



Land preparation is always necessary in order to achieve successful plantation establishment. Land preparation is an important part of establishment with the aim of achieving high survival and rapid early growth of the planted trees. Land preparation achieves this largely by removing (or controlling) the competing vegetation and through cultivation of the soil to aid root development of the newly planted seedlings. It is often the most costly silvicultural operation though choosing the most appropriate techniques and good timing can significantly reduce its cost.

Land preparation encompasses several separate activities, namely - clearing (often combined with burning), lining out and pitting. NB. Pre-plant spraying is also considered a land preparation activity but is dealt with in a separate SPGS Guideline (No. 15).

helps us with all subsequent weeding operations.

Initial Clearing

Often a combination of manual slashing, which targets all the smaller shrubs and trees, and a power saw is employed – the saw being used to fell the bigger trees. This allows the cheaper method of slashing to be the primary source of work done while the more expensive power saw comes in later and only does what it is designed to do. Also by opening up the area first manually, the chainsaw operator can work more safely. NB. Always ensure that the chainsaw operator is properly trained and has the appropriate safety equipment.

Some of the larger commercial planters are using bulldozers to assist with the clearing. Although this can be very cost-effective, like most other forms of mechanization it can be very costly if allowed to work unproductively. To avoid this it is important to agree the area to be cleared in a specific time period. Generally it is advisable to pay per area cleared and not for the time used. When using a bulldozer it is also important that it works along the contours in areas where there is a slope - this is to avoid all the trash being pushed into streams or natural forest areas as well as to help in protecting against erosion.



Well cleared land ready for lining out, pitting and pre-plant spraying.

Initial clearing is the removal of the vegetation that occurs on the site to be planted. It is important to note that the SPGS does not support the clearance of natural high forest for plantations. The land for plantations should be either grassland or heavily degraded natural forest land only.

Land clearance can be done in a number of ways depending on the nature of the vegetation e.g.:

- Manual slashing.
- Burning.
- Spraying with herbicide.
- Mechanical means such as mulchers or bulldozers.

Often combinations of two or more are used. Whatever method is used, it is important that the area is cleared properly since the initial clearing prepares the land for all subsequent operations. When done properly it has a positive effect of reducing the cost of following operations. Two major factors are:

1. That the area has been cleared and access is uninhibited. All the vegetation must be cut down to ground level and burnt or otherwise removed. By cutting the vegetation down at ground level it means that there are no high stumps to get caught up in and if the stumps coppice, the regrowth comes from close to the ground which is easier to control.

2. That all or most of the vegetation is killed. If we can get rid of the weeds before planting, we can be sure that the trees we plant have the space, nutrients and water they need to establish themselves quickly. It is also easier to use herbicides before planting. Good initial clearing



BURNING

Once all the trash has been stacked it is normally burnt. The burn will be more successful if the cut vegetation has dried out for a period following cutting. The trash will also burn better if it has been piled together rather than scattered throughout the area. Care must be taken only to burn when conditions are favourable (i.e. Fire Danger Index must not be high – refer to SPGS Guideline No. 18 - *Fire Protection*). Do not burn on windy days and ensure there are sufficient people (with suitable fire fighting equipment) on standby during the burn.

CHARCOAL

In certain circumstances - especially where there is some woody vegetation being cleared – there may be opportunities to reduce the land clearance costs by allowing people to come in and clear the area to make charcoal: this requires planning well in advance, however, so that the area is cleared in good time for subsequent operations.

THE IMPORTANCE OF GOOD TIMING

As with all silvicultural operations, the timing of land preparation is crucial for its success. Manual clearing – the most common method used currently in Uganda – can be very labour intensive, which means it can take a long time to clear a large area. Whatever method of land clearance is employed, it is important to allow enough time ahead of planting to allow the vegetation to be cut, piled, dried and burnt. Where pre-plant spraying with Glyphosate is planned (and this is recommended for all those planting on a large scale), time must also be allowed for a flush of weeds to grow so that they can be sprayed with the herbicide just before planting.

ESPACEMENT

Espacement is the uniform distance at which you make your planting pits and how far you plant your trees apart. Refer to the table below to see what your stems per hectare (sph) will be at some common spacings. The espacement is determined during the lining out operation.

Spacing (m)	2.0 x 3.0	2.7 x 2.7	3.0 x 2.5	3.0 x 3.0
Stems per hectare (sph)	1667	1372	1333	1111

LINING OUT

The purpose of lining out is to ensure that the trees planted have sufficient space to grow but to provide enough competition to ensure a straight bole and reduced branches. The spacing is critical so as not to suppress the tree's growth. Also by planting your trees in straight lines subsequent operations are made easier, for instance,

line weeding, thinning and harvesting. It also allows managers to more easily estimate the volume expected from the crop.

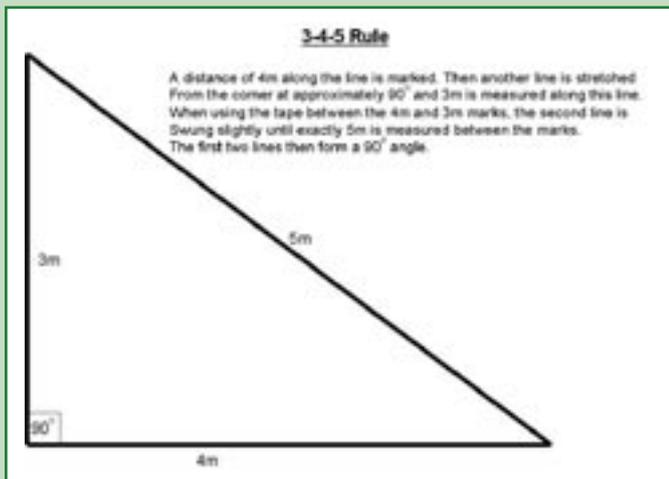
The actual distance between trees may change according to circumstances. The distance may not always be square (e.g. 3 x 3m) but may be elongated (3 x 2m): this can be very useful where mechanical weed control methods may be used subsequently (to allow enough room for a tractor to run between rows). Rectangular spacings do not effect the trees' form or growth: what is important is the total number of stems per hectare.

When lining out for the first time or where the spacing is being changed from the original crop), it is important that it is accurate as the original stumps can be used as guides for the next time the area is planted.



Lining-Out Method:

1. Firstly we lay out a line (cable or rope) marked at intervals with our desired tree spacing: preferably this should be along the edge of the area to be planted. This is called the baseline.
2. Then mark off two cross-lines at each end of the baseline at 90°. The 90° can be worked out by using a compass or the 3,4,5 rule (see text box on the next page). The cross-lines need also to be marked with the correct planting espacement.
3. Now move the baseline up between the two cross-lines, stopping at each mark and marking the pits on the ground at the marks along the line. Marking can be done by chipping a small hole in the soil with a hoe or putting a stick into the ground.
4. When you get to the end of the cross-lines, start over again in the area adjacent to the one you just marked.
5. The method on steep slopes is quite similar but the cross-lines need to be held level and not along the ground. The planting sites are then marked by dropping a line from the rope to the ground. If this isn't done, the espacement and stocking per ha will be reduced.



PITTING

Pits are the holes into which you are going to plant your seedling. The basic method is to use a hoe (or a pick mattock on harder ground) as follows:

1. Firstly clear any vegetation or debris from an area of 1 metre in diameter around the planting hole.
2. Then dig the pit itself in the centre of the cleared area. The normal pitting standard is 25cm deep and 25cm diameter: NB. 1 foot (=30cm) can also be used as the standard if more easily understood. Loosen the soil and work around the pit digging from different sides to ensure that the pit does not go down at an angle. The soil must be loosened and large clods of soil broken down. Rocks should also be removed.
3. The soil should be all replaced into the pit forming a slight mound.
4. Do not prepare the pits too far in advance of planting as they can become compacted in time and they can also be difficult to find after heavy rain on the site.

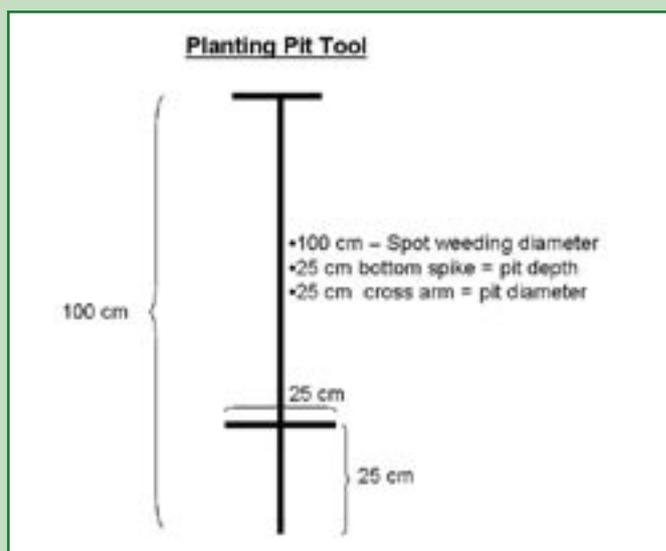


Why is a good pit important?

Pitting is carried out in an effort to improve the physical environment into which a young tree is planted. Some benefits are:

- decrease in the soil bulk density, and physical strength;
- improved water infiltration rates;
- promotion of higher oxygen diffusion rates;
- increased rates of organic matter decomposition in the topsoil;
- removal of weed competition around the seedling.

Please remember that the depth of the pit is critical: if it is shallow, correct planting cannot be carried out and your plantation is doomed even before a tree is planted. Pit depth can be checked with a simple tool made out of a metal rod (see illustration). By poking the tool into the ground it is easy to see if it penetrates to the required depth: if the pit isn't deep enough it needs to be re-done.



Each component of land preparation described in this guideline must be carried out in sequence, which also means that the quality of one operation will depend on how well the previous one was carried out. For example, poor land clearance makes it impossible to line out correctly; poor lining out leads to poor pitting and incorrect espacement. The key message is to plan carefully and allow sufficient time for each land preparation operation to be carried out prior to planting into the early rains (NB. planting is dealt with in SPGS Guideline No. 25 - *Planting & Beating Up*).