

RIPPLE Africa Step by Step Tree planting Guide



RIPPLE Africa - Tree planting Calendar

Planting site identification																				
	Earlier	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Training from forest guard / Ripple Africa Coordinator																				
Planting site identification and measuring to determine quantities etc																				
Reports to Ripple Africa office of what is required																				
Nursery																				
Training from forest guard / Ripple Africa Coordinator	Earlier	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Make Compost																				
Establish the Nursery - clearing and construct fence and shade																				
Delivery of tubes and equipment by Ripple Africa																				
Tube Filling																				
Plant slow growing seeds - Mbawa, Msambatumu, etc																				
Plant fast growing seeds - Cassia etc																				
Plant Papaya seeds																				
Plant slow growing seeds in seed beds Jul - Sendrella,Guava, Mng'ona - in tubes in sept																				
Plant fast growing seeds in seed beds Aug - Blue Gum - in tubes in oct																				
Management of seedlings water - daily, weed, till, root prune - 2 weekly																				
Remove the shade and harden off the seedlings																				
Planting site preparation and planting																				
Training from forest guard / Ripple Africa Coordinator	Earlier	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Slash grass in planting sites																				
Marking, pegging and pitting																				
Plant tree seedlings																				
Management of planted sites first year																				
Training from forest guard / Ripple Africa Coordinator	Earlier	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Weeding and tilling																				
Replace any failed trees																				
Create large 1m x 1m basins around the trees and mulch																				
First slashing of the grass in planted sites																				
Second slashing of the grass in planted sites																				
Slash 4 metre wide fire breaks around planted sites																				
Management of trees for the second and third years																				
Training from forest guard / Ripple Africa Coordinator	Earlier	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Replace any failed trees																				
First slashing,weeding and tilling																				
Mulch the tree basin																				
Second slashing and slash fire breaks																				
Counting the trees																				





TREE NURSERY ESTABLISHMENT AND MANAGEMENT: STEP-BY-STEP GUIDE

Usually, a tree club applies to RIPPLE Africa for assistance to establish a tree nursery.

The first stage is for the club to decide on locations for planting trees, types of trees to be planted and for what purpose. All clubs will require a large number of fast-growing trees for firewood and poles for building. The areas need to be measured to establish quantities of trees to be grown. The nursery is then established, and it is essential that all stages are carried out on time to a high standard. When the tree seedlings are growing, the next stage is preparation of the sites to be planted. This involves slashing, marking and pitting, and this work must be done in good time. Finally, the tree seedlings are planted out – this must be done by the end of January **at the latest** to give the tree seedlings a good start. This is really just the start of the project. The planted out tree seedlings must be looked after like young children for the first three years. This will involve slashing grass, weeding, tilling and mulching around the newly planted trees, ensuring the soil around each tree is formed into a basin to catch water, and creating fire breaks around the planted site by the end of July. The clubs and coordinators must count all of the trees on an annual basis to provide accurate records for RIPPLE Africa.

Stage 1: Introduction and Evaluation

Introductory Meeting

The RIPPLE Africa coordinator will meet with all tree club members to discuss the following points:

- Establish the club's need for trees: Why does the community want to plant trees? Is it for firewood, poles for building and selling, fruit, timber, or for soil improvement and conservation?
- Find out what areas are available for planting, and assess the viability.
- From the above information, the type and quantity of trees to be grown can be established.

Evaluating the Tree Club's Requirements

- All to be planted sites will be surveyed and measured. This will be done by pacing out in metre strides the average length and width of the site and multiplying these measurements together to establish the area in square metres.
- Normally, trees will be planted at 2 metre by 2 metre intervals. This will mean that there will be one tree in each area measuring 2 metres by 2 metres. To establish the quantity of trees required in a measured area, the total area in square metres is divided by 4, and the result is the total number of trees needed for that site.
- Understanding areas is always difficult for people, but an area that everybody knows is the size of a football pitch. This is typically 100 metres by 50 metres which equals 5,000 square metres. If this area is divided by 4 (i.e. a tree spacing of 2 metres by 2 metres), the quantity of trees to be planted in the area of a football pitch is 1,250. If blue gum poles are being planted for small poles, the trees can be planted at 1 metre by 1 metre spacing, thus producing 5,000 blue gums.
- This method of estimating is done for all sites selected by the club. In addition to these larger areas, individual requirements for club members and the community, together with trees for sale, will also be estimated.
- For each site, the purpose of planting is established, i.e. for firewood, poles, conservation, soil improvement, or fruit trees.
- Normally, clubs and communities will want a large number of fast-growing trees for firewood and poles.

Education

Firewood

When communities first moved into an area, there were always many trees for firewood, poles and timber. Firewood was always close at hand. When trees are available in large quantities, people are careless with how much is used and wasted. When wood becomes scarce, people have to travel greater distances to collect firewood. This also means that, in areas close to towns particularly, people are now having to buy firewood at high prices.



- How much wood does one cooking fire for a family of five people use in one week? The answer is at least three large bundles which can be equal to up to three trees per week per family of five people, and this is approximately 150 trees per family per year. Normally, one Village Headman or Group Village Headman has about 100 families of five people within their area which equals 100 families × 150 trees = 15,000 trees per Village Headman or Group Village Headman per year.
- The solution is to plant fast-growing trees in woodlots for firewood and to minimise the amount of wood consumed for cooking by using fuel-efficient wood-burning stoves (mbaula).
- If an mbaula is used instead of a three-stone fire, this will reduce the amount of firewood consumed to one bundle of wood from three bundles of wood per week. Therefore, one bundle of wood equals one tree per week per family which is approximately 50 trees per year. This would mean that the number of trees needed for one Village Headman or Group Village Headman's area would be 100 families × 50 trees = 5,000 trees.
- The above figures provide a rough estimate for the quantity of trees needed for a typical Village Headman or Group Village Headman's area just for firewood.

Poles

The best trees for poles are blue gum (eucalyptus) which are fast-growing and produce excellent poles. They can be coppiced regularly. These trees are a good cash crop – each pole can sell for K100 and, the following year, the tree will normally produce four poles which equals K400 per tree. The main disadvantage of these trees are that they consume a lot of water and use up the nutrients in the soil very quickly, but there is definitely a need to grow some of these trees in restricted area.

Timber

In many areas, all the trees that produce good timber, for example mng'ona and mbawa, have already been cut down and used. These trees definitely need to be planted, but they are slow-growing and will not give immediate benefit to the community. They should be planted for their grandchildren.

Soil Improvement

A number of trees can be planted in the gardens to improve the soil, for example msangu and the cassias which are nitrogen-fixing.

Conservation

There are many areas where planting trees for conservation is vital, for example on steep hills where soil erosion is a major problem. These areas need to be planted with mixed species of trees and not cut down.

The Value of the Planted Trees

All of the new trees planted will have a value to the community, whether it is financial, soil improvement for agriculture, conservation to reduce soil erosion, or fruit trees for business and nutrition.

- Fast-growing trees for firewood have both a financial and convenience benefit for the community. If woodlots are evenly located within a community, firewood is always available and close at hand. In certain areas, firewood can be sold and the money can be reinvested in future programmes.
- Good firewood trees include cassias. A cassia tree can be grown for firewood within three to five years. The tree can then be coppiced, with each tree producing one large bundle of firewood. In rural areas, a bundle of firewood is often free but, in urban areas, the value of one large bundle can average K1,000. This would mean that a firewood woodlot the size of a football pitch with 1,250 trees could produce, after three to five years, K1,250,000, and the same value every three years thereafter.
- Blue gum trees for poles can produce, after three years, poles which can be harvested for building and selling. In Year 3, an area the size of a football pitch can produce 5,000 poles at 1 metre by 1 metre spacing × K100 per pole = K500,000. In Year 4, each tree produces four poles, which is a total of 20,000 poles × K100 per pole = K2,000,000.

Stage 2: Tree Nursery Management

At this stage, the club and the community have discussed their requirements, and the potential has been evaluated. The next stage is to establish the tree nursery.

Establishing the Tree Nursery

A suitable location for the tree nursery needs to be identified.

- **Water:** A permanent supply of water close to the nursery is essential.
- **Area:** The area required will depend on the number of seedlings to be planted.
- **Soil:** There should be good quality soil available nearby, either from a dambo or forested area. The ideal soil will be light and sandy, well drained, and free of weed seeds and stones. Avoid choosing heavy clay, waterlogged, or dimba soils.
- **Flat ground:** The nursery needs to be located on flat ground which will not be exposed to flooding and running water. Nurseries can be located on slopes if the areas are terraced.
- **Sun:** Avoid east-facing sites. Seedlings exposed to morning sun may suffer from heat shock which may lead to seedlings dying.

Equipment and Resources Required

- **Compost:** Compost needs to be made in April by the club so that it is ready for tube filling in June (compost can be ready for use in six weeks). Typically, compost should be made in pits – a pit of 2 metres long by 1 metre wide and 1 metre deep will produce enough compost for up to 8,000 small polythene tubes.
- **Compost making process:** The first layer in the bottom of the pit is 10cm (4 inches) of forest or dambo soil. The second layer is 10cm (4 inches) of leaves or grass which should be compacted by walking on top of it. The third layer is 10cm (4 inches) of manure. Except for the first layer, each layer should be watered with three watering cans of water before adding the next layer. These layers are then repeated in the same order until the pit is full. Normally, there will be three layers of each material in a 1 metre deep pit. The compost pit should be completed with a final 10cm (4 inches) layer of soil which is compacted by walking on it, and the finished compost heap should be the same level as the surrounding ground.
- **Minimum basic equipment required:** Two watering cans, two buckets, two metal basins, two hoes, two slashers, two phanga knives, one shovel and one rake.
- **Polythene tubes:** Polythene tubes are supplied in quantities equal to the estimated number of trees required. These tubes can be used for two years and must be carefully saved after planting out.
- **Seeds:** Seeds are supplied in plastic bags according to the calculated number of trees required.

Tree Nursery Site Preparation

- **Establish the size required:** Typically, an area of 10 metres by 10 metres will provide sufficient space for 5,000 tree seedlings and a suitable area for tube filling, seed beds, piles of compost manure, soil and sand, etc.
- **Clearing:** The area for the tree nursery needs to be cleared, the size of which will relate to the number of trees to be raised.
- **Fence:** A fence made from grass and poles should be constructed around the nursery site to the height of a person. There also needs to be an entrance with a door. The fence will keep out animals and people, and will shield the seedlings from the wind.
- **Shade:** Ideally, a structure of poles with thatching grass should be erected to provide shade for the delicate tree seedlings. This should be at a height so that people can comfortably walk underneath it. Some clubs establish their nurseries under the shade of trees. This can be done, but it is not as good as providing a structure with shade as this can be more easily controlled and can be removed four weeks before planting out to harden off the tree seedlings.

Record Keeping

It is essential that careful, accurate records are maintained at all stages. These will include dates of compost making, tube filling and quantities filled, and seed sowing of various species together with



quantities. A drawing of the nursery layout showing the groups of tubes, types of trees and dates planted, should be made. In addition to this, labels can be made from chibuku packets (as these are waterproof) using a ball point pen to show the tree species and quantities, and these should be placed by the respective groups of tubes.

Tube Filling Process

- **Tube filling materials:** Piles of compost from the compost pit, dambo or forest soil, and sand must be delivered to the nursery.
- **Mix:** Take two buckets of compost, two buckets of forest or dambo soil, one bucket of sand, and mix together thoroughly with one watering can of water. This is the mixture to be used for tube filling, and it will provide a good start for the new tree seedlings. Success of the project will depend on this mixture.
- **How to tube fill:** Open the polythene tube and place one open end on the ground. Fill soil to a depth of 2½ inches and firm down strongly with your fingers to create a soil plug in the bottom of the tube. Then gently fill the rest of the tube to the top with the compost mix. Take the tubes and arrange in their final position. All tubes should be arranged in groups of 200, i.e. 20 tubes by 10 tubes. If this is done, counting of the seedlings will always be easy. The groups of tubes should be arranged in lines with gaps of 2 feet between them for ease of watering and weeding.
- **Watering:** When the tubes have been filled and arranged in their final position, thoroughly water them.
- **When to fill the tubes:** Ideally, the tubes should be filled one month before seed sowing. This will give ample time for this process.
- **How long will it take?:** Different people will take different amounts of time. The whole process, from mixing the compost mix through to filling the tubes, arranging them in groups and watering them, will take between 2½ minutes to 5 minutes per tube. This means that one person will complete 24 tubes an hour at 2½ minutes per tube and 12 tubes an hour at 5 minutes per tube. Ten club members will complete about 400 to 800 tubes in a three-hour period.
- **Weeding:** Once the tubes have been watered, weeds will be stimulated to grow. These should be removed as early as possible as the weeds will consume the goodness from the compost mix in the tube.

Seed Sowing in Tubes

- **When to sow:** Tree seeds need to be planted at the correct time. If they are planted too early, they will overgrow and produce weak trees when planted out. If they are planted too late, the trees will be very small when planted out and are less likely to survive.
- **Direct sowing tree species which are slow-growing in the nursery:** The following tree species are slow-growing in the nursery and need to be sown into tubes in July: mbawa, msambafumu, and mtangatanga.
- **Direct sowing fast-growing tree species:** Tree seedlings that grow quickly in the nursery, for example cassia, need to be sown into tubes in August.
- **Watering and seed sowing:** Tubes which have been filled some time beforehand need to be thoroughly watered two days before sowing. Tubes which have only just been filled can be sown immediately and watered afterwards. Once the tubes have been sown, they should all be watered.
- **Quantity of seeds to sow per tube:** Not all seeds will succeed so, for different tree species, varying quantities of seeds are sown per tube (for example, three for cassia and one for msambafumu (see table below)). When the seeds have germinated, some tubes will have no seedlings growing and some will have one, two or three.
- **Labelling:** Labels should be made to identify the tree species in each group. These can be made from empty chibuku packets, as these are waterproof, and can be written on with a ball point pen. The labels should be placed with each group of tree species.

Tree Species	Seeds per Tube	Seed Sowing			
		July	August	September	October
Senna siamea (cassia)	3	–	Tube	–	–
Senna spectabilis (cassia)	3	–	Tube	–	–
Eucalyptus (blue gum)	–	–	Seed bed	–	Tube
Mtangatanga	3	Tube	–	–	–
Sendrella	–	Seed bed	–	Tube	–
Mbawa	5	Tube	–	–	–
Msambafumu	1	Tube	–	–	–
Msangu	2	–	Tube	–	–
Mng'ona	–	Seed bed	–	Tube	–
Papaya	3	–	–	–	Tube
Guava	–	Seed bed	–	Tube	–

Seed Sowing in Seed Beds

Certain seeds are very small and need to be sown in beds. These include sendrella, blue gum, and mng'ona. Mng'ona and sendrella are slow-growing in the nursery and need to be sown in the seed beds in July and transplanted into tubes once they have produced two leaves, normally after two months. Blue gum needs to be sown in the seed beds in August and will be transplanted into tubes once two leaves have grown, again normally after two months.

- **Size of the seed bed:** For mng'ona and blue gum, a seed bed of ½ metre by ½ metre is needed. A seed bed for sendrella will need to be 1 metre by 1 metre.
- **Preparation of ground for seed bed:** Till the soil to a depth of 2-3 inches. Break down the large pieces of soil until it is fine, remove all stones and unwanted material, and then level the area. Lay dry grass to a depth of 1 inch over the entire area, and then burn the grass. This will kill the fungi and diseases in the soil. Leave the burnt bed untouched for one week. After one week, mix the burnt soil with compost manure to a depth of 2 inches. Lay logs around the seed bed – these logs need to be 2 inches higher than the seed bed. Water the seed bed.
- **Amount of seeds required:** Mng'ona and blue gum each require three heaped bottle caps of seeds to be evenly distributed over the ½ metre by ½ metre seed bed area. Sendrella, which has a larger seed, requires 20 matchboxes of seeds to be evenly distributed over the 1 metre by 1 metre seed bed area.
- **Apply sand:** Apply a thin layer of sand – approximately one handful of sand for a seed bed of ½ metre by ½ metre, and four handfuls of sand for a seed bed of 1 metre by 1 metre.
- **Cover the seed bed:** Lay reeds across the poles, which are 2 inches above the seed bed, and then cover with a thin layer of grass so that some light can come through. The reason that the grass is only 2 inches above the seed bed is to minimise the damage caused when watering.
- **Water the seed bed:** Use a quarter of a watering can of water for a ½ metre by ½ metre seed bed, and one watering can of water for a 1 metre by 1 metre seed bed.
- **Ongoing watering:** Water the seed beds once every day with the same amount of water either early morning or late afternoon for two weeks.
- **Check the germination:** After two weeks, remove some of the grass to check for germination. (If the seeds have not germinated, you will probably need to re-sow.) Replace the grass and continue watering every day for another two weeks.
- **Raise the shade height:** Two weeks after germination, the shade can be raised to 1½ feet.
- **Weeding and watering:** As there is now access to the seedlings, remove any weeds from the seed bed carefully and continue watering once a day for four weeks from the sides but not through the grass shade. (Watering through the grass shade is likely to damage the young seedlings.)
- **Watering the tubes:** When the seedlings are ready for planting into tubes, make sure that the tubes are thoroughly watered two days beforehand.



- **Transplanting the seedlings into tubes:** After eight weeks from sowing, the seedlings should have produced two leaves which means that they are ready for transplanting into tubes. This process should take place either early in the morning or late in the afternoon. Take a shovel, dig to a depth of 2 inches and transfer the seedlings on the shovel to the prepared tubes. Plant each seedling into one tube and thoroughly water them immediately.

Tree Nursery Management

The young tree seedlings are like young children and need to be looked after carefully with regular watering and weeding.

- **Watering:** All the tree seedlings in tubes need to be watered twice a day – early morning and late afternoon until the seedlings are 4 weeks old. After 4 weeks, watering should be reduced to early mornings only. On average one full watering can is needed for every 200 tree seedlings. Use common sense when watering. If it is very hot and or windy it may be necessary to water twice per day.
- **Weeding:** Remove weeds from all tubes as soon as they are seen.
- **Tilling:** Till the top surface of the soil in the tubes with a stick every two weeks. This will allow water and air to penetrate, providing better growth for the seedling.
- **Germination:** Not all seeds planted in the tubes will germinate, whilst other tubes will have several seeds that germinate. When the tubes with two or more germinated seedlings have reached a stage of having two leaves, normally after two months, the extra tree seedlings can be transplanted into the ungerminated tubes. This must be done either early in the morning or late in the afternoon. If there are not enough empty tubes, quickly fill some more. There must not be more than one tree seedling in each tube.
- **Ungerminated tubes:** If there are a large number of ungerminated tubes and not enough extra seedlings, then remove these tubes to another area of the nursery and make sure that each group of 200 contains only germinated seedlings.
- **Weed and termite control:** Regularly remove any weeds from the nursery. Also remove any termites that are climbing the poles.
- **Root pruning:** Because the tubes are open at the bottom, the roots will grow down into the soil. Roots need to be pruned after the tree seedlings have grown four leaves. This is done by carefully cutting the roots using a phanga knife or some thin wire. The best method is to use a piece of wire about 1½ metre long and, with two people, drag this underneath a group of 200 tubes. Alternatively, one person can drag a phanga knife underneath half the tubes in a group at a time.
- **Frequency of root pruning:** Once root pruning has started, it needs to be carried out every two weeks until the tree seedlings are planted out.
- **Benefits of root pruning:** Root pruning encourages a good fibrous root system which binds the soil and helps the seedling to absorb water and nutrients, improving their survival when planted out.
- **What will happen if root pruning is not carried out?:** If root pruning is not carried out, the taproot will grow into the soil and become established and, if the taproot is cut before planting out, the newly planted tree seedling is likely to die.



TREE PLANTING AND MANAGEMENT: STEP-BY-STEP GUIDE

When the tree seedlings are ready, they are planted out – this must be done by the end of January **at the latest** to give them a good start. This is really just the start of the project because the planted out tree seedlings must be looked after like young children for the first three years. This will involve slashing grass, weeding, tilling and mulching around the newly planted trees, ensuring the soil around each tree is formed into a basin to catch water, and creating fire breaks around the planted site by the end of each July. The clubs and coordinators must count all of the trees on an annual basis to provide accurate records for RIPPLE Africa.

Planting Site Identification

Potential planting sites for trees need to be identified at an early stage before the tree nursery is set up.

- **Planting site identification:** Identify planting sites between August and February for the tree seedlings to be planted out the following December/January (for example, site identification done between August 2009 and February 2010 is for planting out in December 2010/January 2011).
- **Decide which trees are to be planted:** The community must decide on the reasons for planting the trees, i.e. for firewood, poles, timber, etc.
- **Measure the planting site:** Measure the potential planting site and establish the area in square metres.
- **Calculate number of trees needed:** Work out the quantity of trees to be planted. This will give the quantities of tree seeds to be provided and seedlings that need to be raised in the nursery.
- **Report to Environmental Projects office:** RIPPLE Africa coordinators will record all information and communicate to the RIPPLE Africa Environmental Projects office.

Planting Site Preparation

All planting sites must be prepared in good time, preferably during the dry season, so that tree seedlings can be planted out early. Ideally, grass slashing of the planting sites should be done by the end of September, and all marking, pegging and pitting must be finished by the end of October.

- **How long does it take to slash, mark and pit an area the size of a football pitch? (average figures based on 10 people working 3 hours a day):**
 - **Slashing:** 5 mins per tree, which equals 3½ days.
 - **Marking and pegging:** 2 mins per tree, which equals 1½ days.
 - **Pitting:** 10 mins per tree, which equals 7 days.
 - **Total time to prepare an area the size of a football pitch:** 12 days.
 - **Planting out (to be done in December/January):** 2 mins per tree, which equals 1½ days.
 - **A group of 10 people** will be able to provide the work for a maximum of 5,000 tree seedlings per year. If more seedlings are planted, additional club members will be required.
- **Grass slashing:** Firstly, the planting site must have all grass slashed. This is the most time-consuming job and must be done for all planting sites before the end of September.
- **Marking:** It is very important that the trees are planted in straight lines and are spaced correctly. This will simplify the counting of the trees and will give each tree sufficient space for healthy growth. A rope is provided by RIPPLE Africa which should be marked by club members with a knot at 2 metre intervals. The 2 metre interval can be measured by using a 2 metre stick (the RIPPLE Africa coordinators can accurately measure several 2 metre sticks for each club). Once the rope has been prepared, it can be stretched from one end of the planting site to the other and held by a peg at each end.
- **Pegging:** A peg (a 60 cm stick) is fixed into the ground at each knot which is at 2 metre intervals. Pegging is done for four rows. Other club members will follow close behind and start digging pits, removing the pegs which can be used for the next set of rows.
- **Pitting:** At each planting station, a pit is dug which is 60 cm by 60 cm by 60 cm deep. Remove the first 30 cm of topsoil and place on the left hand side of the pit. Then remove the bottom 30 cm of subsoil and place on the right hand side of the pit. The pit is now left open until planting time.
- **Why is the pit prepared early and left open?:** Firstly, preparing the pits early means that there is no delay in planting out the tree seedlings, and early planting will provide good initial growth for the

newly planted trees. Secondly, if the pit is dug in the dry season, the soil in the pit will dry out and this will discourage termites from attacking the newly planted trees. Thirdly, leaves and grass will fall into the pits and act as good compost for the newly planted trees.

- **Late pitting:** If the club is late with pitting and the work is done when the rains have started, then marking, pegging and pitting will be done and, instead of leaving the pit open, the soil will be replaced in the pit in the following order: The topsoil will be placed at the bottom of the pit, the subsoil at the top of the pit, and a stick will be placed in the middle of the pit to indicate where to plant the tree seedling. The disadvantage of late pitting is, firstly, that there is likely to be termite damage to the newly planted trees and, secondly, there will be no compostable material at the bottom of the pit. Also, planting of the tree seedlings will probably be delayed and the tree will not benefit from additional months of good growth during the rainy season.

Preparation at the Tree Nursery Before Planting Out the Tree Seedlings

- **Root pruning:** All tree seedlings should have their roots pruned three weeks before planting out so that the roots can recover.
- **Selecting the tree seedlings:** Select the healthy tree seedlings of a uniform size, and organise these into groups and quantities for each planting site.
- **Removing the nursery shade and reducing watering:** One month before planting, remove the shading from the tree nursery and reduce the morning watering to half a watering can for 200 tree seedlings. This will harden off the tree seedlings and get them used to direct sunlight and reduced water before being planted out. (If this is not done, the newly planted tree seedlings will be badly affected by the direct sunlight and the leaves will become scorched.)

Planting Out the Tree Seedlings

- **When to plant out:** Planting out should be carried out after the start of the rainy season in wet soil, ideally from early December to the end of January. If it is a dry day and the soil is dry, then wait until it has rained. If the trees are planted at this stage, it will encourage good root development for survival during the dry season.
- **Transporting the tree seedlings:** Tree seedlings should be carried using the metal basins. One basin will hold between 50 and 70 seedlings. The tree seedlings are then placed by each planting station, ready for planting.
- **Time of day:** Planting out must be done either early in the morning or late in the afternoon to avoid the midday heat.
- **Planting the tree seedlings:** Firstly, the topsoil from the left hand side of the pit is placed in the bottom of the pit, and the subsoil is placed on top. Dig out a hole by hand in the middle of the pit to the same depth as the plastic tube. Squeeze the tube to loosen the soil so the tube can be removed easily. Remove the tube carefully with both hands and slip it over the leaves of the tree seedling. The root ball of the tree seedling is then placed in the hole, and the top of the soil around the tree seedling must be at the same level as the top of the soil in the pit. The soil around the tree is then firmed down by foot. Carefully form a basin of soil 60 cm in diameter around the tree seedling. This will hold extra water for a longer period which will help the tree seedling to grow.
- **Save the plastic tubes:** As soon as the tree seedling has been planted, place the used plastic tube in a plastic bag and save for the next planting season. Each tube is worth K1 and can be used for two planting seasons at least. (**NEVER** leave any used tubes at the planting site.)
- **Why is the topsoil placed at the bottom of the pit?:** The topsoil is placed at the bottom of the pit as there are more nutrients and humus in it. When the tree grows, the roots will naturally grow down into this soil and benefit from it.

Management of Planted Sites

- **Weeding and tilling:** Weeds must be removed from each planting station once every month during the rainy season. Till the soil around the tree seedling when weeding.
- **Create large basins around trees:** After the first weeding one month after planting, create a square basin 1 metre by 1 metre with raised sides 15 cm high with a hoe. This will make slashing and weeding easier, will trap the maximum amount of water and control soil erosion.



- **Mulch the tree basin:** After the basin has been made, place cut grass and/or tree leaves in the complete basin, leaving a space of 15 cm around the stem of the tree (if the mulch is too close to the tree stem, it will attract termites). This will preserve moisture, and the grass and leaves will decay and provide nutrients for the tree.
- **Slashing:** Grass at the planted site must be slashed every three months up until the end of July and left (definitely not burnt). This grass will decay and improve the soil which will help the growth of the planted trees.
- **Fire breaks:** In July/August, create 4 metre wide fire breaks around the planted site by slashing the grass.
- **Check the growth of the newly planted trees:** Normally, clubs will grow 10% additional tree seedlings for the required planting sites. These can be used to replace any tree seedlings that fail shortly after planting out.

Management in the Second and Third Years

- **Replace failed trees:** Some trees planted the previous year will fail. Inspect all trees after the first rains in December and replace any failed trees with the current year's tree seedlings. Look after these in the same way as newly planted trees.
- **First slashing, weeding and tilling:** The grass around the trees needs to be slashed during the rainy season in March. Also, the 1 metre basin needs to be weeded and tilled, and maintained.
- **Mulch the tree basin:** After the main rains in May, place cut grass and/or leaves in the complete basin as a mulch, leaving a space of 15 cm around the stem of the tree (if the mulch is too close to the tree stem, it will attract termites).
- **Second slashing:** Slash the grass around the trees for a second time during July. Slashing will next need to be done in March the following year.
- **Fire breaks:** In July/August, create 4 metre wide fire breaks around the planted site by slashing the grass.
- **Counting the trees:** Every year, the trees at each planted site must be counted and a record made of the total quantities and species. The RIPPLE Africa coordinators will be responsible for documenting this information accurately and submitting it to the RIPPLE Africa Environmental Projects office.

Trees Used for Cooking with a Three Stone Fire for One Family

Three Stone Fire

One Week = **3 trees**



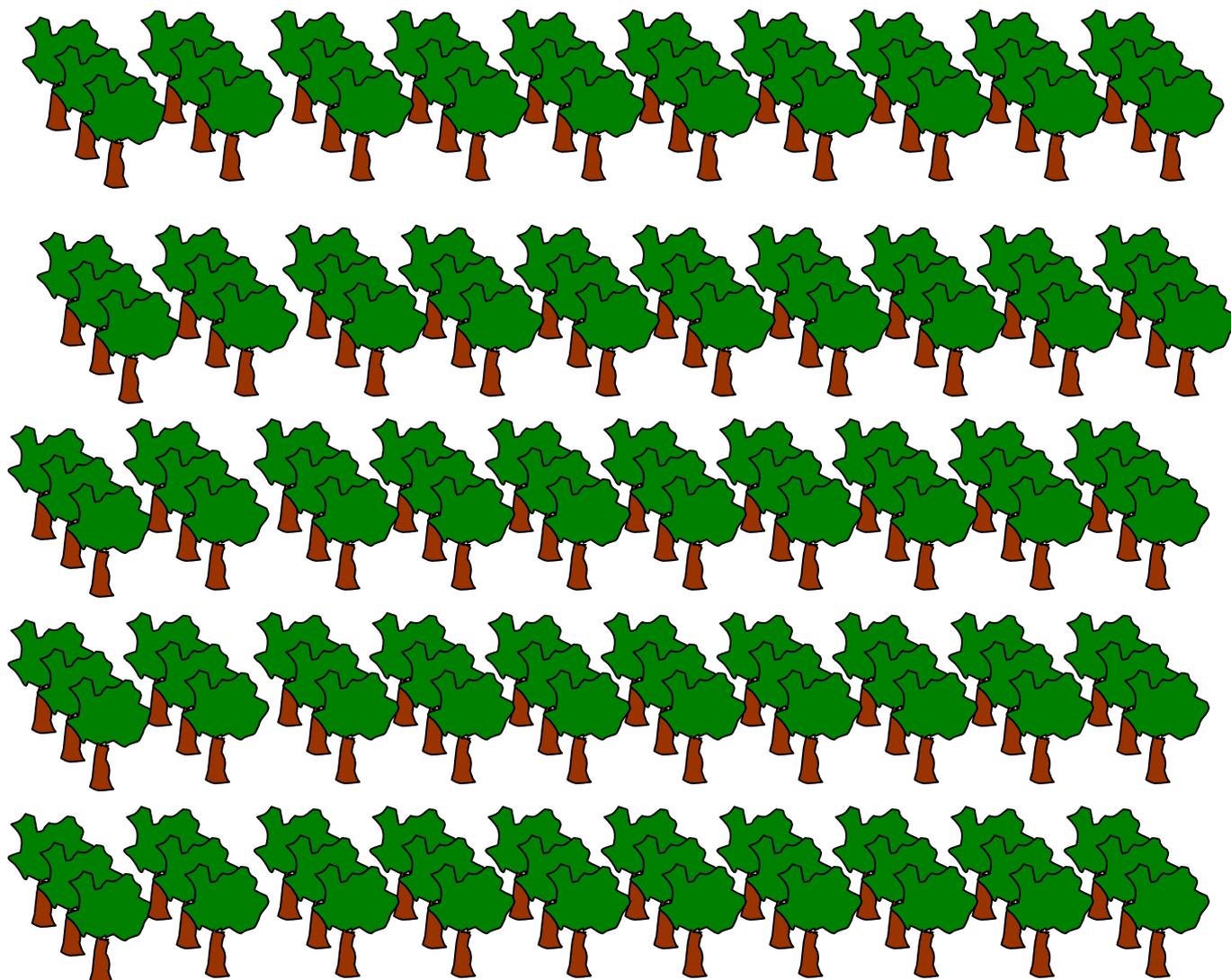
Three Stone Fire



Typical tree for firewood

Three Stone Fire

One Year = **150 trees**



Typical Chiefs area = 500 people = 100 Cooking fires

150 trees x 100 cooking fires = 15,000 trees per year

Trees Used for Cooking with an Mbaula for One Family

Mbaula

One Week = **1 tree**



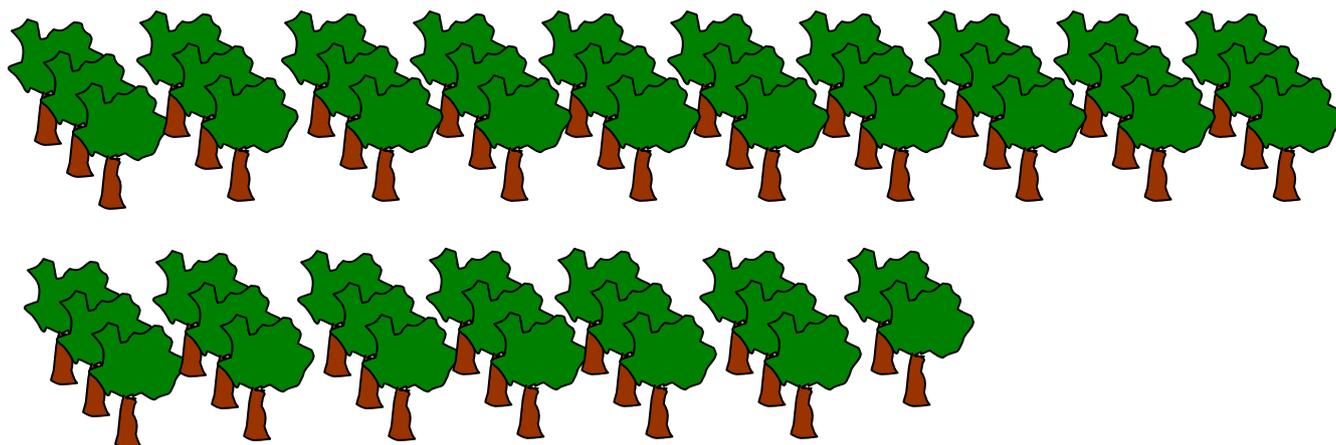
Mbaula uses less wood



Typical tree for firewood

Mbaula

One Year = **50 trees**



Advantages:

- Less trees cut down
- Less firewood to collect (one load per week not three loads)
- Faster cooking
- Less smoke
- Can move an mbaula and cook in kitchen or outside

Typical Chiefs area = 500 people = 100 Cooking fires

50 trees x 100 cooking fires = 5,000 trees per year

Target for firewood trees per Chief (500 people) using Mbaulas



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees

**Year 1 – 5000 trees
4 football fields**



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees

**Year 2 – 5000 trees
4 football fields**



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees

**Year 3 – 5000 trees
4 football fields**



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees



Football pitch area
100m x 50m
5000sq m
2x2 metre spacing
1250 trees

3 years -This will produce 15,000 trees which can be coppiced after 3 years

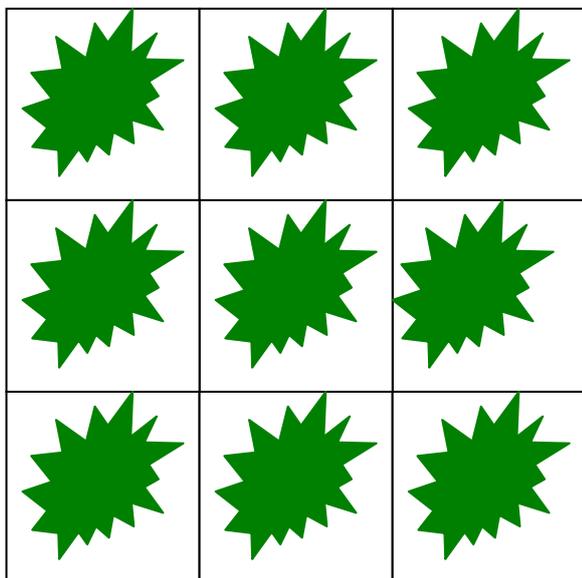
5000 trees will be available for firewood each year after 3 years

If **3000 trees** are planted each year – this will need to be done for 5 years

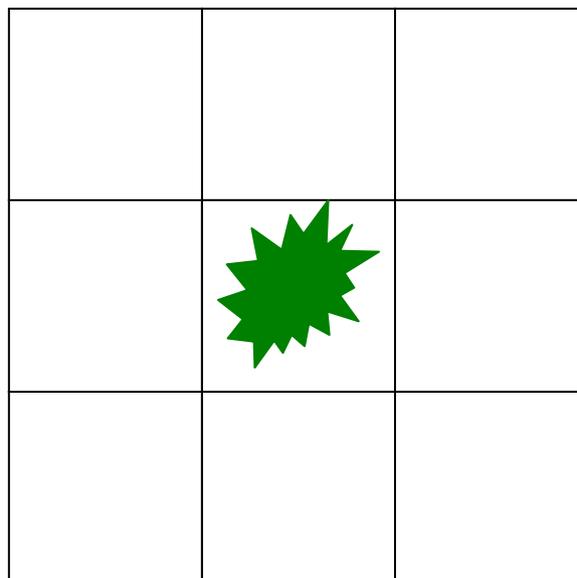
Tree Spacing related to football pitch areas



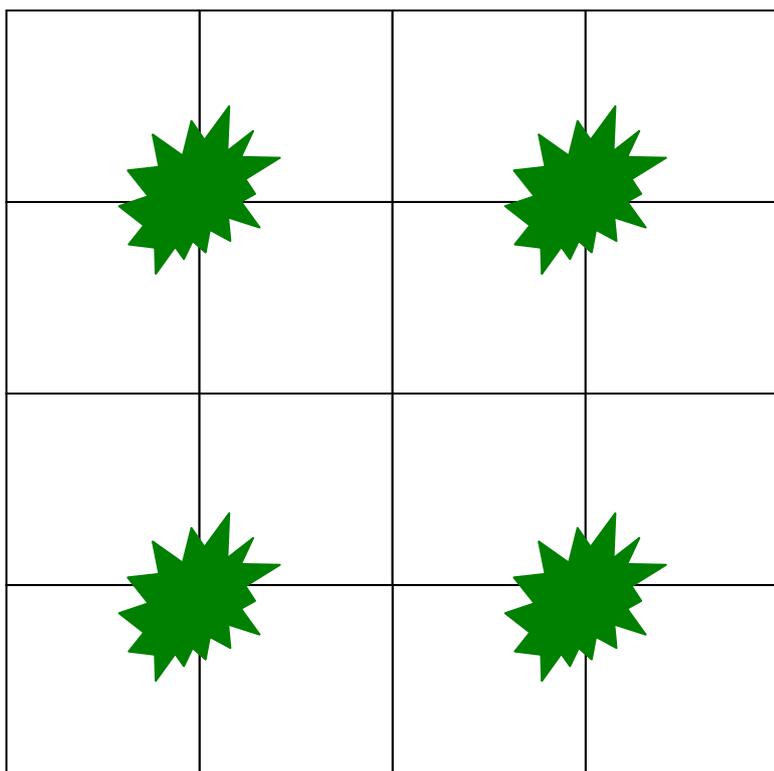
1 metre x 1 metre spacing
5000 sq metres divided by 1
5000 trees per football pitch



3 metre x 3 metre spacing
5000 sq metres divided by 9
555 trees per football pitch

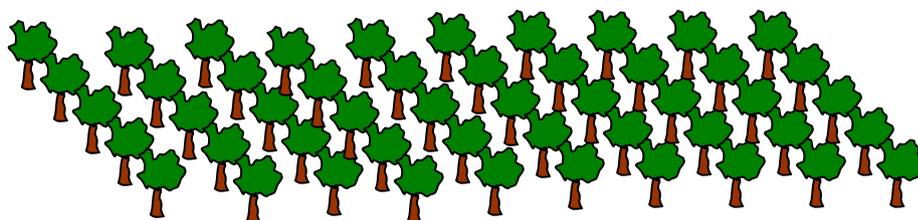


2 metre x 2 metre spacing (normal spacing)
5000 sq metres divided by 4
1250 trees per football pitch

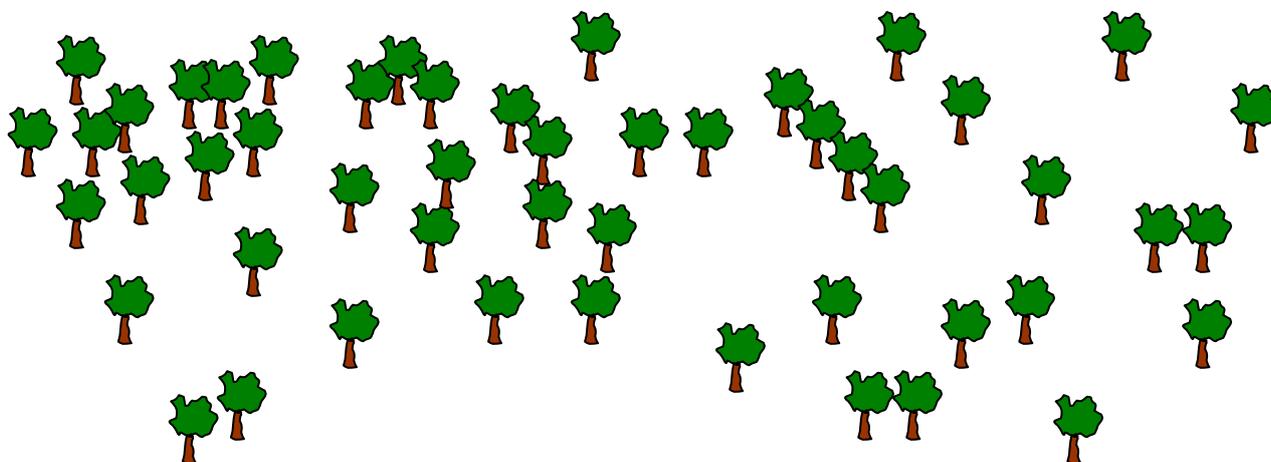


Tree spacing and counting the trees

Regular Spacing – easy to count



Poor spacing – difficult to count



- Every planted site needs to be measured Length x width = area (square metres)
- The correct number and type of tree seedlings are raised for the measured area
- Regular planting at the correct spacing will make counting much easier
- All trees in planted sites need to be counted each year (this will be useful for RIPPLE Africa and the community)
- Total Tree requirements for a given area need to be assessed i.e. Firewood, Poles, Timber, Soil improvement and Conservation.

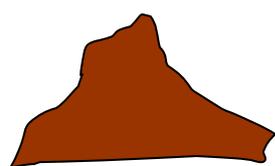
Compost Making

- **Compost:** Compost needs to be made in April by the club so that it is ready for tube filling in June (compost can be ready for use in six weeks). Typically, compost should be made in pits – a pit of 2 metres long by 1 metre wide and 1 metre deep will produce enough compost for up to 8,000 small polythene tubes.
- **Compost making process:** The first layer in the bottom of the pit is 10cm (4 inches) of forest or dambo soil. The second layer is 10cm (4 inches) of leaves or grass which should be compacted by walking on top of it. The third layer is 10cm (4 inches) of manure. Except for the first layer, each layer should be watered with three watering cans of water before adding the next layer. These layers are then repeated in the same order until the pit is full. Normally, there will be three layers of each material in a 1 metre deep pit. The compost pit should be completed with a final 10cm (4 inches) layer of soil which is compacted by walking on it, and the finished compost heap should be the same level as the surrounding ground.

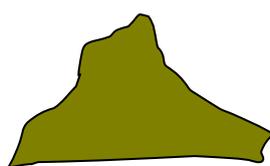
Compost Layers



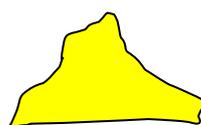
Tube filling mix



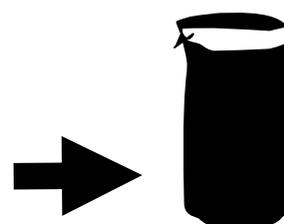
Dambo soil 2 parts



Compost 2 parts

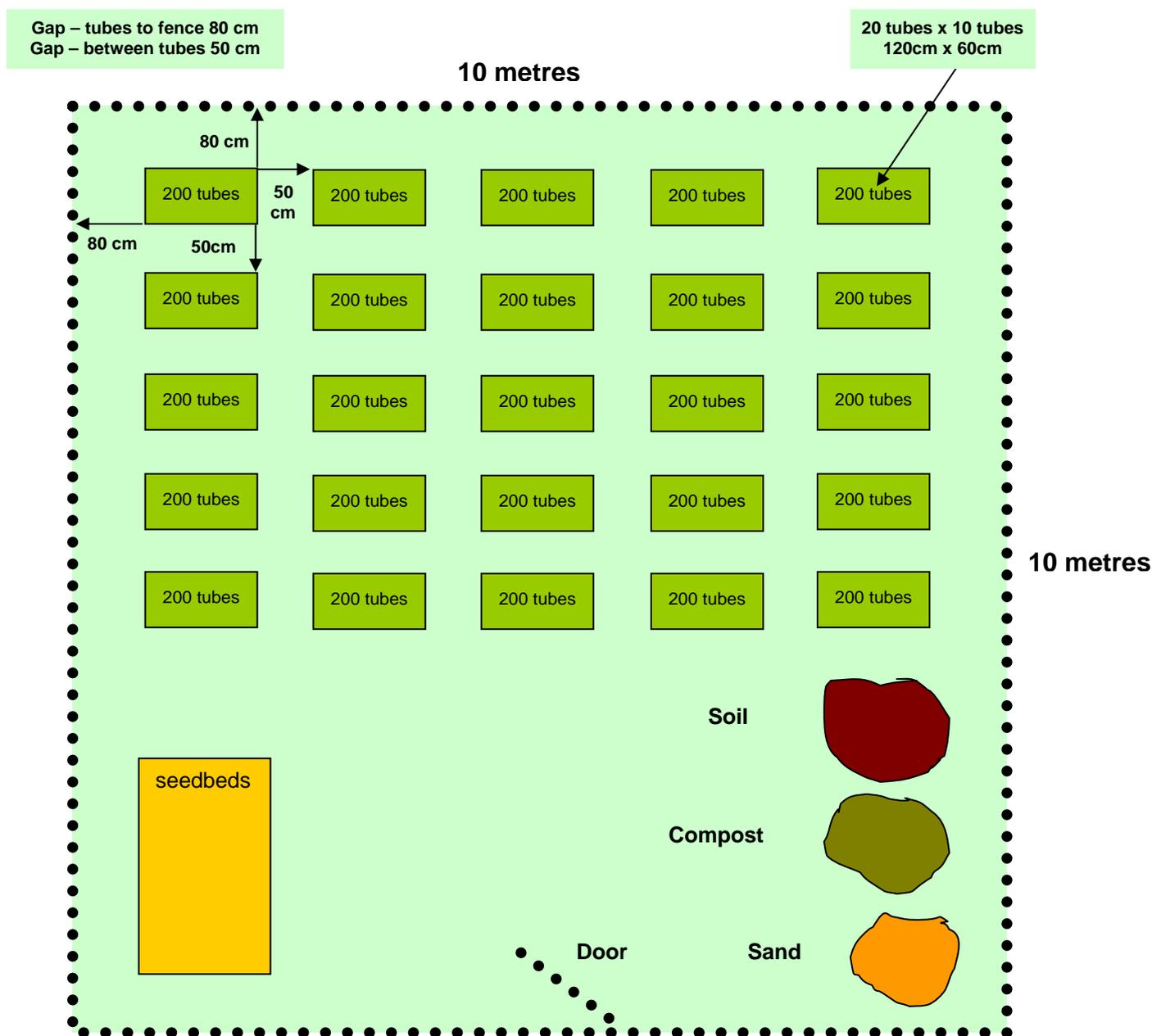


Sand 1 parts



Compost provides good food for the tree seedlings

Nursery Layout For 5000 Tree Seedlings



Tree Nursery Site Preparation

- **Establish the size required:** Typically, an area of 10 metres by 10 metres will provide sufficient space for 5,000 tree seedlings and a suitable area for tube filling, seed beds, piles of compost manure, soil and sand, etc.
- **Clearing:** The area for the tree nursery needs to be cleared, the size of which will relate to the number of trees to be raised.
- **Fence:** A fence made from grass and poles should be constructed around the nursery site to the height of a person. There also needs to be an entrance with a door. The fence will keep out animals and people, and will shield the seedlings from the wind.
- **Shade:** Ideally, a structure of poles with thatching grass should be erected to provide shade for the delicate tree seedlings. This should be at a height so that people can comfortably walk underneath it. Some clubs establish their nurseries under the shade of trees. This can be done, but it is not as good as providing a structure with shade as this can be more easily controlled and can be removed four weeks before planting out to harden off the tree seedlings.

Times to prepare and plant

**Planting site - Size of a football pitch
100mx50m = 5000 sq metres = 1250 trees**

Quantity of trees	1250					
Quantity of people	10					
Hours per day	3					
Filling tubes	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Filling tubes	2	4	1.4	2500	42	13.89
Preparation of site	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Slashing	5	10	3.5	6250	104	34.72
Marking/Pegging	2	4	1.4	2500	42	13.89
Pitting	10	21	6.9	12500	208	69.44
Total	17	35	11.8	21250	354	118.06
Planting out	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Planting out	2	4	1.4	2500	42	13.89
Total time excluding nursery management	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Total time	21	44	14.58	26250	438	145.83

Target 5000 trees

Quantity of trees	5000					
Quantity of people	10					
Hours per day	3					
Filling tubes	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Filling tubes	2	17	5.6	10000	167	55.56
Preparation of site	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Slashing	5	42	13.9	25000	417	138.89
Marking/Pegging	2	17	5.6	10000	167	55.56
Pitting	10	83	27.8	50000	833	277.78
Total	17	142	47.2	85000	1417	472.22
Planting out	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Planting out	2	17	5.6	10000	167	55.56
Total time excluding nursery management	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Total time	21	175	58.33	105000	1750	583.33

Total Times for preparation and maintenance (not in the nursery)

**Planting site - Size of a football pitch
100mx50m = 5000 sq metres = 1250 trees**

Quantity of trees	1250
Quantity of people	10
Hours per day	3

Total time for site preparation and planting out	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Total time	21	44	14.6	26250	438	145.83

Total time for maintenance of planted trees 1st Year	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Total time	11	23	7.6	13750	229	76.39

Total time for maintenance of planted trees 2nd and 3rd Years	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Total time	9	19	6.3	11250	188	62.50

Total Times for all activities excluding the nursery time	Mins/tree	Hours	Days			
	Time per tree mins	Hours per person	How many days	Total time mins	Total time in hours	Total time in Man days
Total time year 1	32	67	22	40000	667	222
Total time year 2	41	85	28	51250	854	285
Total time year 3	50	104	35	62500	1042	347