4
(d) Net annual income = (c) ÷ rotation (45)										8.6 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	45	60	70	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.186	.900	.638	.453	.321	.270				
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income				16.0	5.2	127.0				148.2
(d) Multiply entries in VI(b) to give discounted net expenditure	88.9	8.1	31.2							128.2
VIII Net discounted revenue per £100 of initial establishment expenditure										£
(a) NDR on rotation of 45 years										+ 20 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70 per acre
(c) = 100 (a)÷(b) = NDR per £100 of initial establishment expenditure =										+ 28.5 per £100

IX Cases for assumptions

- (a) Rotation: **Maximum N.D.R. at 3½% to be assessed.**
- (b) Expenditure: **Inclusive of Direct Overheads: Forest maintenance £1/ac/yr to 15th yr then £0.85 to 35th yr. Roads new 1 mile per 110 acres at £4,000 - £40 per acre. Road maintenance at £40 per mile or £0.35 ac/yr.**
- (c) Price-size evidence: **Local markets.**
- (d) Other: **No thinning after 40 yrs.**

Signature **J. Chrystall**Date of Compilation **29/1/63**

PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	Yield Table Data	M.a.i. at chosen rotation	Price level
(a) Conservancy <u>N(S)</u>	(c) Species <u>D.F.</u>	(g) Rotation <u>50</u>	(m) Thinnings <u>-1h.ft.-5d.</u> <u>1-2h.ft.-7d.</u> <u>3-10h.ft.-11d.</u> <u>11-15h.ft.-14d.</u>
(b) Location <u>Culloden Group</u>	(d) Yield Table <u>F.C.(Rev)</u>	(h) Y.T. m.a.i. <u>176</u>	(n) Main crop <u>Av.vol.29h.ft.</u> <u>2/2</u>
	(e) Q.G. <u>III</u>	(j) Reduction factor <u>.8</u>	
	(f) Max. m.a.i. <u>176 at 50 yrs.</u>	(k) Net m.a.i. <u>140.8</u>	

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5									5
(b) Establishment	68									68
(c) Brushing, cleaning			12							12
(d) Roads			40							40
(e) Protection, forest & road maintenance	2	10	12	12	10	5				51
(f) Other										
(g) Sum (a) to (f) = total expenditure	75	10	64	12	10	5				176 £/acre
IV Expected volume yield by periods and standing values										Net Yield
(a) Thinnings, H.ft.		60	650	1290	950	-				
(b) Main crop fellings, H.ft.						5860				
(c) Net volume of thinnings ((a) x reduction factor) H.ft. <u>.8</u>		48	520	1032	760					2360
(d) Net volume main crop ((b) x reduction factor) H.ft.						4688				4688
(e) Price standing per H.ft. thinnings £		.021	.029	.046	.066					7048 H.ft./acre
(f) " " " " main crop £						.108				141 = m.a.i. at 50rs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)		1.0	15.0	47.4	50.1					113.5
(b) " " main crop: IV(d) x IV(f)						506.3				506.3
(c) Other income						45				45
(d) End rotation value of land, roads, etc.										
(e) Sum: (a) + (b) + (c) + (d) = total income		1.0	15.0	47.4	50.1	551.3				664.8 £/acre
VI Balance of income and expenditure										Total
(a) Net income (+)				35.4	40.1	546.3				621.8
(b) Net expenditure (-)	-75	-9	-49							133.0
(c) Net result for rotation (a)-(b) =										488.8
Grand total of V - grand total of III										488.8
(d) Net annual income = (c) ÷ rotation (50)										9.7 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	50	60	70	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.137	.864	.612	.434	.308	.218				
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income				15.3	12.3	119.				146.6
(d) Multiply entries in VI(b) to give discounted net expenditure	85.2	7.7	29.9							122.8
VIII Net discounted revenue per £100 of initial establishment expenditure										E
(a) NDR on rotation of 50 years										+ 23.6 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70. per acre
(c) = 100 (a)÷(b) = NDR per £100 of initial establishment expenditure =										+ 33.7 per £100

IX Assumptions

- (a) Rotation: Maximum N.D.R. at 3½% to be assessed.
- (b) Expenditure: Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then £0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre. Road maintenance at £40 per mile or £0.35 ac/yr.
- (c) Price-size evidence: Local markets.
- (d) Other: No thinning after 45 yrs.

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PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	Yield Table Data	M.a.i. at chosen rotation	Price level
(a) Conservancy N(S)	(c) Species D.F.	(g) Rotation 55	(m) Thinnings 1h.ft. - 5d.
	(d) Yield Table F.C. (Rev)	(h) Y.T. m.a.i. 173	(n) Main crop 10-15h.ft. - 1/4d. - 20h.ft. - 1/8
(b) Location Culloden Group	(e) Q.G. III	(j) Reduction factor .8	(n) Main crop Av. Vol. 35h.ft. - 2/4h.ft.
	(f) Max. m.a.i. 176 at 50 yrs.	(k) Net m.a.i. 138.4	

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5									5
(b) Establishment	68									68
(c) Brashing, cleaning			12							12
(d) Roads			40							40
(e) Protection, forest & road maintenance	2	10	12	12	10	10				56
(f) Other										
(g) Sum (a) to (f) = total expenditure	75	10	64	12	10	10				181 £/acre
IV Expected volume yield by periods and standing values										Net Yield
(a) Thinnings, H.ft.		60	650	1290	950	460				
(b) Main crop felling, H.ft.						6095				
(c) Net volume of thinnings										
((a) x reduction factor) H.ft. .8		48	520	1032	760	368				2728
(d) Net volume main crop						4876				4876
((b) x reduction factor) H.ft.										7604 H.ft./acre
(e) Price standing per H.ft. thinnings £		.021	.029	.046	.066	.083				
(f) " " " " main crop £						117				138 = m.a.i. at 55 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)		1.0	15.0	47.4	50.1	30.5				144.0
(b) " " main crop: IV(d) x IV(f)						-	570.4			570.4
(c) Other income										
(d) End rotation value of land, roads, etc.							45.0			45.0
(e) Sum: (a) + (b) + (c) + (d) = total income		1.0	15.0	47.4	50.1	30.5	615.4			759.4 £/acre
VI Balance of income and expenditure										Total
(a) Net income (+)				35.4	40.1	20.5	615.4			711.4
(b) Net expenditure (-)	-75	-9	-49							133.0
(c) Net result for rotation (a)-(b) =										578.4
Grand total of V - grand total of III										578.4
(d) Net annual income = (c) + rotation (55)										10.5 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	50	55	70	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.099	.835	.592	.420	.297	.211	.178			
(c) Using discounting factor for 3 1/2% multiply entries in VI(a) to give discounted net income				14.8	11.9	4.3	109.5			140.5
(d) Multiply entries in VI(b) to give discounted net expenditure	82.4	7.5	29.0							118.9
VIII Net discounted revenue per £100 of initial establishment expenditure										£
(a) NDR on rotation of 55 years										+ 21.6 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70.0 per acre
(c) = 100 (a)÷(b) = NDR per £100 of initial establishment expenditure =										+ 30.8 per £100

IX Bases for assumptions

- (a) Rotation: **Maximum N.D.R. at 3 1/2% to be assessed.**
 (Inclusive of Direct Overheads: Forest maintenance £1/ac/yr. to 15th yr.)
- (b) Expenditure: **then £0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre. Road maintenance at £40 per mile or £0.35 ac/yr.**
- (c) Price-size evidence: **Local markets.**
- (d) Other: **No thinning after 50 yrs.**

Signature

J. Chrystall

Date of Compilation

29/1/63

PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I	(a) Conservancy N(S)	Yield Table Data	N.a.i. at chosen rotation	Price level
		(c) Species D.F.	(g) Rotation 60	(m) Thinnings 1h.ft. - 5d.
	(b) Location Culloden Group	(d) Yield Table F.C. Rev.	(h) Y.T. m.a.i. 170	(n) Main crop Av. vol. 39h.ft.
	(e) Q.G. III	(j) Reduction factor .8	(k) Net m.a.i. 136	
	(f) Max. m.a.i. 176 at 50 yrs.			

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										Total
(a) Land	5									5
(b) Establishment	68									68
(c) Brushing, cleaning			12							12
(d) Roads			40							40
(e) Protection, forest & road maintenance	2	10	12	12	10	10	5			61
(f) Other										
(g) Sum (a) to (f) = total expenditure	75	10	64	12	10	10	5			186 £/acre
IV Expected volume yield by periods and standing values										Net Yield
(a) Thinnings, H.ft.		60	650	1290	950	800	-			
(b) Main crop felling, H.ft.							644.5			
(c) Net volume of thinnings ((a) x reduction factor) H.ft.	.8	48	520	1032	760	640				3000
(d) Net volume main crop ((b) x reduction factor) H.ft.							5156			5156
(e) Price standing per H.ft. thinnings £		.021	.029	.046	.066	.083	.117			8156 H.ft./acre
(f) " " " " main crop £										136 = m.a.i. at 60 yrs
V Income per acre by periods										Total
(a) Value of thinnings: IV(c) x IV(e)		1.0	15.0	47.4	50.1	53.1				166.6
(b) " " main crop: IV(d) x IV(f)							603.2			603.2
(c) Other income										
(d) End rotation value of land, roads, etc.							45.			45.
(e) Sum: (a) + (b) + (c) + (d) = total income		1.0	15.0	47.4	50.1	53.1	648.2			814.8 £/acre
VI Balance of income and expenditure										Total
(a) Net income (+)				35.4	40.1	43.1	643.2			761.8
(b) Net expenditure (-)	-75	-9	-49							133.0
(c) Net result for rotation (a)-(b) =										628.8
Grand total of V - grand total of III										628.8
(d) Net annual income = (c) + rotation (60)										10.4 £ per acre
VII Discounted income (+) and expenditure (-)										Total
(a) Years from planting	2	10	20	30	40	50	60	70	80	
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.069	.812	.576	.408	.289	.205	.145			
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income				14.4	11.5	8.8	93.2			127.9
(d) Multiply entries in VI(b) to give discounted net expenditure	80.1	7.3	28.2							115.6
VIII Net discounted revenue per £100 of initial establishment expenditure										£
(a) NDR on rotation of 60 years										+ 12.3 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70 per acre
(c) = 100 (a)÷(b) = NDR per £100 of initial establishment expenditure =										17.5 per £100

IX Bases for assumptions

- (a) Rotation: Maximum N.D.R. at $3\frac{1}{2}\%$ to be assessed.
 (Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then
- (b) Expenditure: £0.85 to 35th yr. Roads new 1 mile per 110 acres at £4,000 - £40 per acre.
 (Road maintenance at £40 per mile or £0.35 ac/yr.
- (c) Price-size evidence:
 Local markets.
- (d) Other:
 No thinning after 55 yrs.

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PROFITABILITY ASSESSMENT FOR AN INDIVIDUAL CROP

I		Yield Table Data	N.a.i. at chosen rotation	Price level
(a) Conservancy	North (S)	(c) Species D.F.	(g) Rotation 65	1h.ft. = 5d. 1-2h.ft. = 7d.
		(d) Yield Table F.C.	(h) Y.T. m.a.i. 164	(m) Thinnings 3-7h.ft. = 11d.
(b) Location	Culloden Group	(e) Q.G. III	(j) Reduction factor .8	10-15h.ft. = 1/4 16-20h.ft. = 1/8 20-30h.ft. = 2/-
		(f) Max. m.a.i. 176 at 50 yrs.	(k) Net m.a.i. 131.2	(n) Main crop Av. vol. 45h.ft.
				Price expected 3/- per h.ft.

II Period, years from planting	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-75	76-85	
III Expenditure per acre by periods										
(a) Land	5									Total 5
(b) Establishment	68									68
(c) Brushing, cleaning			12							12
(d) Roads			40							40
(e) Protection, forest & road maintenance	2	10	12	12	10	10	10			71
(f) Other										
(g) Sums (a) to (f) = total expenditure	75	10	64	12	10	10	10			191 £/acre
IV Expected volume yield by periods and standing values										
(a) Thinnings, H.ft.		60	650	1290	950	800	400			Net Yield
(b) Main crop fellings, H.ft.							6600			
(c) Net volume of thinnings ((a) x reduction factor) H.ft. .8		48	520	1032	760	640	320			3320
(d) Net volume main crop ((b) x reduction factor) H.ft.							5280			5280
(e) Price standing per H.ft. thinnings £		.021	.029	.046	.066	.083	.100			£.ft./acre
(f) " " " " main crop £							.150			132 = m.a.i. at 65 yrs
V Income per acre by periods										
(a) Value of thinnings: IV(c) x IV(e)		1.0	15.0	47.4	50.1	53.1	32.			Total 198.6
(b) " " main crop: IV(d) x IV(f)								792.0		792.0
(c) Other income										
(d) End rotation value of land, roads, etc.								45.0		45.0
(e) Sum: (a) + (b) + (c) + (d) = total income		1.0	15.0	47.4	50.1	53.1	32.	837.0		1035.6 £/acre
VI Balance of income and expenditure										
(a) Net income (+)				35.4	40.1	43.1	22.	837.0		Total 977.6
(b) Net expenditure (-)	-75	-9	-49							133
(c) Net result for rotation (a)-(b) =										844.6
Grand total of V - grand total of III										84.6
(d) Net annual income = (c) + rotation (65)										£13 £ per acre
VII Discounted income (+) and expenditure (-)										
(a) Years from planting	2	10	20	30	40	50	60	70	80	Total
(b) Discount net income or expenditure (from VI(a) and VI(b))	1.05	.794	.563	.399	.283	.200	.142	.120		
(c) Using discounting factor for 3½% multiply entries in VI(a) to give discounted net income				14.1	11.3	8.6	3.1	100.4		137.5
(d) Multiply entries in VI(b) to give discounted net expenditure	78.3	7.1	27.5							112.9
VIII Net discounted revenue per £100 of initial establishment expenditure										
(a) NDR on rotation of 65 years										£ 24.6 per acre
(b) Initial establishment expenditure = III(b)+(d)+(e)+(f) in years 1-5 =										70. per acre
(c) = 100 (a)+(b) = NDR per £100 of initial establishment expenditure =										+ 35.1 per £100

Assumptions for assumptions

- (a) Rotation: **Maximum N.D.R. at 3½% to be assessed.**
- (b) Expenditure: **(Inclusive of Direct Overheads: Forest maintenance £1 /ac/yr to 15th yr then £0.85 to 35th yr. Roads new 1 mile per 110 acres at £4000 - £40 per acre. Road maintenance at £40 per mile or £0.35 ac/yr.**
- (c) Price-size evidence: **Local markets.**
- (d) Other: **No thinning after 60 yrs.**

Signature **J. Chrystall**

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