



National Agricultural Research Institute

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HOW TO BUDGRAFT CITRUS



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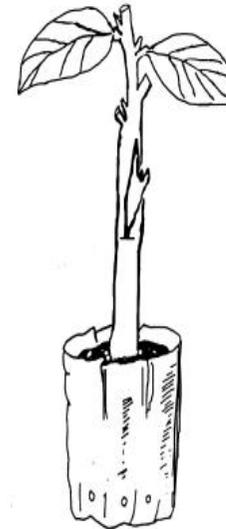
THE INSTITUTE

The **National Agricultural Research Institute (NARI)** was established by an Act of National Parliament of Papua New Guinea in July 1996 as a publicly funded, statutory research organisation, to conduct applied and development oriented research on food crops, alternative food and cash crops, livestock and resource management issues. Besides applied and adaptive research, NARI is responsible for providing authoritative technical, analytical and diagnostic services and up-to-date information to the entire agriculture sector in PNG. The major targets are the smallholder semi-commercial farmers in the country.

The mission of NARI is to contribute, through applied research and technical services, to the development of the agriculture sector and realisation of the national goals by identifying, adapting and transferring agricultural technologies and information, so as to:

- Enhance the productivity, efficiency and sustainability of the smallholder agriculture
- Improve farmer income, food security and welfare of Papua New Guineans and the Nation

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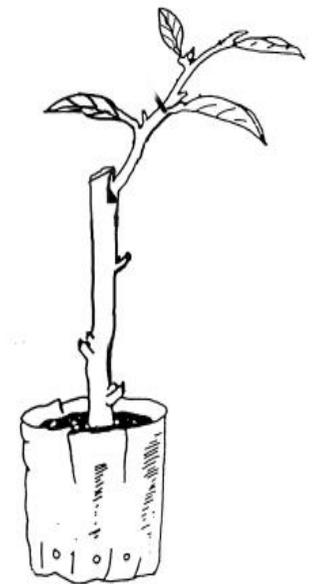


Step 7

If the budding was successful the bud will still be green when the tape is removed. If the bud is green, then cut back the top of the rootstock and remove all but two or three leaves. Any new shoots that grow from the rootstock should also be removed.

Step 8

Cut back the rootstock to just above the newly sprouted bud. Remove all shoots that grow from the rootstock. Water as required and maintain growth until they are ready for planting - usually after about 3 months.



HOW TO BUDGRAFT CITRUS

One way to produce high yielding, good quality, or pest, disease and drought resistant oranges, pomelos and mandarins is by **vegetative propagation**. There are many ways of propagating citrus vegetatively. Here we will describe the most commonly used method which is called **bud grafting**.

In bud grafting we have a **rootstock** and a **scion**. The plant used to provide the root system is called the rootstock and the bud that comes from a twig or a branch is called the scion. The scion grows up to become the stem, branches, leaves and the fruits of the grafted plant. We use a seedling for rootstock and the scion is a bud taken from an improved or pre-selected tree. The joining of scion to the rootstock is called bud grafting or budding. A plant produced in this way is called a clone. A clone should be almost identical to the mother tree from which the bud was taken.

Step 6

Wrap the bud with budding tape starting from the bottom to the top making sure all wounded areas and the bud are covered.



The tape should be removed 14 days after budding.

Before budding you will require the following:

- a. A nursery to supply the **root stock**. The root stock you choose will depend on many factors like tolerance to pests and diseases, climate, soil, water, expected yield and targeted market. Seeds for the nursery can be ordered from overseas or collected from good rough orange or lime trees. It should be noted that some root stocks will affect the taste of the orange so it is best to use rootstock seeds like Carrizo citrange, Troyer citrange and Trifoliata seeds usually ordered from overseas (see your nearest DAL, DPI, FPDC office or NARI for help).
- b. **Bud wood source trees** are the trees which you obtain budwood from. These will be the Didiman's selected sweet oranges, Valencia, Naval oranges, Mandarins or may be oranges or any type of citrus selected by yourself because of their good quality, good yields, or other good character such as trees that withstand pests, diseases and adverse soil or climate conditions or just to increase the number of plantings from your single backyard tree.

Step 5

Slide the bud up behind the bark until it fits into the slot of the T-cut.

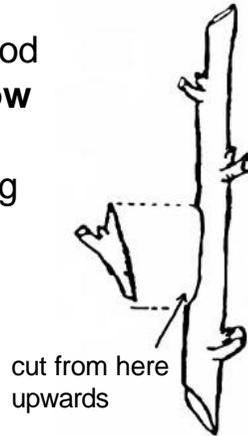


It is now ready for wrapping with budding tape to prevent the bud from drying out.

Step 3

Remove the bud from the budwood with a clean slicing cut from **below** the leaf stock. It is easier if the budwood is held with the tip facing you.

Do not slice of the bud from above the bud to avoid damaging it.



- c. **Budding knife.** These can be bought from major Didiman suppliers. If you cannot afford this special knife, you can use scaple blades, a razor blade or small knives but they must be kept sharp.
- d. **Budding tape.** This can be bought from major Didiman suppliers such as Farmset, and AgMark. If you can not get any and are budding only small numbers you can use plastic strips of about 2 cm wide. Even strips made from rice packets can sometimes be used successfully for budding citrus.

Step 4



Insert the bud behind the bark flap created by the inverted 'T' cut by sliding it from the bottom upwards.

Make sure that the bud is facing upwards!

The Rootstock

- a. The chosen seedling should be actively growing single stemmed and trimmed clean for 15-30 cm above ground. It should be at least 1cm thick at 15 cm above ground before budding is attempted. There are new methods to graft much younger rootstocks but these are not discribed here.



- b. Dry rootstocks cannot be grafted successfully! They must be watered and seedlings kept moist prior to grafting. However, the rootstock should not be wet during budding.
- c. Up to 25 % of the seedlings in the nursery will be undersized or misshapen. These should be discarded - to avoid budding on a generally inferior rootstock.

The Budwood (Scion)

- a. Budwood is selected from the semi hardwood section (green wood turning brown) of a round branch, about 5 mm average in diameter. Avoid using angular branches as this usually result in plants with vigorous vertical growth. Suitable scion wood should have visible bud growth at the base of each leaf stalk. You should encourage bud formation by curing i.e. by tipping and removing all the leaves of the selected scion wood two weeks before cutting of the scion wood for grafting.

THE ILLUSTRATED STEPS OF BUD GRAFTING

Step 1

The rootstock you choose to use should be healthy and vigorous. Avoid using inferior stocks.



Step 2

Make an inverted T-cut on the rootstock and lift the bark where the two cut ends meet.



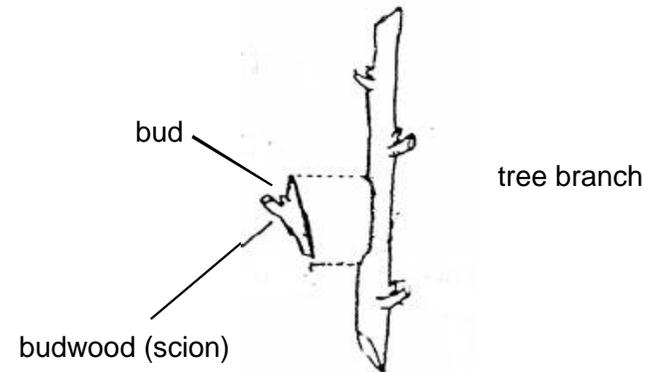
Handling of stock

The rootstock should be de-headed as soon as the tape is removed to force the bud to sprout. De-heading or cutting the tip of the root stock should be done carefully with a secateur, cutting from the budded side, and holding the secateur so as not to bruise the stock.

The cut should be just above the bud, so that the wound grows over quickly as the new shoot develops from the bud. Buds are rarely lost after heading, however, in very hot weather, buds can be killed.

After-Care of the Nursery Trees

After heading the trees must be staked. As the new shoot grows it should be tied firmly at regular intervals. The new shoot from the bud should be trimmed to one stem. Allow this stem to grow to its full height and do not head it further. This is preferable as it facilitates all nursery operations. A single stem tree offers other advantages: it is easier to handle and pack, and when planted in the field it can then be headed to correct height. This will give strong trees with well-spaced branches and a well-developed crown.



- b. Budding must commence immediately following cutting of the budwood. They must be kept moist at all times during grafting by wrapping in wet hessian or a wet plastic bag both during the collection of the scion wood and the budding operation.
- c. If necessary budding can be delayed up to a maximum of 48 hours. Here you should dip cut petioles and budstick ends into melted paraffin wax to prevent them from drying out. The budwood should be stored in moist saw dust or placed in plastic bags and stored in a refrigerator or esky for transporting.

How to do budding

The method is called **inverted 'T' Budding**.

The inverted 'T' cut (upside down 'T') is made in the root stock at least 15 cm (if planting in wet areas graft at 20-30 cm) from the ground, budding lower must be avoided to stop the soil covering the bud union, which leads to a disease called collar-rot.

Remove the bud with a clean slicing cut just below the bud. To avoid damaging the bud the cut should be made from the lower end where the leaf stalk attaches to the branch. Try to remove as little wood from the bud wood as possible but if the bud is sliced off with a small portion of wood do not worry about removing it.

The 'T' cut is made with a bowing action with the knife which slightly lifts the corners of the bark flap. The bark flap can then be lifted further with the bone handle of the budding knife to give way for the inserting of the bud. This cut should be made after you have removed the bud.

The bud is pushed firmly home from the bottom to the top of the upside down 'T' with the bone handle of the budding knife. The bud is then tied up with plastic budding tape (0.05 mm thick x 1.5 cm wide x 10 cm long). This tape is transparent and the bud 'take' can be seen through it. One roll of tape will tie about 200 nursery seedlings of normal size.

The tape commences below the bud with a half loop and the bud is completely covered by the tape which pulls the bark flaps back firmly against the stock to ensure quick callusing of flaps. It is finished above the bud with a half hitch and pulled tight. The budded plant is left for 14 - 21 days. By this time the bud will have 'taken' and the plastic is removed by simply slitting the tape with the budding knife on the side of the stock opposite the bud. A good budding will result with only a faint scar.

Stocks on which the bud has failed to 'take' should be rebudded as soon as possible on the opposite side of the first budding.