P. RADIATA SITE GRADING.

A.L. Clifton.

The question may well be asked.

How does one arrive at the suitability of a site for Pinus radiata?

It is well known that P. radiata makes big demands on the nutrient reserves of a soil. Intensive plantings of any species require a lot of moisture; and trees the way we want them to grow require good anchorage. A certain amount of protection from exposure to the elements of weather is essential too.

It will be readily seen that parent materials lacking in nutrients can not develop into a fertile soil, and aging of a good soil will lead to a loss of fertility due to leaching and lateritisation. Excessive drainage or lack of it will limit the available moisture reserves, and so will exposure to sun and wind. Anchorage will be limited by conditions which restrict the deep ramifying of roots, such as sheet rock, impermeable clay, permanently waterlogged layers and so on.

With experience, one can examine a site, especially the soil profile and read from its characteristics what condition it is in.

External evidences give a preliminary guide. Thus slope and aspect give an indication of the exposure of the site; while condition and type of vegetation indicate moisture and fertility. Land form gives a clue to underground water, too.

Within the soil, the depth and colour of the A_1 horizon is a useful guide to fertility. Colour and texture of the A_2 horizon is a guide to drainage, and moisture storage conditions, age of the soil and to its nutrient status in the case of basic soils. The A_2 horizon depth is a guide to anchorage. B horizon conditions also point to nutrient reserves (colour), moisture relations (type of mottling and structure), anchorage (friability or pentrability). Age is expressed in the contrast between texture of the A_2 and B_1 horizons, and the presence of immature ironstone gravels in the mottles indicates degree of lateritisation. Hardened, rounded gravels, and certain structure features in this zone indicate that the soil is forming on material dumped there as erosion products from higher up slope. Parent rock, too, is a valuable guide to the nutrient potential of the site, and so on.

All these points should be integrated by the field officer. Most people readily gain an impression of a "good" soil or a "poor" soil, without being conscious of the factors which contribute to the final judgement.

A more scientific approach is to consider the site under the four headings:

Nutrient, Moisture, Anchorage, Protection.

Field characteristics which point to sites' status in these basic requirements are then considered.

Points can then be given to each characteristic according to its significance for P.radiata. Assign each requirement a maximum number of points so that the total maximum is 100. Table No. 1 sets out these headings.

Table No. 1.

Basic Requirement & Maximum Points.	Indicative Characteristics	Maximum Points.
Apparent Nutrient Status (30)	(a). A_1 horizon thickness, colour, texture.	(6)
	(b). Parent Rock type	(6)
	(c). Ageing effects (podsolisation) (lateritisation)	(6)
	(d). Colour sequence down profile	(6)
	(e). Native vegetation(Health)	(6)
Moisture Availability (40)	(a). Effective storage capacity (texture) (+ consistence) (+ structure) (+ pore space)	(10)
	(b). Moisture from sources (seepage) or other than precipitation (impounded)	(10)
	(c). Native vegetation (lushness) of growth)	(10)
	(d). Effective depth (penetrability of subsoil).	(10)
Anchorage (20)	(a). Effective root (penetrability of growing space (subsoil).	(10)
	(b). Drainage (colour patterns). (subsoil structure)	(10)
Protection (10)	* Exposure (slope) (aspect) (shape of surface)	(10)

* Meteorological conditions and insolation only necessary when there is variation within a region.

Tally the scores and treat as a test in school with grades as in Table No. 2.

Table No. 2.

Point Score Range for Each Grading.

Excellent	A	=	86 - 100.
Good	B	=	71 - 85.
Satisfactory	C	=	56 - 70.
Marginal	D	=	41 - 55.
Submarginal	E	=	26 - 40.
Unsuitable	F	=	below 26.

Anticipated yields are shown on Table No. 3.

Anticipated Yields Within Each Grade.

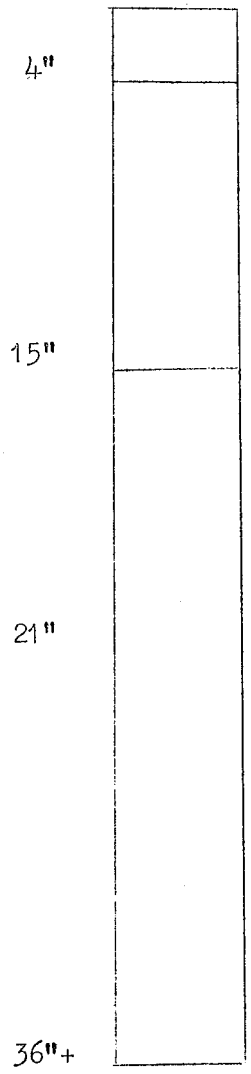
Table No. 3.

Grade.	Est. S.Q. (S.A. System).	Yield M.A.I. Age 30.	Height Growth* M.A.I. Age 30.
A	I - II	520c'/ac/yr.	4.5ft/yr.
B	III	430 "	4.0 "
C	IV - V+	350 "	3.3 "
D	Low V. & poorer.	Unpredictable.	Unpredictable.

* Growth rate varies with age.

Let us examine a typical pine soil in the Blackwood Valley, using the normal field description procedures.

Profile



Strong brown sandy loam.

Red brown sandy clay loam friable.

Dark red clay, cloddy, becoming massive.

Dark yellow clay, tough, intractible weakly structured.

Topography :- upper slope near crest of ridge. western aspect. Slope; one in three.

Vegetation :- jarrah - marri regrowth (healthy.) bracken.

Probable fertility :- high.

Moisture relations :- poor, due to shallowness to dense clay.

Genesis :- parent rock is basic gneiss.

Classification :- Suitability - fair, C grade.
Soil type - basic.

Location :- F x 56: 4.9.

This standard description* covers all the information we need to allocate points.

Apparent nutrient Status	(a).	6 (rich appearance).
	(b).	6 (basic).
	(c).	6 (No ageing in evidence).
	(d).	6 (Strong colours).
	(e).	5 (healthy vegetation).

S/Total 29/30.

Moisture Availability	(a).	8 (good consistency to 20"+).
	(b).	0 (no other reserves apparent).
	(c).	7 (healthy).
	(d).	5 (only 20" free penetration).

S/Total 23/40.

Anchorage.	(a).	5 (restricted growing space).
	(b).	6 (transverse drainage due to slope not much in subsoil).

S/Total 11/20.

Protection.	(a).	3/10 (exposed site).

66/100.

This tally confirms the field estimate of "C" grade. With high fertility, pines will probably grow fast initially until stiff competition for moisture slows the stand down. Growth rate over 30 years should be equivalent to top S.Q. IV.

Many of the ideas in the above have been expressed previously by the following authors (and others)-

Coile, T.S. 1952 "Soils and the Growth of Forests." Advances in Agronomy. Vol. IV.

Hamilton, C.D. 1962 "Soils and Forest Site Classification" 3rd Aust. Conference of Soil Science. P No. 24.

* Slightly modified for simplicity in presentation. Abbreviations minimised.