

TREES



*Teacher's Book
for Years 4, 5 and 6*

Trees

A Teacher's Book for Years 4, 5 and 6



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Written by Steven Sau
Graphics prepared by Jean William

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Foreword

“Trees” was originally written as a book for teachers and pupils in Years 5 and 6. It is now produced as a teacher’s guide only, with contents designed to meet the requirements of the outlines for the Basic Science curriculum for Years 4, 5 and 6, with regard to plants, and in particular trees, as follows.

Year 4 Topic 3A Structure of plants (Chapters 1 and 2)

Year 5 Topic 3B Ecology and interdependence (Chapter 5)

Year 5 Topic 4D Plant growth and development (Chapter 3)

Year 5 Topic 4E Plant reproduction (Chapter 3)

Year 6 Topic 2D Plant adaptations (Chapter 4)

Year 6 Topic 3A Endangered species (Chapter 7)

Year 6 Topic 3B Ecology and biodiversity (Chapter 7)

Year 6 Topics 3C and D Conservation (Chapter 7)

*Year 6 Topic 3E Impact of population, agriculture
(Chapters 6 and 7)*

It has been extensively revised and had a considerable amount of new material added to it for this purpose. It includes both information for the teacher and activities to be carried out by the children.

Introduction

If children look at trees themselves, they become familiar with them.

If they are to look at trees and remember and understand what they see, they must do things for themselves as well.

Because they have been looking at trees for nine or ten years without really seeing them, they need someone to help them open their eyes. That someone is you, the teacher.

It is therefore important that you give the children plenty of practical activities, as this is the way they learn best. This learning should come first, before you ask them to start writing or drawing.

Then the children can record what they have done and seen...but not what they think they should see. Do not ask them to copy the pictures from the book or the blackboard. Their drawings may not be as beautiful as yours, but they will reveal what they see and understand, and each child will probably see something different.

With the rich vegetation that we have all around us in Vanuatu, you will never need to give a lesson about trees without taking the children out to see them, or without asking them to bring parts of trees to the classroom. A few of the activities use small plants instead of big trees to teach something. We cannot dig up a big tree to look at its roots.

If you are teaching your class about seeds, get the children to collect as many as they can. Select what you want and help the children to sort them into groups and display them. Do the same thing with flowers, leaves or fruit.

Always have an attractive display in the classroom. Try to make the collection related to the subject for the week. For example, if you are learning about flowers, have a display of flowers, if you are talking about leaves, display leaves, if you are finding out about fruit, display fruit. Branches of chilli fruit make an attractive show! The children will enjoy arranging the displays for you and will be learning while they are doing so.

Information for the teacher

is written in ordinary print. This is for you, the teacher, to use as you plan your lessons. You will need to prepare carefully, so that the children can go outside and do the activities you want.

Sometimes you will need to plan well in advance, to make sure that

the children can carry out the practical learning that is suggested. Many of the activities are best done in the second half of the year, when most trees have flowers and then fruit.

The activities for the children

are written in italics. They are written directly to the children. You may decide to copy them onto the blackboard for them to read themselves, or you may prefer to read them aloud.

Note on names

The tree names that have been used in this book are the English or Bislama names by which the trees are commonly known, so that you will be able to identify them. When you are teaching, however, use the names which are most familiar to the children. In most cases these will be the names in their own language.

Descriptions of trees

The descriptions of trees in the back of the book are provided to help you, the teacher. They are not supposed to be “taught” as separate lessons. The children will need the information, or, best of all, will discover it for themselves, only when it is related to what they are learning in one of the chapters and what they are seeing for themselves. For example, you might need to look up some information about the banyan tree to help you when you are studying about different kinds of roots.

I hope you will enjoy using this book with your children as much as I have enjoyed preparing it.

Chapter 1

What is a tree?

What is a tree? It is a special kind of plant.

The world is full of living things. All living things grow and change. In the end they die, but, before they die, they make new copies of themselves. Things that are not alive cannot do any of these things.

Some living things are animals, and some are plants.

Most animals can move around. When they are adult, and have reached their full size, they stop growing. They feed on plants or other animals or both.

Plants cannot usually move around. They go on growing all their lives. They use sunshine and what their roots take in from the soil to keep them alive.

Trees are the biggest kinds of plants.

Here in Vanuatu we are surrounded by trees. If you fly in a plane over our islands, all you can see is trees. Our trees play a very important part in our lives.

Activity

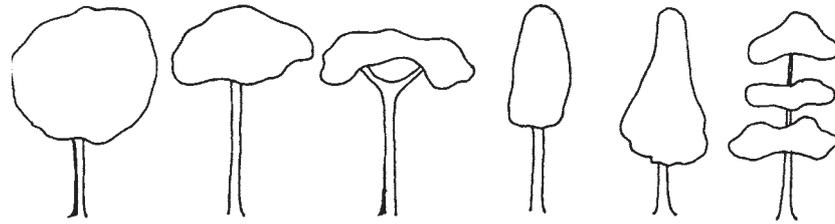
*Go outside and look at the different shapes of the trees around you. We call the branches of the tree and all the leaves, flowers and fruit on them the **crown**. Stand well away from the trees, then you will see the shapes of their crowns more clearly.*

What did you see?

What does the crown of each tree look like - an umbrella, a circle, a cone, a rectangle or any other shape? Are all the branches and leaves at the top of a long trunk? Are there a lot of branches coming out all the way up the trunk? This will change the shape.

Now, working in groups, make a tree picture. Draw the outlines of trees (only their shape, not the branches and leaves), cut them out and stick them onto a piece of card or paper. If you have any coloured paper, use it. Your work will look very attractive if you cut all your trees out in one colour and stick them onto a background of another colour.

Here are some tree shapes to help you know what to look for when you go outside.



We are lucky because, even though Vanuatu is a very small country made up of tiny islands, it has some of the most interesting trees in the world. We have two of the earliest kinds of trees that ever grew on earth, the tree fern and the namele. Once great forests of them covered the whole world. Now they grow in only a few places. We have our own special trees too, that grow only here and nowhere else. One of these is the *Carpoxyylon macrospermum*, which has only just been re-discovered. You will learn about these trees, and many others besides, as you work through the chapters in this book.

Chapter 2

The parts of a tree

In this chapter we encourage the children to look closely at the different parts of a tree, and to understand what they do.

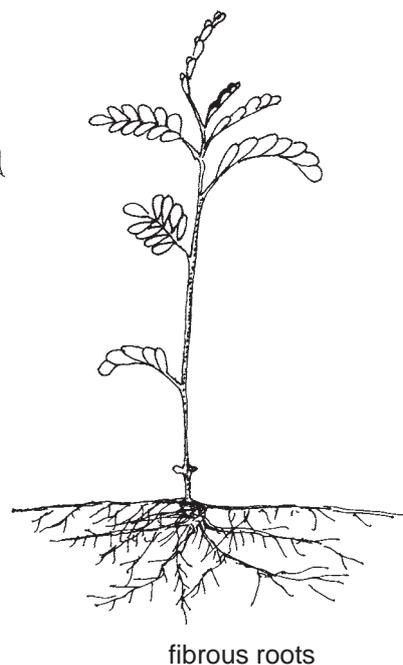
The roots

The roots anchor the tree into the ground. They take in water and mineral salts from the soil for the tree.

There are two types of root systems.

One is known as a **fibrous** root system. There are many roots all of much the same thickness and length. These roots do not go down very deep into the soil. A good example of a fibrous root system that the children can look at is the grass plant. The roots look like a lot of thin pieces of white string. We call them fibres.

The other root system is a **tap** root system. This has one main root which can grow down a long way and is often quite thick. It has smaller roots growing out of its sides. A good example of a tap root is the pawpaw.



If we look carefully at the root of a plant, we can see that near its end there are tiny hairs growing out of it. These are called the **root hairs**. They are there to take water from the ground to feed the plant.

Some plants also use their roots to store food for themselves. An example of a tree with a tap root that stores food is the pawpaw. An example of a tree with a fibrous root system that stores food is the manioc.

Most trees have their roots hidden under the ground. However, there are some roots we can see above the ground. Can the children think of any?

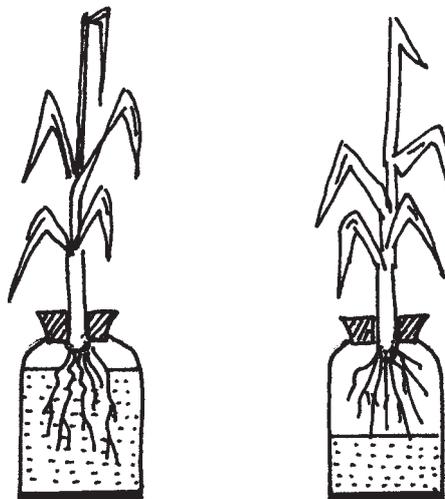
There are at least two trees which they should be able to tell you about, the aerial roots of the banyan tree and the special kinds of roots of the mangrove. There is a picture of the roots of a banyan on page 63, and one of the mangrove roots on page 38.

Activity 1

Pull out of the ground a grass plant and a small pawpaw seedling. Make sure you get all the roots. Now wash the roots and dry them and look at them closely. Talk about what you can see.

Activity 2

Dig up a plant very carefully with all the roots. Put the roots in a jar of water and seal the top with plasticine so that the air cannot get in. You can see what to do in the drawing. Make the level of the water with a piece of paper on the outside of the jar. Leave the jar for a few days and watch what happens.



What did you see ?

Did the level of the water go down? What does this tell you?

Activity 3

Copy this into your book and fill in the spaces.

The grass roots look like a lot of pieces of thin white string. Another name for this string is _____, and the proper name for these roots is _____. These fibres spread out in the soil and hold onto it so that the wind cannot blow the plant away.

The pawpaw root is different. The pawpaw has one thick root with small fibres growing from it. This is called a _____.

The trunk

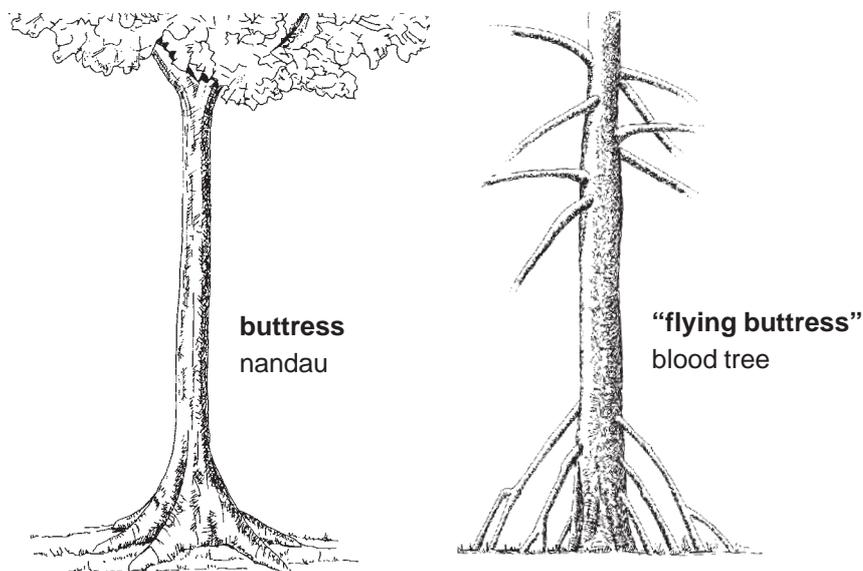
The stem of a tree is called the trunk.

Trunks hold a tree up. They hold up the leaves to the sunlight. They carry water and mineral salts from the roots to the leaves. They carry food from the leaves to other parts of the plant.

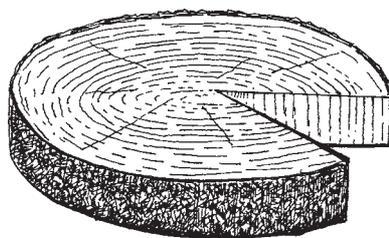
There are many different shaped trunks. Some are very thick at the bottom but become much thinner near the top. Others are much the same thickness all the way up.

Sometimes the trunk divides into thick branches quite near the ground. Sometimes the branches grow out of the trunk high up above the ground.

Sometimes the bottom of a tree trunk has special parts called **buttresses** that stick out from it. These help support the tree and stop it from blowing down easily. There are many kinds of trees in Vanuatu which have buttresses of different shapes and sizes. Some of them look like thick roots above the ground. The example best known to the children is probably the nakatambol.



The tree trunk also tells us a story. The trunk is made of wood. The wood makes it strong to hold up the crown of the tree. When a tree is cut down, you can see many rings in the wood inside the trunk. You can find out how old the tree was, just by counting the rings. Each ring shows how much the tree grew in one year. Some rings are thicker than others. The tree grew more in those years. Perhaps it rained a lot. Or maybe other trees were cut down, giving this tree more space and light.



Activity 1

Go out and look at as many stems as you can find. Look at some tree trunks too. They are the stems of trees. Look at their shapes. How tall are they? How thick are they? Can you reach your arms right round them? Draw what you saw.

Activity 2

Take a jar or a piece of bamboo with some water in it and mix some red ink or dye in the water. Cut the stem of a plant and stand it in the coloured water. (A thick white stem like manioc is a good one to use.) Leave the jar on the table for about a day. Then cut through the stem. Look at the leaves too.

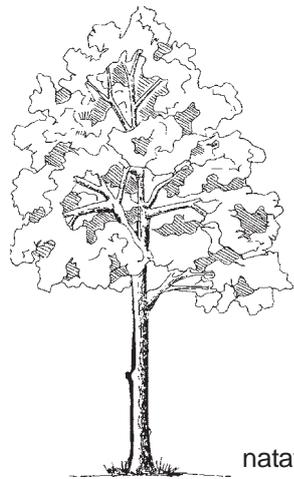
Activity 3

Find the stump of a tree that has been cut down, or a piece of its trunk. Count the rings. How many years old was the tree when it was cut down? Notice whether most of the rings were the same size, or whether some were thick and others were thin.

What did you see?

Outside you saw the stems of some flowers. You can find those easily. Did you see any stems that lie along the ground, like kumala? Did you see any stems that climb, like the yam plant or bush vines? Some stems hold onto other plants. Water melons do this. How do they hold on? How many different stems did you find?

Did you see some tree trunks? They are the stems of trees. Some kinds of trees too climb up other plants. In the bush you can find a kind of climbing pandanus and the rattan palm. Look at the banyan, whose trunks and branches surround the tree it grows on, and in the end kills it.

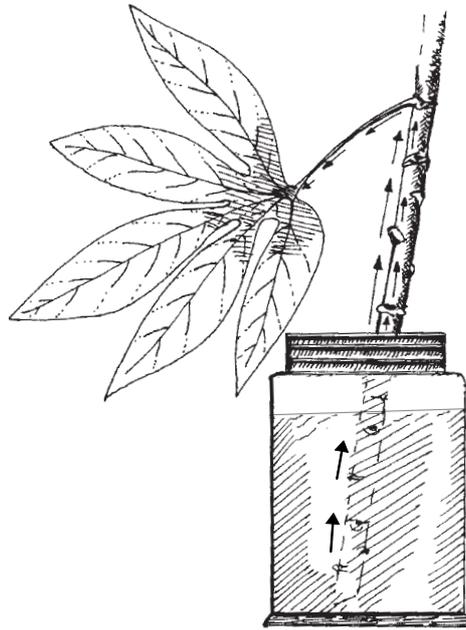


a free-standing trunk



a climbing trunk

Look at the stem which you put in the coloured water. The water has moved up the stem. Has the ink or dye has gone up into the leaves, hasn't it?



What have you discovered?

Some stems grow up straight, some climb up sticks or plants, and some run along the ground.

All stems carry water from the roots of a plant to the leaves.

The stems of trees, the trunks, are thick and strong to hold the tree up.

The bark

The bark is the outer covering of the woody parts of a tree. It helps to protect the plant from disease or from damage caused by animals or people.

The bark of a tree has three layers. The outer layer is heavy and waterproof, and has many breathing holes all over it, through which the air enters the inside of the plant. The middle layer is thick and often used as a place for storing food for the tree. The third layer consists of tiny tubes which carry plant food made by the leaves to other parts of the tree.

It is possible to know, or **identify**, a tree by its bark alone. There are many different kinds of bark. The bark of each tree is different. Some trees have very smooth bark. Some of them have very rough bark with cracks going up it or across it. Some bark has little bumps. The bark of some trees has scales or flakes or long strips which come off easily.

Activity 1 Bark rubbings

For this activity you will need some sheets of paper and wax crayons. If you do not have wax crayons at your school, you can use an old piece of candle instead.

You are going to make some bark rubbings. Hold a sheet of paper up against the bark. Rub the crayon or candle over it to make the pattern of the bark show up.

Do several rubbings. Choose trees which have different kinds of patterns.

If you used candle for your rubbings, when you get back to the classroom paint over the whole sheet of paper with a thin paint mixture. The paint will stay on the paper but not on the candle wax. The pattern of the bark will show up clearly now. You can do this with your crayon rubbing too, to give the rubbing a different coloured background.

Label each bark rubbing with the name of the tree.

Activity 2 A bark collage

Make a collection of different kinds of bark. Remember, do not take it from a living tree. That could kill the tree.

Arrange the pieces into an interesting picture and stick them onto a piece of strong paper or carton. Use other kinds of material from the trees in your school area to finish the picture.

The branches

Branches hold up the buds, the leaves and the flowers. The branches grow out from the trunk to hold up the leaves to the sunlight. The branches on different trees are arranged in different ways.

Activity 1

Go outside and look carefully at the trees around the school. How are the branches arranged? Do they come out near the top of the tree, or do they start coming out near the bottom? Do they stick out sideways or do they point upwards? Are they all much the same size, or are there a few thick branches from which all the other branches grow?

Are they arranged in a special pattern? Can you find a tree without any leaves on? You can see the pattern of its branches more clearly than when its leaves are there.

Draw one of the trees that you have been looking at. Show how its branches are arranged.

Activity 2

If you have a natavoa tree growing near the school, go and have a look at it. Its branches are arranged in a special way. What makes it different from the other trees nearby?

What did you see?

Each group of branches on the natavoa tree comes out horizontally in a circle round the trunk. The leaf buds stick straight up from the end of each branch. The next time the tree puts out new branches, they grow out horizontally from the end again.

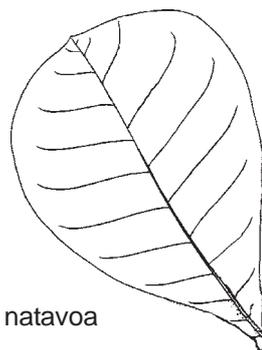
There is a picture of a natavoa tree without its leaves on page 18.

The leaves

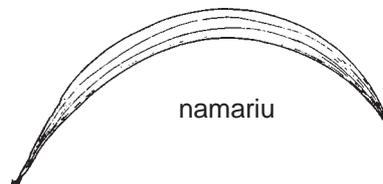
The leaf is one of the most important parts of the tree. Leaves make the food a plant needs. They use sunlight, air and water to make the food. Often the easiest way for people to identify a tree is by looking at the leaves.

All leaves have **midribs** (a large vein down the centre of the leaf) and **veins** (raised, fibrous tubes which carry water). We can sort leaves into two groups.

Simple leaves have only a single leafstalk with the leaf joined on to it. The burao is a good example of a tree with simple leaves.

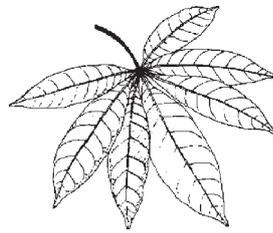


simple leaves

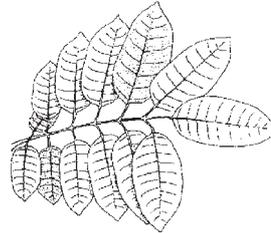


Compound leaves have a main leafstalk and out of it grow many other leafstalks, each with a leaflet joined to it. The Christmas tree is a good example of a tree with compound leaves.

compound leaves



sterculia



nangai



kasis

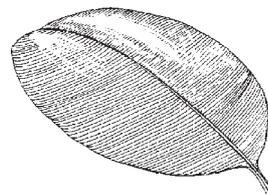
The shapes of leaves vary greatly. Some have **lobes** like the breadfruit, others are long, others again are almost round, while some are even shaped like a heart.

Their edges are different too. Some have toothed edges like the hibiscus, but most of them have smooth edges. Many of them end in a point at the end of the leaf. Why do you think this is? Ask the children to look at the leaves of a tree when it rains heavily, then they will know.

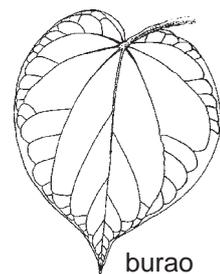
The veins of the leaves make different patterns. On some trees, the side veins of the leaves are **parallel** to the stalk or mid-rib and, if you tear them, the leaves usually tear in parallel lines too. Look at the leaves of the namariu. They are like this. The leaves of some trees also have parallel veins, but these veins all come out close together at right angles from the mid-rib. Most kinds of leaves, however, have a **network** of side veining and when you tear them they usually tear in an uneven way.



coastal namariu



nabangura

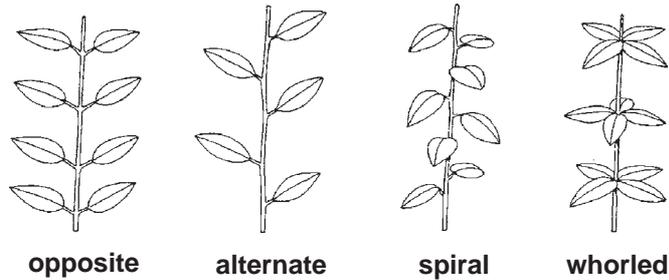


burao

We think of all leaves as the same colour - green. But are they really so? Have a look! The surfaces, or outsides, of leaves are not all the same either. The leaf may be thick and leathery, or thin and soft. It may be smooth or hairy. It may be shiny or dull. The upper and lower sides of the leaf may be different.

The leaves are arranged in different ways along the twigs. Sometimes they grow **opposite** each other, sometimes they grow **alternately**. Sometimes they grow in a **spiral**, sometimes they grow in **whorls**. Take the children out to look at the arrangement of

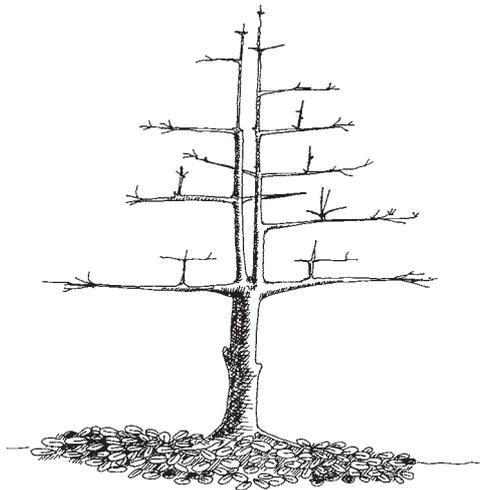
the leaves on the trees near the school. If this is not possible, you yourself can pick some twigs of leaves and keep them in a jar of water on the nature table. Do not encourage all the children to do this themselves, as they may damage the trees by taking too many twigs.



Some trees lose all their leaves at one time and grow new ones. These are called **deciduous** trees. Other trees lose their leaves one by one throughout the year. They are called **evergreen** trees. Are there any deciduous trees near your school?

The natavoa tree is a deciduous tree. Twice a year its leaves turn red and fall off the tree. Here is a custom story about the natavoa tree's red leaves. Read it to your class.

The legend of the Natavoa tree leaves from Bytora, Maewo



Once upon a time there was a man called Taharo. He lived in a house with a natavoa tree growing beside it.

One day, while he was making some arrows, he accidentally cut his finger. It bled rather a lot, so he took a little piece of bamboo and filled it up with his blood. Then he hung the bamboo up in the fireplace where the smoke always reached it. Later on, he climbed up the natavoa tree and hid the bamboo filled with the blood at the top of the tree.

In his home he had two servants. Before leaving the house to work in his gardens, he would tell them what to do while he was away. They would sweep his house, weed the ground round his house and cook some food as their daily jobs. He would tell them to work only there but not to go to the natavoa tree.

One day, when he had gone to the garden, the two servants (a man and a woman) said to one another, "Let's go to that thick burao and amuse ourselves and forget all about what Taharo has told us to do."

While Taharo was busy in the garden and the servants were playing, the blood came out of the natavoa tree and went into the house. It took the form of a person and quickly did all the jobs and then went back into the bamboo. When the lazy servants knew Taharo would be coming home, they went quickly to the house. To their surprise everything was done. They did not tell Taharo about it. Taharo thought the two servants had done their work. This went on for many days.

One day the two lazy servants decided to find out who was doing the hard jobs. When Taharo had gone they went a little way behind the bushes and hid themselves and watched. Soon they saw among the leaves something gradually taking the form of a person. It climbed down the natavoa tree and went into the house. It did all the work and then went back to the tree and disappeared into the bamboo.

The foolish servants quickly climbed the tree and took the bamboo. While they were looking at it, they broke it and the blood splashed everywhere onto the leaves of the tree. This is why when the natavoa leaf dries and falls to the ground it looks like blood.

When Taharo returned he realised what had happened. He went to the tree and killed the two foolish servants. He put their bodies against the bottom of the trunk. That's why, if you happen to observe the base of the tree properly, you'll see two raised parts coming out at the side of the trunk and going down to the ground.

Go to the tree and see if you can find the two signs - the colour of the leaves and the shape of the trunk.

Activity 1

Your teacher will organise you into four groups for this activity. Each group will make a collection of leaves.

- *One group will make a collection of simple leaves of different shapes.*
- *One group will make a collection of different kinds of compound leaves.*
- *One group will make a collection of leaves that feel different when you touch or hold them.*
- *One group will make a collection of leaves of different shades of green.*

You must not show your leaves to the other groups.

Then your group will play a game with one of the other groups. The children who are playing must close their eyes. Can they recognise a leaf by feeling it? Change the groups around, so that each group has felt the difference between several simple leaves, between several compound leaves, and between leaves with different surfaces and thicknesses.

If you have a bag, you can hide the leaves in that. Tell each child in the other group to put their hand in the bag and find the leaf you ask for.

Can you name all the leaves just by feeling them, without looking?

If yours is the group that has made a collection of leaves of different green colours, can you think of a game for the other groups, using your leaves?

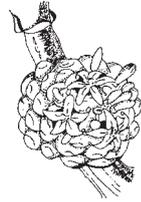
Activity 2

Make a collection of leaf prints. Carefully paint the underside of each leaf (this is where the veins show up best). Then press the leaf onto a clean piece of paper. When it is dry, cut it out and stick it into your book and label it. Look at the pattern of the veins.

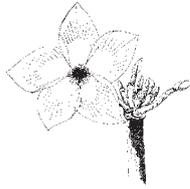
The flowers

Flowers make seeds for the tree. Many have coloured petals and a sweet smell. Sometimes the flowers grow singly. Sometimes they grow in a group of little flowers arranged along or at the end of a flower stalk; this group is called an **inflorescence**. Can the children find examples of each kind? A very good example of an inflorescence, because it is so big and easy to see, is that of the namele tree, which hangs down like a furry rope.

some different kinds of inflorescences



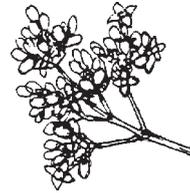
morinda



frangipani

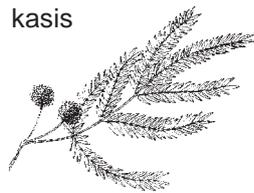


nabangura



sandalwood

Most flowers grow from buds at the bottom of a leaf stalk or on small twigs at the end of branches. A few grow directly from the main branches or trunk. Ask the children to give you examples of the three types.



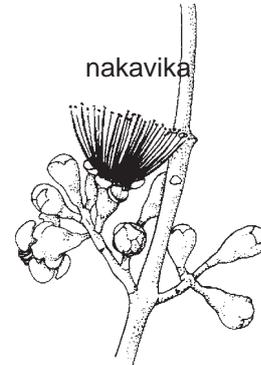
kasis

at the base
of a leaf



fish poison tree

at the end
of a twig



nakavika

directly from
a branch

Activity 1.

Collect as many flowers as you can. Look at them closely. Are there several flowers together on the same little stalk, or only one? Draw and write about what you see.

Count the parts of each flower. Compare the parts.

We will learn the names of the different parts of the flower and what they do in the next chapter.

Activity 2

Pull a petal off a hibiscus flower and suck the end. What can you taste? Why do you think it tastes nice?

Do not taste any other flower unless your teacher tells you to, as some kinds of flower are very poisonous.

Some flowers are very unusual. Is there a casuarina tree growing near your school? If so, look at it. Both its leaves and its flowers are adapted for life near the sea. It has two different kinds of

flowers, a male flower and a female flower. The male flowers are little **catkins** with lots of yellow pollen growing at the ends of twiglets. The female flowers are inside small **cones** growing on the twigs. We see the cones on the ground when the flowers have died. Look at the picture in Appendix A.

Can you think of any other trees that have cones, and not the usual sort of flowers with petals? We call these kinds of trees conifers.

The fruit

Fruits are the part of trees that contain the seeds. They develop from the flower. The seeds inside are the beginning of a new tree. Trees have different kinds of fruit, not just the kind we can eat! Many trees in Vanuatu have long pods. Others have soft, fleshy fruit. Some have dry or fleshy capsules which split open to show the seeds inside. Some have hard dry fruits or nuts.

Activity 1

Collect as many kinds of tree fruit as you can. (Remember a fruit is any seed case, not just the kind you can eat.) Sort the fruit into groups on the nature table.

Activity 2

Cut open the fruit and look carefully at the seeds inside. Can you count them?

What have you discovered?

A fruit contains one seed or several seeds.

Some fruits, like pawpaws or oranges or Christmas tree pods, contain many seeds. Some, like natavoa or canoe tree or coconut, contain only one seed.

Now make a collection of seeds too.

An interesting fruit to look at, if the tree grows near you, is that of the puzzle nut tree. It is the shape of a large ball, about 15cm. across, and has inside it between 6 and 12 large, three-sided seeds that fit together like a puzzle. If you can find one, let the children take it to pieces and try to fit it together again.

Final activity - Riddles

Note for the teacher: This activity could be done orally in class, and then written down for the children to complete in their exercise books as a record of what they have learnt.

1. *I make food for the plant.
I use water from the air and sunlight.
What am I?*
2. *I carry water from the roots to the leaves.
I carry food from the leaves to other plant parts.
What am I?*
3. *You might not see me.
I take in water for the tree.
What am I?*
4. *I protect the trunk from damage.
I am sometimes rough and sometimes smooth.
What am I?*
5. *I make seeds for the tree.
I sometimes have a nice smell.
What am I?*
6. *I am found inside the fruit of trees.
Sometimes there are many of me, sometimes only one.
What am I?*

Chapter 3

How does a tree live ?

Feeding and breathing

Plants and animals are all living things. All living things need **air** and **food**, if they are to go on living and growing.

Air is a mixture of two important gases, called **oxygen** and **carbon dioxide**, with some other gases as well. Animals, like people, take in oxygen and breathe out carbon dioxide. Plants, like the trees we are studying, take in carbon dioxide and give out oxygen, in a process that we call **photosynthesis**.

The roots take in water and mineral salts from the soil. The water and mineral salts then pass up the tree through the trunk and into the leaves. We have already seen this happening in the experiment in the previous chapter.

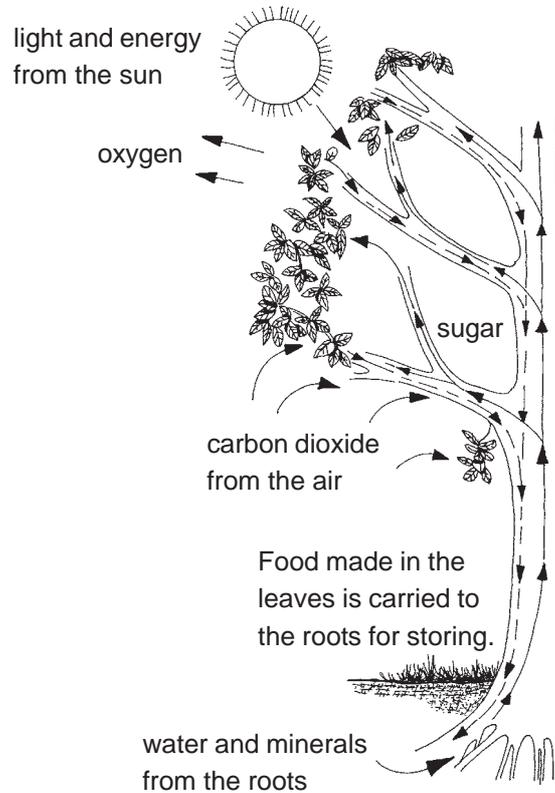
The leaves take in **carbon dioxide** from the air. It enters the leaves through tiny holes which are usually found on the underside of the leaves. They are very hard to see without a magnifying glass.

Inside the leaves is a substance called **chlorophyll** which is what gives the leaves their green colour. The chlorophyll takes in energy from the **sun**. This energy is used to mix the water, mineral salts and carbon dioxide together to make **sugar** and **oxygen**.

The food is taken back down the branches and trunk and used. Sometimes extra food is stored as **starch** in the trunk or roots. We saw this when we learnt about roots in the previous chapter.

The trees use the sugar and the oxygen for energy to help them grow and move. This process is called **respiration** (another word for breathing).

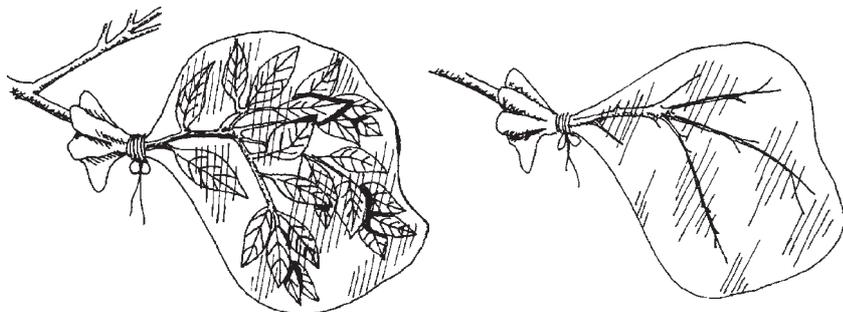
While making their food during the day, the leaves give out the extra **oxygen** which is not needed by the tree. The extra water that the tree does not need for making food also comes out through the leaves and **evaporates** into the air.



Activity

For this activity you will need two plastic bags and something to tie up their openings.

You need to do this activity quite early on a sunny day. Go outside to a tree. The sun must be shining on it. Take one of your plastic bags and put it over a leafy twig. Tie it on tightly. Take all the leaves off another twig. Tie the other plastic bag over this twig.



Leave them both for several hours. Go back towards the end of the afternoon. Look at the bags.

What did you see?

Was the bag covering the twig with the leaves wet on the inside?

Was the bag covering the twig without leaves dry?

What does this tell us?

Extra water not needed by the trees is given off by the leaves.

Growing new trees

There are a number of ways in which a new tree can grow, but the usual way is from a seed.

The work of the flower

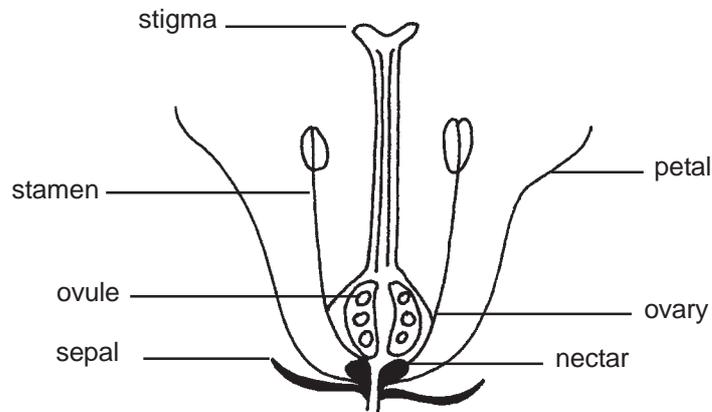
In the months from June to August, most trees have flowers. Some trees have flowers at another time of the year. Some trees have flowers all year round. The flower has an important part to play in the life of a tree, because from it develops the fruit containing the seeds from which new plants grow.

We have looked at flowers before. This time we are going to learn the names for the different parts of a flower and what their purposes are.

Look at a flower carefully. A Christmas tree flower is a good example. Under the petals are the green **sepals** which protect the bud. The **petals** are the brightly coloured part of the flower. There is sometimes a sweet juice called **nectar** at the bottom of the petals.

Inside the petals you will see thin stalks with powdery yellow dots on the end. These are called **stamens** and the yellow dots are **pollen** grains. This is the male part of the flower. Some flowers have many stamens, but their petals are small. Do the children know what the flower of a fish poison tree or a nakavika looks like? Can they think of other flowers with lots of stamens?

In the centre of most flowers is a long stalk. This long stalk or tube has a little head on it and the tube leads down to a box at the bottom. The tube is called a **style**. Its head is the **stigma** and the box at the bottom is the seed-box or **ovary**. This is the part of the flower in which **ovules** (eggs) are made and stored. The style, stigma and ovary make up the female part of the flower.



(In some flowers, some of the parts that have been described are not separate but have grown together. They are all there but they are difficult to see. For this reason it is not a good idea for the children to try and name the different parts of a bougainvillea, hibiscus or frangipani flower.)

Activity

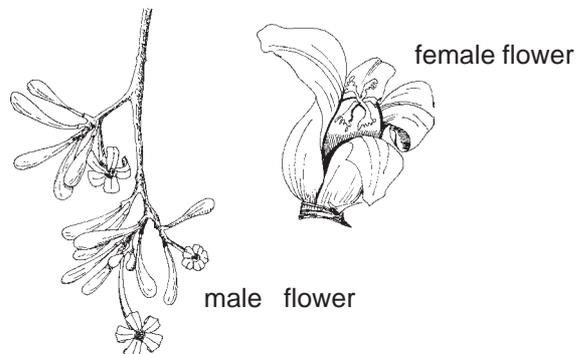
Collect several different flowers. Carefully cut open the ovaries and look at the ovules inside. How many do you think there are?

What did you see?

In some ovaries there is only one ovule. In others there are many.

Most trees have the male and female parts together in one flower. Some trees, however, like the casuarina, have separate male and female flowers. Some trees have either only male flowers or only female flowers. Can the children think of any trees like that? There is one very common one whose fruit we all enjoy.

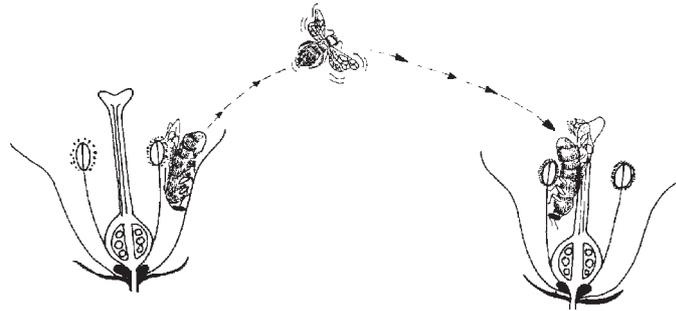
pawpaw flowers



To start a new tree, the pollen from the flower must travel to the ovary, to **fertilise** the ovules (the developing seeds) in the ovary. How does this happen?

Pollination

Do you remember we said that flowers sometimes have a nice smell and that petals have bright colours? This is to attract insects and birds to the flower. An insect or bird lands on the flower and reaches down to the nectar inside the flower. As it does so, some of the pollen gets onto its body. When it moves, the pollen is brushed from its body onto the stigma. This process is called **pollination**.



Sometimes the insect or bird takes the pollen from one flower onto the stigma of another flower of the same kind. With plants that have separate male and female flowers, it must go from a male flower to a female flower.

When the male flower and the female flower are on different trees, it is more difficult. If you have a female pawpaw tree and you want it to bear fruit, you must make sure that there is a male pawpaw tree growing nearby. Explain to the children that it is not a good idea to cut down all the male pawpaw trees in their garden because they do not have any fruit. For the female tree to bear fruit, pollen must be carried from the flower of the male tree to the flower of the female tree.

Sometimes the wind helps with pollination. Some trees produce a lot of very light pollen which the wind easily shakes from the flowers and carries away. Some of it settles on the other flowers.

Trees that are pollinated by insects or birds usually have large, brightly coloured flowers to attract them. Trees that are pollinated by the wind do not need colourful petals to attract the insects; they usually have smaller flowers which are not so brightly coloured and instead are a greenish or yellowish colour.

Activity

Look at the trees around the school or your village. What are their flowers like? Watch carefully, or ask your parents, to find out how they are pollinated.

Then copy this chart into your book.

Name of tree	Petals big/small	Colours bright/not bright	Pollinated by wind/insect/bird

What have you discovered?

Are the big, brightly coloured, scented flowers pollinated by insects and birds, and the small flowers without bright colours and special scents pollinated by the wind?

When pollination has taken place and the pollen grains are on the stigma, they start growing down the style to reach the ovules. Once the pollen reaches the ovules or eggs, they are **fertilised** (given life). The ovary develops into the fruit and the ovules develop into the seeds. The petals and stamens and other parts of the flower are not needed any more. They dry up and fall off.

Once this has happened and the seed has grown bigger, it is ready to grow into a tree. To grow into a big healthy tree, it needs space for itself. It has to move away from the mother tree.

Seed dispersal

There are many ways in which seeds are carried from one place to another. The seeds can travel by wind, water, animals, human beings, birds and so on. This is called **seed dispersal**.

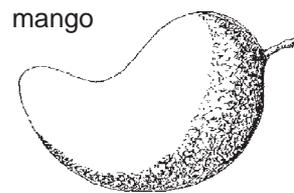
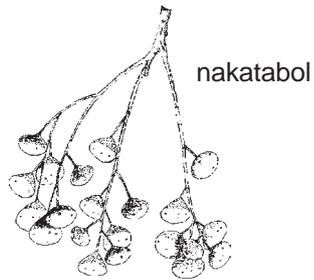
Activity

Collect as many fruit as you can from your home or use the fruit you collected in the earlier activity. Put them on the table and try to group them according to how they are dispersed.

Draw pictures of the fruit you find. Keep one page for each kind of fruit so that you can add to your collection when you are in Year 6.

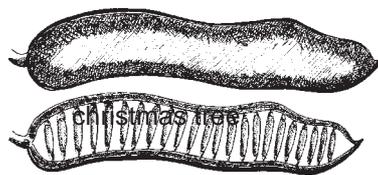
What did you find out?

1. Some seeds are covered in a soft fleshy fruit. Sometimes birds or flying foxes, and people too, eat the fruit. The seed comes out later as waste and is left away from the mother tree. Sometimes the fruit falls on the ground and rots. The seeds inside can then begin to grow.

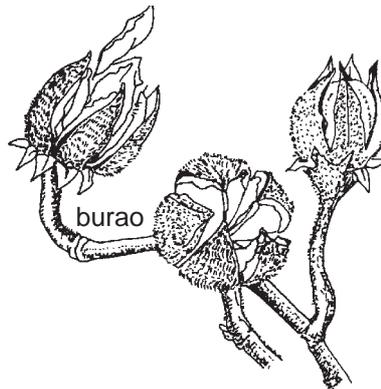


2. Some seed cases explode (burst open suddenly) and throw the seeds out on the ground, away from the parent plant. Some of these cases are pods, others are capsules.

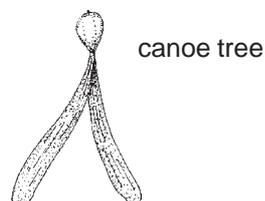
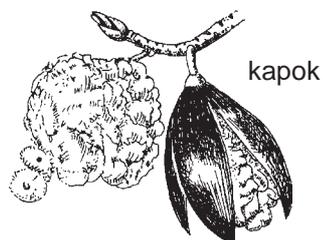
a pod



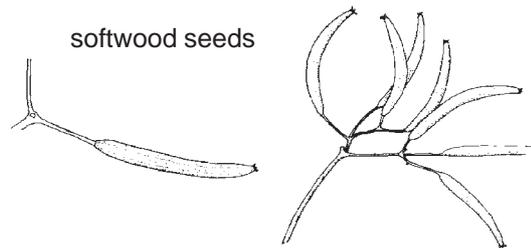
a capsule



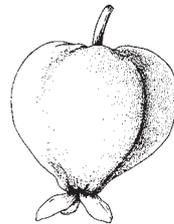
3. Some seeds have wings and the wind blows them away from the parent tree. Some seeds have light fluffy ends and the wind blows them a long way from the parent tree too. We sometimes call these seeds parachute seeds.



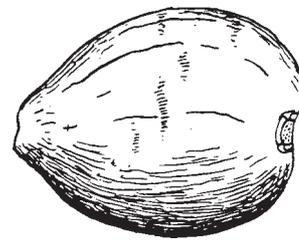
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4. Some seeds are sticky or have little hooks so that they stick to the fur or hair of animals or to our clothes. In this way they travel away from the parent tree until they drop to the ground and can begin to grow. There are not many trees that have seeds like this in Vanuatu. Can you think why? Are there many animals with fur that live in our forests and can carry these seeds?



5. Coconuts are fruit, too. They often travel on water. A coconut has a thick waterproof skin to protect the seed inside and stop it getting wet. This is how coconuts came to grow on lonely coral islands as the sea carried them there. There are other seeds that travel on water too. How many can you think of? If you live by the sea, you will find several different kinds on the beach.



fish poison tree fruit



coconut fruit

What have you discovered?

Seeds spread in many different ways. The wind, water or animals carry some; others explode; others blow away; some of them rot.

Can you think why they need to spread away from the parent plant? If seeds do not travel away from the parent plant they will choke it, and there will be too many plants trying to grow in one place.

An example of seed dispersal

Between Motalava and Ureparapara, the reef has grown up from beneath the sea and has made very, very low islands of dead coral surrounded by a living reef. The poor soil in holes in the dead coral is made only from coral sand and other materials which have been washed onto the islands. Seeds have been washed onto the dead coral and have germinated in the poor soil and grown into low

trees. The trees are mainly casuarina (sea oaks) but there are also a few small coconuts. Perhaps this proves that the best travellers are those whose seeds are carried by the sea.



Germination

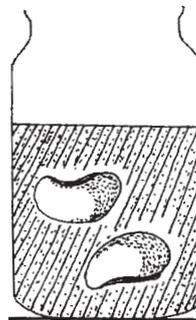
Once the seed has travelled to its new home and has fallen to the ground it remains **dormant** (asleep) until it **germinates** (begins to grow). Now we shall see how this happens.

Activity 1

Plant a few bean seeds in the corner of the garden and mark the position of each seed with a stick. Every few days dig up one seed and draw and make careful notes of what you see.

Activity 2

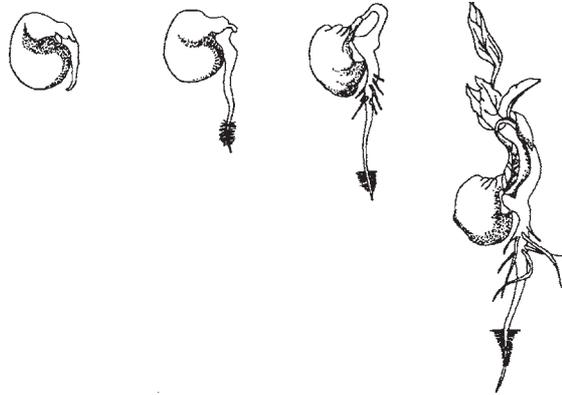
Put a piece of paper round the inside of a jar. Push two bean seeds down between the jar and the paper. Fill the jar with damp soil. Keep the soil damp and leave the jar in the dark for a few days. You should put one of the seeds in the right way up and one upside down. Take the jar out every day and look at it. Write about what you see and draw it.



What did you see?

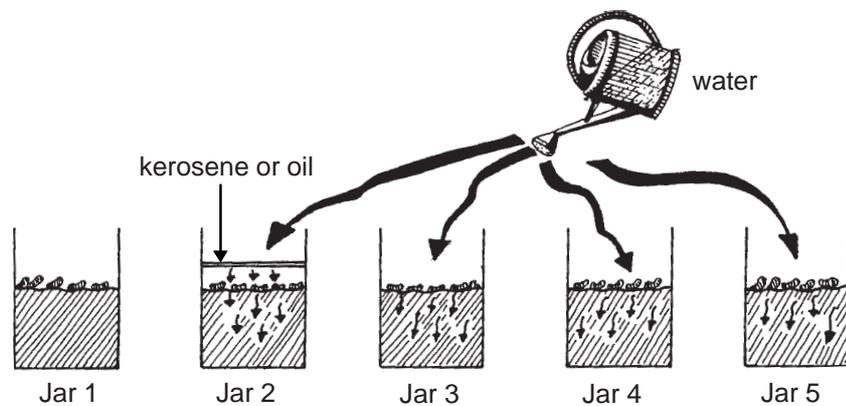
You saw the root begin to grow first, then the shoot. You saw the seed split open. You noticed that the root grew down and the shoot grew up, even if you planted the seed upside down.

When the shoot begins to grow it is yellow. When it has been in the light for a little time it turns green. Why is that?



Activity 3

Get five jars and put dry cotton wool or plant fibre into the bottom of each jar. Scatter a few seeds on the cotton wool. Grass or cabbage seeds are good for this, but small flower seeds or any quick-growing tree seed will do.



Jar 1. : Do not add anything. The seeds have air but they do not have any water.

Jar 2. : Pour some cold, boiled water over the seeds and add a little kerosene to the top of the water. This keeps out the air so that the seeds have water but they do not have any air.

Jar 3. : Add some water but keep the jar in the coldest place you can find, in an ice box or a refrigerator if you have one.

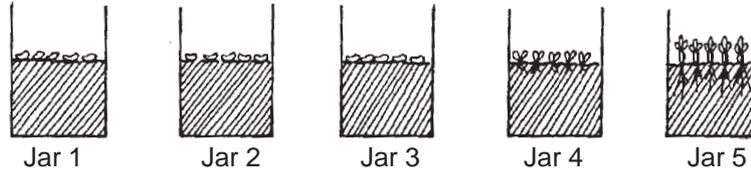
Jar 4. : Add some water and keep the jar on the table in the light.

Jar 5. : Add some water and keep the jar in a dark cupboard.

Watch all the jars for a few days and make notes and drawings of what you see.

What did you see?

What happened to the seeds in the five jars ? Is this what happened?



Jar 1. The seeds did not germinate at all.

Jar 2. The seeds did not germinate here either.

Jar 3. If the jar was in an ice box or refrigerator the seeds did not germinate; if they were in a place that was only cool they started to germinate.

Jar 4. The seeds germinated but only slowly.

Jar 5. The seeds germinated and are growing well.

You must now bring them into the light or they will die.

What have you discovered?

Germination is the beginning of the growth of a new plant from a seed. When everything is just right the seed will begin to grow. We say it **germinates**.

Before seeds will germinate they need water, warmth, air, and darkness.

Water: there must be enough water to split the seed.

Warmth: the seed must be kept warm. It must not be too hot or too cold: the seed will not grow if we boil it or put it in a freezer.

Air: like all living things, seeds need air to breathe and cannot live without air.

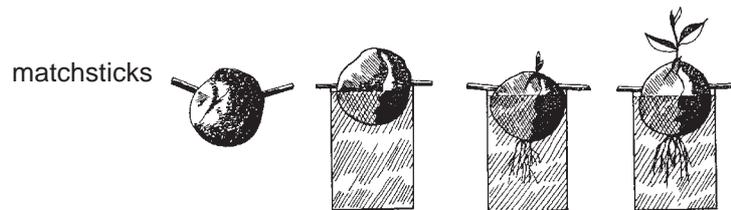
Darkness: seeds grow better when they are under the soil and away from light.

Once seeds have germinated they need light to grow into healthy plants.

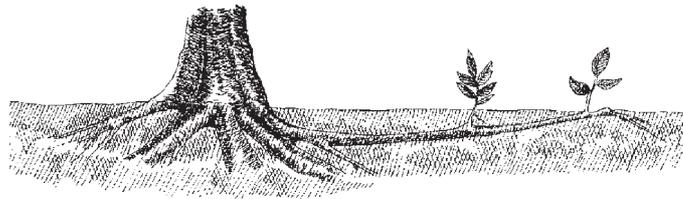
There is one kind of tree which is very common in Vanuatu whose seed does not always grow in the ground. Sometimes it starts growing on another tree. If the children cannot tell you which this tree is, look at page 62. If there is one of these trees near your school, take the children to look at it carefully. What has happened to the tree it started growing on?

Activity 4

Grow an avocado seed in a jar of water. Watch it develop over the weeks. Plant it out in the school area when it is about 15 centimetres high. This picture shows you how to do it.



Some new trees can start in a different way. A mature tree can put up new shoots from the roots under the ground, which then grow up into trees. Can the children find any shoots like this from the breadfruit tree?



Chapter 4

Where do trees grow ?

Some trees like growing in one kind of place, others like growing in another kind of place. In Vanuatu with all its different islands we have many different kinds of places where trees can grow. Some grow near the beach. Some grow high up in the hills. Others grow near where we live or plant our gardens, in the flat parts of our island or on the slopes leading up to the high hills.

In this chapter we look at trees growing in three different areas:

- the seashore, or coast
- the coastal plain and secondary forest
- the primary forest or bush

Trees growing in one place change to suit that kind of place. We say that they **adapt**. Over many years parts of the trees have become different to enable them to live easily in their environment. As we look at the kind of trees which grow in each of these three areas, we can think about how well the trees grow there and why.

It is suggested that the children look carefully at the trees growing in the area they live in, and see how they are adapted to the conditions of that area. Then tell them about the trees in the other two areas that are described here. Some may have visited these other areas and be able to talk about them too. If you live on a small island, it may be possible for the children to visit the three different kinds of area and look at the trees in them.

The seashore or coast

We have several kinds of coastline around our islands. On some islands, such as Ambae and Tongoa the coastline is very rocky and there are many steep cliffs. On others the land slopes gently to the sea. There are long sandy beaches with coral reefs surrounding islands such as Emae and Uripiv. Often, where a river flows into the sea or where the land is flat, a mangrove swamp develops. There are many areas of mangrove on the east coast of Malakula and around the island of Malo. There are some on the coasts of Efate too.

Our coastlines are exposed to the wind which carries with it the salty air from the sea. The wind increases the rate of evaporation from land surfaces so that more water is lost by plants growing close to the sea. The soil on the coast is usually very sandy or stony and plants have difficulty in obtaining food and water through their

roots. As a result of these factors the plants which grow close to the sea have had to adapt (change themselves) in order to survive.

Here are the names of some of the trees which usually grow near the sea in Vanuatu. If you live by the sea, you will be able to add the names of other trees that are common in your area.

Mangrove, Pandanus, Casuarina, Nabagura, Fish poison tree, Namariu.

These trees are described at the end of the book. How have they changed to make life easy near the sea?

Activity 1

Go for a walk along the beach. Can you find any seeds on the sand or floating at the edge of the water? Do you know what trees or other plants they came from? Bring one of each kind back to the classroom for the nature table.

Look again along the edge of the beach where there is some sandy soil. Are there any seeds beginning to grow? What kind are they?

What did you see?

You will probably have found some different kinds, as there are several kinds of trees that have seeds that are dispersed by water. They include the coconut, the fish poison tree, the pandanus and burao blong solwota. There are also the seeds of some vines which are dispersed by the sea.

What do they look like?

They all have tough leathery outsides with thick fibre or a hard case inside to prevent the seed in the centre from being damaged by the salty water.

What have you discovered?

The seeds that we found on the beach are dispersed by water. They can all float in the water.

When they are washed up by a wave onto the edge of the beach, they are softened by the rain water in the soil and begin to grow.

Activity 2

Walk along the edge of the beach again. Look at the leaves of the trees that grow there. Is there anything special about them? Look at the casuarina tree. Can you see its leaves? What are they like? Bring back a few to the classroom for the nature table.

What have you discovered?

The leaves of many trees are adapted for life by the sea where the salt spray sometimes reaches them and the wind often blows them strongly. They have a shape or a surface adapted for their life.

The casuarina has adapted so much that it is difficult to see where its leaves are. They are not the long green “needles” which hang down. These are its twigs (small branches). Look carefully at one of these twigs. At each joint along it you will see a circle of about seven tiny pointed things. These are its leaves. Because they are so small, they do not lose much water by evaporation in the strong sea breezes.

Have any of the children experienced a big cyclone? What happens to the leaves of trees that the sea spray does not normally reach, when the cyclone blows salt water off the sea and carries it inland over them?

The mangrove swamp, a special coastal area

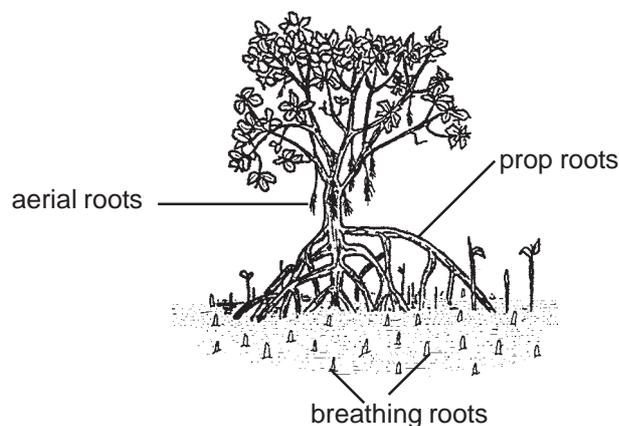
Mangrove swamps are coastal areas where trees actually grow in the salt water. The trees that grow there, which we call mangroves, are special trees that have adapted in a number of ways to life on the coast. There are many kinds of mangroves that grow in tropical countries. Several of them grow here. They grow in flat coastal areas, in the salt water at the edge of the sea, and along the edges of the mouths of wide rivers, where the water is brackish, that is, it is a mixture of fresh water coming down the river from the hills and the salt water coming into the river at high tides.

Because the trees grow in salt water, the roots have had to adapt to a very different life from other island trees. There are three kinds of special roots.

prop roots: These are strong roots with thick branches. They help prop up, or support, the tree.

breathing roots: Breathing roots grow upwards, out of the mud.

aerial roots: They look like ordinary roots but they hang down out of the branches.



With these three kinds of roots, the trees are able to get all the water and nutrients they need.

The trees that live in mangrove swamps also have special seeds. In some kinds of mangrove, the seed begins to germinate while it is still hanging on the parent tree, and develops a long spear-like root. When it falls off the tree it floats away, and eventually starts growing in a new place, putting down more roots into the soil under the water.

If you live near a mangrove swamp, you will be able to do these activities.

Activity 1

Take a pencil and paper with you. Go and find a mangrove tree. Look carefully at its roots. Can you find the three kinds we have been talking about?

Draw a picture of your mangrove tree.

Activity 2

Look for the mangrove seeds. Can you see any growing on the tree? Look carefully at them and draw a picture.

Can you see any floating in the water? Which way do they float? Draw another picture.

Can you see any seeds which are beginning to grow leaves? Where are they? Draw another picture.

What did you see?

Did you see a seed hanging down from a branch in the tree? How long was it?

Did you see a seed floating in the sea? Which way was it floating? Was it floating on its side on the surface of the water? That is how a branch floats, isn't it? Or was it floating vertically, with the top of the seed at the surface of the sea, and the rest of the seed hanging down? Why do you think it was floating this way?

What have you discovered?

The seeds of mangroves start growing when they are still on the tree. They then fall down into the sea and either start growing where they fall or float away to a new place. When they float they hang downwards. This makes it easy for them to start growing when they touch the soil under the water.

The coastal plain and secondary forest

The second main area into which we can divide our islands is the coastal plain. This is an area of usually gently sloping land which provides the most favourable place for people to live in. It is within reach of the sea, it has fertile soil washed down from the hills, the land is fairly flat and therefore suitable for gardens and plantations and the bush is not as thick as it is further up the hills. Because of this, the coastal plains of many of our islands are the areas which man has developed and in which he lives and works. It is here that most villages are to be found.

On some islands, such as Santo, Malakula and Efate, the coastal plain is wide and highly cultivated. On other islands, however, the coastal plain is very narrow and the areas of cultivation have to be up on the hills. Paama, Tongariki and parts of Pentecost are examples of this.

People have learnt how to control the vegetation on the coastal plain areas where they live. Around their villages people have cleared the bush leaving only the trees which will be useful to them.

The trees which they do not cut down will provide food, shade, attractive flowers and materials which will be useful to the community. These trees include some that are not native to Vanuatu, but have been brought here by people because they found they were useful or attractive for their way of life.

Sometimes after land has been cleared and used for gardens or as a plantation, it is no longer used but left to grow wild again. After some time, trees begin to grow on it. These trees, too, are often **introduced** trees. This means that they are not native trees of Vanuatu, that have been growing here for a very long time, but are trees that have more recently been brought into the country by its human inhabitants. They can often grow on poor soil that has been worn out by cultivation, where other kinds of trees cannot survive. Recently introduced trees include guava, kasis and castor oil. When land that was once cultivated has grown over with trees again, we call it secondary forest.

Here are some of the trees which are commonly found on the coastal plain and in secondary forests. If you live in this kind of area, you will be able to add the names of many other trees.

Breadfruit, Mango, Banyan, Canoe tree, Frangipani, Guava, Naus, Nangai, Kapok (Cotton tree), Natavoa, Pawpaw, Christmas Tree, Kasis.

Activity 1

You can do this activity if there are any pieces of ground near you, such as an old garden or a coconut plantation, that are no longer being used, or an area along a road that was once cleared and is now overgrown.

Work in groups. Your teacher will give each of you a different area to study. The areas will be about the same size. Count how many different kinds of trees, including young ones, you can find. How many are there of each kind? Are they native forest trees or are they introduced trees like kasis or guava? What other kinds of plants are growing in your area?

What did you find?

Did you find many new trees starting to grow? Were there many different kinds? Were they mostly introduced trees, or mostly native trees? Did you find any other introduced plants growing there as well?

What have you discovered?

When land has been cleared for growing things and then left alone again, plants will start to grow.

Usually these plants are ones that are adapted to grow on poor soils. They include “nail grass” and various introduced trees like kasis and guava. Often there are vines growing over them. It then becomes hard for other trees to grow.

When trees begin to grow in a cleared area, they are not the same kinds as those that grew in that area before the primary forest was cut down.

Activity 2

Divide into groups and each choose part of the village to work in.

If your school is not near a village, use the school area.

In your part of the village, look carefully at all the trees that are growing. Write down their names in four lists: fruit trees, trees with attractive flowers, shade trees, other trees that are not used by the people in the village.

What did you discover?

How many different kinds of trees did you find? Which was the longest of your four lists? Why do you think this was so?

Ask your teacher to help you find out which of the kinds of trees on your list are native to Vanuatu, and which are kinds of trees that have brought here from another country by people who liked them or found them useful. One way of finding out is to look at the name of the tree. If it has a name in your local language, it is likely to be native to Vanuatu.

The primary forest or bush

Primary forest is the original forest of Vanuatu, which existed before people began to live here. It is old forest and contains many interesting plants and animals. We find it in the parts of our islands over which people have, at present, little or no control. These are generally the central parts of our islands which have not been cultivated or settled.

Because the islands of Vanuatu are stretched out over a long distance, the climate varies between the islands and so do the kinds of trees that grow in the primary forest there. On Aneityum, for example, there are many areas of open bush and grasslands. In the Banks and Torres, the islands are almost completely covered with thick bush. As we travel through Vanuatu from Aneityum to the Torres Islands, we go northwards towards the equator. The temperature becomes higher and the amount of rainfall increases. The amount and type of natural vegetation also increases.

Some islands are very high. In the area of Santo around Mount Tabwemasana, for instance, and in the high centres of other islands like Malakula and Efate, you will find true rain forest. This area is usually covered with clouds and it rains most of the time. The trees here are tall and close together and form a “roof” over the forest.

In areas where there has been recent volcanic activity such as on Tanna, Ambrym and Gaua, the soil supports a more open type of growth than it does on Malakula, Pentecost or Santo. The man who lives in the Whitegrass area of Tanna or near the slopes of the Ambrym volcanoes knows a very different type of bush vegetation from the man who lives in Central Malakula or on the hills of Pentecost.

Here are some of the trees which grow in the primary forest. Some of the trees that are found in the coastal areas also grow in the primary forest. Depending on what kind of primary forest you have on your island, you will be able to add some more names to the list.

Softwood, Blue water tree, Black palm, Java olive (Skunk tree), Blood tree.

Activity

If your school is near an area of primary forest, you are lucky. You will be able to go and look at it for yourself. If not, your teacher will invite someone from your community to come and talk about what it is like in the parts of forest on your island that have been there a long time. If the visit is arranged in good time, this person could bring some examples of fruit from the bush for you to see.

The kind of vegetation, including the trees, in an area is controlled by three factors, the type of soil, the amount of rainfall and the height above sea level (and therefore the temperature). These three factors together decide what kinds of trees are to be found.

Concluding activity

Work in groups to draw a sketch map of your island. Put in the names of the villages. Your teacher will help you. If your island is a very big one, draw a map of just the area round you, going up to the highest part nearby. Mark in the where the villages are. This will help you do the next part of the activity.

Mark on the map the different areas that we have learnt about. Colour the seashore and coastal area yellow, colour the coastal plain and secondary forest red, colour the primary forest green. If you have any mangrove swamps round your coast, mark them blue.

If you come from a small island, maybe your teacher will be able to take you out one day so that you can see the different areas for yourself.

What did you discover?

The kind of vegetation, including the trees, in an area is controlled by three factors, the type of soil, the amount of rainfall and the height above sea level (and therefore the temperature). These three factors together decide what kinds of trees are to be found.

What is the biggest area of ground on your island - the seashore and coastal area, the coastal plain and secondary forest or the primary forest? Why do you think that is?

Chapter 5

The community of a tree

As we saw in the last chapter, trees, like all living things, are affected by their environment and are adapted to living in it. Trees develop differently to suit the particular kind of place they live in.

But they also have an effect on, and are affected by, the plants and animals that grow and live around them. So far, we have studied the tree in isolation. Now we look at its relationship with the plants and animals around it as part of a “community”.

The children themselves will make a study of a nearby tree and record all that they find out. They can draw pictures and write to make a record of their project. They can collect anything they want to as well. They will be able to include some creative writing and artwork. Can they make a folder each in an art lesson to keep their work tidy? The children will need to use at least a week’s lessons to complete their project.

You will probably have to decide yourself whether the children work singly, in pairs or in larger groups. This will depend on the trees that are around you.

Main activity: a tree study

You are going to “adopt” a tree and study all the living things that live in it, on it or under it, or that visit and use it. You may do this with a friend or in a group. If you are working with friends, share out the different activities between you.

Your tree

First, choose your tree. Choose a big, old one that you think will be interesting. Try and find out from people in your community how long the tree has been there. Can anyone remember a time before it was there? Work out how old it might be - older than you, over 20 years, over 50 years, over 100 years?

Write the name of your tree and where it is growing.

Here the children can say if their tree is growing on flat ground or on sloping ground, if it is near the sea or a river or far away from water, if it is by itself or with a lot of other trees, if it is in a garden or by the houses in the village or the school area.

Now, describe your tree, its shape, its trunk and bark, its branches, its leaves, flowers and fruit. You can do this by

drawing or writing, or both. Keep a small piece of bark and a seed if you want to. Your teacher can show you how to press a leaf or a flower between two pieces of paper under a heavy weight until it dries.

This will be useful revision work for the children. Remind them of their work on the different parts of the tree.

Your tree's plants

Can you see the ground under the tree? Is the soil wet or is it dry and dusty? Does it have any dead leaves or flowers covering it? Does anything grow under your tree?

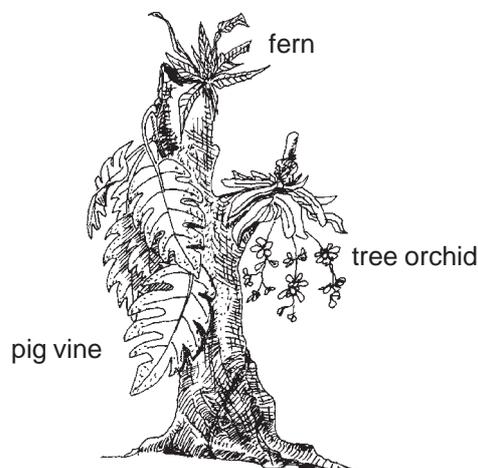
Record what you find.

The children will study the plants that grow under their tree. Some trees have nothing growing in the shade on the ground under them. Is this because the tree drops its leaves often and the air and light cannot get to the ground? Is it because animals and people use the area? Encourage the children to think about this. Then they can record what they find. If they do not know the name of any plant growing underneath their tree, do not worry. They can draw a picture of it instead.

Now look up into your tree. Can you find any plants growing in the tree? Are there any plants where the branches join the trunk? Are there any plants with roots in the ground that climb up high into your tree?

Record what you find.

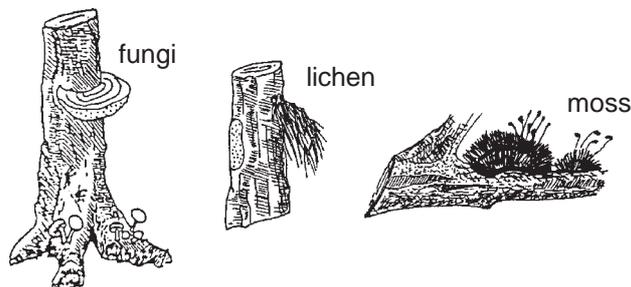
On some trees we may find orchids with beautiful flowers. On others we may find ferns. There are several kinds that grow in trees. We may find vines climbing up the tree. We may find a young banyan.



There are also other kinds of plants that the children may not notice. There may be **moss** growing on the tree. Moss is a special kind of plant that grows in a clump or cushion. It has tiny green pointed leaves on a creeping or upright stem. It produces capsules on little stalks. Inside the capsules are spores, which are dispersed by the wind to grow into a new plant. Mosses like damp places.

They may find **lichen**. This is another kind of plant that does not have flowers. Lichens grow very, very slowly, not like other plants. They are the first plants to grow on walls or tree trunks and can live with very little food or water. Some grow flat and close to the surface of the tree, some have parts that stick out from the surface like scales or branches. Lichens are all different colours. You may find greyish or orange ones and other colours too. Which side of the trunk do they grow on best - the side that gets most sun or the side that gets least sun?

The children may find **fungus** too, either under the tree growing on the ground amongst dead leaves, or growing in the tree itself. How many kinds can the children find?



Your tree's animals

Go to your tree. Stand under it and stay there very quietly for five minutes. Can you hear anything?

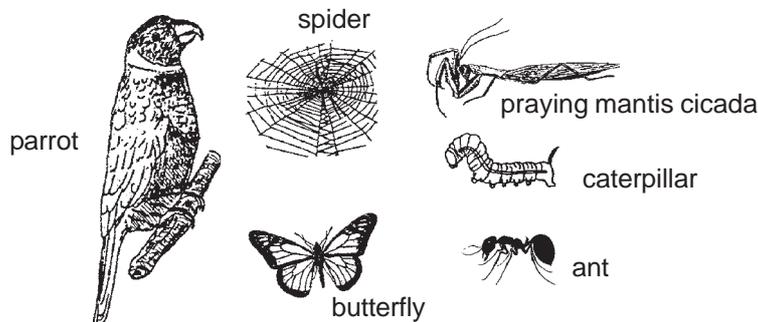
Write down what you heard.

Did the children hear any animal noises? (By animals, we mean birds, reptiles, insects or mammals.) This will give them some idea what animals live in their tree.

Now look carefully. What animals can you see in your tree?

Draw the animals you found, and write their names if you know them. Write down where they were and what they were doing. Were they drinking nectar in a flower? Were they eating the fruit? Where they resting on a branch? Were they running up the trunk?

Here are some of the kinds of animals the children might see.

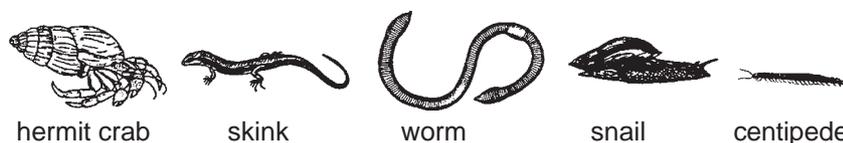


Sometimes we do not see all the animals in our tree the first time we look. Look again. Can you see any signs that animals are sometimes there? Are there any folded-over leaves with insect eggs or pupae inside? Are there any leaves which caterpillars or other insects have been eating? Are there any bird's nests? Is there any fruit with holes in? Can you guess which animals have visited your tree that you cannot see now? Write them down. Some of these animals are only seen at night.

Here are some other animals that may visit the tree when the children are not there.



Now look at the ground under your tree. Are there any animals among the leaves or the plants under it? Are there any holes under the tree? What do you think made them? Record what you find.



You have recorded all the life that goes on in and under your tree. All these plants and animals need your tree to help them stay alive.

Now complete your project by doing some special written work or drawing. Can you write a poem or story about your tree? Can you make a special picture of life in your tree? Call it "My tree is a home".

Chapter 6

People and trees

The traditional uses of trees

Have you ever thought how much we depend on plants for our daily food and clothing? It is interesting to make a list of things we eat, drink and wear, and then see how many of them come from plants. We need to remember too that, although we get meat or eggs from animals or birds, these creatures themselves live on plants.

Long ago early men learnt to use different parts of the wild plants which they found growing around them. They tasted fruits, seeds and roots and liked them. Once they had discovered how to make fire from the wood of the trees, they began to prepare and cook their food in different ways. Then later came the great discovery of cultivation. Men learnt how to grow the plants they wanted, instead of spending time looking for the wild ones.

Many of the plants and trees which are now growing in Vanuatu did not always grow here. Some were brought here by the people who first settled the Pacific islands long, long ago. They came with taro and yams, they brought coconuts and breadfruit and grew them here.

Much later, other travellers and traders brought new plants with them from other countries, and people here have learnt to make use of these too for food and other purposes.

We use the trees growing around us for shelter in bad weather and for shade from the sun. Our cattle and other animals use them for the same purposes. We plant them as living fence posts. We grow them as wind breaks.

We use them too as part of our traditional practices and in custom ceremonies. How many trees do the children know that have some significance in custom?

Everywhere the namele has a special importance. Small trees too, like cordyline (nakaria) and codiaeum (croton) are planted on nasara or graves and are used as boundary markers. The leaves of these and other trees are used as personal decoration for dances and ceremonies too.

We also use the different parts of trees for a variety of purposes. Let us look more closely at the ways in which people use them.

Roots

We grow some plants because their roots are good to eat. If we did not eat their roots they would grow up into trees. Can you think of any examples? Manioc is one. If we let it go on growing, it would turn into a tree.

We also use roots to make things. We can make bows from the roots of the blood tree, because they bend easily. We can use the roots of the banyan to make ropes. We can use young mangrove roots for medicine. We can use morinda roots to give us yellow dye or colouring.

The wood (trunks and branches)

The wood of trees was one of the first materials used by people to make things with and it has remained an important material to this day.

A very long time ago, men discovered how to make fire from wood by rubbing two dry sticks together. They also made wood into weapons to protect themselves from wild animals and to use for hunting. Later they learnt to make shelters and more permanent houses from it. They hollowed out logs to make canoes. Since then wood has been the most important material used in Vanuatu, for making many of the things we need.

We must not forget that two of the most important things in the classroom are made from trees too. We do not make them here; they are made overseas. What do the children use to write or draw with? What do they write or draw on? Paper and the outside of pencils are both usually made from wood.

Activity

When you go home tonight, look carefully and then write a list of all the things you can see in your house that are made of wood. How many of them were made here?

Bark

The bark of certain trees is of great importance. Traditionally, we use bark for many things. We use it for making baskets and rope. We use the inner bark of the burao to make grass skirts. We use some kinds for medicine. We burn dead bark. It is often good for starting fires. We even give some kinds of bark to animals to eat.

We also use the sticky substance called resin that comes out of the bark of certain trees. Before we had kerosene or candles, people used the resin from the kauri and the nangai trees to burn for light. Now we use them as a waterproof filling for cracks in our canoes.

Leaves

Let us look at the many uses of leaves. We weave baskets and mats with them. We make grass skirts from them. We thatch our houses with them. We use them as fans, as umbrellas, as decorations. We put them over our sores as bandages. We eat some leaves, we cover our food with others. We make dyes or paints from some of them. We make medicine from many different kinds of leaves. This is why we sometimes call traditional medicine “leaf medicine”.

Flowers

In our country there are many different and beautiful flowers that grow on trees, some of them with lovely scents. We use flowers for decorations at feasts, weddings and welcome or farewell ceremonies. We decorate our houses with them, to make them look and smell attractive. We use them to scent coconut oil for our skin and hair.

We use some flowers as medicine. An example is the flower of the fish poison tree which some people use as a treatment for fish poisoning.

We also use flowers to say something without words. In parts of South Santo, for example, if a person wears a hibiscus flower to another village, people know straight away that a person has been killed in his village. The red hibiscus flower stands for blood.

Activity 1

Find out if there are any tree flowers that have special meanings in your area.

Activity 2

Next time you have an important visitor to your school, make a special “lei” for him or her.

Fruit and seeds

We use fruits and seeds for many things, apart from eating. We use the fruit of the fish poison tree to stun fish so that we can catch them easily. We use the juice of some kinds of fruit as glue.

Can you think of any seeds that we make into things? We use them for necklaces and for anklets for dancing. Scouts use the nuts from the namele to make their woggles (scarf rings). We can carve coconut shells into all sorts of different things.

Activity

What can you carve out of a coconut shell? Have a competition and see how many different things your class can make.

Main activity

You will need a special place in the classroom for your experiments and observations about trees. The best way to meet this need is to build an “experiment house” in one of the corners of the classroom. You can make it entirely with our local materials - which are, of course, the various parts of the trees that we have studied in this book. When the house has been made, you can keep it to use for other work that you do in science lessons.

Things you may need to build the house

Trunk kasis or young burao or similar, for the posts.

Leaves coconut or other suitable leaves, for the thatch.

Bark the inside part of the burao bark, for ropes to tie the posts and roof together.

Seeds Christmas tree or any other seeds that are suitable can be used to write the name “Experiment House” as collage work. The seeds can be pasted onto the bark of a tree which then can be hung at the entrance to the experiment room.

Fruit Glue tree fruit, for gluing the seeds used in the collage work.

Flowers for decorations inside the experiment room.

Roots as ropes for tying the posts together.

This will be an activity in which the whole class participates. The children can be divided into groups to make different parts of the house.

Some children will think it is a waste of time. A boy may say, “When I leave school I shall never build a house made of local materials, or live in one.”

Then he goes off and lives in such a house, and before long the joints of the door frame come away. His resolution is broken, and he picks up a hammer and some nails and starts fixing the joints. This is not really the way to repair a house built of local materials.

Eventually he gets married and he has to build his own house. He goes out into the bush to find some local materials to use. With the background knowledge from his school days he will be able to

construct the house himself. The student who has never had the lesson of building the experiment room will have to seek help.

Learning how to use local materials is a vital part of our children's education. It is important for all children aged 10 to 12 to have the opportunity to build an "Experiment Room", so as to give them a good foundation for the future.

Commercial uses of trees

As well as making use of trees ourselves in our own villages and gardens, we also use them commercially. Here are some of the ways in which we use trees to make money for ourselves to buy the things we need.

Timber

Ever since white men first came to our country, we have sold the wood of our trees as timber. Early traders came here and cut sandalwood and kauri, which they sent overseas. Sandalwood was sold to China, where it was used to make sweet-smelling boxes and to burn as incense. Kauri was valued for its high quality timber.

Nowadays, timber is sold for local use too. As the towns of our country grow, and wooden planks are needed for constructing houses and making furniture; and as more people in villages want to build permanent houses and buy furniture made from prepared timber, there is a greater demand from builders and carpenters in Vanuatu for good quality timber.

If you live in Vila or Luganville, you will have seen the huge lorries carrying tree trunks to the town or to the wharf, and the timber yards where tree trunks are cut into planks for local carpenters and builders to buy. In rural areas, people use portable sawmills to cut up tree trunks ready for carpenters to use.

As well as using timber locally, we continue to sell it overseas. Kauri and sandalwood are felled mainly for export by licence. Other trees whose timber is used locally and also exported include whitewood, nabangura (tamanu), milk tree, black bean tree, natora, natavoa, nakatambol, nakavika, stinkwood and blue water tree. These trees are not grown specially for logging. They are cut down where they are found in the forest. In the next chapter, we will look at some of the effects of cutting down more and more of our trees to sell locally or overseas.

Possible activities

If your school is in Santo or Luganville, ask your teacher to arrange for you to visit a timber yard and see how logs are cut into planks and the timber prepared for sale to carpenters and builders.

If your school is in a rural area and there is someone who operates a portable sawmill nearby, arrange to visit him.

Visit a local carpenter. Find out what he makes and where he gets his wood from. What kinds does he use? What does he make with them? Maybe you have a secondary school or a rural training centre near your school. Do the students there learn carpentry?

If there is logging going on in your area, this is another place you could visit. We will talk more about logging in the next chapter.

What did you find out?

Draw some pictures that show what you learnt from your visit.

Fruit

We do not sell just the timber from our trees. We use the fruit too as a way of making money. The most important fruit is, of course, the coconut, from which we dry the white meat to sell as copra. Most of our copra is sold overseas, but some is used locally to make products like soap and body oil. There are several local companies making things from copra and a big new mill is being built in Santo.

We also grow other trees in plantations especially to export their fruit. The most important ones are coffee and cacao. The fruit of the coffee tree, called beans, is dried and then exported or sold locally, either as whole beans or ground into powder. The coffee produced on Tanna is very popular with tourists. There is a big plantation of cacao at Metenesel on Malakula. The cocoa beans are dried and sold overseas to make chocolate, cocoa powder and other products.

We are lucky in Vanuatu because we have so many trees that bear delicious fruits or nuts that we can eat. Sometimes we have more fruit than we can eat, so we sell it to other people. The markets in Vila and Luganville are very big. People living in towns who have no gardens cannot grow their own fruit, so they have to buy it from people in the rural areas around the towns. Now, even in the islands, there are small markets, especially at festival times like Christmas. People can earn a small amount of money by selling fruit from their gardens to pay for the things they cannot make themselves, such as soap and kerosene, and to help with school fees.

We can do other things with fruit and nuts, as well as eating them raw or selling them. We can use them in our cooking. Have you ever cooked pawpaw with your fish or meat? It tastes very nice. We can also make jam from fruit.

In Vila a local businessman makes over 75 different products from local fruit and nuts. This brings money to many people from different islands, who collect and send the fruit to him. His products include jams, lollies, salted nuts and fruit, crystallised fruit (preserved in sugar), fruit in syrup (fruit salad), dried fruit, pickles and chutneys to eat with meat or fish, and many other kinds of preserved fruit and nuts.

To **preserve** means to treat something to prevent it going bad. Raw fruit and other agricultural products, which do not last long once they have been picked, can be kept a long time when they have been cooked, dried or treated in some other way. Other people are now beginning to make and sell similar products.

Activity

All you need to make jam is fruit (not too ripe), lemon juice, sugar and sometimes water. The lemon juice is important, as it helps the jam to “set” (become firm, not runny). Here are two recipes for you to try. Make some jam with your teacher and sell it to raise money for your class.

Pawpaw jam

You will need:

ripe pawpaws

lemons or limes

14 cups of sugar

- *Peel and cut up enough pawpaw to make 14 cups of fruit.*
- *Cut some lemons in half, and squeeze enough to make 2 cups of juice.*
- *Put the pawpaw and juice in a big pot with 14 cups of sugar.*
- *Put the pot on the fire. Bring the mixture to the boil, stirring it continuously.*
- *Continue boiling it for about 15 or 20 minutes, stirring it frequently.*
- *To test whether the jam is ready, put a spoonful on a plate. Allow it to go slightly cool, then push the skin on the top of it sideways with your finger. If it wrinkles, the jam is cooked.*
- *Take the pot off the fire, and pour the jam into warmed jars.*

(What do you think will happen if you do not warm the jars first?) If you have no empty jars, use cups or drinking glasses.

- *Cover the jars. If they have lids that screw on, wait until the jam is cold, before you screw them on tightly. If you have no lids, cut a piece of paper or cloth a little bigger than the top, and fix it into place with string or tape.*

You can try this recipe with guavas or mangoes instead of pawpaw. If you use any of these fruit instead of pawpaw, you will need to add enough water to cover the fruit before cooking it.

Banana jam

You will need:

24 large lemons

Sugar

24 small (lady's fingers) bananas

2 cups of water

- *Cut all the lemons in half and squeeze out the juice into a big pot or dish. Make sure that the lemon pips (seeds) do not go in as well.*
- *Add two cups of water to the lemon juice.*

Peel the bananas and cut them into small pieces. Add them to the lemon juice and water mixture.

- *Measure the mixture of lemon juice, water and bananas, using a cup or a small bowl. Add an equal amount of sugar. (For example, if you have filled the cup ten times with the fruit mixture, you must add ten cups of sugar to it.)*
- *Put all the mixture into a pan over the fire. Heat the mixture, stirring it continuously.*

When it has come to the boil, go on boiling it briskly until it turns a good red colour.

- *The jam is now cooked. Put it into jars and cover it.*

Take some breakfast crackers, cabin biscuits or slices of bread. Spread them with some butter or margarine if you have any. Then put some of your jam on top. Enjoy the taste of something you have made yourself!

Chapter 7

Caring for our trees

Why are trees important?

In the last chapter we looked at some of the ways that we people use trees, both for ourselves in our villages and as ways of making money. There are other ways, too, that trees are important to us, and we discover this only when we cut down too many of them.

If we had no trees, what would happen?

Trees are important for the land.

They stop the soil from being washed away. The roots of the trees hold it in place. What happens if we clear some ground on a hillside to keep cattle, and do not leave any of the trees there?

What happens if we cut down the trees along the banks of a river?

What happens if we cut down the trees that grow along the coast?

When it rains, the top soil is washed away, there is no good ground left to grow things, there are no trees nothing to protect us from cyclones.

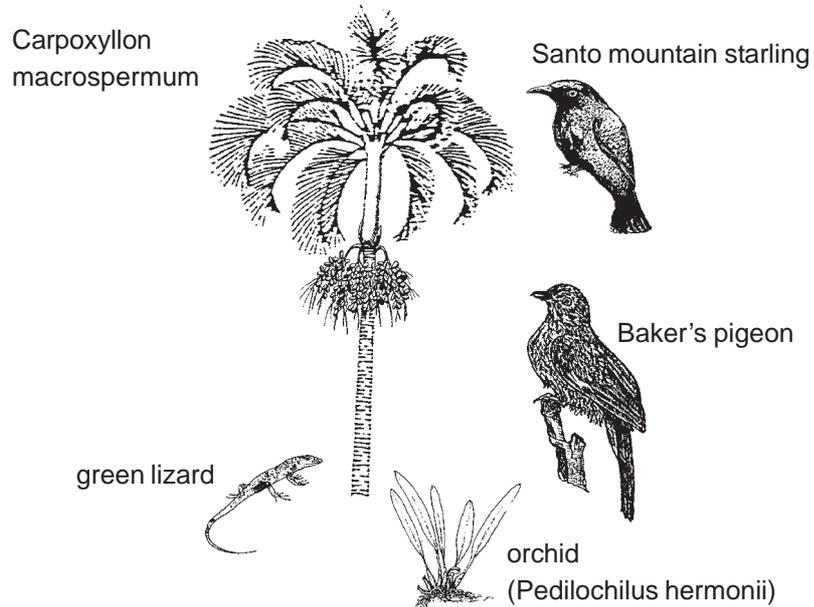
Do you know of anything like this happening near where you live?

Trees are important for the plants and animals that live in or around them.

What plants, mammals, birds, reptiles and insects live in our forests? What did you discover when you studied your tree? Living things need trees for food and shelter and as a place to have their young. If we cut down the trees where they live, they will die. Even the fish and sea creatures will suffer, if we cut down the trees in the mangrove swamps.

In some parts of our forests, especially in primary forest, we can find trees and other plants and animals that belong specially to Vanuatu. We cannot find them anywhere else. We call them **endemic**. If we cut down the endemic trees, we will lose them from our world for ever. If we cut down the forests where endemic plants and animals live, we will lose those plants and animals too for ever.

Here are pictures of some of our endemic plants and animals.



The Santo Mountain Starling is the rarest bird in Vanuatu. It is found only in the high mountains of Santo. The Carpoxyllon macrospermum is an endemic palm tree that has recently been re-discovered. You can read the interesting story about it in the appendix at the back of the book.

We have many other plants and animals in Vanuatu that are interesting and unusual. Even if they are found in other countries as well, it is important that they go on living here.

Trees are important for all living creatures.

Do you remember studying how trees feed, in Chapter 3? We learnt that during photosynthesis the trees give out extra oxygen into the air. All animals need oxygen to breathe. If there is not enough oxygen in the air, they will die. They need the plants to provide the oxygen that they need to stay alive.

In another way too, plants keep other living things alive. Animals eat plants, or they eat other animals that have eaten plants. If there are no plants to eat, they will die.

So, if there are no plants, there can be no animals and no people, for people are animals too.

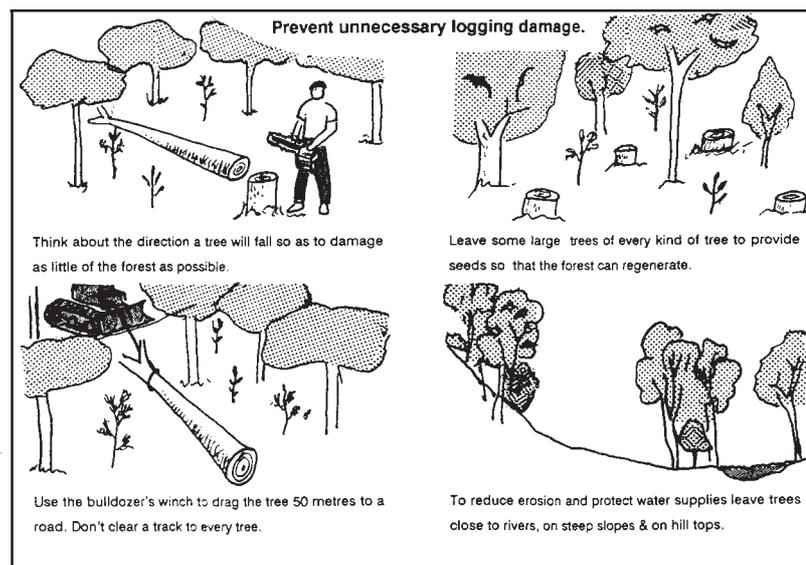
Looking after our trees

All over the world, people are beginning to be concerned about our earth. The leaders of the countries of the world have held two Earth Summits to discuss the problems that we are making for ourselves by not looking after our natural environment.

Year by year, there are more people, who need more food, more houses and more land to go on living. In many countries, especially tropical countries, more and more trees are cut down. They are cut down to make room for people to live and plant their gardens. They are cut down so that people can use the timber for houses and furniture and all the other things they need. These are not trees that people have planted specially to use or sell. They are trees that have grown up naturally in the primary forests where they belong. Now people have realised that we cannot go on cutting down our forests for ever without preparing for the future.

In Vanuatu, the government has prepared a National Conservation Strategy. This helps us look after our environment properly. It shows us that there are ways in which we can go on using our trees and all the living things around us, without destroying them for ever. If we act wisely, we can take all the things we need from our land and still leave enough for the people who will live here after us. This is what **conservation** means.

Here is part of the National Conservation Strategy. It shows us how to take care when we are **logging**, or cutting down trees.



In the old days, people had their own rules about looking after the environment. Chiefs used custom laws to protect plants or animals, so that they went on reproducing and did not die out.

Activity

Ask your chief to talk to you about the environment. How did they look after the trees in the old days? How did they decide which trees to cut down and which to leave if they were building new houses or canoes?

In some parts of Vanuatu, people are looking carefully into ways in which they can use their forests so that they can continue to live in their traditional style and also bring in income for the family, without having to cut down their trees.

At Big Bay on Santo, the villagers of Matantas and Sara have come together to form a conservation area. They are continuing to use the forest as they have always done for the things they need for their daily lives. They go on using it for firewood and for materials for houses, canoes, fences, glues and ropes. They continue to collect wild fruits and nuts, forest birds and flying foxes for food. They go on using plants to make medicine. They continue using the area for their gardens too.

In addition, the people are working together to make better use of the land for these traditional purposes. They are experimenting with new ways of gardening that mean they will not need to clear land for new gardens so often. They will be able to use the same land year after year. They will not need to cut down trees to clear new areas of the forest for gardens.

The people of the Big Bay area, like everyone else in Vanuatu, must earn money to buy some of the things they need in their lives. They have decided not to do this by logging. They are not going to cut down large numbers of trees and sell them for cash. Instead, they are finding ways in which they can go on using the products of their forest to earn a regular income.

Instead of earning a large sum of money once from their logged trees, and then not being able to earn any more, because their trees are gone, they are earning smaller sums of money continuously, by selling the fruit and nuts that they gather each year.

They are also encouraging tourists who are interested in the natural environment to visit their villages and enjoy their unspoilt forest. Tourists can be guided on walks through the forest and can see a number of interesting creatures, including megapode birds, flying foxes and coconut crabs, as well as appreciating the varieties of native trees that grow there. This too will bring a regular income without doing any harm to the forest and its trees.

*The people of Matantas and Sara villages are practising what we call **sustainable development**. If you are interested, there is a video cassette about the Big Bay project which you may borrow from the Environment Unit in Vila.*

What can our children do to protect our trees?

There is not much our children can do about the big question of logging. This is for the leaders of our country and of individual communities to decide. But there are some ways in which they can help, to make sure that we have enough trees for the future.

Make sure that your children understand that trees can be easily damaged. Encourage them not to cut their names in the bark or destroy young trees by slashing at them with bush knives when they are walking along. Do not let them cause damage to trees by breaking branches to get at the fruit. Help them to clear up any rubbish that they find under or in trees, especially plastic bags, which can stop the air from getting at parts of the young trees, or old batteries, which can poison them. Do not let them damage trees by lighting fires under them.

Finally, arrange a special tree celebration time when you have completed this book.

Final Activity

When we cut down a tree, or a tree comes down in a cyclone, we must make sure that another one is growing to take its place. On Environment Day we are encouraged to plant a tree, but we can plant new trees at other times too.

Can you plant a tree or some trees in your school area as a celebration, now that you have finished your work about trees? Some of the best kinds to plant are those that belong to Vanuatu and grow well in the area in which you live. Talk with your teacher and head teacher about what would be a good tree to plant and where you can get it from.

Then plan a special ceremony for the planting. Can you display your work on trees for other classes to see? Can you read out your story or poem? Can you serve refreshments made with tree products? Use some of the ideas in this book to help you.

Do not forget that you have just started something when you plant a tree. You must take care of the tree afterwards too.

Appendix A

Descriptions of some common trees

Avocado (Butterfruit)

Origin

The avocado is believed to have originated in Central America. It was brought to Vanuatu by the early explorers. There are 10 species which are found in tropical America.

Habitat

The avocado tree grows best in the lowlands of the tropics and subtropical countries. It can be grown on a wide range of soil types but cannot grow where the soil is too damp.

Description

The tree is evergreen and reaches a height of up to 20 metres. The roots are shallow and hair roots are invisible. The fruit has a large seed inside. It is enclosed in an edible part which varies from yellow to yellowish green in colour. Under normal conditions the seeds will germinate 2 to 3 weeks after removal from the fruit but they can be stored for longer periods in dry heat. Seedlings begin to bear fruit after 5 to 6 years.



Uses

The fruit is eaten when ripe. It can also be used in salads and other dishes. Avocado oil is used in cosmetics for men and women.

Banyan

Origin

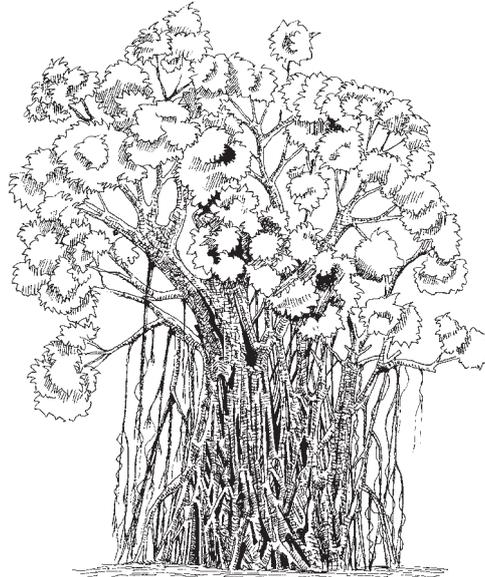
The banyan originated in India and the nearby lands of South-East Asia.

Habitat

Banyan trees are common in coastal plain areas and middle altitude forest, including secondary forest.

Description

The banyan tree grows on one main trunk and as it grows up it sends down great new roots called aerial roots and develops new trunks. It grows to a height of over 60 metres and can live for many years. It is one of the biggest trees in the world. A single tree may develop thousands of trunks and spread over several metres. The original trunk may decay leaving the younger ones to support the tree. It has props or buttresses to help support it. The wood is light and full of pores.



It has heart-shaped leaves and small blossoms that are followed by cherry-like fruit. The small red fruit are eaten by many kinds of animals and birds that spread the seeds. The seeds that become lodged in other trees soon sprout and send several roots to the ground. In the end the host tree is killed, while the banyan remains.

Uses

In Vanuatu, people use the roots from the branches for making houses, generally the roof beam, and the young shoots for ropes. The wood is used for firewood. The tree makes large areas of shade for meetings and rest areas.

Black palm

Another name for **Tree Fern**.

Blood tree

Origin

The blood tree is native to Vanuatu.

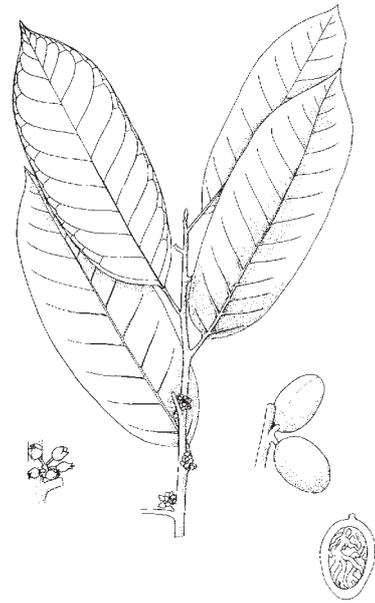
Habitat

This tree is most common in secondary and lowland forests, but is also found under the shade of bigger trees in small gaps in primary forests.

Description

The blood tree is of medium height, with a long thin trunk and noticeable flying buttresses and stilt roots. The wood is hard. When the tree is cut a light red liquid looking like blood slowly flows out from the thick, dark brown bark.

The long leaves are dark green and shiny above, light green with orange-brown scales below. The small flowers grow in clusters. They are light yellowish- or greenish-brown in colour and do not have petals. The fruit is ovoid with a fleshy covering. This splits when ripe to release a dark brown seed covered in a net of bright red fibres.



Uses

The wood is used for fuel. On some islands it is also used for making shelters, but not normally permanent houses, as it is soft and easily attacked by insects. The roots are used for making bows and coat hangers. Young roots are also used in custom medicine.

Blue water tree (Rosewood)

Origin

The blue water tree is native to Vanuatu.

Habitat

Blue water trees grow in primary forest, but are also very common in areas of secondary forest.

Description

The tree reaches a height of about 30 metres. It has steep, straight, thin buttresses. Its branches cover a large area and the smaller branches and twigs are slightly drooping. The light brown bark peels into small thin scales.

This deciduous tree has compound leaves. The leaflets are bright, light green in colour and rounded, with a prominent short tip. The beautiful long inflorescences are bright yellow, with a strong sweet smell. The flowers soon fall. The fruits appear as clusters of thin papery winged pods, each with several seeds. They are dispersed by the wind and water in streams and rivers.

There are two layers of the woody part of the tree, the younger outer one is white and the hard inner part is dark red in colour. The tree gets its name from the blue colour that stains the water when the heartwood or the bark is soaked.



Uses

The heartwood is long-lasting and is often used for making canoes. The buttresses are carved into furniture and dishes.

Breadfruit

Origin

The breadfruit tree is believed to have originated in the Polynesian islands. It was brought to other islands of the Pacific by early travellers.

There are quite a number of species of breadfruit in Vanuatu, for example, in North Ambrym there are over 20 species, and in the Banks Islands about 60.

Habitat

Breadfruit trees are found in most settlements.

Description

The trees can grow to a height of 20 metres and are always evergreen in Vanuatu. The lobed leaves are spirally arranged. They are stiff, dark green and shiny above and pale green and rough below. Some species of breadfruit have round fruits while others have oblong fruits. The fruit forms from a large central core surrounded by numerous flowers. When the fruit develops, in the place of each flower is a segment which, when ripe, form a moist pulp which is pale yellow or whitish in colour.



Some kinds of breadfruit have many seeds, while others have only a few. The trees grow fairly rapidly and begin to bear fruit at the age of 3 to 6 years. The fruit is ready to be harvested 60 to 90 days after the flowers have fallen. Mature trees will produce up to 800 fruit in one year.

Uses

Breadfruit is an important staple food. It can be boiled, roasted, baked, fried or made into soup or stew with meat and vegetables. The seeds can also be eaten.

The wood can be used for many purposes, including food dishes, canoes and house posts. On Ambrym, large gongs are cut from the trunks.

The young leaves can be eaten and also used for baking food. On Ambae, the leaves are burnt and the ash used as manure for yam planting. The latex collected from the bark can be used as chewing gum and traps for birds.

Burao (Cotton Tree)

Origin

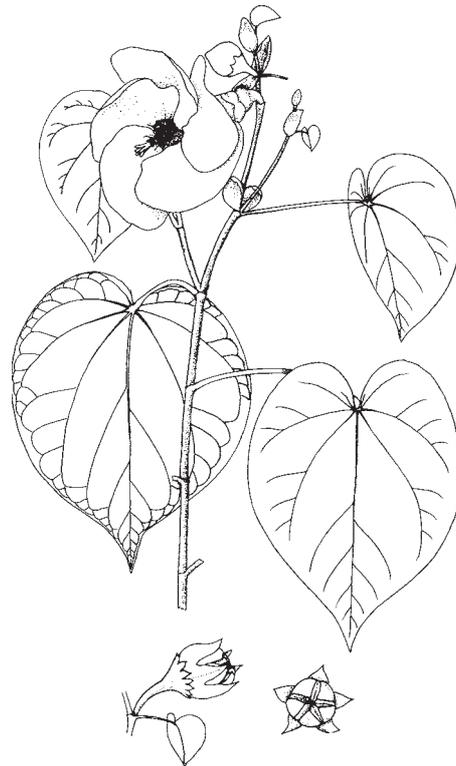
This tree grows throughout the Pacific and tropical parts of Asia.

Habitat

Burao is very common on the coast, on the coastal plains and in secondary forest.

Description

Burao trees are of a medium size, reaching up to 15 metres in height. The trunks and branches are often scrambling and the trees frequently form dense thickets, particularly near the coast. The leaves are big and heart-shaped. The large flowers grow in small clusters and usually drop after a day. They are yellow with dark red centres, but turn a pinkish colour before the petals drop. The fruit dries and splits open to release the seeds.



Uses

The trunks are used for fences and posts. The bark is used for making grass skirts and for general use as ropes.

Butterfruit

Another name for **Avocado**.

Cacao

Origin

The cacao grew originally in Central and South America, where it was cultivated by the Indians for many centuries before the European voyages of exploration. The dried beans of cocoa were used as a form of money, and in Mexico cocoa was a national drink at the time of the Spanish discovery in the sixteenth century. It is from the Mexican language that the words “cacao”, “cocoa” and “chocolate” were taken.

From South America, cocoa seeds were taken to Africa. The first plantations were in Ghana which now produces half the world’s cocoa. It is now grown in Vanuatu and other Pacific countries as a cash crop.

Habitat

Cacao trees are grown in plantations or gardens as a cash crop.

Description

These small trees range from 5 metres to 10 metres in height. Those grown in plantations are protected from the wind and sun by taller trees. The flowers and fruit appear in areas known as flowering pads or cushions on the trunk and branches. The ridged fruit is oval and ranges from 15cms to 25cms in length. When ripe it is either yellow or red. Each fruit contains as many as 25 to 40 seeds.



Uses

The seeds are either sun-dried or dried in cocoa dryers and exported to other countries. There they are made into chocolate or cocoa powder, or other cocoa products.

Canoe tree

Origin

The canoe tree belongs to a small tropical family of trees, shrubs and creepers.

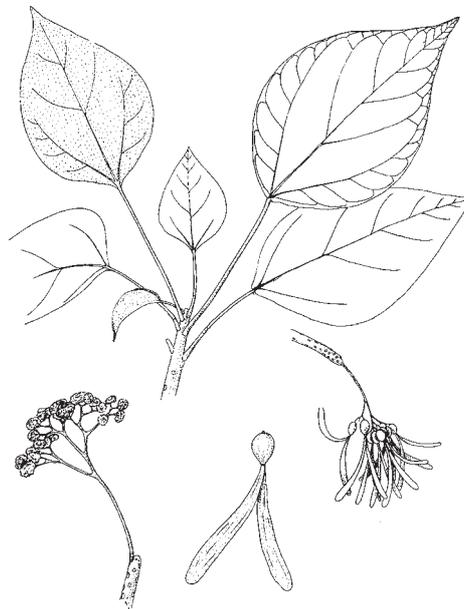
Habitat

The tree is common and widespread on the coastal plains.

Description

Canoe trees are noticeable for their pale, rather naked looking appearance, with only two or three heavy branches and small crowns. In older trees, the trunk develops a very large base with lumpy growths on the bole.

The leaves are simple and arranged spirally on thick twigs. The tree is deciduous, and the large heart-shaped leaves turn black and fall in about April. New leaves are produced after the fruit has formed in June or July. The flowers are arranged in dense heads and are creamy white and very small. The fruit are round, with two long narrow wings. They hang in dense clusters before falling with a twisting motion.



Uses

The wood is soft and resistant to insects. It is a useful general-purpose timber. As its name indicates, it is often used for making canoes.

Carpoxylon macrospermum

Origin

This palm tree is endemic to Vanuatu. This means that it does not grow anywhere else in the world except here.

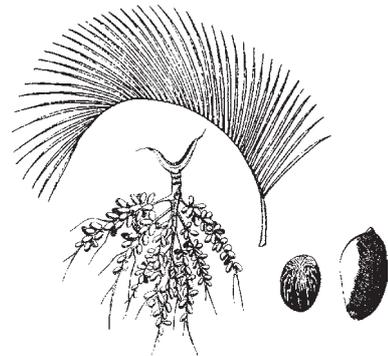
It was first described by a scientist in 1875, from fruit collected in 1853 and 1859 when it was discovered growing on Aneityum. Then people believed that it had died out, or become **extinct**. However, when a scientist was preparing to write a book about the palms of the South West Pacific in 1987, he found that the Carpoxylon was still growing on several islands. Seeds are now being collected and grown in a special project undertaken by the Foundation of the Peoples of the South Pacific (FSP), to make sure that the palm does not die out. Some of them have been planted in Vila along the road to the airport.

Habitat

The Carpoxylon was originally identified in high locations, but now grows mainly at sea-level in exposed areas, often near rivers. It is found growing and reproducing naturally on Tanna, Aneityum, Malakula, Santo and other islands.

Description

The palm is tall, reaching about 18 metres in height. The trunk is thin, with a thickened base, and is often covered with lichen. There are about twelve leaves, which grow upwards and are noticeably arched. The leaflets too are unusual as they arch upwards from the mid-rib. The inflorescences grow erectly from the stem and are branching. The fruit are elongated, about 6 cm long. They taper towards the base and are bright red when ripe. The seed case inside the fruit is ridged and bony.



Uses

The fruit is jelly-like, as in green coconuts, and is eaten. The germinating seed, which is similar to the navara of the coconut, is also eaten. The strong leaf sheathes are used as baby baths, food dishes and mats. The mid-ribs of the leaflets are used to make brooms. The leaves are used as thatch. The trunk is used for house-building.

Casuarina (Sea Oak)

Origin

The casuarina belongs to a family of tropical trees and shrubs growing from South-East Asia to Polynesia, but particularly in Australia.

Habitat

Casuarinas are usually found in sandy or rocky areas on the coast.

Description

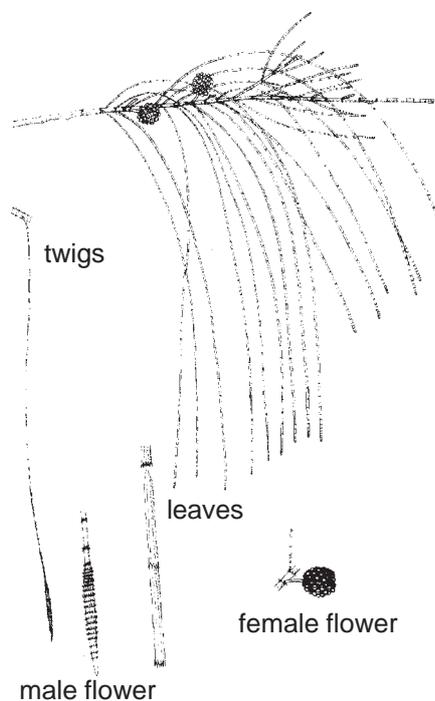
The casuarina is a large tree with drooping branches and narrow buttresses. It has two kinds of small branches or twigs. The first kind of twigs are green only at the tips and soon become woody and develop into branches. The second kind are pale green, jointed, needle twigs looking like leaves. After a time they fall off and form a mat under the tree.

The real leaves have become very small indeed and are hard to see without a magnifying glass. They look like fine teeth

and are set in circles at the joints of the twigs. As they are so small, the tree does not lose much water by evaporation in the strong winds blowing off the sea.

Some of these trees have male flowers, and some female, while others have male and female flowers on the same tree. The male flowers are small catkins with yellow pollen growing at the ends of twiglets. The female flowers, each with two dark red styles, grow in clusters in cones below the twiglets along the branches. The pollen from the catkins is blown off in clouds, landing on the female flowers to fertilise them.

On the roots of the casuarinas are small swellings called nodes; these help to make the soil richer in the same way as bean plants. The seeds germinate quickly on hot, open sand above the high tide mark. The tree grows quickly and can reach 30 metres in height in 25 years.



Uses

It does not give much shade but it makes an excellent windbreak. The wood is hard and tough and is used for carving clubs and making arrow heads and the branches are also good for making small items of furniture.

Christmas Tree

Origin

The Christmas tree is a native of Madagascar, an island off the coast of Africa, and was introduced into Vanuatu by early European settlers.

Habitat

It is planted as an ornamental tree in villages and towns.

Description

This deciduous tree is of medium size, usually with several main branches. Its flowers appear on the bare tree towards the end of the year, in clusters of crimson, scarlet or orange blossoms, each with a white or yellow patch on one petal. Soon afterwards, the feathery foliage appears. The fruit of the tree are long flat woody pods, up to about 36 cms in length. They slowly change from green to brown and remain on the tree for most of the year.



Uses

The tree is grown mainly for its ornamental value, and when it is in flower the branches are picked for use as decoration. They are a special feature of Christmas decorations. The young seeds may be eaten. The pods are often used as shakers by children making music.

Citrus family

Oranges, lemons, limes, mandarins and grapefruit (“pamplemousse” is their French name) are all members of the citrus family.

Origin

Their home was probably in South-East Asia but they have been cultivated by man for hundreds of years.

Habitat

Citrus trees are grown near human settlements.

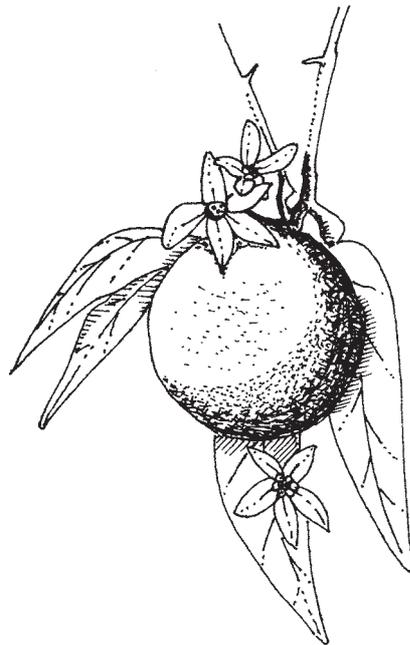
Description

The orange tree has closely packed foliage. Its trunk has a smooth greenish bark with no thorns and becomes rougher with age. The leaves are oval, thick and sharp-tipped. They have no hairs and are arranged alternately. The leaf of the orange tree has another very small leaf where the leaf joins the stalk. The leaves have little dots. They are oil glands that produce a sweet-smelling oil.

The flowers are white. They have a sweet smell and nectar to attract insects. They have many stamens.

The skin of the fruit has glands that produce an oil. This gives the skin a bitter taste. The fruit is divided into sections, each containing seeds or “pips”. The sweet pulp is made up of fleshy hairs.

Other members of the citrus family are similar in appearance.



Uses

Citrus fruits are important to man because they contain certain vitamins which are necessary for the proper nourishment of the body. In the old days, sailors on sailing ships who could not get fresh vegetables and fruit which contain these vitamins suffered

from a disease called scurvy. Nowadays, we know that oranges and other citrus fruits are an important source of those vitamins. In Vanuatu, several different kinds of citrus fruits are grown for using at home and selling in markets and stores. People eat their fruit or make drinks from their juice. They also make “tea” by pouring boiling water on their leaves. A special sort of jam called marmalade can be made from the fruit and the peel of citrus fruits. The oranges grown on Aniwa are particularly popular.

Coastal namariu (Namariu blong solwota)

Origin

Namariu trees are found in Melanesia and Western Polynesia.

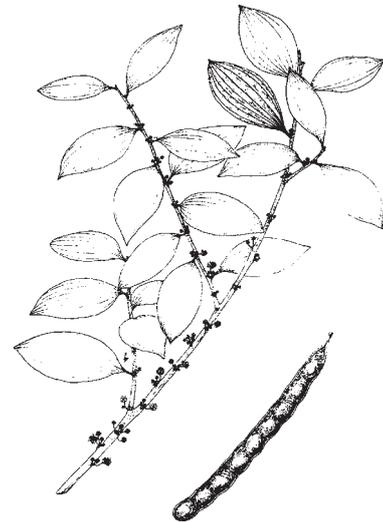
Habitat

The coastal namariu is one of the first plants to establish itself on the sandy coral and rocky beaches, and can tolerate salt water spray well.

Description

The tree is of medium height and, when growing alone in an exposed area, often has a short, crooked trunk leaning away from the prevailing wind.

It has oval-shaped leaves, with parallel veins along its length. Its sweet-scented flowers have stalked heads, arranged two or three together amongst and below the leaves. They have numerous bright yellow stamens. The fruit is a straight, brown, flat pod, constricted between the seeds. It may be slightly twisted. The seeds are small, black, hard and shiny.



Uses

The wood is used to make houses and is a good firewood. Its bark is ground up with sand and stones and put into rock pools to poison fish.

Coconut palm

Origin

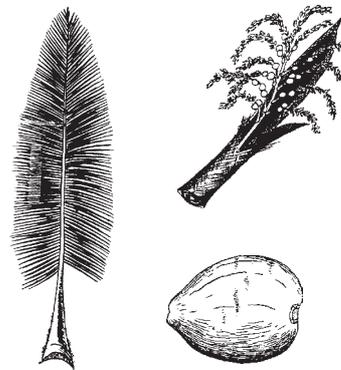
The coconut palm probably originated in the Indo-Malaysian region. Though coconuts can float for a long distance over a long period of time, it is likely that they were brought to most islands by the original Pacific island settlers. It is now found throughout the tropics and subtropics. It is a member of the very large palm family, of which there are more than 1,500 different kinds in the tropical Pacific.

Habitat

Coconut trees are found along the coasts and on the coastal plains. It is the most common tree of inhabited shores.

Description

The coconut is a large palm tree, reaching 30 metres in height. It has a single trunk with shallow fibrous roots. The base of the trunk is swollen to form a bole. The leaf fronds with their many leaflets grow in a cluster from the top of the trunk and are often up to 4 metres long. The flowers grow in long branching clusters, with the female flowers at the base and the many male flowers along the branches. The fruit is a large, one-seeded nut enclosed by a thick, fibrous husk.



Uses

The coconut is the most useful of all the trees in the Pacific. The nuts are used for food and drink, and the white flesh is dried and sold as copra to make oil, soap and other products. The shell is used to make ornaments and utensils, including kava shells. The leaves are used for weaving thatch, baskets, mats, hats and other items. The midribs of the leaflets are used for making brooms. The husk is used to make rope or for cleaning pots. The wood is used in house construction, for seats and so on.

Coffee

Origin

The coffee tree is a native of tropical Africa. It was discovered by Arabs in about the 3rd century AD and traded by them throughout the Middle East. It was introduced to Western Europe early in the seventeenth century. Coffee houses (places where people go to drink coffee) became popular in England and France and soon coffee became one of the world's most popular drinks. The chief coffee-growing areas are now found in South and Central America, the West Indies, parts of Africa, South-East Asia and some Pacific islands.

Habitat

Coffee trees are grown as a cash crop in Vanuatu. They grow best between 270 and 1,670 metres above sea level, on rich, well-drained volcanic soil in not too humid a climate. Tanna is famous for its coffee.

Description

The coffee plant is a small tree that grows five to fifteen metres tall. It has dark shiny foliage and has sweet smelling, trumpet-shaped white flowers.

The small round berries change from green to light yellow then to scarlet and at last to crimson or black. Each fruit has sweet yellow pulp that covers a pair of oval seeds lying with their flattened sides together.



Uses

Coffee is grown for its fruit or “beans”, which are sold as a cash crop both locally and overseas.

Cotton tree

Another name for **Burao**.

Fish poison tree

Origin

This tree is native to countries from the south-west Pacific islands to India.

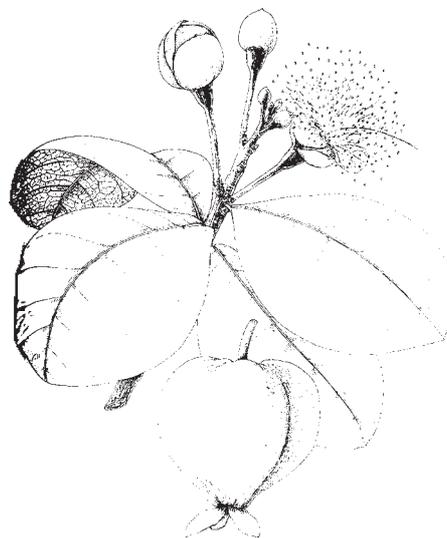
Habitat

Fish poison trees are normally found along the seashore.

Description

The tree is large, with widely spreading branches. The leaves are very big and a shiny green. They have reddish veins and soft edges.

The flowers, which usually appear in November and December, have four white petals and many large pink-tipped stamens. Some kinds of the tree are night-flowering and the flowers do not open until sunset. On the morning following flowering the stamens and petals drop off.



The fruits are heart-shaped with four large ridges. They are woody and contain a single large seed. They are adapted for floating in water and can be carried long distances by the sea.

Uses

In some places fishermen use the fruit as buoys for nets because they float easily. When the seeds are crushed and thrown into a pool, they stun fish. The wood rots easily if it is exposed to the weather and is usually used for firewood in Vanuatu.

Frangipani

Origin

The home of this tree is in a dry part of Central America. It grows well in parts of Mexico and Guatemala.

Habitat

Frangipani trees are usually planted close to where people live, in coastal and coastal plain areas.

Description

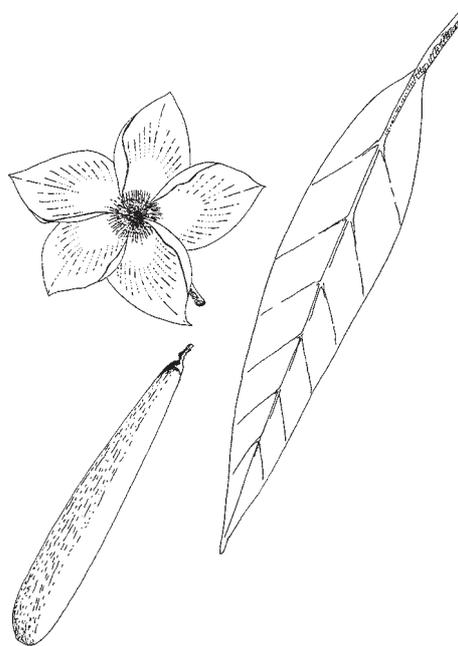
The frangipani has adapted itself to suit life in the dry places where it originated. It has a short trunk with branches spread out like the fingers of an open hand. The branches are swollen and often have small hairs on them.

The big thick leaves have smooth edges. On some kinds of frangipani the underside of the leaf has very small hairs. The leaves are grouped at the end of the branches.

The yellow, white or red sweetly scented flowers also grow in inflorescences at the end of the branches.

In some places the tree flowers twice a year. At one of the times the flowers appear when there are no leaves. At the other time flowers appear when leaves are on the tree.

The pods are long and black when ripe. The seeds are winged at one end. Although the tree flowers for a long time it does not often produce fruit.



Uses

The flowers are used for decorating rooms on special occasions and for making garlands which are hung around people's necks at special celebrations such as welcomes and farewells.

Grapefruit

See **Citrus family**.

Guava

Origin

The tree is a native of the American tropics. Guavas were taken to the Philippines by early Spanish explorers and from there they spread across the Pacific. There are more than one hundred species of guava but only a few produce fruit that can be eaten.

Habitat

Guavas grow in the tropics from sea level to 1,600 metres in a wide range of climate and soil conditions. They frequently take over cleared land that has been neglected and can form dense thickets.

Description

The trees range from 3 to 10 metres in height, with branches close to the ground. Shoots are often produced from roots near the trunk. The bark is smooth, greenish- or reddish-brown in colour, and it peels off from time to time. The leaves are simple, with noticeable veins on the underside.

The flowers are white, with many stamens. The fruits are round and juicy. They become yellow when ripe with a reddish or yellowish pulp and numerous small seeds inside.



Uses

The fruit is eaten fresh in Vanuatu. In some countries it is stewed and made into pies. After the removal of the seeds, the fruits can be made into jam or juice. The leaves are used as medicine.

Java olive (Skunk tree)

Origin

The Java olive originated in Asia, and is now common in the Pacific.

Habitat

The tree grows inland in the bush or forest. It is most common in Tafea province.

Description

The Java olive is deciduous and has a whitish-coloured bark. The hand-shaped compound leaves are thin, with dark green upper surfaces. The red, yellow or purple flowers have a rather unpleasant smell. The Java olive's other name, skunk tree, reminds us of the small animals in America that give off a very unpleasant smell when frightened.

The fruits resemble cupped hands and, upon opening, reveal a striking red interior with smooth black olive-like seeds along the split edge.



Uses

The seeds are edible and are used as a purge to cleanse the bowels. They can be eaten raw if dried in the sun for several days but are usually roasted. Before the seed is eaten, the hard seed coat must be taken off. The taste is similar to that of a peanut. The leaves are also medicinal. The wood can be used as posts and for small pieces of furniture and utensils. It is soft and white in colour.

Kapok

Origin

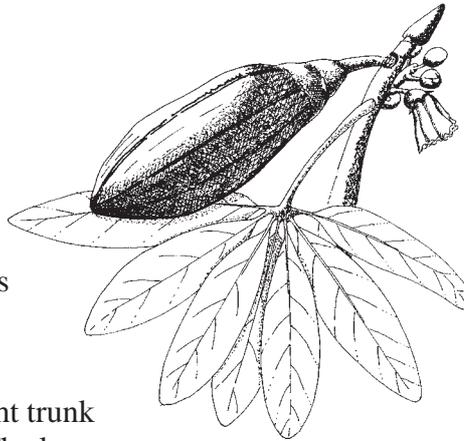
The kapok tree is found throughout the Asia-Pacific region.

Habitat

Kapok trees are found near human habitation in coastal and lowland areas.

Description

The kapok tree is tall with small branches spreading horizontally and at right angles to the trunk. Although it is normally a thornless tree, conical spikes are sometimes found at the base of the trunk.



The kapok has a long straight trunk with a smooth green bark. The leaves are compound and are made up of 5 to 9 bright green canoe-shaped leaflets, curving to a tip at the end. The leaf stalks are arranged alternately along the branch.

In June, the kapok begins to lose its leaves. The clusters of little greenish-white flowers are already showing when the leaves finally fall.

The pods contain creamy-white silky fibres closely packed with small seeds. The outside fibres are covered with a waxy substance which makes them waterproof.

Uses

Kapok trees may be grown easily from slips. For this reason they are useful as live fence poles. The trunk is used for canoes and the timber for firewood.

The silky floss from the seeds is used as stuffing for pillows, cushions and mattresses.

Kasis

Origin

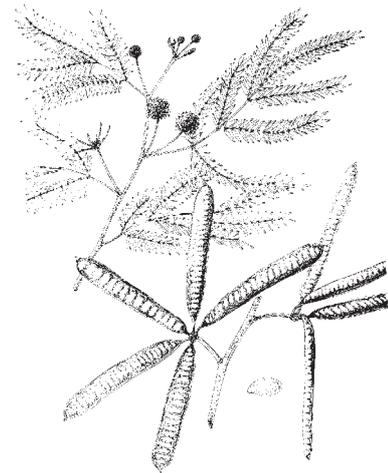
The kasis was originally an introduced plant, but has now become naturalised and has spread rapidly in the drier southern and central islands.

Habitat

Kasis trees grow freely on “waste” or uncultivated land, such as abandoned gardens or plantations, and along the sides of roads.

Description

The kasis is a small bushy tree, up to 10 metres tall, but usually less. It is often found growing in thickets of a number of trees. It has feathery-looking leaves, each with 10 to 16 pairs of leaflets. The leaflets close up at night. The round flower-heads grow at the end of small stalks and have five small whitish-green petals and ten white stamens. The flowers usually have a slight sweet scent. The trees flower either continuously, or several times a year. Each flower-head develops into one to twelve pods, up to 16 cms. in length. When they ripen, they turn dark brown and burst open, releasing up to 25 small, dark brown, shiny seeds.



Uses

It is frequently used as firewood, as its quick-growing qualities and its multitude of thin stems make it convenient for cutting, carrying and burning.

Kauri

Origin

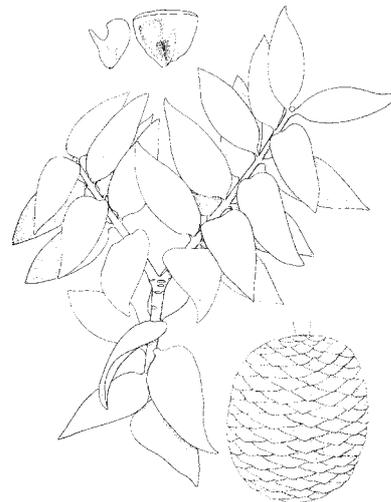
Kauri pines are an ancient family of trees, found mainly in Australia, New Zealand and Melanesia, as well as in South America and South-East Asia. In Vanuatu it grows most abundantly on Erromango and Aneityum.

Habitat

The kauri is generally found in groups in primary forest on steep slopes or ridges, but is also found on level ground lower down.

Description

It is a big tree growing to 40 metres in height. The trunk is very thick from the roots to where the first branches come out. Its large roots are sometimes exposed above ground, and spread over a very large area underground. The bark peels easily in roundish scales. It is light sandy or greyish-brown in colour and the fresh scars left by the peeling bark are pink. The leaves are thick and leathery, and a dark shining green on the upper surface.



The kauri is coniferous. Both the male and the female cones are green, changing to brown. The male cones are small and cylindrical. The female cones are round, with numerous flat scales which break up and fall away from the ripe cone while it is still on the tree, releasing the seeds, which have a flat wing, to blow away.

Uses

The kauri is one of the most useful trees in Vanuatu. On Erromango it is regarded as sacred. In earlier times, the resin, the sticky substance that oozes from the bark, was burned to provide light. It was also used to patch holes or cracks in canoes. The wood was occasionally used for canoes too, but not very often, because of the tree's huge size and high location. The bark was used in the construction of simple huts.

The timber is smooth-grained and is used in joinery and cabinet making. It is an important export for Vanuatu.

Lemon

See **Citrus family**.

Lime

See **Citrus family**.

Mangrove trees

Origin

The mangrove is a native of Malaysia, India and South China. There are a large number of species of mangrove. The word mangrove is used as the name both for a number of different trees that are adapted to growing in salt water, and also for the type of area in which they grow, a mangrove swamp. Vanuatu has several different kinds of mangrove tree.

Habitat

Mangroves grow below the level of high tide and spread out to make a forest on the tidal flats. Mangrove swamps are very important as breeding grounds and nurseries for young fish and other marine life.

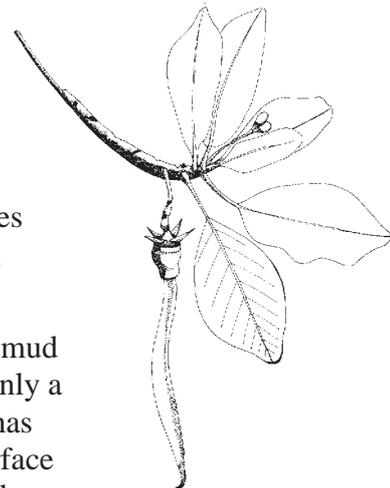
Description

The mangrove has adapted to living in places where the ground is saturated with water.

Some varieties of mangrove are tall, others are short and bushlike. All types of mangrove have dark green, glossy, leathery leaves.

The roots, growing as they are in the mud of these swampy places, can obtain only a small amount of oxygen, so the tree has other roots which grow above the surface of the water. The roots catch and hold floating mud and so help to build up the sand until it reaches above sea level. As the land is raised other trees grow on the new land.

The tree has small greenish white flowers which grow in clusters. In some kinds of mangrove, the seed begins to grow while it is still inside the fruit and hangs down as a long shoot. It can grow to about half a metre in length before it drops from the tree, and roots into the soil under the water.



Uses

The wood of the mangrove is hard and tough and the prop roots are used for bows and also in house-building. In some areas the roots, fruit and leaves are used for medicine. People in Tonga use the tree to put the black colouring in their tapa cloth.

Milk tree

Origin

This tree is a native of Vanuatu. It belongs to the same family as the breadfruit and the banyan.

Habitat

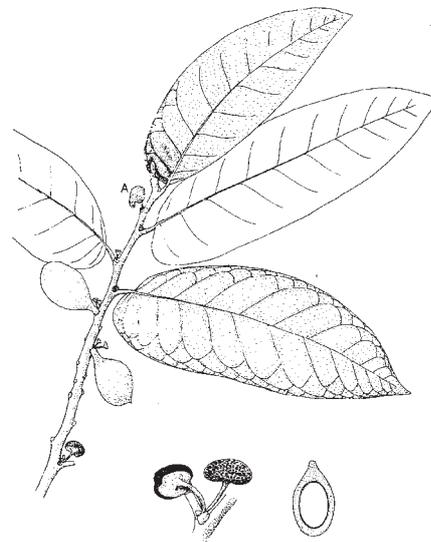
The milk tree is very common in central Vanuatu, not known in the south and less common towards the north. It is often found in large stands (groups) in secondary forest.

Description

This is probably our largest tree, sticking up above the other trees in the forest. It has a small crown without thick leaf coverage. Its branches are horizontal. Its trunk is large and very long, with huge, thin, steep buttresses. The bark is pale grey.

The leaf twigs are often curved, with long leaves, alternately arranged. They are dark green and shiny, with yellow veins. The separate male and female flowers are found on the same tree.

The male flowers grow low on the branches in thick mushroom-shaped heads, often seen on the ground after falling. The tiny female flowers grow in clusters of two or three at the base of the leaf stalk. The tree produces flowers for most of the year. The fruit are ovoid, about 4 cms long, pale green, ripening through red to dark purple, with a velvety surface. They have a thin layer of flesh, enclosing a large seed.



Uses

The wood is used locally and exported, frequently as veneer.

Morinda

Origin

The morinda is a native of Asia, Australia and the Pacific islands.

Habitat

Morinda trees are commonly found along the seashore and in coastal areas.

Description

The trunk is smooth and whitish grey. The young branches have a square cross-section. The leaves are oval shaped, dark green, thick, soft to feel and free from hairs.

The small flowers are white and grow in clusters. The fruit is fleshy and shaped like a small breadfruit, being covered in bumps, each of which was once a flower. Inside the fruit are many seeds which are scattered by birds. When the fruits fall to the ground they have an unpleasant smell. When trees and bushes have been cut down, the morinda is one of the first trees to grow. The young trees grow up straight.



Uses

The leaves and fruit can be used for medicine. The wood is very hard and is used for carvings. On Ambrym it is used to make combs. The roots give a yellow dye and the bark can give a red dye when mixed with lime.

Nabangura (Tamanu)

Origin

The tree is found in coastal areas across the Indo-Pacific Region.

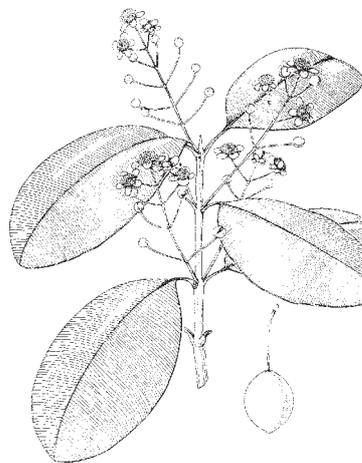
Habitat

The nabangura is a common tree, growing along the coast just above the high water mark throughout Vanuatu. It is often found leaning over the water.

Description

Nabangura trees are very large, with a huge, spreading thick crown. The heavy branches grow out from low down on the trunk. The bark is very thick and rough, and flakes in thick pieces.

The large leaves are simple and arranged opposite each other, each pair at right angles to the last. Their veins are close and parallel, connecting with the edge of the leaf. The young leaves are green, and turn red, yellow or brown as they die. The flowers are white with a yellow centre and are arranged in spikes. Only the flower at the end developing into a fruit which hangs from the long flower stalk. The fruit are round, hard and green, turning yellowish-brown when they fall. They remain a long time on the ground and are often found floating on the sea. They are poisonous.



Uses

The wood from the nabangura, known in other places in the Pacific as tamanu, is widely used for boat-building and other forms of construction, and for carving. The flowers were commonly used for scented oil for personal use, before scented oil could be purchased in stores.

Nakatambol

Origin

The nakatambol is a native of Vanuatu, and belongs to the same family as the naus.

Habitat

Though the nakatambol may be found throughout Vanuatu, it is more common in the centre and north of the country. It is found on Tanna only where it has been planted.

Description

Nakatambol trees are noticeable for their very distinctive huge and thin buttresses, probably the largest to be found in Vanuatu. The bark is a pale pinkish colour, flaking to show pink or brown areas underneath. The long compound leaves, arranged spirally, each have six or more pairs of leaflets.

The small, greenish-white flowers are arranged in long, upright inflorescences. The round hard green fruit, ripening to yellow, hang in clusters on a long stalk. Each has a single irregularly-shaped stone.



Uses

The outside of the fruit is eaten. The wood is used locally for building and the buttresses are popular for such items as table tops. The living buttresses are frequently used as two sides of a pig enclosure.

Nakavika

Origin

The native nakavika comes from a large family of trees, growing widely in the tropics. The family has two main centres of diversity, one in tropical America and the other in Australia. The family includes the guava, which has been introduced into Vanuatu, and the eucalyptus of Australia.

Habitat

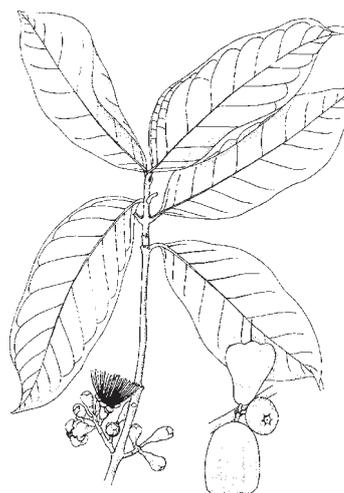
The nakavika is very common throughout Vanuatu and is found growing both in the bush and as a village fruit tree.

Description

The tree has brown, cracked and flaking bark and a dense, dark green cone-shaped crown. The large oval leaves are thick and shiny, the old ones are dark green, the young are bright green. They are arranged opposite each other, each pair being at right-angles to the last.

The flowers are very noticeable, being vivid red with numerous long stamens and four small pink petals. They grow either on short twigs below the leaves, or directly from the branches and, less commonly, from the trunk.

When the flowers fall, the stamens make a rich red carpet under the tree. The elongated fruit are white at first, later becoming streaked with pink or red. They have crisp white flesh around a single stone.



Uses

The fruit, which usually appears towards the end of the year, is one very popular in Vanuatu. The timber is used for general building purposes.

Namariu

Origin

Namariu trees are found in Melanesia and Western Polynesia.

Habitat

There are two types of namariu found in Vanuatu. The coastal namariu usually grows near the shore while the inland namariu grows in coastal forest areas. The coastal namariu is described in the entry following this.

Description

The namariu reaches a height of about 16 metres. It has a short crooked trunk without buttresses.

The leaves are arranged spirally. They are narrow, curving like a new moon. They have parallel veins running lengthways along them. The flowers grow in spikes and have numerous long bright yellow stamens. This type of namariu has long, green, soft pods, which become coiled and black as they dry. They contain small, flat, hard, shiny seeds, black with a bright orange-red spot at one end.



The tree is interesting in another way, in that it is the host tree for the sandalwood (see Sandalwood, below).

Uses

The wood is not of commercial value as the trunks are small and twisted. It is sometimes used for fence posts and tool handles as it is hard and lasts a long time. It is one of the best fuel woods in Vanuatu.

Namariu blong solwota

Another name for **Coastal Namariu**.

Namele

Origin

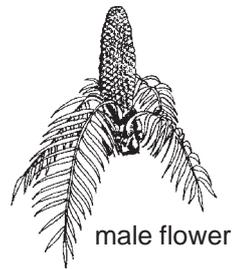
The namele belongs to a very special group of trees called cycads. They were the very first plants to have seeds. Seeds were larger and better protected to survive than the spore of tree ferns. At one time a very, very long time ago cycads and tree ferns were the most widespread trees growing on the earth. They provided food for the plant-eating dinosaurs. Today most trees growing on earth are flowering trees. There are only a few kinds of cycad left in a few places. We are fortunate to have one kind of cycad in Vanuatu.

Habitat

The namele is found growing in a variety of habitats, both near the coast and higher up in the interior.

Description

The namele is a short tree rather like a palm. Its leaves come out from the top of the trunk. There are separate male and female trees. The male tree makes pollen and the female tree makes ovules.



male flower



female flower

The male tree produces a cone at the top of the plant. The wind blows the pollen from it over the ovules on the female tree. After fertilisation, the ovule remains attached and is fed by the mother plant. When the tiny plant is big enough it is enclosed in a protective coat to become a seed. The seed is then enclosed in an edible fruit.

Uses

The namele is widely used in custom. Its leaf is used to mean “tabu” - forbidden or sacred. It also symbolises peace and authority.

Nangai 31

Origin

The family to which the nangai belongs is widespread in the area from the South-West Pacific to Malaysia. The botanical name comes from the East Indian name for the tree.

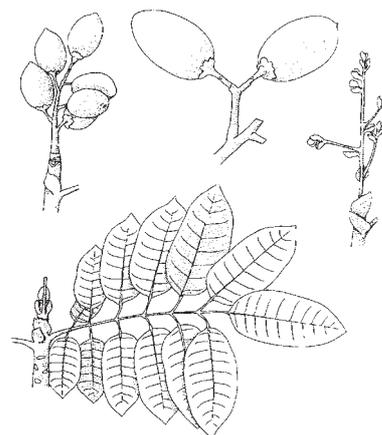
Habitat

Common and widespread, particularly in the northern islands, the nangai is usually found in secondary forests.

Description

The nangai is usually of small height, and with or without buttresses. Its bark is grey and normally smooth. The compound leaves have about 7 or 8 opposite pairs of leaflets with a single one at the end.

The tree has separate male and female flowers in large



inflorescences. The individual flowers are small and creamy-white. The ovoid fruit are a dull green colour at first and then ripen to black. There is a stone with two seeds inside each fruit.

Uses

The wood is used for canoe building and other construction. The seeds are edible, oily and very nutritious.

Natavoa (Indian almond)

Origin

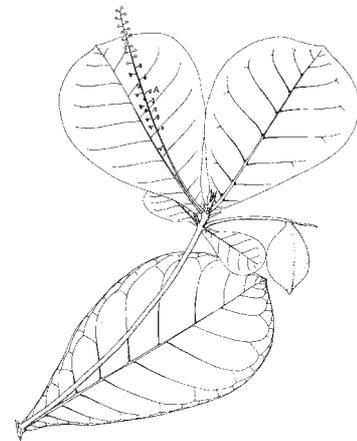
This tree originated in South-East Asia and now grows in the South Pacific islands. There are about 140 species throughout the tropics. In Ambrym alone, there are 5 kinds.

Habitat

The natavoa tree is common on coastal plains.

Description

The tree can grow from two to three metres in circumference and to a height of 15 to 25 metres. Its branches grow horizontally in wide-spreading circles at different levels on the trunk. They spread from 7 to 10 metres from the trunk. The bark on the trunk is rough but the branches are quite smooth. It has leathery leaves which turn red before they fall, leaving the new leaves and flowers to develop from their buds in May and June. The little creamy-white flowers grow in spikes.



The fruits are flat and oval-shaped. They turn red in some kinds and white in others when they are mature. The flesh around the seed becomes soft when it reaches maturity. The seed case is very hard and can only be broken with a stone or hammer. It usually breaks from end to end. Covering the seed is a special coat which turns from white then yellow to brown in colour when the seed is ripe. Usually the seedcase contains only one seed. Occasionally, however, two may develop.

Uses

The raised root or buttress is used for wooden dishes, washing boards and toilet covers. Its trunk is used for making canoes, canoe-paddles, gun-handles, firewood and dishes. On Ambrym and Malakula, people of higher rank carve the roots and trunk into birds for ceremonial purposes. The seed is mainly used for food. Sometimes children use the fruit for games. The leaves are used as fans in some places and children in Ambrym use them for masks. The flower is used as a sign that the yams are mature.

Naus

Origin

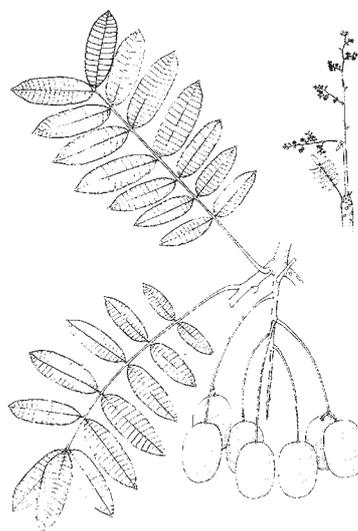
The naus is a native of Vanuatu, and belongs to the same large family as another native tree, the nakatambol, and a widespread introduced one, the mango.

Habitat

Naus trees are found throughout the group in lowland forest or are planted in and around villages.

Description

The short branches of the naus tree start low down on the long trunk. The rough bark is pale grey and peels easily to show the inner bark, which is streaked bright green, red and pale brown. The compound leaves are bright green, soft and thick, with pale-coloured parallel side veins joining at the edge of the leaf. The tree is deciduous, with the old leaves turning yellow before they fall, and the new leaves appearing with the flowers.



The small, yellowish-green flowers form small erect inflorescences on fleshy stalks. The fruit are oval, about 5 cm long, hanging in clusters on a long stalk. They are green, turning yellow when ripe, and have white flesh containing many fibres coming from the large central stone.

Uses

The fruit are popular for eating whole, and can also be used raw in salads and cooked to make jam or chutney. The leaves are used in traditional medicine. The wood is soft and does not last long, so is not extensively used.

Navele

Origin

The navele tree, and the other common tree belonging to the same family, the fish poison tree, are native to Vanuatu. They are related to a family of trees found in tropical areas around the world, of which the most famous is the Brazil Nut tree, growing in South America.

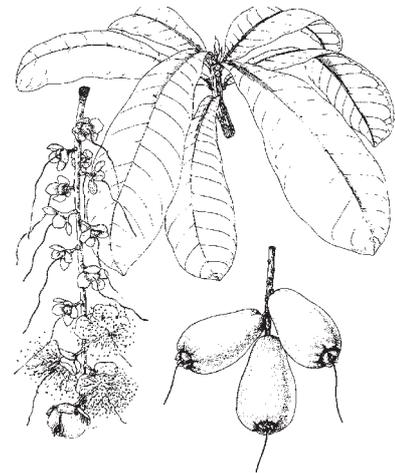
Habitat

Navele trees are very common, often planted in villages and in the wild growing best in lowland secondary forest. They are found throughout Vanuatu.

Description

This small tree is distinctive because of its large hanging spikes of fruit and flowers. The branches grow horizontally from the short trunk in clusters. The large leaves grow in rosettes. They are thick, leathery and very shiny.

The flowers are large and showy, and grow thickly down a long, hanging spike. They have four petals and numerous long yellow stamens. The fruit are green or brownish-purple, depending on the variety of the tree, and are covered with fine soft hairs. They are angled at the base. They each contain a single, white, edible seed. Occasionally a red variety of navele, with long pinkish-red flowers, is found.



Uses

The tree is used only for its fruit.

Navenue

Origin

Navenue trees are native to Vanuatu.

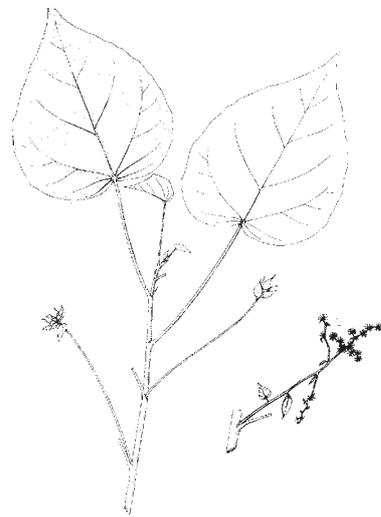
Location

The navenue is a lowland tree. It is quick to colonise open ground or former garden areas that have been left uncultivated.

Description

The tree is fairly small with foliage in one layer at the top of the trunk. The bark is light-coloured. The large leaves are heart-shaped, with seven to nine veins spreading from the leaf stalk. They are smooth above and covered with fine hairs underneath the leaf.

The tree flowers throughout the year. The male and female flowers are on separate trees. The very small yellowish-green male flowers grow in clusters along branching flower stalks. The females grow singly or in pairs at the tips of long stalks or in small clusters where the leaves join the branches. The seed cases have thick bristles, and inside are three small black seeds.



Uses

As it is easily accessible, the navenue is commonly used for house building. The dried wood can be split easily with an axe and gives a good, light firewood. However, it burns rapidly and does not give a strong heat.

Orange

See **Citrus family**.

Pandanus

Origin

The pandanus is widely spread across the Pacific, with many different varieties.

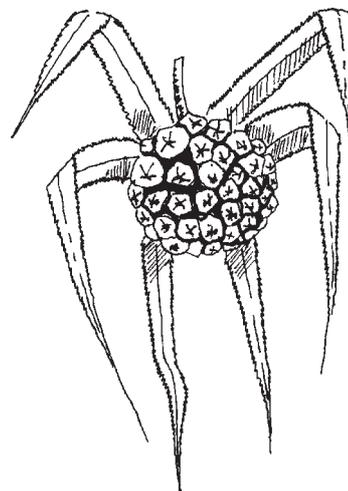
Habitat

There are several kinds of pandanus, including a climbing variety found in the bush. The most common kinds occur on rocky or sandy shores or in coastal areas.

Description

The trunk and the branches of the pandanus are supported at the base by a number of prop roots. The surfaces of the roots and trunk are covered with sharp prickles. At the ends of its spreading branches are many long drooping saw-edged leaves.

Male and female flowers grow on different trees. The small scented male flowers are cream in colour. The round female flower heads consist of many small flowers joined together. The large heavy round fruits are made up of a number of woody “keys”, orange coloured when ripe with a “brush” at the end, each of which contains several seeds.



Uses

The pandanus probably comes next to the coconut palm in its importance in the Pacific. The dried leaves can be used to make very good thatch as well as hats, mats and baskets and other items of handicraft. Cultivated varieties have been developed for this purpose. The trunk can be used for posts in house building and the round aerial roots made into brushes.

In some parts of the Pacific, the fruit of the pandanus is an important food. The keys of the fruit of the pandanus in its cultivated form can be steamed, pounded and dried to make a nutritious flour which keeps for a long time. The kernels can also be eaten.

Pawpaw

Origin

The pawpaw comes originally from South America, but is now spread throughout the tropical world. There are about 5 varieties of pawpaw in Vanuatu of the 45 kinds growing around the world.

Habitat

Pawpaw trees are found wherever people are living, or in areas of former habitation. They seed easily and can spread rapidly.

Description

The pawpaw is a very fast-growing tree, of between 3 and 6 metres in height when fully grown. The trunk is hollow and is made of soft, spongy wood. There is normally a single trunk, from which the leaves grow in a cluster at the top. The large, deeply lobed leaves with prominent veins are joined individually by the leaf stem to the trunk. When the leaves fall, they leave distinctive marks on the bark.

Like some other tropical plants it has two different flowers, male and female. They are generally found on different trees. The male flowers

branch out from the trunks in a spray, live about a week, and then fall off. They are strongly scented at night and attract insects.

The larger female flowers appear singly just above the leaf stalks. It is these flowers that develop fruit.

The tree bears fruit when 6 to 8 months old and continues bearing throughout the year. Pawpaw fruit are large and vary in shape from almost round to elongated, according to the type of tree. The fruit has a sweet juicy flesh and is hollow with many seeds. Animals, birds and insects eat the fruit and help spread the seeds.



Uses

The pawpaw is mainly used for its fruit, which may be eaten raw when ripe, and is often used in fruit salads and salads. It is also cooked when ripe or still green. It may be roasted, or cooked with

meat or used in sweet dishes. Pawpaw jam or chutney can also be made. The fruit has a very high vitamin content.

The leaves are sometimes used for covering laplap while cooking. They are also often used as an umbrella for sheltering when travelling in the hot sun.

Most parts of the tree contain a rich liquid called papain which is often used to tenderise meat (make it soft). In the United States of America the papain is extracted in factories for this purpose.

Perfume tree (Ylang-ylang)

Origin

The perfume tree is a native of Asia and Australia. It is found throughout the Pacific islands.

Habitat

It is confined to central and northern parts of Vanuatu, and is not very common. It is usually found inland, rather than near the coast.

Description

This tree often grows to a height of about 10 metres, with a trunk 50 to 60 cm in diameter. The branches grow from high up the trunk. As the tree grows, the lower branches die and drop off from the main trunk rather like the stems of the pawpaw. The wood from the tree is soft. When it falls it rots very quickly.

The tree has large droopy flowers with long thin yellow petals. It produces small black fruit, popular with birds.



Uses

The flower has a strong, very fragrant perfume. Sometimes coconut oil is scented with its flowers and used as hair oil. In Malaysia there are commercial plantations of perfume trees. The flowers are collected and the oil extracted for use in the perfume industry.

Some people on Santo and elsewhere use the trunk for making canoes. These only last for a short time. Trunks are also used for making copra beds. Branches are used for firewood.

Rosewood

Another name for **Blue Water Tree**.

Sandalwood

Origin

The sandalwood is a family of small trees with sweet-smelling wood, found widely in tropical and warm temperate countries.

Habitat

Sandalwood trees are usually found in the cooler drier lowland forests of the southern islands of Tafea Province. They also occur in smaller quantities on Efate, Malakula and Santo.

Description

The sandalwood tree is a small tree of about eight to ten metres in height and twenty to fifty centimetres in diameter. It often starts life as a parasite on another kind of tree, a namariu. It has a greyish brown bark and its branches grow out at irregular intervals fairly low on the trunk. The leaves are dark green on the upper side and are small and shiny. The sprays of flowers are small and not very noticeable; they are whitish green in colour. The fruit are round or oval, about 13 mm long, green and firm, ripening to a purplish black.



Uses

The sandalwood tree has been very important in the history of Vanuatu. The heartwood from the roots and the bottom of the trunk contains special sweet-smelling oils. It is used to make objects such as boxes, bedroom furniture and fans, as the scent remains in them for a very long time. It also has a beautiful smell when it is burnt, and so it is used for burning as incense during Buddhist religious ceremonies. It is made into perfume too and the scent is added to soap and other beauty products. In Vanuatu it is grated into coconut oil and used for special occasions.

Before white men discovered it growing here, it was used for carvings and implements and as firewood, but it was not valued for its scent. However, since the beginning of the sandalwood trade in the early nineteenth century, it has been used mainly as a cash crop for export. From the 1820s until today, sandalwood has been one of the most important products in the economy of Vanuatu.

Sea-Oak

Another name for **Casuarina**.

Skunk Tree

Another name for **Java Olive**.

Softwood

Origin

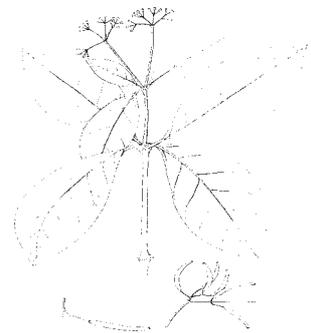
The softwood tree is native to Vanuatu. The family to which it belongs is found throughout the Pacific, in South-East Asia and the Indian Ocean area as far as Africa. Another member of the family growing in Vanuatu is the bougainvillea.

Location

The trees usually grow in primary or lowland secondary forest.

Description

The softwood tree grows to a height of about 20 metres. The trunk divides low down into several erect branches. The twigs have swellings or nodes from which the large leaves grow in whorls. The leaves are thick and have shiny, network veining.



The tree has small, tube-shaped, scentless white flowers which form a cluster. As the flowers die and fall off, the fruits begin to form. At this stage they are green in colour. As they begin to mature, they turn dark brown and begin to ooze a very sticky substance. As birds or other animals pass underneath the tree, the seeds stick to them and so are dispersed.

The wood is very soft and pulpy.

Uses

Because of its very soft nature the wood is useless even for firewood. The sticky substance from the seeds used to be used in bird traps.

Some of the old trees have holes in their trunks which people hide inside when it rains. The holes can also be used as tool sheds if the trees are beside new gardens.

When the tree has been rotting for some years it makes the soil rich and in north Ambrym people use the place for planting yams. Sometimes they harvest extra-long, big yams from the fertile area.

In most islands in Vanuatu there is a special kind of bird called a megapode (scrub duck or namalau) which lays eggs in the rich warm soil produced by the softwood trees.

Tamanu

The name by which the **Nabangura** tree is known throughout the Pacific.

Tree Fern (Black Palm)

Origin

The tree fern or black palm grows in the tropics. It belongs to the same family as the small fern plants that we find growing on the ground or in trees. A very long time ago, tree ferns were the only kind of tree on earth. Now they grow in only a few parts of the world.

Habitat

Tree ferns grow in thick forests. They like damp soil, and grow mostly near creeks and on mountainsides where it is warm.

Description

The tree fern has a single trunk with no branches. The hard outside part of the trunk is black. Inside is a soft pulp. At the base of the tree are black fibrous roots which grow together to form a solid mass of roots around the tree up to a height of about two metres from the ground.



Close to the top of the palm, near the leaf stalks, the trunk is covered with fur. The long feathery leaves grow from the top of the trunk.

Like all ferns, the tree fern does not have flowers or seeds. Instead it reproduces from tiny spores, which develop on the underside of the leaves. This is a very early way of plant reproduction. There were tree ferns growing on earth a long time before there were any flowering plants with seeds.

Uses

The soft part of the trunk can be used to make balls for kicking. The hard part of the trunk is black and used for posts of houses, fences and arrow points. The young leaves are eaten by people. The black solid fibrous root is used for the carving of statues on Ambrym and Malakula and plays an important part in pig-killing ceremonies. The statues can be seen erected near nakamals. The soft fur around the leaf stalks can be used for stuffing pillows.

Ylang-Ylang

Another name for **Perfume Tree**.

Appendix B

Word list

A

- adapt** change or adjust
- aerial** in the air. **Aerial** roots hang down from the branches, rather than growing from the soil.
- alternate** following one after the other, not side by side. Leaves are sometimes arranged **alternately** along a twig.

B

- bark** the outer covering of the trunk and branches
- bole** the swollen base of the trunk
- brackish** slightly salty. **Brackish** water is a mixture of salt and fresh water.
- branch** the limb of a tree
- bud** the flower or leaf before it has opened
- buttress** a support. A **buttress** on a tree is an extension of the main trunk which gives it extra support.

C

- capsule** a small case or covering. Sometimes a tree bears its seeds in a **capsule**.
- carbon dioxide** one of the important gases that form air
- catkin** the tassel-shaped male flower of a tree
- chlorophyll** the substance in a leaf that makes it green
- compound** made up of more than one part. Some trees have **compound** leaves.
- cone** the cone-shaped fruit of certain trees
- conifer** a tree bearing cones, instead of petalled flowers
- conservation** the protection of nature by the careful use of natural resources
- crown** the top of the tree, starting from where the branches come out, and including all the leaves

D

deciduous shedding its leaves all at one time

disperse scatter, spread

dormant sleeping, inactive

E

endemic belonging to a place, not found anywhere else

environment the surrounding, the physical condition of a place

evaporate change from liquid into steam or vapour

evergreen always green. An **evergreen** tree does not shed its leaves all at the same time.

F

fern a green leafy plant that does not have flowers and seeds, but reproduces by spores

fertilise give life to

fibre thread, string, the stringy parts of a plant. Some plants have **fibrous** roots

forest land thickly covered with trees

fruit the part of the tree that contains seeds

fungus a simple plant that grows in dark and damp places. A **mushroom** is a kind of fungus.

G

gas an air-like substance, not a liquid or solid. Air is made up of several **gases**.

germinate begin to grow or develop

H

habitat the place where a plant or an animal naturally grows or lives.

heartwood the wood in the centre of a tree trunk

I

identify recognise

inflorescence the group of flowers on a single stem

introduced brought into the country from overseas

J

K

L

- lichen** a dry-looking plant that grows in patches, especially on rocks and tree trunks
- lobe** the soft, hanging part of your ear. The **lobe** of a leaf is shaped like the lobe of your ear.
- log** the trunk or part of the trunk of a tree that has been cut down
- logging** the cutting down of trees

M

- midrib** the large vein along the centre of the leaf
- mineral salts** salts from minerals or rocks in the soil
- moss** a plant with very small leaves which grows in patches in damp places

N

- nectar** a sweet liquid collected by insects or birds from flowers
- network** an arrangement looking like a net or spider's web. There is a **network** of veins on some kinds of leaves.
- nut** a hard dry fruit containing a seed

O

- opposite** facing. Leaves sometimes grow **opposite** each other.
- ovary** the seed box, the part of the plant where the seeds are made and stored
- ovule** an unfertilised seed
- oxygen** one of the important gases that form air

P

- petal** the thin outer part of the flower. The **petals** are often brightly coloured to attract insects.
- photosynthesis** the process by which air and water are turned by sunlight into food for the plant

pod	a long container in which seeds grow
pollen	the yellow powder found in flowers, part of the male part of the flower
pollinate	brush pollen onto the female part of the flower
preserve	treat something in a special way to stop it going bad
prop	support. Prop roots are roots that grow downwards from the branch or trunk of a tree into the soil, to support the tree.
pulp	a soft wet mass
Q	
R	
resin	a sticky substance that comes out of the bark of certain trees
root	the part of the tree that anchors it into the ground
root hairs	fine hairs growing near the end of the root
S	
seed	the part of a plant from which a new plant grows
seedling	a young plant, a seed that has put out a root and a shoot
sepal	the green covering that protects the bud. Many flowers have five sepals .
simple	the opposite of compound. A simple leaf has only one leaflet.
spiral	winding round and round in a curve from a starting point
spore	the part of a fern plant which produces a new plant. Many spores develop on the underside of fern leaves.
stalk	stem
stamen	the stalk inside the flower which has pollen at the end of it. Some flowers have many stamens .
starch	a carbohydrate

style	the stalk inside the flower which leads down to the ovary
surface	the outside of something. The surface of the leaves is smooth.
sustain	keep something alive. Sustainable development is the way resources are used for the benefit of people, without finishing them up, destroying them or damaging them.
T	
tap	something that controls the flow of a liquid. The tap root of a plant is the large, main root which draws up water from the soil.
timber	wood that has been sawn ready for use
twig	a small stalk or stem, growing off a branch
twiglet	a small twig branching from a twig
U	
V	
vein	a raised fibrous tube, which carries water in plants
W	
whorl	a circular arrangement, for example, of leaves round a twig
wing	the part that is used for flying. Some seeds are winged , so that the wind can blow them away from the mother plant.
X,Y,Z.	

