Why is an understanding of tree nursery production systems important if successful transplanting and final independence in the landscape is to be achieved ?

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Have been many topics covered today

A lack of understanding of nursery production systems is just one of the many elements which contribute to tree planting failure.

There is a PERFORMANCE GAP.

Existing research and knowledge is NOT applied consistently and well.

Why should it be assumed that new research and knowledge will improve the situation.?

But now a brief summary of below ground nursery interventions which can impact on planting success if not understood.

It is estimated that 1 in a billion of the tree seeds produced annually makes it to maturity.

Unfortunately such a success rate would not be acceptable to the nursery industry

The production of trees at the nursery begins from either seeds
or cuttings.
Each involves modifications which potentially impact on final longevity in the landscape.

What follows is a brief examination of some of those modifications and how they might impact on transplanting success.

This presentation will attempt to explain how such knowledge can impact on transplanting success and inform post planting management and maintenance.

It will also hopefully enable to differentiate between good and bad nursery practice.

Production influences tree development both above and below ground with modifications necessary to facilitate quality, uniformity and yield.

First below ground, the bit we rarely see yet probably the most important

The roots

Nursery Mark.
The depth
of the plant at the
nursery.

Naturally tap roots grow until they reach an inhospitable soil zone.

Surface lateral roots develop at this point

Note the position of lateral roots and their depth in relation to the nursery mark

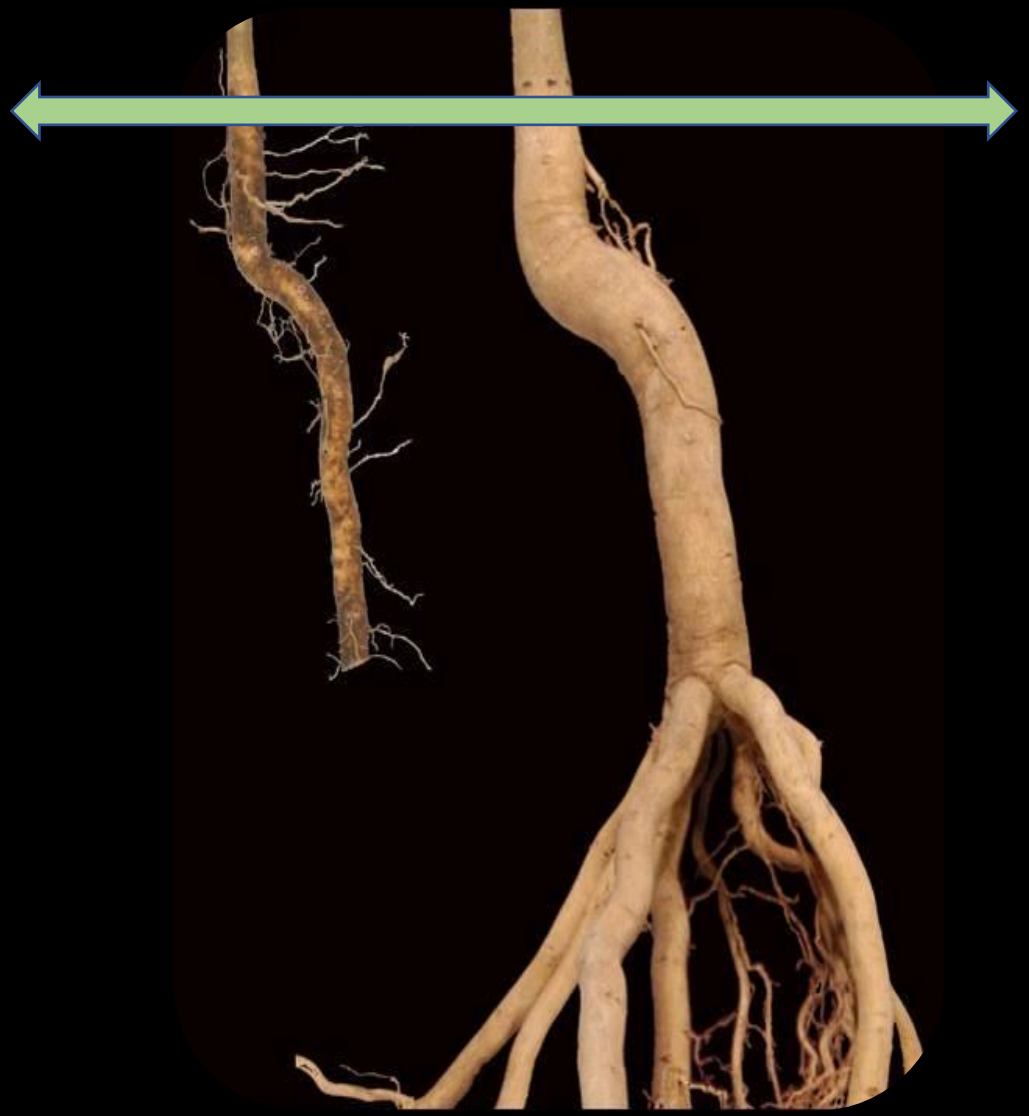
Seed Production

On the nursery seedlings are germinated and grown on in seed beds.

On lifting from these seed beds the tap root is cut.

It is important to realise that seedlings may be raised in cells or other containers. This will be covered later in the presentation.

Point at which tap root is cut



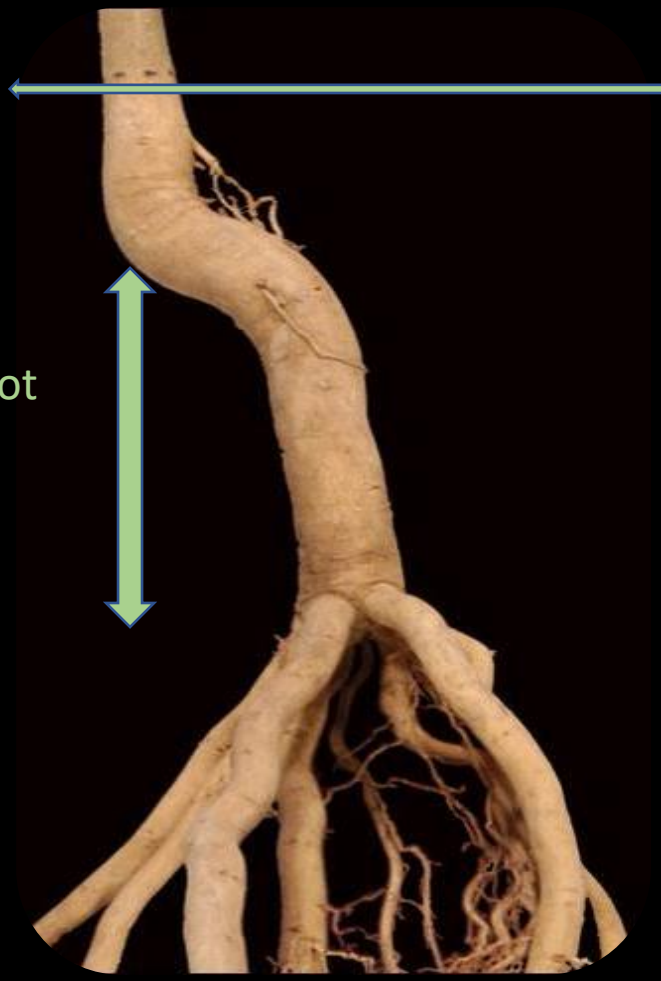
At the cut point there is often a proliferation of root development

Soil depth in cutting bed or container

Cuttings

New root initials at the base of the cutting

For rooting the cutting is inserted in compost either in a bed or form of container



Known as root shank

Soil Depth

Seedling

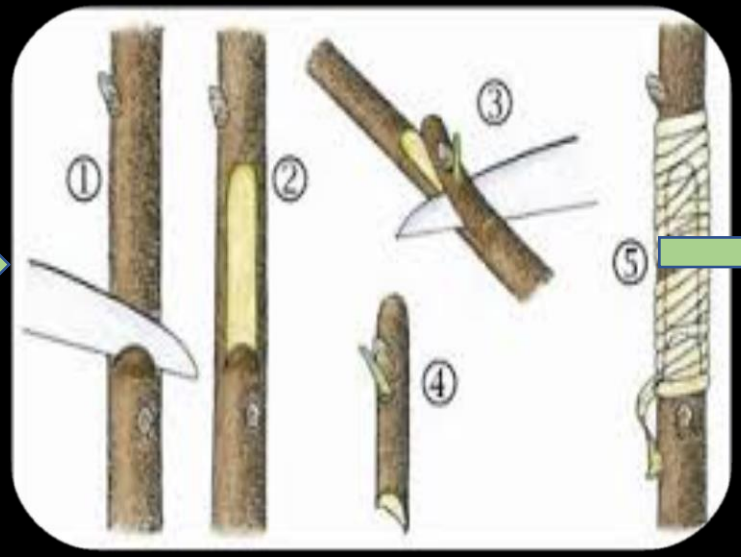
Cutting

* Note the depth of the adventitious root system, the most vigorous root development

Note: Distance between planting depth and adventitious roots

The depth of adventitious root flare can have implications for future transplanting success and can be seen as root systems develop.
This is of particular importance when considering long term failure associated with trees being planted too deep.

Both seedlings and cuttings can be used as understock for budding



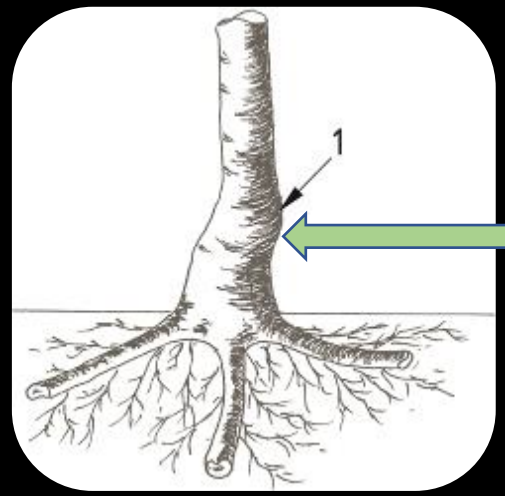
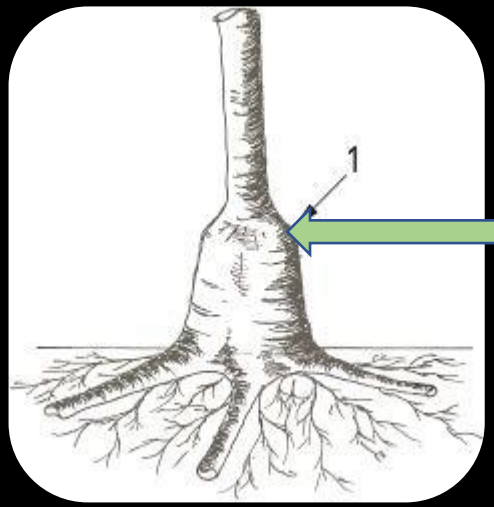


Illustration of bud union with slight bending apparent



Any disparity between growth rates at the bud union can be an indication of incompatibilty between stock and scion wood.
This and abnormal amounts of growth from the understock can be indicative of future failure.

Root development on the nursery prior to planting

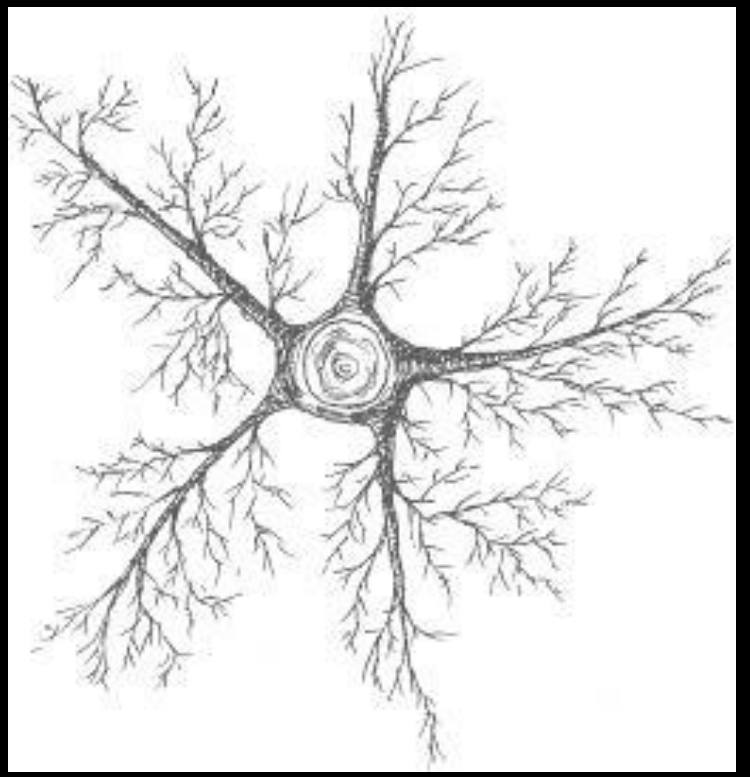
Three principle systems used in the UK.

Bare root Rootball Containerised

None is right or wrong: All have advantages and disadvantages but each has associated nursery best practice and slightly different planting , management and maintenance requirements to ensure success.

Bare root

Distorted ‘hockey stick’ root formation caused during production



Idealised,well balanced bare root system with evenly spaced lateral roots distributed radially from the central stem

But the ideal is rarely realised in practice as will be seen from the following examples.

Root systems will vary from species to species and from differing nursery conditions.

It can be noted that each of the examples, to a greater or lesser extent, displays the development of a root shank and an adventitious deep root system.

Acer campestre Louisa Red Shine

Acer freemanii Autumn Blaze

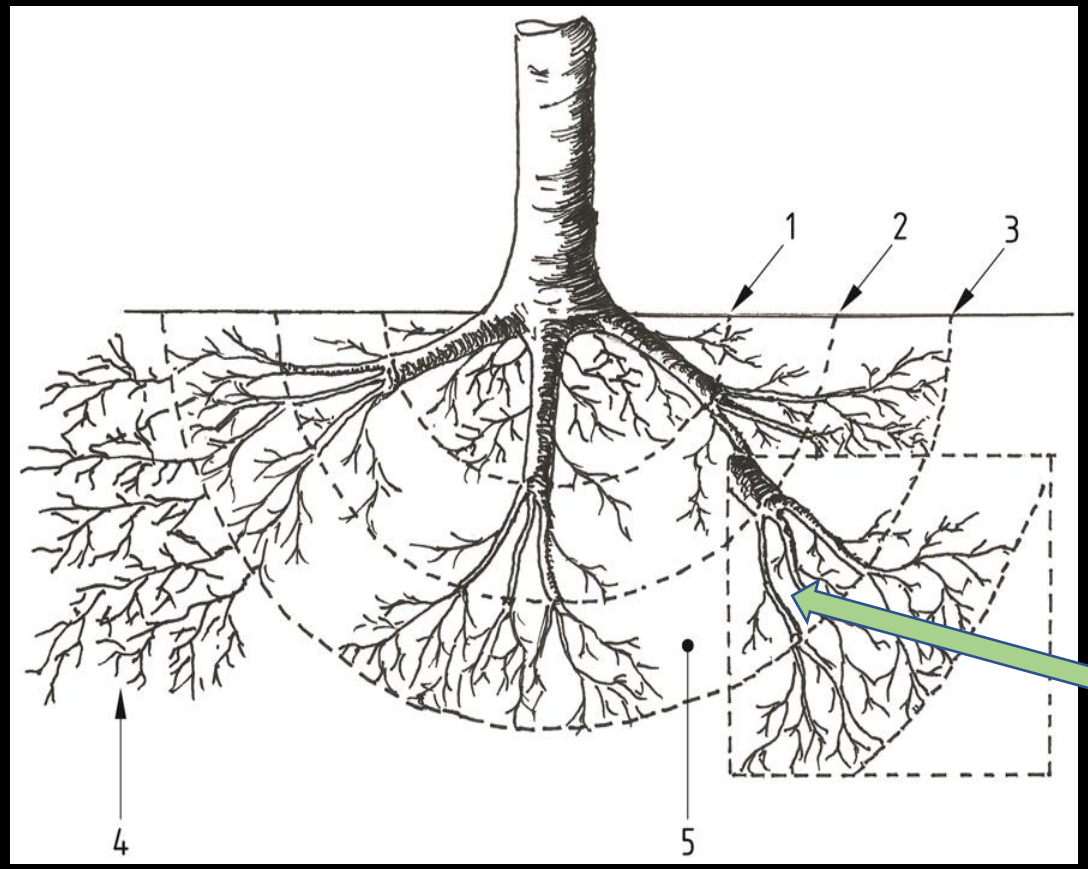
Ailanthus altissima

Crateagus monogyna stricta

Platanus hispanica

Sorbus aria Lutescens

Rootballs

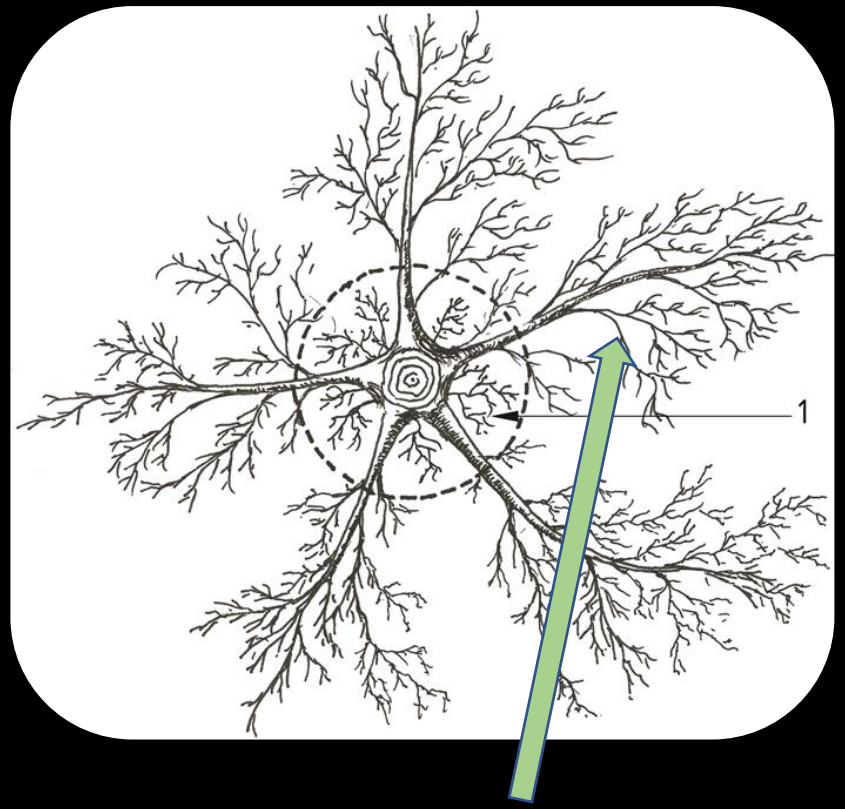


The principle of undercutting

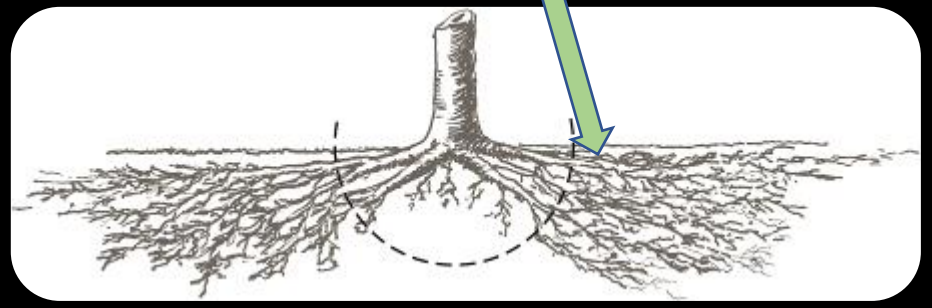
1. First Cut
2. Second Cut
3. Lifting Cut

Proliferation of root from cut root end

Note: a correctly prepared rootball should not be confused a bare root tree wrapped in soil and hessian for protection during dispatch. A correctly prepared root ball will exhibit the growth illustrated above. A protected bare root tree will be just that, a bare root tree. It is a perfectly justifiable method but should be identified as such and not passed off as a true rootball. Again, it is question of understanding nursery practice.



Amount of root system left below ground if undercutting is not practiced



Impact of not undercutting diagramatically represented and the reality extracted from a rootball

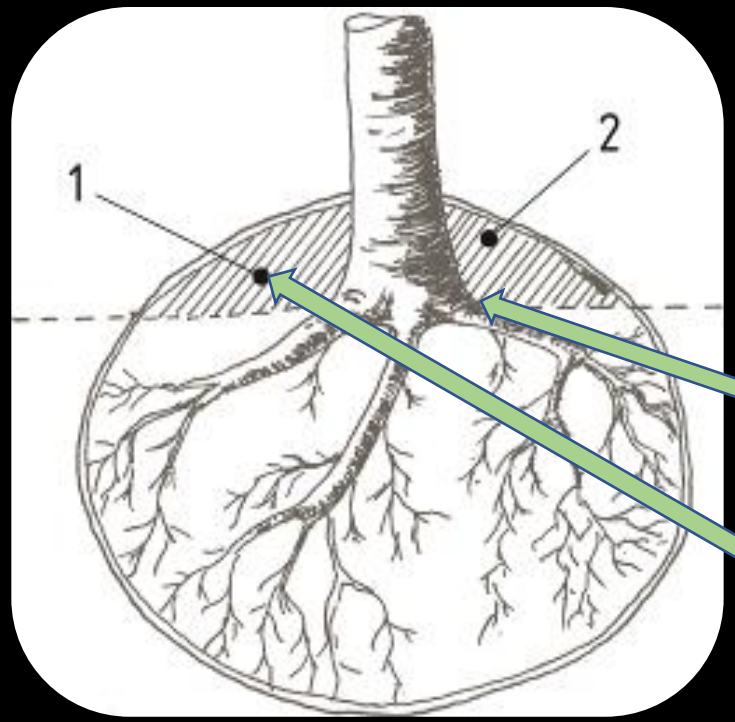
Large wounds and lack of structure. A rootball which has not been undercut but just lifted and wrapped at the nursery

Research has demonstrated that as much a 95% of a young trees root system can be left in the ground if undercutting is not practiced correctly

Roots left in the nursery field

Girth size at 1metre in cms	Minimum diameter of rootball cm	Number of times transplanted
8-10	30	-
10-12	30	-
12-14	40	3
14-16	45	3
16-18	50	3
18-20	55	3
20-25	60	4
25-30	70	4
30- 35	80	4
35-40	90	5
40-45	100	5
45-50	120	5
55-60	130	6

Recommended number of times a young tree should be transplanted In relation to stem diameter plus minimum size of rootball

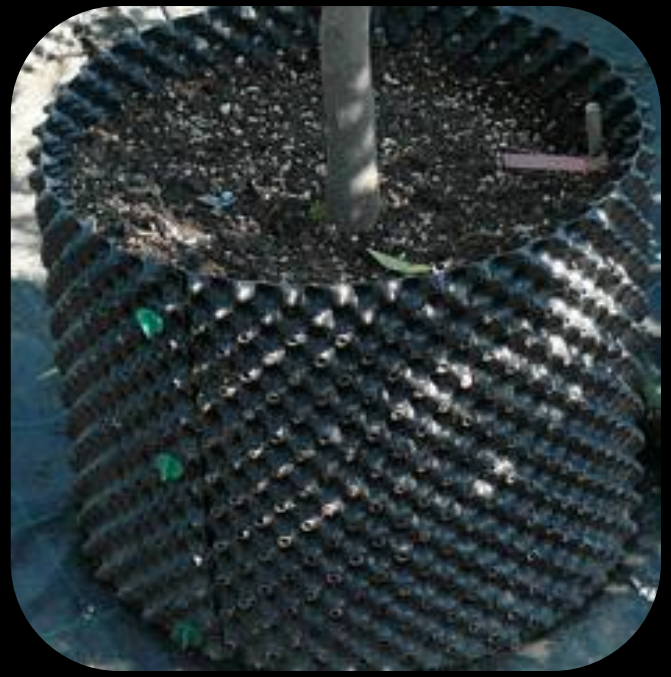


Soil Mounding during production is often lifted as part of the rootball. This results in the rootflare being buried within the rootball

rootflare

Soil mounding

Containerisation.



Airpot

White bag

Two principle systems found in the UK and across Europe although there are many alternatives

There is much mythology about the merits of different container types.
All the claims are true as far as they go BUT.
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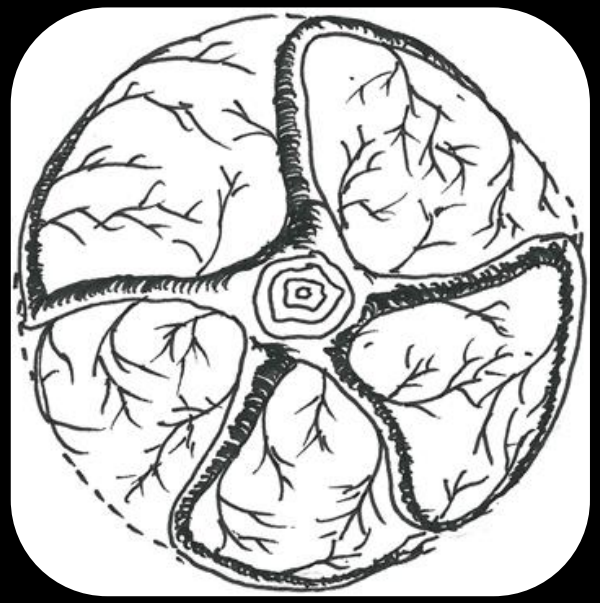
Any tree left in a container for too long will produce circling and eventually girdling roots



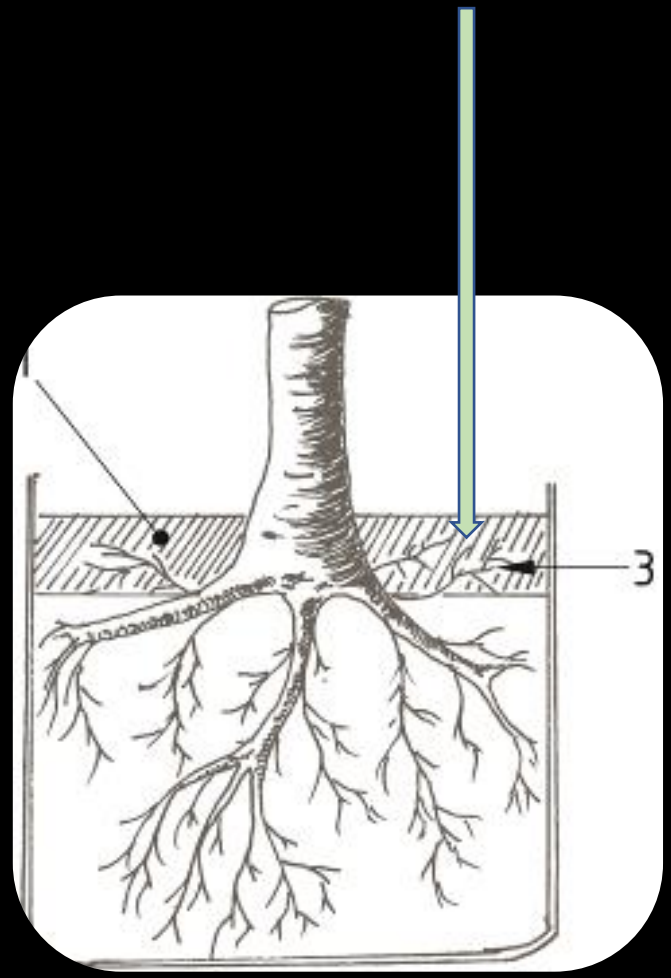
Root circling is progressive.
Beginning with root circling as the
laterally expanding root hits
the side wall of the container.
These roots thicken and the circling
Is reinforced

Root circling can begin at a very young age.
The photograph opposite shows circled roots from a nursery liner.
The circled roots were only visible once subsequent lateral root development had been stripped away

Progressive stages of root girdling
in containers

More examples

As with rootballs compost above rootflare can encourage fibrous root development above the root flare.



Containerised root system

Note shaving of roots at the side of the container ball

There are constant calls for more research, greater knowledge, new species and a plethora of cries for more innovation but…….

We are seemingly incapable of applying what we already know.

There is a PERFORMANCE GAP

It really doesn’t matter what species is planted, where , at what density if young trees once planted fail.

This surely is the challenge

Thank You for listening

Any Questions ?