

- ▶ The frequency, type and size of knots are a major causes for timber quality downgrade.
- ▶ Pruning allows the early formation of clear knot free timber and improves timber quality.
- ▶ To make the pruned material attractive for sale, the ratio between the diameter of the knotty core (diameter at time of first pruning lift) and final diameter of the tree should be a minimum of 2.5:1.
- ▶ To achieve the required 2.5:1 ratio, the correct timing of pruning and the rotation length are critical.
- ▶ Pruning can be costly but with the generous Forest Service grants now available, it makes good economic sense to prune.
- ▶ Pruning in conjunction with thinning is economically more attractive for yield classes 18 and greater.

Pruning adds value to plantations

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General

There are many factors that influence the quality of timber and the end use to which it can be put. Some of these are dependent on the inherent qualities of a specific species, such as wood density and colour, while others, like knots, can be influenced by the growing regime adopted. The frequency, type and size of knots are the only major causes for timber quality downgrade that can be influenced relatively easily by silvicultural practices. This is done through spacing and pruning. Pruning involves the removal of the lower branches and allows the early formation of clear knot free timber. It is undertaken to increase tree and plantation value.

Because pruning is a technique for adding value to trees growing in forest stands, it can be thought of as the grower's "value added" effort. It is, however a long-term investment as the payback occurs at the time of clearfell when the final crop trees are harvested.

Pruning is undertaken in stages known as lifts. The height of the lift depends on the traditional sawlog lengths that the market demands. Under Irish conditions, pruning is undertaken in two lifts. The first to 3.5 m and the second to 6 m, thus providing a high quality log with a minimum length of 6 m.

To make the pruned material attractive for sale, the ratio between the diameter of the knotty core (diameter at time of first pruning lift) and final diameter of the tree should be a minimum of 2.5:1 (Figure 1).

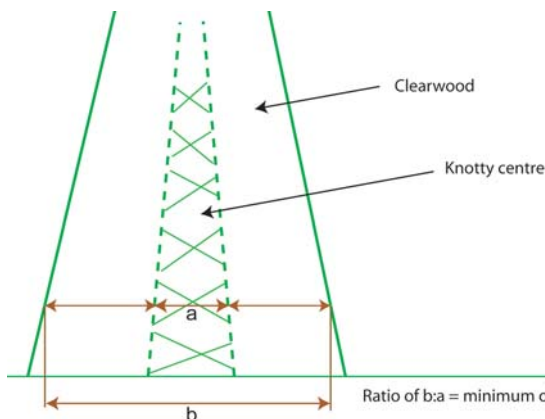


FIGURE 1: Knotty core and clearwood for pruned stems.
Ratio of b:a = minimum of 2.5:1

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Although widely practiced in countries like New Zealand and Australia that have extensive areas of private forest plantations, pruning fell out of favour in Ireland during the early 1980s due to the lack of a significant price differential between pruned and unpruned material (Fitzsimons 1989). However, much of the pruning undertaken had been carried out too late in the life of the crops and did not allow for the development of sufficient clearwood. Thus it is understandable that sawmillers were unwilling to pay a premium for this material.

Pruning operation

Pruning of conifers is a relative simple operation. It involves three steps:

- i) the selection of approximately 500 suitable stems per ha;
- ii) pruning to 3.5 m – first lift; and
- iii) between two to four years later pruning to 6 m – second lift.

When selecting the stems, care should be taken to ensure that they are evenly spaced throughout the crop, coarse roughly branched or malformed/damaged stems are avoided, and selection is confined to dominant or co-dominant trees which will form the final crop. Care should be taken not to remove too much of the live tree crown/branches, as this will impede growth. As a general rule of thumb, up to 30% of the lower live crown can be removed without affecting volume growth.

Pruning and rotation length

In order for the pruned trees to achieve sufficient diameter growth to reach the knot free ratio of 2.5:1, the timing of the pruning operation together with the rotation length is critical (Table 1). This has implications regarding the initial selection of sites for pruning, which should be wind firm and stable and capable of growing the crop for the required rotation. The required rotation depends on yield class and the timing of the first pruning lift.

The normal felling age in Table 1 refers to the estimated financial rotation age, i.e. rotation of maximum return to grower. For yield classes of less than 24, the rotation should be extended beyond the normal felling age in order to achieve the 2.5:1 ratio.

TABLE 1: Pruning schedules for Sitka spruce.

YC	Pruning age	Mean DBH (cm)	Estimated DBH of pruned trees (cm)	Rotation to achieve 2.5:1 ratio	Normal felling age
24	13	12	16	37	37
	14	13	17	39	
	15	14	18	42	
	16	14	18	43	
	17	15	19	45	
22	14	12	16	39	38
	15	13	17	42	
	16	14	18	44	
	17	14	18	45	
	18	15	19	49	
20	15	12	16	42	40
	16	13	17	44	
	17	13	17	46	
	18	14	18	48	
	19	14	18	49	
18	16	12	16	47	42
	17	13	17	49	
	18	13	17	50	
	19	14	18	53	
	20	14	18	56	
16	17	12	16	52	44
	18	13	17	55	
	19	13	17	58	
	20	14	18	60	
	21	14	18	62	

Costs and returns of pruning

Pruning can represent a significant cost to the grower. Pruning costs range from €1.00 to 1.35 per tree for the first lift and from €1.30 to 1.50 for the second lift based on contract rates operating in 2001. Thus total costs can amount to between €1,150 and €1,400 per ha assuming 500 trees are pruned. Table 2 shows the increase in final crop revenue required to fund the pruning cost, under different scenarios.

TABLE 2: Analysis of clearfell price premium (€/m³) to recover cost of pruning.

	Years to clearfell from first lift					
	24	26	28	30	32	34
Case 1: No Grant Shortfall						
Net cost of pruning compounded at 5% real interest rate	0	0	0	0	0	0
Clearfell premium to cover costs	0.00	0.00	0.00	0.00	0.00	0.00
Case 2: Grant Shortfall of €250/ha						
Net cost of pruning compounded at 5% real interest rate	736	812	895	987	1,088	1,200
Clearfell premium to cover costs	1.64	1.80	1.99	2.19	2.42	2.67

The Forest Service provides a grant scheme for the pruning of conifers and the details are shown below. Assuming that the grant fully covers the cost of pruning, the decision to prune is an easy one for growers - any increase in log price at clearfell will represent clear profit for the grower.

At current prices for sawlog, this is equivalent to a 5% premium. Experience from other countries such as New Zealand and the United States shows that this is more than

achievable and premiums of 20% and greater can apply (Anon 2000). Thus it makes good economic sense to prune.

An analysis of returns is shown in Figure 2, assuming that pruning costs are covered by the grant and that pruned material would attract a 10% increase in price. Pruning in conjunction with thinning is economically more attractive for yield classes 18 and greater. For yield class 16 the differences are marginal.

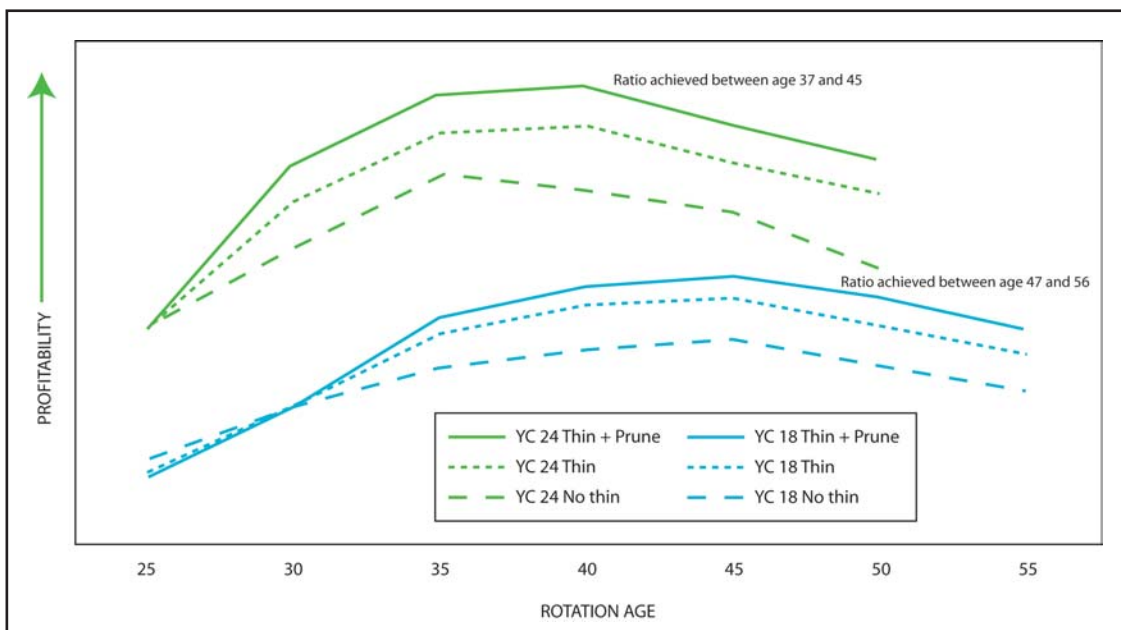


FIGURE 2: Comparison of thin, no thin and thin + prune for Sitka spruce.

2.5:1 = total diameter:knotty core

Pruning grants

The Forest Service Pruning Grant is an element of the Woodland Improvement Scheme which applies to young (13 to 22 years) conifer woodland. The scheme is directed towards the high pruning of commercial coniferous crops to select suitable stands. The following criteria should be used (O'Sullivan *et al.* 2001):

- ▶ Selected trees within a stand must be capable of increasing their mean diameter by a factor of 2.5;
- ▶ Stands will usually be between 13 and 22 years old or between 9 and 10 m in height;
- ▶ Stands of yield class 18 or more should be selected;
- ▶ Stands must be stable with a low risk of windthrow; and
- ▶ Minimum area of 0.4 ha.

The objective is to produce a stand of conifers that will have 6 m of branch/knot free stem. This will increase the value of the crop significantly.

- ▶ Prune a minimum of 500 stems/ha;
- ▶ First lift involves the removal of all branches on the selected stems to 3.5 m;
- ▶ Two to four years after the first lift the second lift from 3.5 to 6 m may be undertaken;
- ▶ Prune an inspection path every 100 metres.

Grant Rates

- ▶ €698.35/ha for the first lift;
- ▶ €825.33/ha for the second lift.

Work should not commence until written approval is received from the Forest Service.

Timing of pruning

Pruning ideally should be undertaken in conjunction with first thinning. This will reduce the cost of pruning and make selection of the pruned trees easier. This, however, presents a dilemma to the grower. On the one hand, early thinning will ensure that the pruned trees will achieve the diameter required for the 2.5:1 ratio, while on the other, it means smaller average tree size and reduced revenues. The small reduction in revenue from first thinnings will be more than compensated by the improved timber quality from the pruned material and the increased saleability of the plantation.

Pruning records

It is important to keep a record of when the pruning was done and the number of trees pruned. The Forest Service currently will issue a letter along with the grant payment verifying the area of the crop that has been pruned. This is not a pruning certificate but should be retained and used as proof of pruning when selling material in the future. This is not an ideal system and if we are to develop a market for high quality material, it makes sense that as a minimum the Forest Service or an independent industry agency/organisation should (a) issue a certificate of pruning recognised by the trade and (b) maintain a database of pruned stands.

References

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