Douglas fir in France

Jean de Champs

1. Historical review

After its discovery by the Scot Archibald Menzies two centuries ago on Vancouver Island, Douglas fir was first planted in Europe in England in 1827 and in Germany in 1829. In France the first Douglas fir was planted in 1842 in Brittany and further specimens were planted in the Centre, Normandy and Limousin Regions. It was planted as an ornamental species, in parks and gardens. Large scale planting of Douglas fir began in 1872, in the Beaujolais area. Its use as a commercial species really dates from 1946 when the FFN (National Forestry Resources) was created. Today Douglas fir accounts for 26% of all French afforestation.

2. Statistics

(The source of most of the statisti-

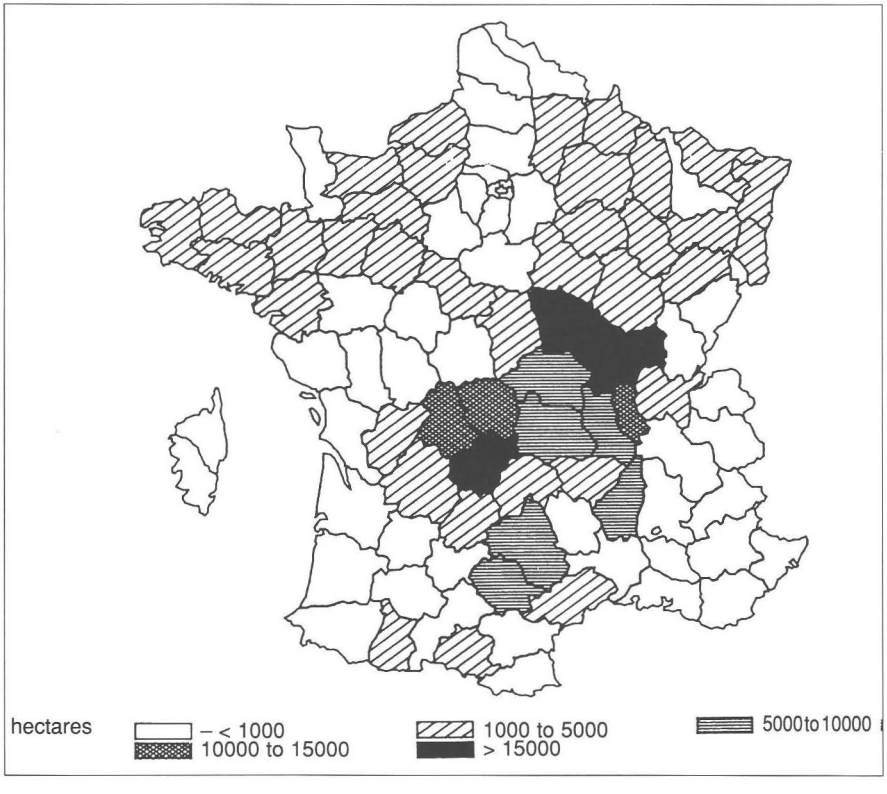

Fig. 1 *Proportionate distribution of Douglas fir plantations in France*

cal data that follow is IFN (National Forestry Inventory)).

As far as forest areas are concerned the data refers to the end of 1992. We have in France 304,000ha of Douglas fir plantations (about 2.1% of the forest area), 209,000ha (69%) are concentrated in five Regions which have more than 30,000 hectares each, and 95,000ha in the other 15 Regions. By Departement, 14 have more than 5,000 hectares (see Figure 1). Figure 2 shows the age class distribution, and it can be seen that we have very few Douglas fir plantations older than 50 years. Furthermore as can be seen in Figure 3 the amount of Douglas fir being planted has reduced in the past 20 years but this is true for all species.

The growing stock and its increment are presented in Table 1. The harvested volumes have been forecasted using a 'high' and 'low' scenario. In my view the high harvest scenario is the most likely to occur.

Component	*Millions of cubic metres*
Standing volume	20.4
Annual Increment	2.1
Forecasted harvest 2000	2.2-3.3
Forecasted harvest 2010	3.3-4.3

Table 1. *Douglas Fir inventory and forecasted harvest*

3. Provenance selection

Provenance choice is very important. In France we have 814ha of approved seed stands, 17ha of controlled stands and 14ha of seed orchards. However, seed years occur only one year in five or six and so very often we do not have enough seed and we must import from the recommended seed-zones in Washington and Oregon, in all cases from stands that occur below 500m.

4. Nursery practice and plantation establishment

Plants are raised in the nursery over a period of three years using a 1 + 2 or 2+1 regime, to reach a height of 60cm. Containerised plants are rarely used.

Spacing at establishment varies, there is still a lot of debate on this point, but the overall trend over the past 20 to 30 years is to increase spacing. The forest administration (FFN) recommends a planting density of between 600 and 1,600 plants/ha. At AFOCEL we plant between 800 and 1,000 plants/ha. The site is usually prepared using a bulldozer or power shovel to remove coppice growth where it occurs. In most cases the site is completely cultivated because we get better establishment and early growth and the amount of cleaning is reduced. Fertilisation is very commonly practised, especially with phosphate as this is very important for good growth. As an example we have the following result from a cultivation by fertilisation field trial (Table 2).

Controlling competing vegetation is very important during the first three to four years after planting as Douglas-fir is very susceptible to competition.

	No fertiliser	*Fertiliser*
	Mean height after ten growing seasons (cm)	
No cultivation	410	487
Cultivation	450	554

(*) Applied at a rate of 120kg/ha P_2O_5/ha (before ploughing) or 30/40g/plant in the form of 'natural' phosphate (30% P_2O_5) at 400kg/ha or superphosphate (25% P_2O_5) at 480kg/ha.

Table 2. *Effect of cultivation and phosphate* application on the growth of Douglas fir*

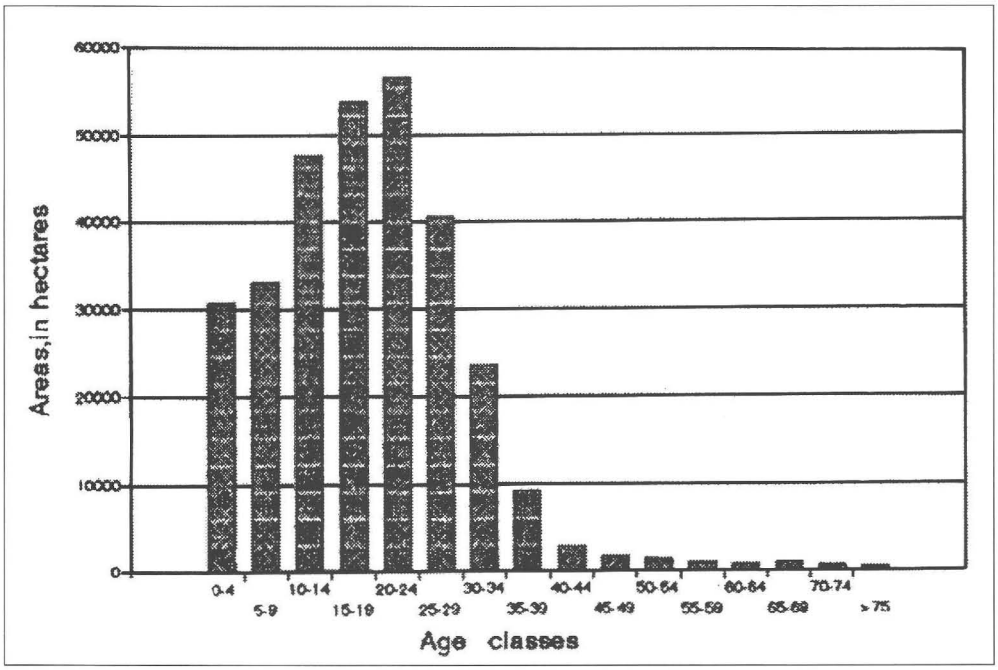

Figure 2. *Areas of Douglas fir in France by age class (1992 data)*

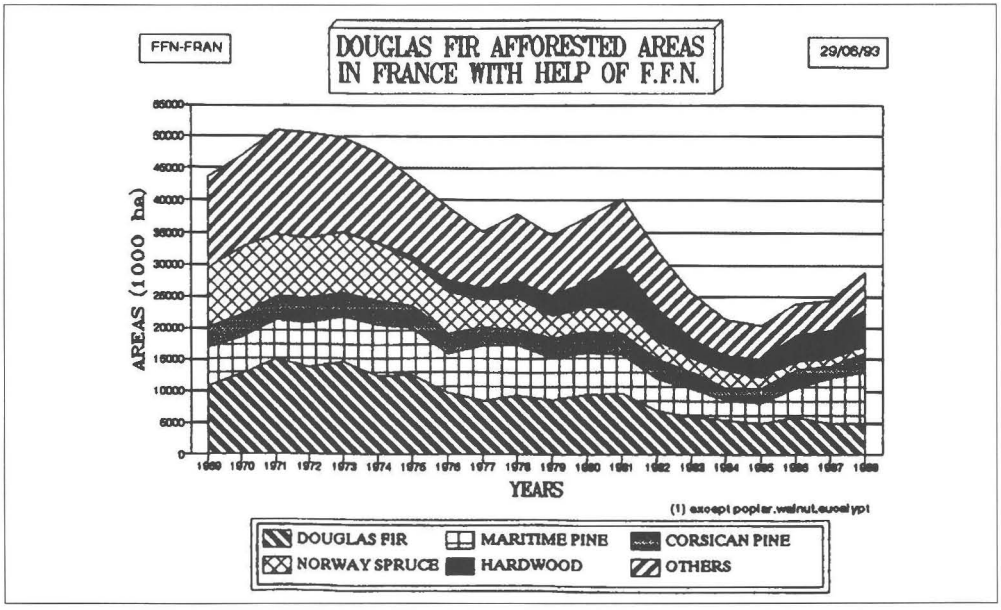

Figure 3. *Areas of plantations established under grant aid from FFN (apart from eucalyptus, poplar and walnut)*

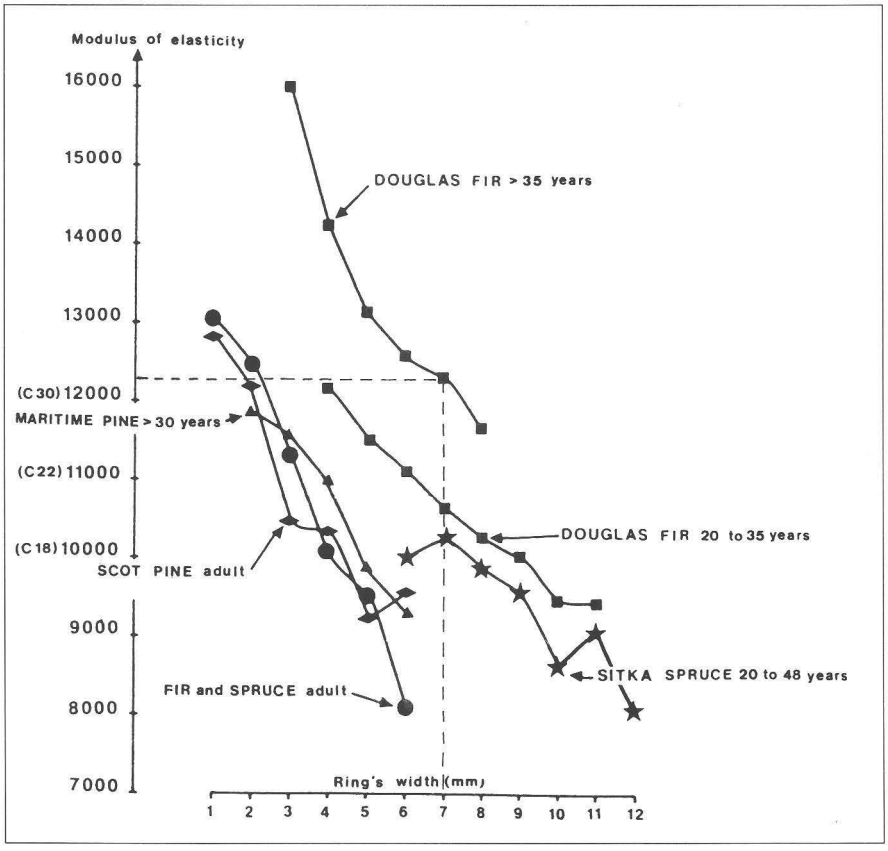

Figure 4. *Correlation between modulus of elasticity and ring width for some conifers*

We often use chemical weed control with herbicides such as triclopyr.

5. Silviculture

The conventional French 'yield table' silviculture is not applied as the regime for Douglas fir is quite different from the normal. The number of thinnings, for example, is more numerous and the plantation density and number of stems removed at first thinning is quite different from the conventional. In practice starting at about 1,000 stems/ha it is possible to go to 300/ha in only two or three thinnings. This results in a more uniform ring width, gives better stand stability and optimises the discounted cash flow.

First thinning is often systematic (one row in three or one in five), subsequent second and third selective thinnings remove from 20 to 30% of stems. First and second thinnings are more and more mechanised.

Crops are clearfelled at from 40 to 50 years of age, when the stocking varies from 300 stems/ha (tree volumes up to 1.5m^3), to 225 stems/ha (tree volumes up to 2.5m^3). Pruning is now practised extensively, to a height of 6m. It is done either at first thinning

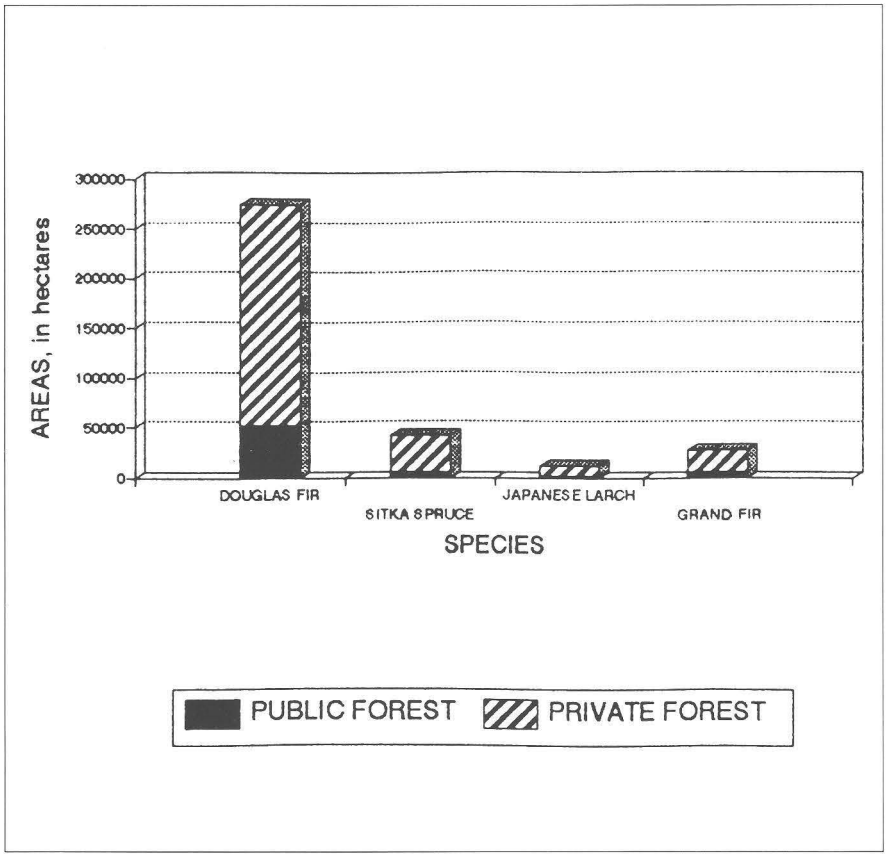

Figure 5. *Development in France of four exotic softwods*

stage or a few years before. Two hundred stems/ha are selected and pruned using either the conventional pruning saw or a pneumatic secateurs. Pruning machines are rarely used.

6. Protection

As far as diseases are concerned "Swiss rust" (*Phaeocryptopus gaeumannii*) is common but it is easy to counteract with NP fertilisation. The occurrence of *Fomes annosus* is exceptional. The principal insect is *Hylobius abietis*, frequent after pine clearfelling. It affects all species but treatment is easy with insecticidal sprays.

Frost damage is avoided and reduced by the use of late flushing provenances. Wind damage risk is often over-estimated, Douglas fir is not very susceptible to windthrow (provided the height/dbh ratio is less than 75). It is certainly less susceptible than many other species, particularly Norway spruce.

The species is palatable to deer and in France we have problems with roe deer where they are too numerous.

7. Yield

The yield table for West Massif-Central gives production over height (Table 3).

Of course these are theoretical production levels but we can easily enough have 75 to 80% of these in practice.

Site class	*Height (m) at 50 years*	*Cumulative production (m^3/ha) at 50 years*
1	34.1	1049
2	31.2	928
3	28.3	808

Table 3. *Volume production/top height relationship for Douglas fir*

8. Wood quality and uses

The wood of Douglas fir is excellent, even where the diameter growth is fast. For the same annual ring width, mass per unit volume, modulus of elasticity and tensile strength are higher than for other conifers. As shown in Figure 4 for a 7mm ring width the modulus of elasticity is greater than 12,000 Newton/mm^2 (1200 MPascals) and the wood therefore qualifies for the top strength C30 structural grade. So our silviculture which will give this type of diameter growth is certainly a good compromise between growth, stability and profitability.

What are the uses for Douglas fir wood?

- small trees (dbh 10-15cm): pulp, fibre-board, or particle-board
- medium trees (dbh 20-25cm): pallets, small sawlog applications
- big trees (dbh 30+): carpentry, joinery or peeled veneers (if pruned).

9. Research

At AFOCEL Douglas fir research is concerned with:

- breeding
- clonal propagation techniques
- afforestation techniques
- silviculture and growth modelling
- wood quality.

10. Who plants Douglas fir?

Private forest owners were the first to plant the species and today they own 81% of Douglas fir plantations. You can see from Figure 5 that of the four main exotic conifers planted in France that Douglas fir is by far the most predominant, despite the fact that all four were at more less the same level 50 years ago.

11. Why plant Douglas fir?

Douglas fir has five main qualities:

- it is a fast growing species as early as the second year after planting
- it has very few diseases and is wind-firm
- it has high productivity
- it has high wood strength
- it leads to no soil degradation

And it qualifies for a subsidy ! So, now you know why I think that Douglas fir is the best conifer in the world!

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