A Re-appraisal of Irish Silvicultural Practices[1]

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To look at Irish silvicultural practices today, it is necessary to look at their history to see how and why they have developed as they have.

The requirements for timber in the British Isles over the past few centuries have primarily been for structural purposes, or for fuel for smelting, and concentrated almost entirely on the growing of hardwoods. During the 18th and 19th centuries Britain was able to supply from her colonies, structural hardwoods that were cheaper and more plentiful than could be produced at home. This coupled with an expansion of agricultural lands and the high demand for home timber for smelting caused a dimunition of the afforested area in Britain and Ireland.

In Europe however, demand could not be met by sea-borne transport, and had to be met by homegrown timber. Heavy structural timber was supplied by the hardwood forests, while light structural timber and the demand for poles of high form factor (used mainly as pit-props) was met by conifers. The growing of conifers for this end product in mind suited well the climate, terrain and industry of continental Europe. Thus evolved a system of silviculture that entailed initial close spacing, frequent thinning, long rotations, resulting in crops with high form factors and small light crowns.

Coniferous forestry in the British Isles has no such history or tradition. In 1909 a German, Wilhelm Schlich was appointed professor at Britain's first forestry faculty, at Oxford. Schlich was at this time one of the foremost men in European forestry, steeped in the continental silvicultural tradition. After the First World War it was felt that a home supply of pit-props was essential in the event

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of another war. On Schlich's advise, large areas (most notably the Kielder forest) were planted with Sitka spruce. Sitka was chosen because it was thought to be the only species capable of growing fast enough. The continental silvicultural system was employed. (Incidentally, at the outbreak of the Second World War, these areas were not ready for production).

Because of this influence of traditional continental methods, we have arrived at our present system of silviculture which is in essence still continental. There are apparent anomalies about using such a system in Ireland today.

Firstly, the produce originally grown using the continental method, was mine timber. Today the demand is for a whole range of products from structural timber to pulpwood. Secondly the species being grown in Ireland are radically different. In Europe the main species is Norway spruce, whereas in Ireland it is Sitka spruce (Queen Charlotte Is. provenance) and coastal Lodgepole pine, which are Oceanic in their natural environment. Ireland too has an Oceanic climate. Rainfall in Ireland is less than in the Q. C. Is., but this is probably compensated by the high water retention of many of the soils in Ireland, notably the gleys and peats. Sitka thrives in moist overcast conditions and not in direct sunlight such as prevails in Europe. Situated as we are on the western seaboard of Europe we experience one of the windiest climates in Europe. Dixon (1959) states that there are violent storms every century, severe storms every 30-35 years, and bad storms every 10-15 years. An example of a bad storm is the storm of 1974 which caused so much damage to forests in Ireland.

It would appear that we are growing an Oceanic species in an Oceanic climate using a continental system geared to a continental species and climate.

Having outlined how we have arrived at our present methods I should point out that there have been changes adopted. These include the introduction of the plough, fertilisation, increasing initial spacing to 2m x 2m, and a replacement of selective first thinnings by line thinnings.

I want to consider next, the important factors governing a silvicultural regime and how these could be applied to an Irish situation. These are:

1 The desired end product should be stated.
2 The crop should remain as windfirm as is possible.
3 The system used should be the most profitable.

These three basic principles will determine the species used, the types of thinning practice employed and the rotation age.

The most important question is, what type of end produce are we trying to grow. The answer to this must surely be sawlog timber, which offers the greatest monetary returns. Coupled with this is the need to supply smaller material for pulping, chipping and other wood processing industries, which is supplied at present mainly from thinnings. Due to the poor market for pulpwood at present, thinnings are often delayed, and thinning cycles become longer, the weight of each thinning is greater because removal of greater volumes/unit area in the short term is more profitable. If first thinnings, which is usually a line thinning, is delayed the remaining crop is thrown wide open to windblow. Further thinnings will continually open the crop to windblow hazards. (The fear of windblow following thinnings is a very real one and in Northern Ireland a no thin policy is the norm for this reason). By the turn of this century the amount of thinnings will probably be upwards of three times what they are at present, so the situation can only get worse.

One solution to the excess of thinnings, is to burn them to provide electricity. If biomass is required there are probably cheaper and more productive methods of obtaining it. Also this would not overcome the pre-disposition of the forest to blow following thinnings.

At this stage a question arises, which is: What is the function of thinnings. These can be considered to be:

1 To give space in the forest to allow the remaining trees to develop.
2 An early return on investment.
3 To provide a continued supply to wood processing industries.

At present there is no early return on imvestments and no wood processing industry to supply. Because of this and the risk of windblow on many sites in Ireland following thinning, a possible answer could be to practice a system of silviculture to produce sawlog whereby thinnings are totally excluded or reduced to a minimum. this can only be achieved by (a) planting at a wide initial spacing, that would represent the final crop spacing, (b) early respacing.

Greater space will allow trees grown by either of the above methods to reach sawlog size sooner because of enhanced diameter growth (Marsh, 1960). Because of this a greater number of stems/ha can be carried as final crop sawlog. At present a final crop is around 400/ha, but with the above methods up to 700-800 stems/ha could be carried. Such a system would be more economical of manpower, but most importantly such a crop would be less pre-disposed to windblow. Total volume production may be down on conventional methods but most of the volume will be as sawlog, and that sawlog will be produced earlier.

The next step is to see how our two most successful species to date, Sitka spruce and Lodgepole pine are suited to such a system. In the case of Sitka, initial planting at say 800 stems/ha, which represents a 3.5m x 3.5m spacing, to produce a final crop would not guarantee enough trees with vigour, form, etc., to produce a good final sawlog crop. Also the fact that the ground remains uncovered for several years would mean repeated clearing operations.

This problem can be overcome by respacing at an early age. Respacing is not a new idea. It is carried out in Scandinavia after natural regeneration. Also 'thinning to waste' in New Zealand and 'pre commercial thinning' in North America are forms of respacing. Planting of Sitka at 2000-2500/ha would give early ground cover and adequate stock from which to choose. Respacing should take place before competition sets in between the trees, which will be from 5-9 years depending on growth. Respacing can be either systematic or selective. Systematic respacing, e.g. removing every second tree, takes away the opportunity to remove the poor quality stems, slow growing trees and wolves. When respacing is selective the quality and uniformity of the stand can be improved. Selective respacing can be carried out by felling the trees at ground level, pollarding at a convenient height, or injection by chemical, such as arsenic.

The use of chemical injection for selective respacing is a little awkward, as it is difficult to see what trees have been treated. cutting at ground level is quick and convenient but will tend to uncover the ground and stumps will have to be treated against *Fomes annosus*. The method of pollarding is part of what is known as the Oceanic System or Early Final Selection. The advantages of this are that no treatment for Fomes is necessary, the lopped trees will surpress heavy branching on the final crop, and the ground will not be left exposed. Pollarded trees should not be cut too high or they will grow back and interfere with the final crop. The lopped stems should die in about one or two years after lopping. The crop at this stage should have 1000 stems/ha, although recent indications (Gilliland, 1980) suggest that this should be reduced to 700-800/ha to achieve the growth rates claimed for the Oceanic System. Other advantages of this system are that:

1 No machinery is required in thinning operations, so that no root damage can be incurred.
2 Constant ground cover provides a better microclimate for the growth of mycorrhizae.
3 The stand is never thrown open to the wind.

This last factor along with the lower centres of gravity, more comprehensive root systems, and lower top heights than in conventionally managed stands will lead to a more inherently stable stand. This results in a system which is simple and cheap to implement, giving an early return for sawlog timber. The question of the profitability of such a system is studied in a recent article by Edwards and Grayson (1979) in which they assume that the continental crops will not blow, as well as assuming certain price size curves. They state that such a system is not as profitable as conventional forestry, but their choice of price size curves appears to be very subjective. The Oceanic system therefore fulfills the principles stated earlier that govern a silvicultural regime, viz.

1 Stated end product: in this case, sawlog of 0.75m^3.
2 Must be windfirm: the Oceanic system is windfirm.
3 Profitability: it is likely that the Oceanic system will be profitable.

Admitedly some of the claims made for the Oceanic system may be extravagant, but these can be overlooked if a windfirm forest is produced. There is likely to be comment about the quality of the timber produced under such a system. At present in Ireland grading is all visual, but with the introduction of machine stress grades, most Oceanic sawlog should make general structural sawlog at least.

The suitability of Lodgepole pine to this system is the next question to be considered. Lodgepole pine would not be suitable for wide initial spacing, and if yearly respacing was to be done, careful and repetitive pruning would probably be necessary. Lodgepole would not be very suitable to a system such as the Oceanic system. Should Lodgepole be grown in Ireland at all? After a disappointing start with Lulu Island provenance we switched to coastal provenances and encountered bad form in many of the trees. Lodgepole does however fulfill an important role as a pioneer species to Sitka and silvicultural methods must be found to suit Lodgepole.

In conclusion I would like to say that there are no easy answers to this problem of what silvicultural system should be used. One possible answer in high risk windblow sites may be the Oceanic system, or other respacing systems. I do feel however that due to our unique climate, terrain and industries in Ireland, that a re-appraisal of our silvicultural methods and subsequent change is long overdue.

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