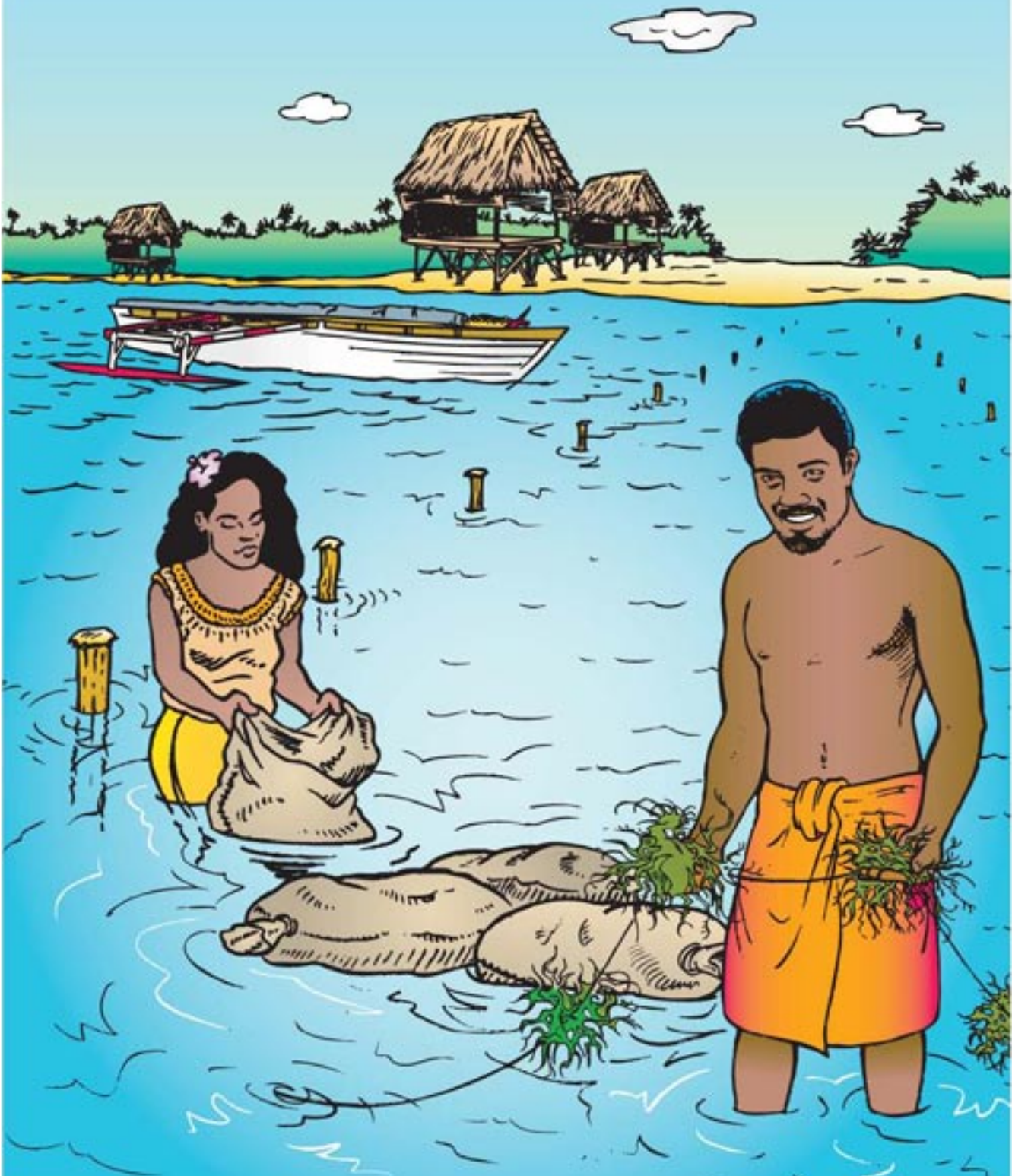


FARMING SEAWEED IN KIRIBATI:

A practical guide for seaweed farmers



FARMING SEAWEED IN KIRIBATI: A practical guide for seaweed farmers

Designed and compiled by: Antoine Teitelbaum

Illustrations by: Sebastien Lesire

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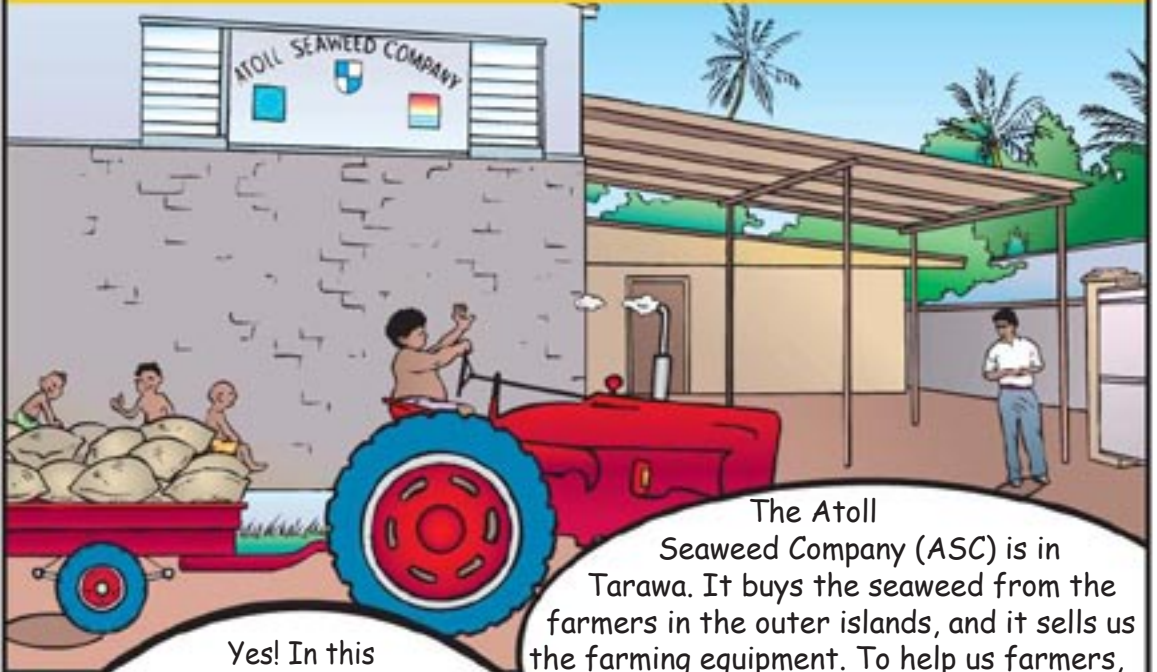
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SEAWEED FARMING IN KIRIBATI

Hello, I am Teborou, and this is my husband, Taira. We farm seaweed in the islands of Kiribati. In the past, there used to be seaweed farming in every lagoon; it looked like this:



THE ATOLL SEAWEED COMPANY



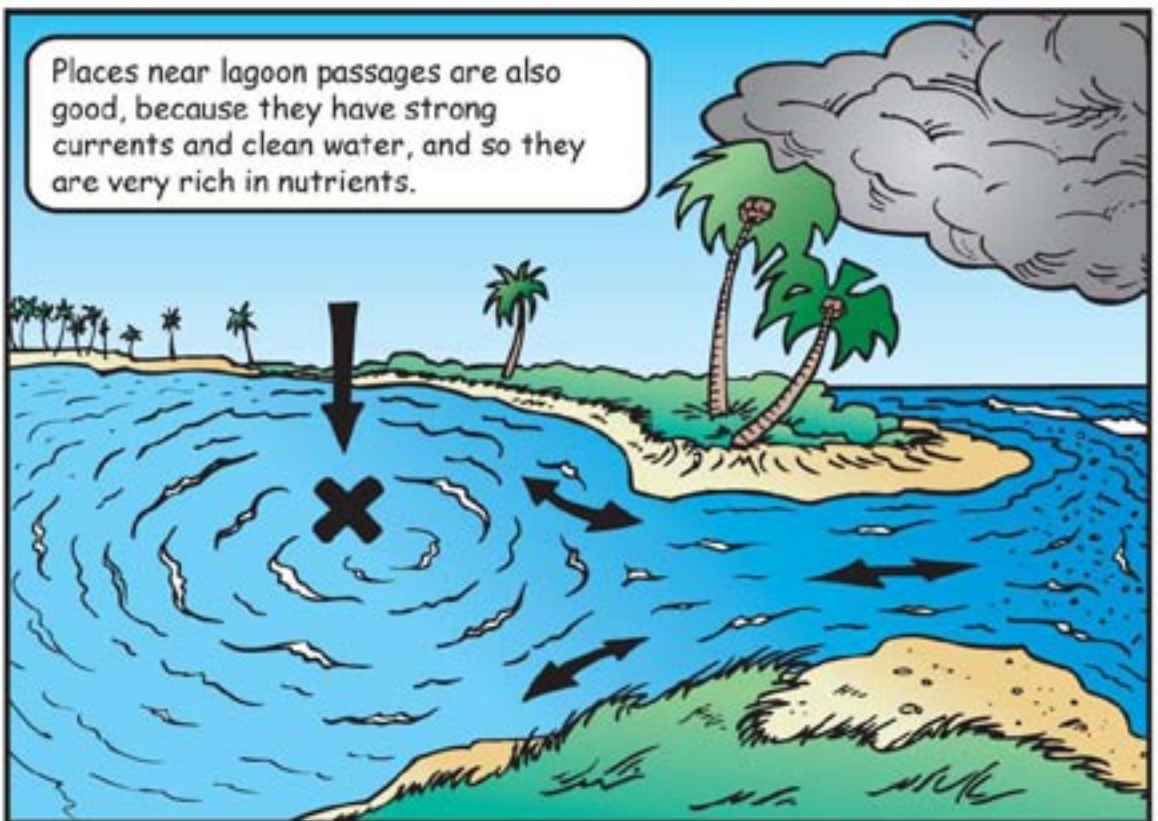
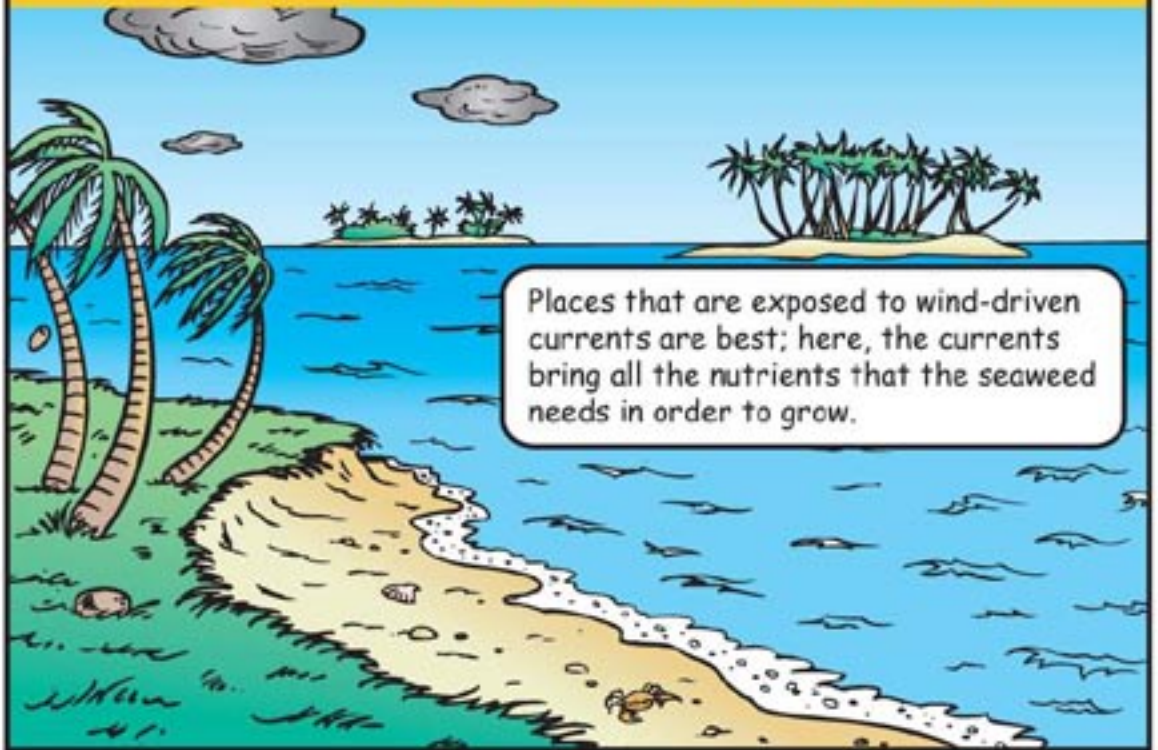
The Atoll Seaweed Company (ASC) is in Tarawa. It buys the seaweed from the farmers in the outer islands, and it sells us the farming equipment. To help us farmers, the Company has created this guide, with financial assistance from the European Union.

Yes! In this guide, Taira and I are going to tell you all you need to know about seaweed farming. We will show you how to choose a good place for your farm, how to choose the right seaweed pieces for seed, how to grow the seaweed, how to harvest it and how to handle it after harvesting. We will also tell you about the problems you may meet while you are farming seaweed.

Now let's go into the lagoon, and we'll show you the best places to set up your seaweed farm.



CHOOSING THE RIGHT PLACE FOR YOUR FARM



WHERE OTHER SEaweEDS GROW IS A GOOD PLACE FOR YOUR FARM

There is a lot of seagrass in Kiribati. In places where seagrass grows well and is healthy, your seaweed is also likely to grow well.

When you have found a good place for your farm, look around for other kinds of seaweed, such as:
seagrass, red seaweed,
seagrapes, and brown, fan-shaped algae.



seagrapes



red seaweed



brown, fan-shaped algae



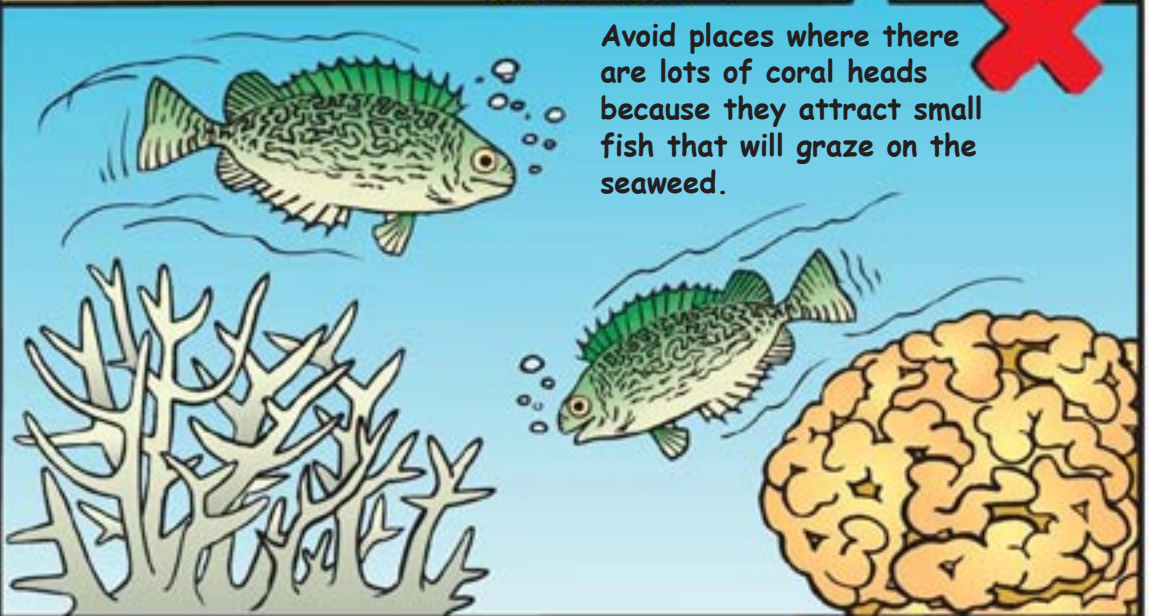
CHOOSING THE RIGHT TYPE OF SEABED



Another thing, when you are looking for the right place for your farm, don't choose a place where the bottom is soft and muddy; in these places, there is no current and the water is stagnant.



Choose a place where the bottom is hard!

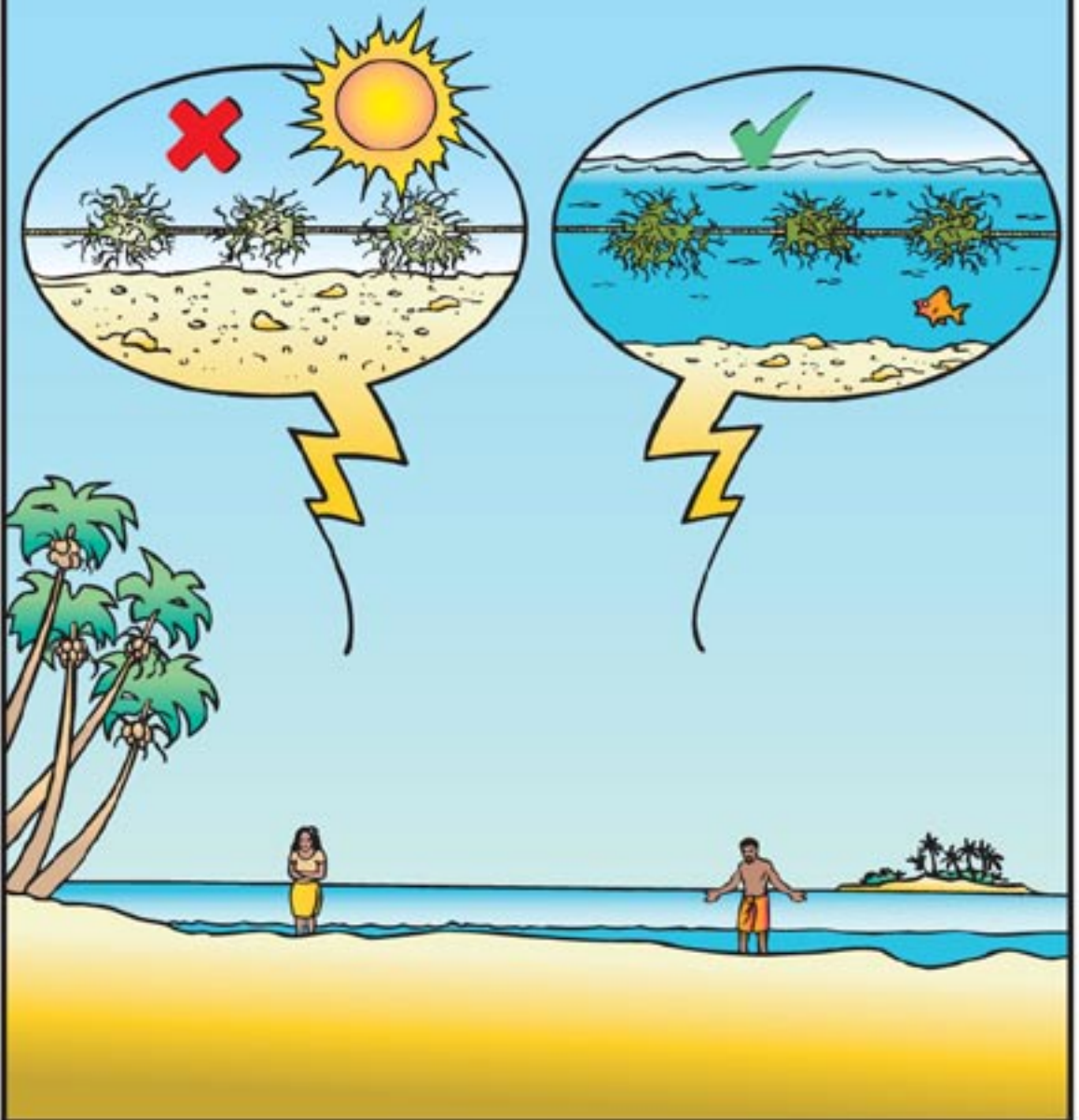


Avoid places where there are lots of coral heads because they attract small fish that will graze on the seaweed.

CHOOSING THE RIGHT DEPTH

At low tide, the inshore part of the lagoon dries out. If you have planted your seaweed too close inshore, it will be exposed to the sun, and it will die. If it recovers, it will grow only slowly. Make sure you plant your seaweed in water that is deep enough.

IT MUST NOT BE EXPOSED TO THE SUN FOR MORE THAN ONE HOUR AT LOW TIDE.



WHAT YOU WILL NEED

It is very important to get your equipment ready before you start planting! You can buy the equipment from the local agents. They will also give you good advice, because they are well trained.

THIS IS WHAT YOU WILL NEED:

A coil of raffia



A coil of 3 mm rope



30 m of
6 mm rope

A crowbar



A bush knife



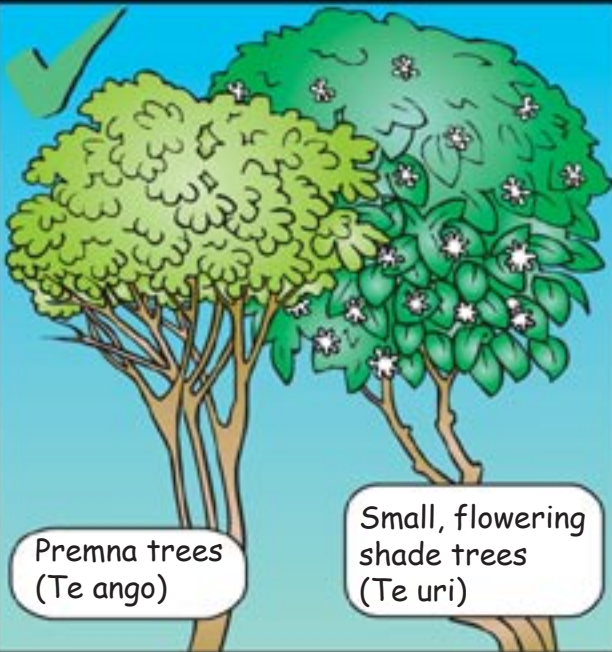
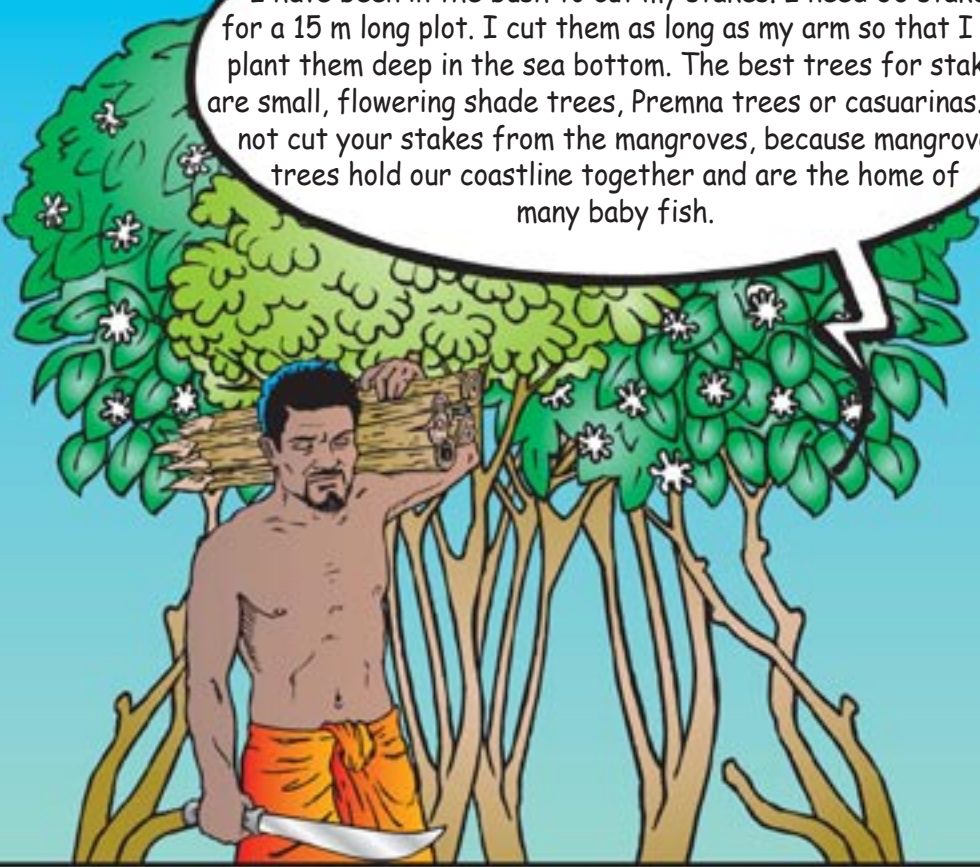
A sledge hammer



A 5 m length of measuring rope

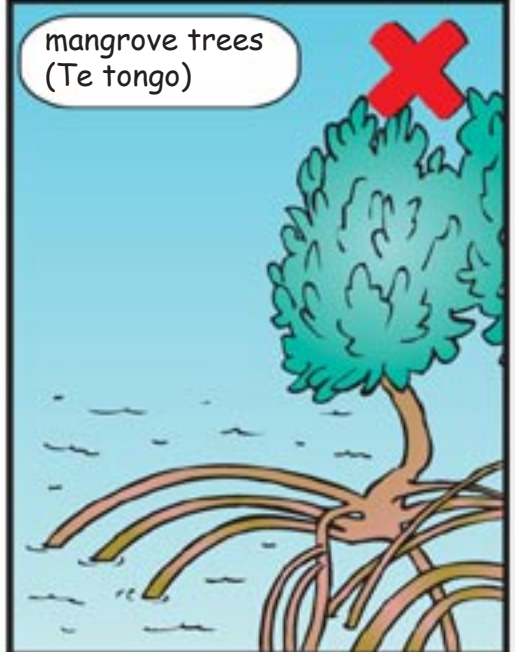
GETTING YOUR STAKES

I have been in the bush to cut my stakes. I need 30 stakes for a 15 m long plot. I cut them as long as my arm so that I can plant them deep in the sea bottom. The best trees for stakes are small, flowering shade trees, Premna trees or casuarinas. Do not cut your stakes from the mangroves, because mangrove trees hold our coastline together and are the home of many baby fish.



Premna trees
(Te angō)

Small, flowering
shade trees
(Te uri)



mangrove trees
(Te tongō)

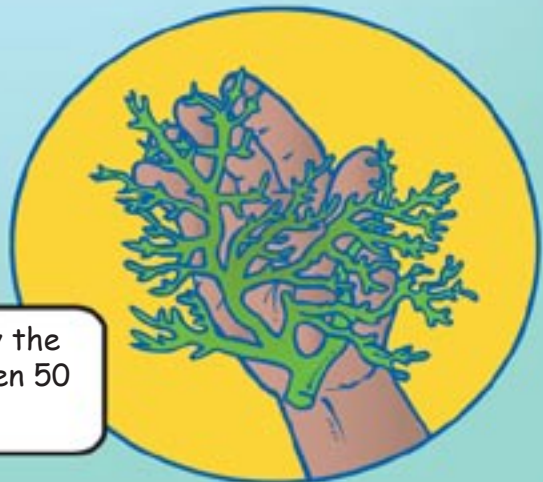
CHOOSING THE RIGHT SEEDLINGS

When you choose your seedlings, choose pieces that are thin, with lots of growing tips, dark in colour and with plenty of mucus. Don't choose plants that are too thick with no new shoots, or that are pale in colour or look sick.



Cut your plant with a knife, or break it with your fingers. Dry the old part of the plant, and use the young parts for seedlings.

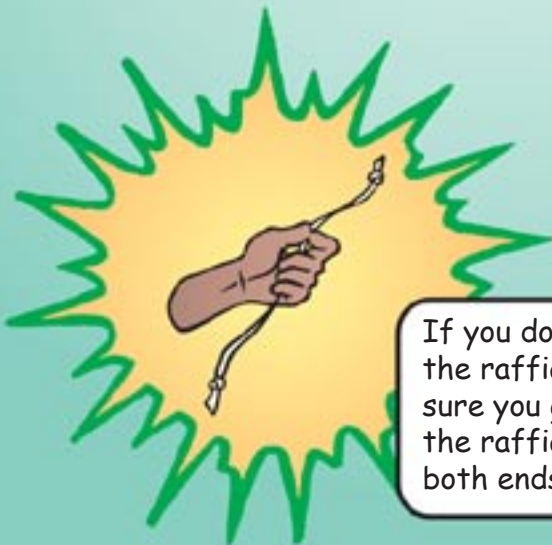
A seedling should be approximately the size of your hand and weigh between 50 and 200 grams.



PREPARING YOUR RAFFIA TIES

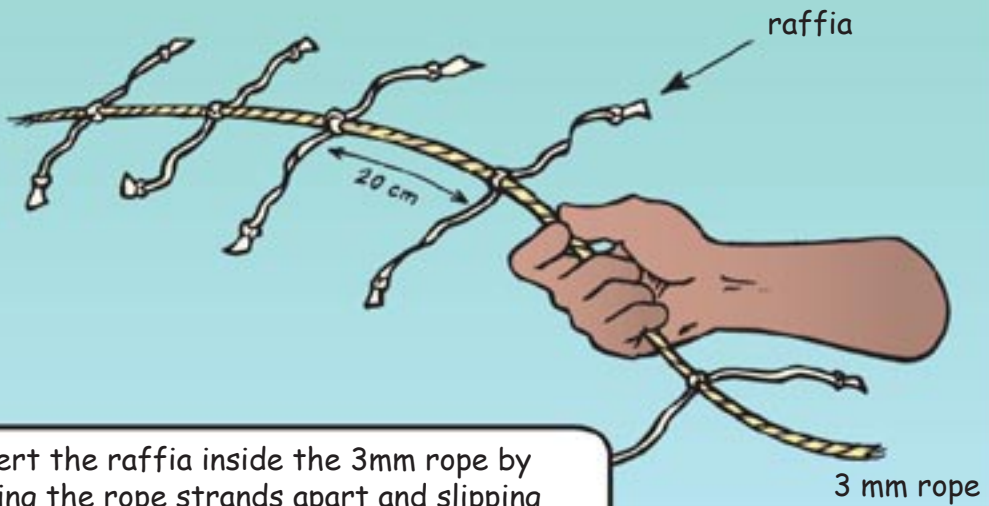


To prepare your raffia ties, take a board (25 cm x 10 cm). Wind the raffia around the board as many times as you need, and then cut the raffia at both ends with a knife. Your raffia ties are now ready!

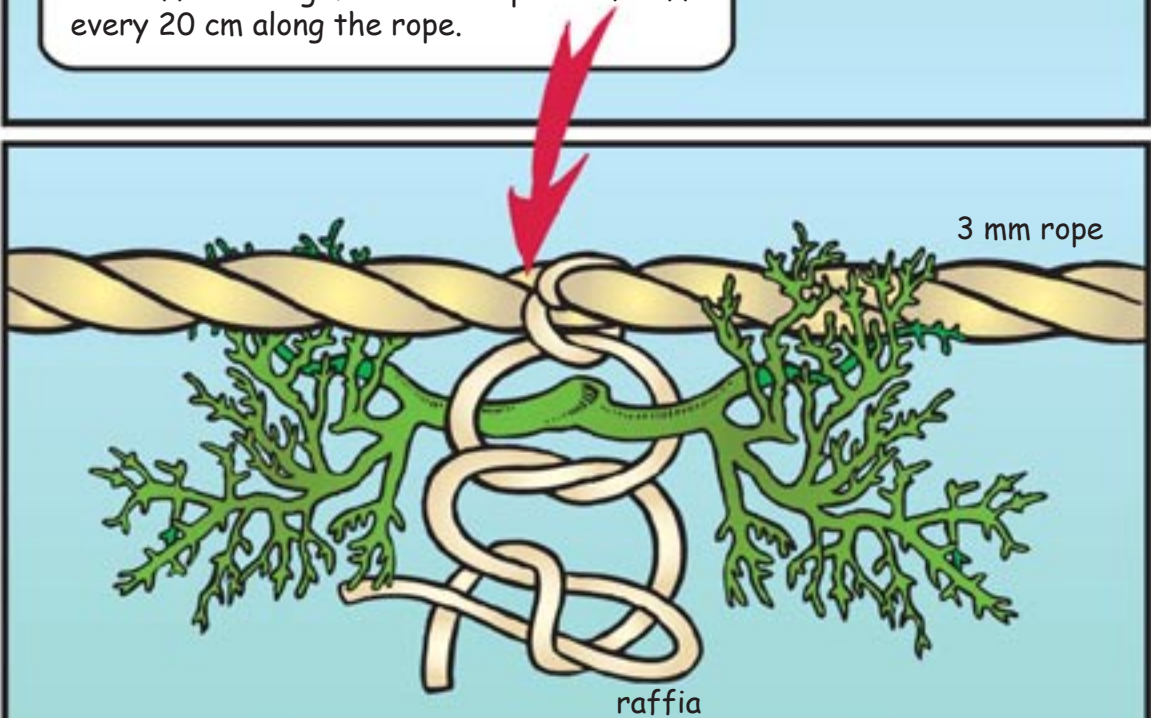


If you don't have a board, you can wind the raffia around your toes, but make sure you get the length right. If you want the raffia to last longer, tie knots at both ends of the ties.

PREPARING THE CULTURE ROPES



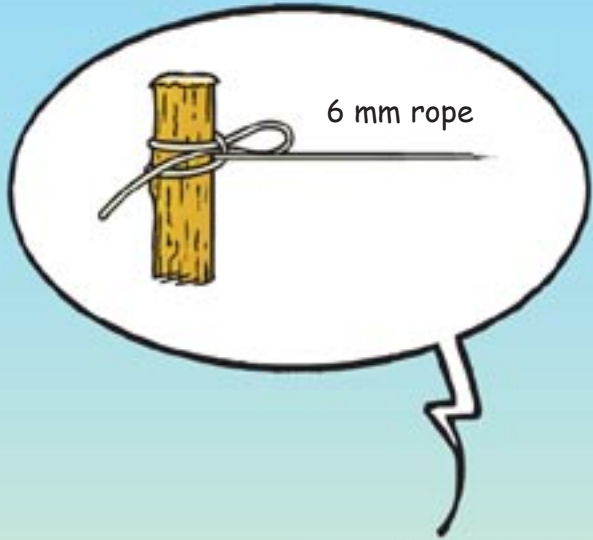
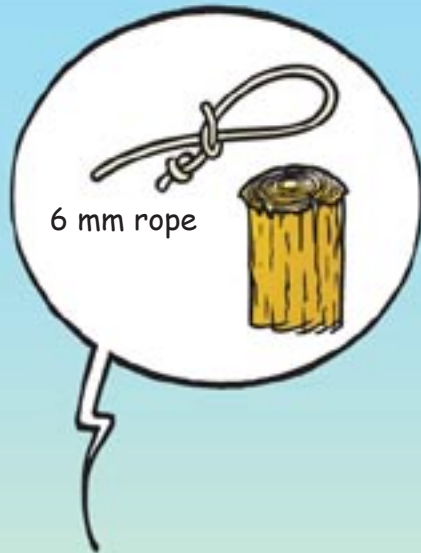
Insert the raffia inside the 3mm rope by pulling the rope strands apart and slipping the raffia through. Insert one piece of raffia every 20 cm along the rope.



Tie the seaweed using the knot shown in the picture. Don't tie the seaweed too tightly, but make sure your knot will not slip.

BUILDING YOUR SEAWEED PLOT

It is important to use 6 mm side ropes as they hold the plot together. Make sure the side ropes are tied very tightly between the four corner posts. Use a slip knot at one end and a clove hitch at the other.



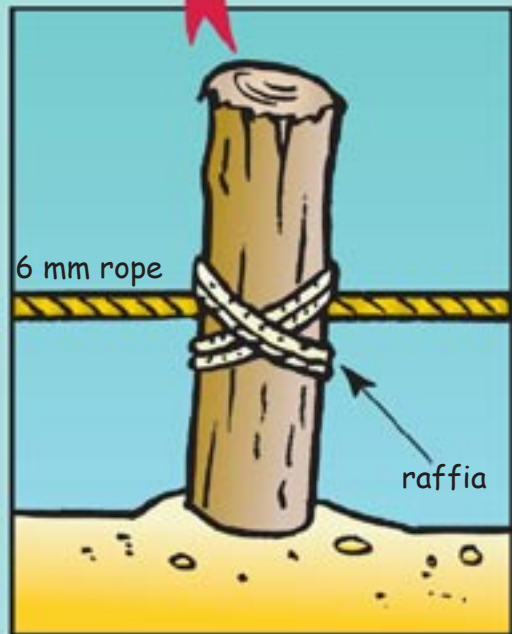
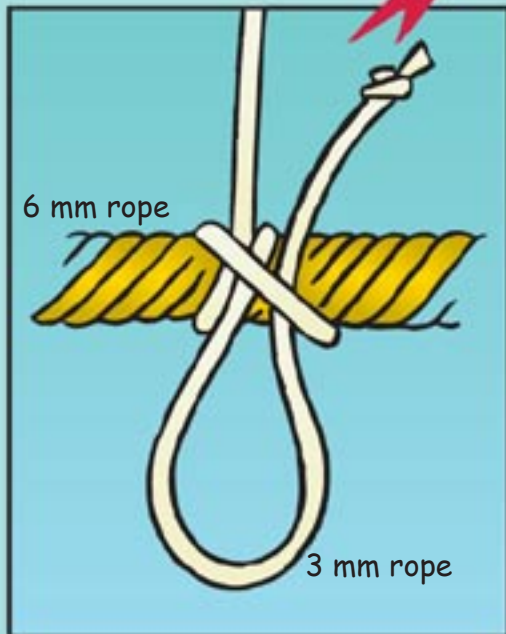
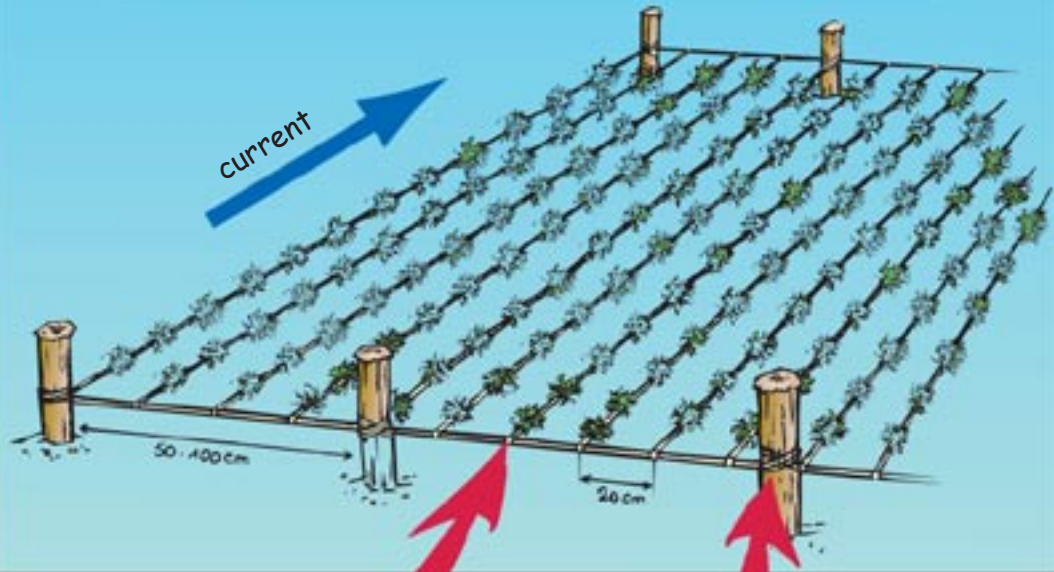
TYING YOUR SEAWEED

It is now time to tie your seaweed onto the ropes. Make sure that you and your family work under the shade of a maneaba! **DON'T WORK OUT IN THE SUN;** you may get sick.



HANGING YOUR LINES

Make your lines 5 m long, and hang them in the same direction as the current flows onto your farm site. Use the knot in the picture to attach the lines to the side ropes. Tie the side ropes tightly to the post with some raffia.



OTHER WAYS OF FARMING

Other farming styles can be practised in the Kiribati islands, such as the stake-to-stake method, which is used in the Philippines, or floating longlines. Farmers have had good results with these methods in some areas.



THE STAKE-
TO-STAKE METHOD

THE
FLOATING LINES
METHOD



NURSERIES AND DEVICES FOR HOLDING SEEDLINGS

In the outer islands, some devices have been used to supply the farmers with healthy seedlings. On your island, you may see floating seaweed cages, or cages on the sea bottom.



A floating cage holds a lot of seaweed and protects it from being eaten.

A seaweed pen also protects the seaweed from being eaten by fish.



MAINTAINING YOUR FARM

A well-maintained farm will give you a good return, but a poorly maintained farm will be very disappointing. You need to work on your seaweed farm every day; at certain times of the year, you need to do a great amount of work in the farm to keep the plots tidy and strong. You must keep your lines tightly stretched and retie any seaweed that has fallen off.

I'm retying all the seaweed that has fallen off the rope, what are you doing?

Oh, I'm tightening the lines again; they have got loose!



MORE WORK TO DO

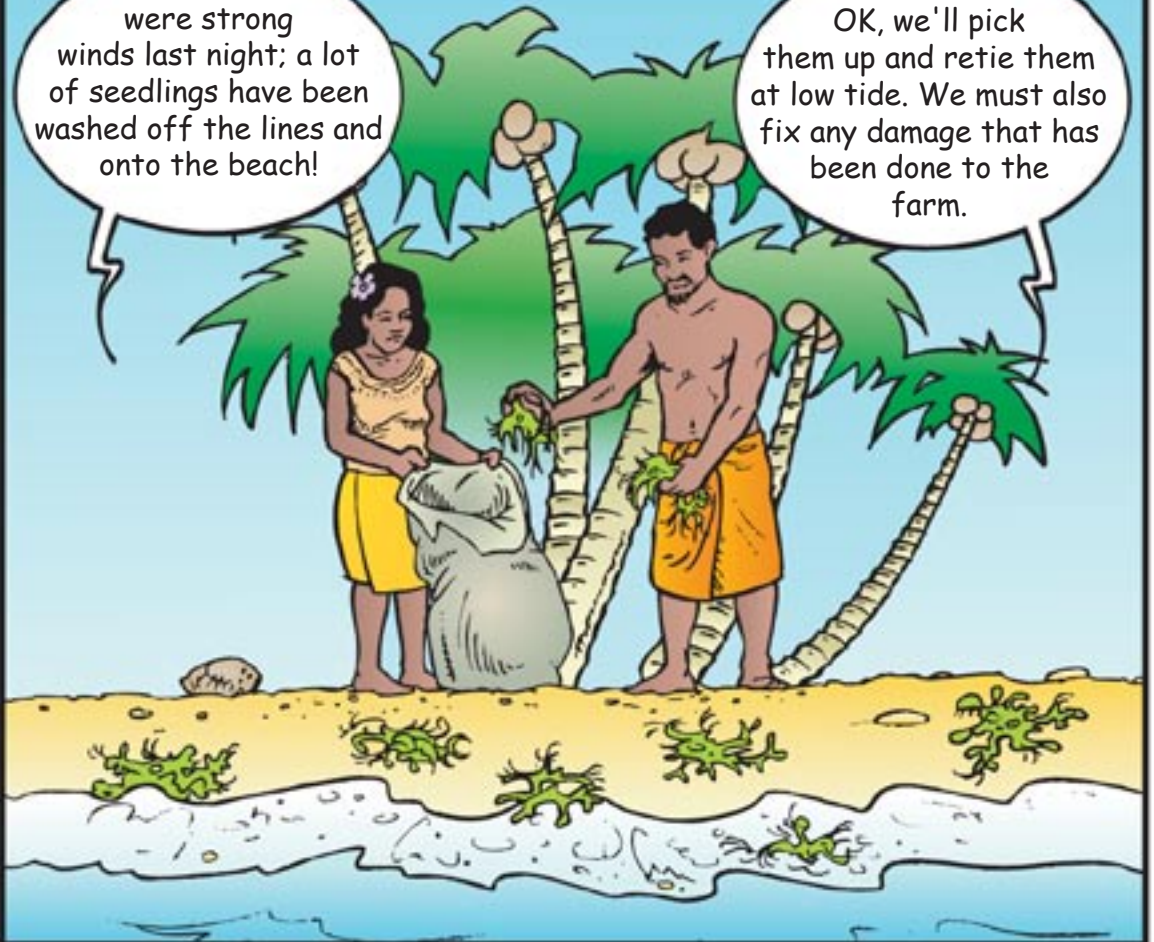
The seaweed in this plot is full of silt and drifting algae.

Yes, but it's not a big problem, just shake the lines to get rid of the silt, and remove the drifting seaweed, we'll take it to shore.



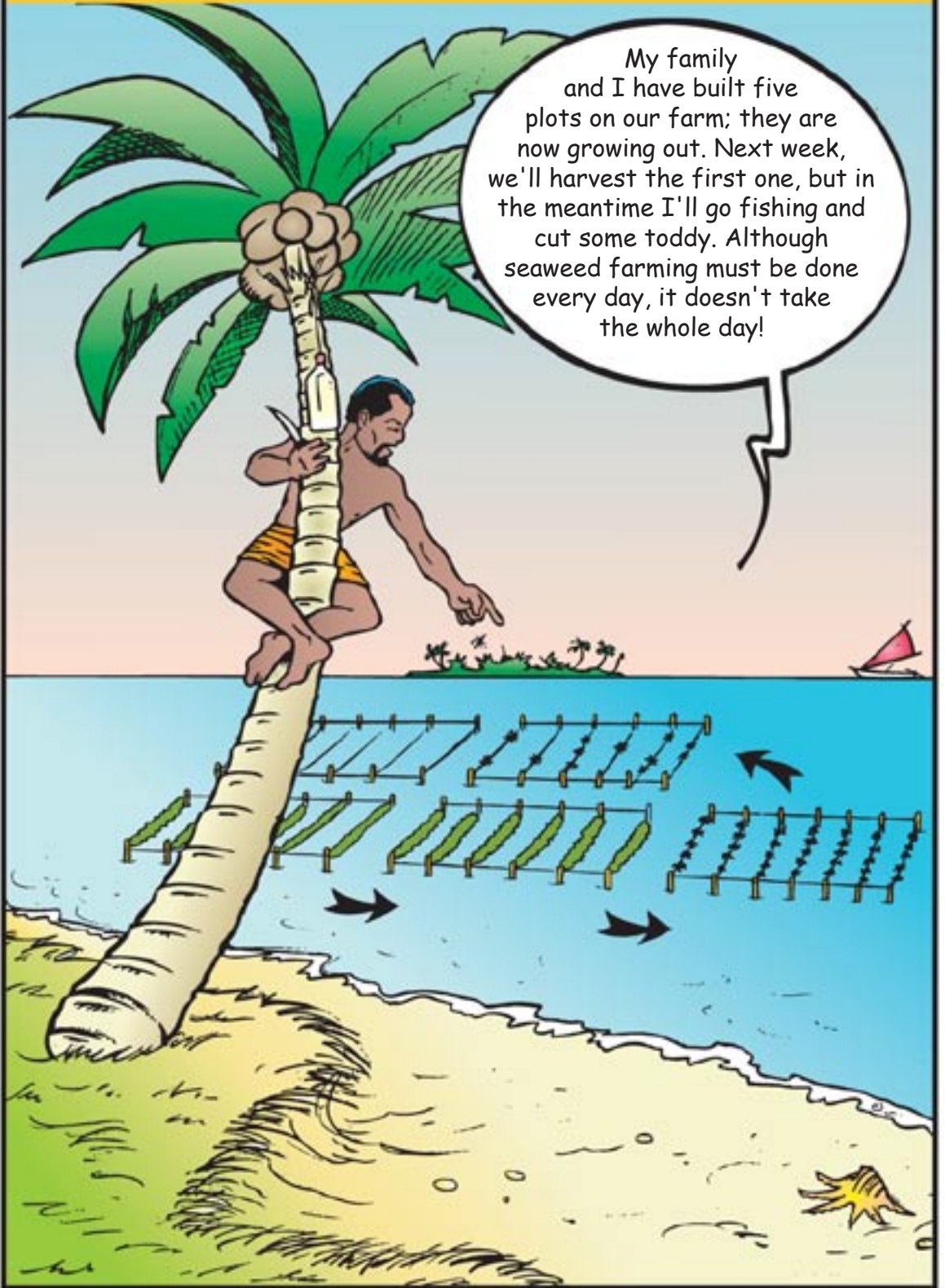
There were strong winds last night; a lot of seedlings have been washed off the lines and onto the beach!

That's OK, we'll pick them up and retie them at low tide. We must also fix any damage that has been done to the farm.



ROTATING YOUR PLOTS

My family and I have built five plots on our farm; they are now growing out. Next week, we'll harvest the first one, but in the meantime I'll go fishing and cut some toddy. Although seaweed farming must be done every day, it doesn't take the whole day!



TIME TO HARVEST

The first plot is now ready for harvesting. Taira is staying ashore with the kids; they are sewing some harvesting bags. Yesterday we chose a good place for drying the seaweed; it's exposed to the sun and the wind. The seaweed will dry quickly there!



GETTING READY TO HARVEST

Now it's time to harvest our seaweed. We have cleared the drying area and prepared some harvesting bags and the new lines for replanting. We have asked our family and friends to come and help us.

At low tide, the family goes to the farm and takes all the seaweed ashore with the help of the harvesting bags. There it will be dried and replanted.



Oh, look how big the seaweed has grown!

Yes! Tell the kids to pick up the broken pieces and put them in the bags, I am going to take some bags ashore.



DON'T WAIT UNTIL IT'S TOO LATE!

Ha! Ha!
Look at the old
man—he has waited too
long to harvest his plot! He
only has one piece of seaweed
left; the rest has been
washed away!!!

Oh yes,
and the piece
is as big as a
whale!!!



A SUCCESSFUL HARVEST

For a successful harvest, bring all your seaweed ashore at low tide. Or, to save your energy, you could use a boat at high tide. Use drying racks if you can and harvesting bags to handle your seaweed.



DRYING THE SEAWEED: WHAT YOU NEED

Coconut fronds are very useful for drying the seaweed on if you have nothing else. However, although they are free, they let a lot of impurities get into the drying seaweed. The best use for coconut fronds is as a first layer for your drying area, underneath a piece of shade cloth.



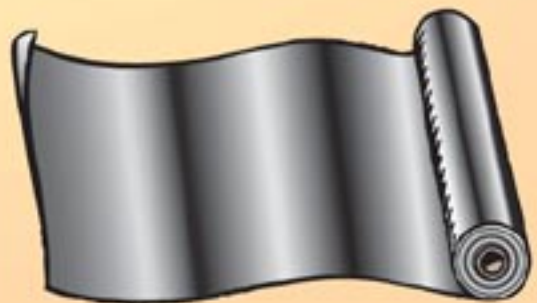
Coconut fronds



Shade cloth

You can buy shade cloth from the ASC. It's very good for drying seaweed on, because it lets the air go underneath. It's also easy to handle seaweed that is drying on top of shade cloth.

Black plastic protects the seaweed from the rain and the humidity at night. To dry the seaweed properly, you must use a piece of black plastic.



Black plastic

RETIE YOUR SEAWEED AS SOON AS POSSIBLE!

DON'T FORGET TO RETIE YOUR SEAWEED AS SOON AS YOU CAN. Don't keep the new seed pieces out of the water for too long (one hour maximum) , and remember to choose healthy branches with lots of new growing tips for the replanting.

After, we'll go out in the lagoon to plant the lines that they are tying.

While Teborou and the kids are tying some new lines for replanting ...

Good idea!

... Taira and his friends are getting the seaweed ready to be dried.

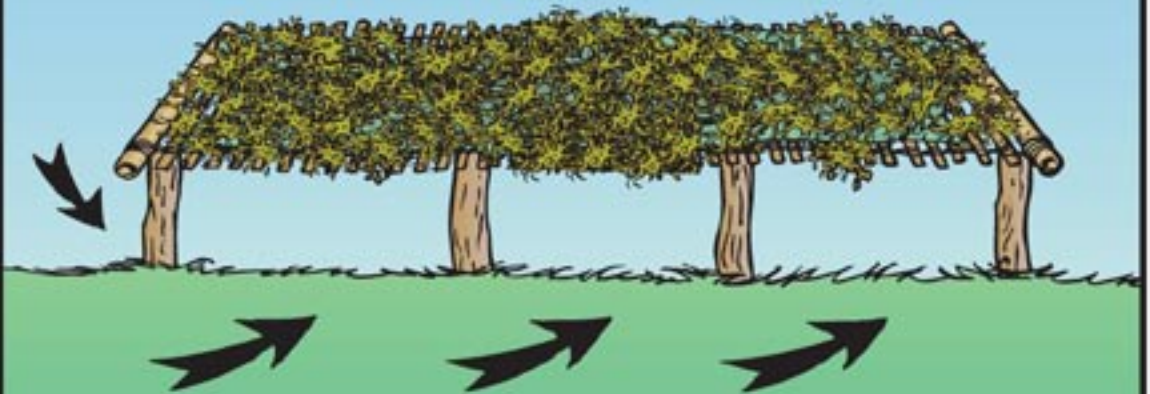
AFTER THE HARVEST

When the seaweed is laid out on the drying area, you must remove any bits of rubbish mixed in it, or any animals or plants, as these will lower the quality of your dried seaweed. For example, some of these may be mixed in with your seaweed:



DRYING YOUR SEAWEED

Put your seaweed on racks. This helps the seaweed to dry more quickly and prevents many impurities getting into it. In a sunny area, it will take only **THREE DAYS TO DRY**. Cover the seaweed with a piece of black plastic to make sure you get the best quality.



At night



When it rains



PACKING YOUR SEAWEED

Look, the seaweed is dry!

Yes, all the salt has come out, you can see it sticking to the seaweed. Now the seaweed is purple, brown and yellow.

THREE TO FOUR DAYS HAVE GONE BY ...

Put as much as you can in the same bag.

OK— I told the kids to re-dry the wet pieces.

WEIGHING DAY ON THE ISLAND

A WEEK HAS GONE BY ...

Well done Teborou. Here's your money; do you want to buy some more equipment?

WAHOOOO!
450 kilos this month—I'm going to buy a hand cart!

Oh no, no, not today—I have better ideas!!!!

Taira, I think you and your wife are now the top farmers of the village!



DREAMS FOR THE FUTURE

ON THE WAY HOME, TEBOROU IS DREAMING ...



Teborou's store



Teborou's motorbike

Ha! Now you're happy, because you think seaweed farming is easy! But there are also problems in seaweed farming. For example, do you remember when the turtle and the fish grazed on our seaweed? Do you remember the epiphytes and the ice-ice? Let's talk about these problems now.



SEASONAL GRAZING



There are two types of fish grazing in Kiribati: seasonal grazing, which happens during certain seasons, and territorial grazing, which occurs in certain places. Both can do a lot of damage to the farms.

Juvenile rabbitfish graze on the seaweed during certain seasons. They gather together in large schools on the lagoon flats of the islands of Kiribati. They don't come every year—but when they do come, they bite the skin of the seaweed and kill it.

If you see them in your farm, harvest your plants immediately, and seek advice from your ASC agent. Wait until the rabbitfish have gone before you start a new farm.

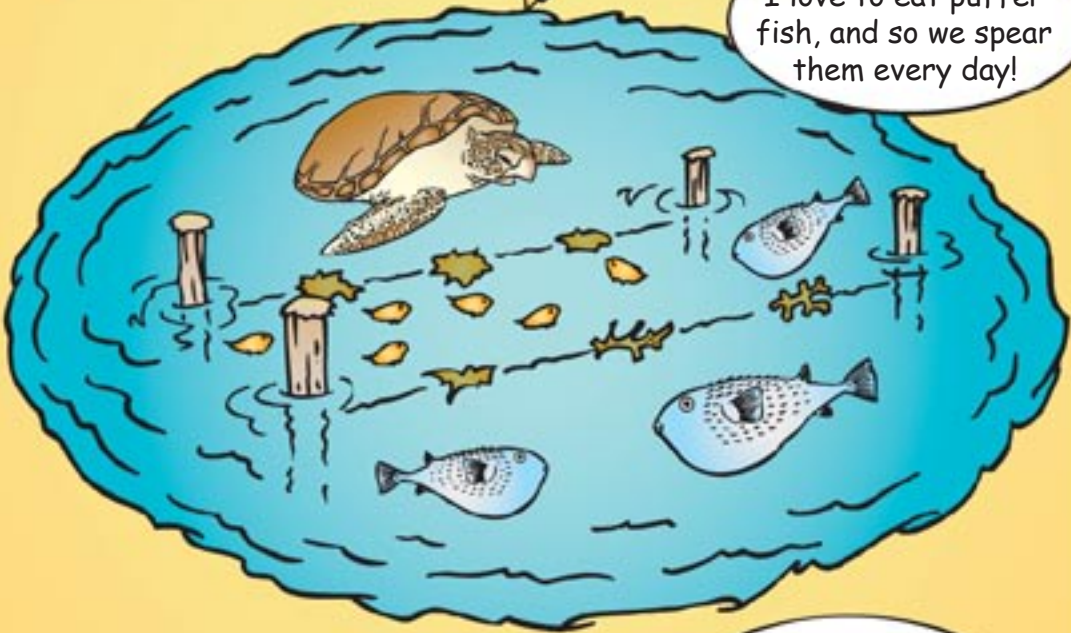


TERRITORIAL GRAZING

Territorial grazing happens when your farm is in the territory of bigger animals that live or feed in the lagoons. Puffer fish, porcupine fish and turtles love to eat your seaweed. They take big bites and can do a lot of harm if the seaweed does not grow fast enough.



Teborou and I love to eat puffer fish, and so we spear them every day!



Please don't kill any turtles; they are getting very rare. Instead, just scare them away!



ICE-ICE AND EPIPHYTES

Do you remember those epiphytes?



Of course!
And do you remember the ice-ice?



Epiphytes and ice-ice are seasonal problems; they usually occur when the seaweed is under stress. This can happen because the water current is slow, for example, during periods when the winds are light. It can also happen if the seaweed doesn't get enough light or if the water temperature is too high. Epiphytes are long, thin threads of algae, which grow on the skin of the seaweed and quickly spread throughout the farm. When the seaweed is affected by ice-ice, it turns white in colour. In Kiribati, seaweed plants recover quickly from these infestations; they are not problems in themselves, but are caused by changes in the environment.

A HAPPY ENDING



Common names and species names used in this guide

| Common name | Species name |
|--|--|
| Cottonii (a species of red seaweed) | <i>Kappaphycus alvarezii</i> (previously known as <i>Eucheuma cottonii</i>) |
| Other red seaweed | For example, <i>Acanthophora</i> spp. |
| Seagrass | For example, <i>Thalassia testudinum</i> |
| Seagrapes | <i>Caulerpa racemosa</i> |
| Brown, fan-shaped algae sometimes called "funnel weed" | For example, <i>Padina</i> spp. |
| Small, flowering shade trees | <i>Guattarda speciosa</i> |
| Premna trees (sometimes called "headache trees") | <i>Premna</i> sp. |
| Casuarinas | <i>Casuarina equisetifolba</i> |
| Mangroves | <i>Rhizophora mucroniata</i> |
| Rabbitfish | <i>Siganus</i> spp. |

Farming Seaweed in Kiribati: A practical guide for seaweed farmers

This manual aims to assist seaweed farmers in the Pacific Islands to successfully farm *Kappaphycus* seaweed. *Kappaphycus alvarezii* is a red seaweed, commonly called "Cottonii" and previously known as *Eucheuma cottonii*. There are three common strains that are successfully farmed. The farming of *Kappaphycus* is well established in Kiribati, with production routinely around 1000 dry tonnes per year. Seaweed growth varies greatly according to where it is planted, and so it is very important to find the right site for setting up the seaweed farms. The problems involved in farming *Kappaphycus* include epiphytic algae, *ice-ice* disease, and grazing by herbivores, such as rabbitfish (Siganidae).

