

Rapid early vine growth depends on soil penetrability

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Fig 1. Vine growth with three different rootzone depths.



Fig 1. Vine growth after a season. The 2MPa depth at planting was: a) 900mm, Goolwa SA; b) 650mm, Yarra Valley Vic; c) 400mm, Yarra Valley Vic. s only while roots are growing actively, and faster root growth means faster vine growth.

The fundamental fact of grapevine establishment is that vine growth is controlled by root growth. Vine growth continues only while roots are growing actively, and faster root growth means faster vine growth.

The grower must therefore ensure that roots can grow rapidly for the whole of the first growing season. Most growers are familiar with basic issues of soil pH and nutrient availability, but they are not aware of how the mechanical properties of the soil affect growth.

It is now an established fact that vine roots do not grow into soil that has a stiffness greater than 2 Mega Pascals (MPa) at field capacity (2MPa is about 300psi). This figure may be as low a 1MPa in heavier textured soils such as clay loams and clays. Rapid growth requires much lower penetration resistance; about 0.5MPa is good but the lower the better.

Newly planted vines continue growing until the roots reach a layer of stiff soil. The deeper that is, the longer growth continues, and the greater the growth achieved at the end of the season. This is illustrated in Fig 1. A 2MPa level deeper than 900mm allows vine growth late into the season and the result is a vine that can be machine harvested in its second year. By contrast, when the 2MPa level is shallow, vines stop growing sooner, and growth and returns are correspondingly less.

Rapid early establishment clearly requires deep, friable, soil that permits rapid root growth. Deep ripping is the first step, but successful ripping is not simple, and monitoring is the only way to be sure the job is done properly. Later operations, like ploughing and driving posts can recompact soil. Again, monitoring is the only way to ensure the soil stays in good condition until the vines are planted.

Fig 2. Measuring soil penetration resistance





Fig 2. Testing soil penetration resistance. a) during deep ripping to ensure a good result b) after a season to check for tractor compaction.

A simple, effective monitoring technique is to measure the depth to 2MPa in intervals of 0.2m across the vine row. (In heavy soils, 1.5MPa or even 1MPa may be a more appropriate limit to root growth.) The results can then be graphed to show the limits to root growth (Fig 3). Inside the limit, penetration resistance should be as low as possible – eg about 0.5MPa.

From these graphs it is easy to work out the cross sectional area of penetrable soil in the furrow. The volume available to each vine is easily calculated by multiplying that area by the spacing of vines in the row. Each vine should have access to about a cubic meter of soil. Less than half a cubic meter is cause for concern, and will impair early vine growth.

Growers who want to achieve rapid early growth must provide each vine with a cubic meter of easily penetrable soil. Following a recipe is not enough to be sure that preparation has been effective. Monitoring is the only way to be certain that the soil is in good condition when vines are planted.

Fig 3: Soil penetrability across the vine row.

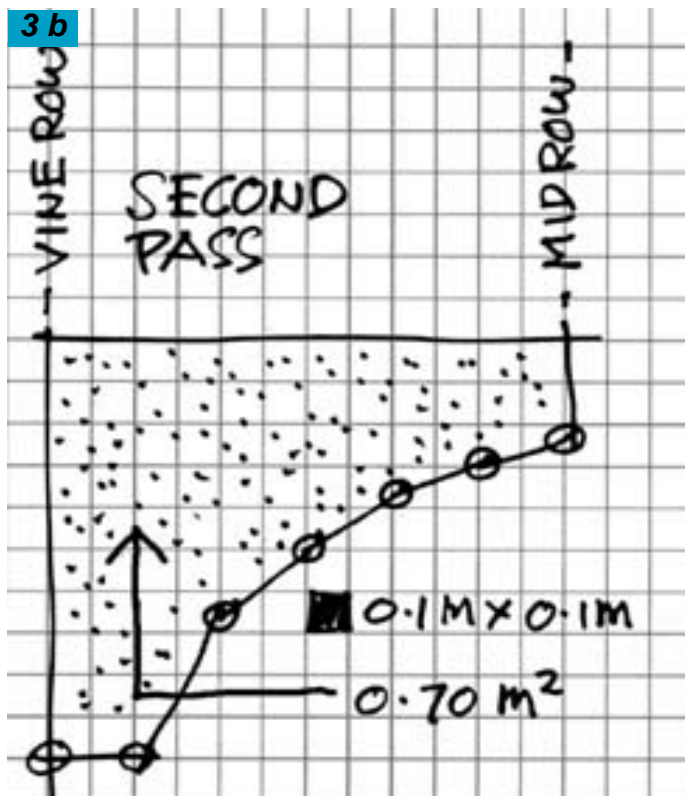
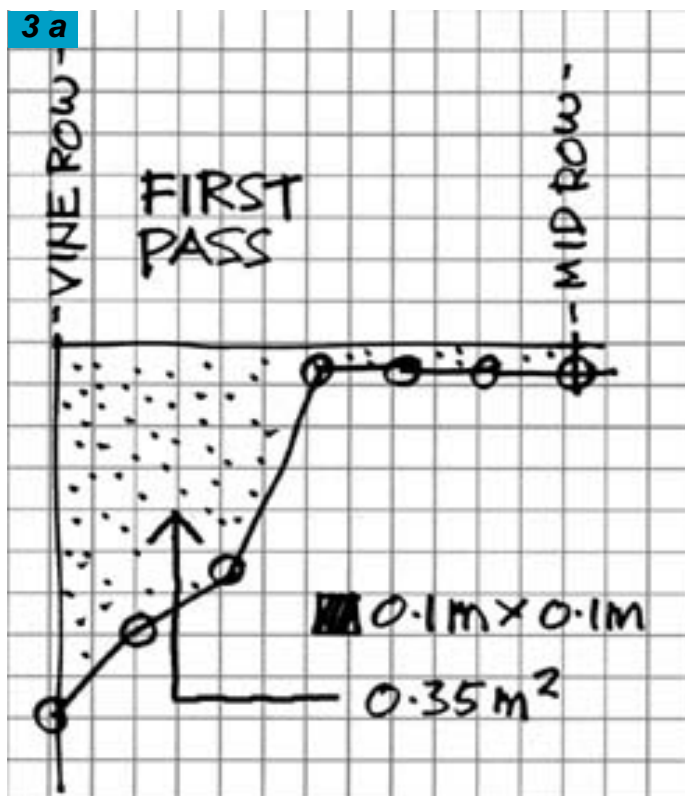


Fig 3. Penetration "profile" across a vine row. a) after one pass at 900mm, b) after a second pass at 1200mm. The cross sectional area in square meters is 0.01 x the number of squares.