# Processing and preserving fresh produce

## At a glance

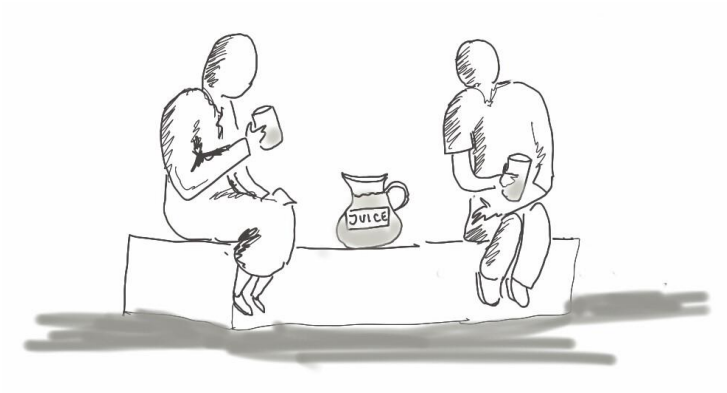
- Processing and preserving fruit, vegetables and fish can add value to the produce and means it can be kept for longer.
- Drying: wash hands and equipment, prepare the product and then dry in the sun on a rack or mat, or use a purpose-built drier.
- Fermenting: this involves adding a harmless micro-organism to food. Find out what methods are used locally.
- Crystallising: pieces of fruit or peel are placed in heated sugar syrup, which absorbs the moisture from within the fruit and preserves it.
- Smoking: this is a traditional way to preserve fish by cooking and drying it at the same time in a smoker. Smokers all require a source of smoke and somewhere for the fish to be hung or placed in trays.
- Juicing: peel fruit and remove seeds, extract the juice from the fruit and mix with sugar, a preservative and clean water. Bring the fruit juice nearly to the boil for one minute before pouring into containers.
- Making jams: chop clean, ripe fruit into small pieces and remove stones and skin. Gently boil the fruit in water until it forms a soft pulp. Add sugar, citric acid and other ingredients and boil the mixture again until it sets.
- Making chutney: cut the clean fruit and vegetables into small pieces and bring to boil. Mix in the other ingredients including sugar, vinegar and spices and boil for another 30-50 minutes stirring regularly.

## Why use this tool?

When fruit and vegetables are in season, prices are low and there may be too much produce for a household to eat before it over-ripens and spoils. Preserving and processing food is a way to keep produce for longer, reduce wastage and increase income.

## A brief description

The tool introduces ways to process and preserve fruit, vegetables and fish using simple technology in the home.




## Time taken

This will depend on the method of processing and preservation chosen and the food item being preserved.

## Explaining the words we use

**Citric acid** – a preservative often used when making jams and juices, found naturally found in citrus fruits, particularly lemons and limes.
**Chutney** – spicy relish made from fruit or vegetables, sugar, vinegar and spices.
**Jam** – sweet spread made from fruit and sugar.
**Micro-organism** – a living organism too small to be seen by the eye, for example, fungi, bacteria or viruses.
**Pickle** – vegetables preserved in spices and vinegar.
**Pulp** – the soft, moist part of a fruit or vegetable left after juice has been squeezed out.
**Preserving** – preventing the growth of micro-organisms which would spoil food.
**Processing** – actions that transform fresh food ingredients into new products.

## Keys to success

- Good hygiene is extremely important when preparing and processing food. Always wash your hands and any equipment before starting.
- Use good quality fruit, vegetables and fish.
- Choose appropriate drying structures for drying food.
- Store the finished product in clean, air-tight bags, jars or bottles.
- Traditional methods of smoking and fermentation can still be important ways of preserving food for longer periods of time. If using a smoker, ensure a good flow of air through the smoker by placing an entrance for air at the bottom and the top of it.
- If using preservatives, check with local experts about which ones are considered safe and in what quantity.
- If producing an item for sale, think about the market, packaging and what might be required, before producing too much of a new product.

## What to do

### Drying

This is one of the oldest methods of preserving food and can be done simply in the home. Drying vegetables, fruits and fish means access to nutritious food for longer and adds value to the produce. Tomatoes, herbs, mangoes and onions can be easily dried. Oily fish do not dry well. Use good quality fruit, vegetables and fish, and keep as clean as possible before drying. Products that are over-ripe, going bad or damaged will not produce a good result.

For more information on drying cereals and pulses see **Tool C2 - Reducing Crop Losses after Harvest**.

- Wash hands before handling the food, and wash any equipment. Avoid contamination from flies.
- Prepare the product:

**Fruit and vegetables:** Wash in fresh water, de-stone if required and slice into thin slices.

**Fish:** Wash in fresh water; remove guts and bones of large fish by splitting the fish open.

- To help preserve for longer, and especially to preserve the colour, dip in a **consumable preservative** before drying. (However, it is not always essential to use a preservative solution - check with local experts about what preservatives they would recommend and in what quantities.)
- Dry the product. Most low-cost ways of drying produce use the energy from the sun (known as 'solar energy'). Sometimes a structure is used to enhance the collection of solar energy (see below).
  Drying time usually takes between 1 and 3 days but the time taken depends on what is being dried, the thickness or size of the pieces being dried and the environmental conditions.
- When the product is well dried, store in clean plastic bags or jars that are tightly sealed.

Types of drying mechanisms include:

- **Sun drying on a rack/mats**: fresh produce is placed in direct sunlight to dry. This method is very simple, but is dependent on the weather and can lead to the food becoming dusty and dirty. This method is often used for cassava and for drying fish.

- **Tent dryer**: a tent-shaped wooden or bamboo frame covered in plastic sheeting. Clear plastic is placed on the sunny side, and black plastic on the shady side, or it can be entirely covered in clear plastic with black plastic on the floor. The plastic sides of the tent can be rolled over a pole and raised or lowered to change the temperature and air flow inside the tent. One end of the tent is left loose for access into the tent. The fruit or vegetable is placed inside the tent on a rack about half a metre from the ground. This structure is simple to make, use and store but is fragile in windy weather and it is difficult to control the temperature and air flow.

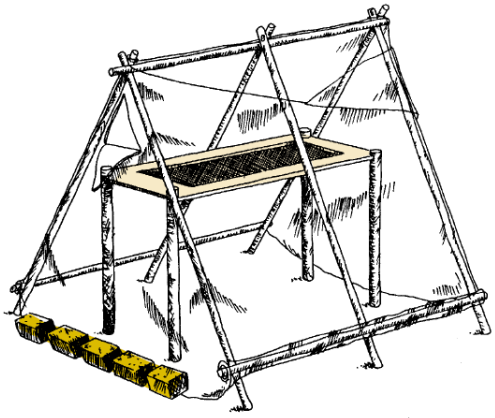


Image source: *Pillars - Improving Food Security p36*

- **Cabinet dryer**: a rectangular box, approximately 2 by 1 metres, covered with clear glass or plastic. The inside of the cabinet is often painted black (with non-toxic paint) to attract the heat and there are holes in the base and sides to allow air to enter. The air holes can be covered with wire mesh to prevent insects from entering. The roof of the cabinet is at an angle of at least 15 degrees in order to collect the most sunlight and to allow rainfall run off. The cabinet should face south in the northern hemisphere and north in the southern hemisphere. The food product is placed on perforated trays inside the dryer. The cabinet dryer is more expensive to make than the tent dryer but is still easy to make and provides faster and hygienic drying than simple sun drying.

- **Artificial dryer**: fuel is used to raise the temperature, and fans are used to increase the air speed. Artificial dryers are often needed in the rainy season when there is little sunlight and high humidity, or at night when solar dryers cannot be used. Artificial dryers give close control over the drying conditions and therefore produce higher quality products. However they are more expensive and complicated to build and operate than other types of dryers. They also need a constant source of fuel.

**Which dryer is best for your context? Questions to consider include:**

- What is the local climate? Is it wet or dry? How much sunshine is there?
- What is the availability and cost of materials? Who will build the dryer?
- How much of the product do you want to dry?
- Is the product for sale or for eating at home?

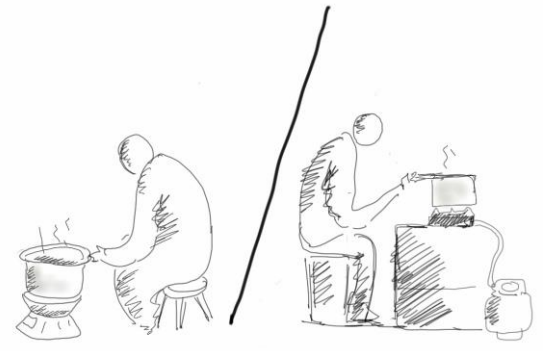
## Fermentation

This is a traditional method of preserving that involves adding a harmless micro-organism to food. This multiplies and brings about good chemical changes which mean the food lasts for longer. There are two kinds of fermentation, **sour fermentation** which produces acid, and **alcohol fermentation**. Fermentation is a simple and low cost method and is an excellent way of increasing the value of raw products. There are hundreds of types of fermented foods, a few are listed in the table below. **In your community, are there traditional ways of using fermentation which will help preserve food for longer in the home?**

| Food type | Region of origin | Ingredients and process |
|---|---|---|
| *Kim chi* | Korea | Mixture of fermented cabbage, radish, green onion or cucumber |
| *Gari* | West Africa | A dough made from fermented grated cassava |
| *Dosa* | India | An Indian pancake made of fermented rice and black lentils |
| *Prahok* | Cambodia | Crushed, salted and fermented fish paste used as a seasoning |

## Crystallising

Crystallised fruit (also known as glacé fruit or candied fruit) is made by soaking fresh fruit pieces in a sugar syrup, then heating the mixture until all the fruit's original water content is replaced with sugar. The syrup absorbs the moisture from within the fruit and eventually preserves it. Dates, pineapple, cherries and ginger all crystallise well, as does orange and lemon peel.



## Smoking

Fish is an important source of nutrition, but can spoil very quickly. Smoking is another traditional way to preserve fish by cooking and drying it at the same time. Smokers have different designs but all require a source of smoke and somewhere for the fish to be hung or placed in trays.

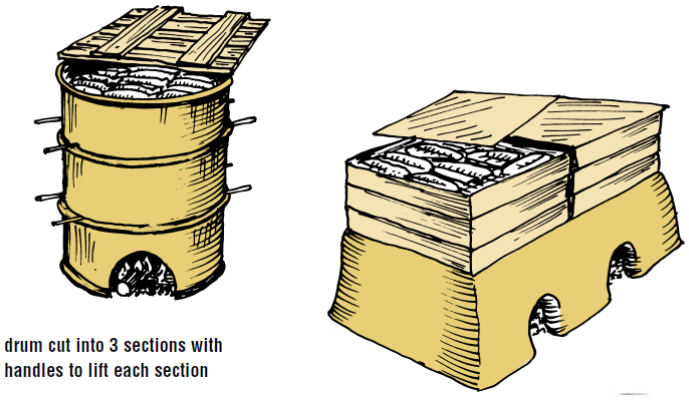



Image source: *Pillars - Improving Food Security p40*

Simple kilns can be made out of oil drums or built using brick or mud walls. To ensure a good flow of air through the smoker there needs to be an entrance for air at the bottom and the top of the kiln. Smoking usually takes between 14 and 24 hours. Different wood or fuel gives different flavours to the fish so try out a variety to decide on what gives the best result.

## Juicing

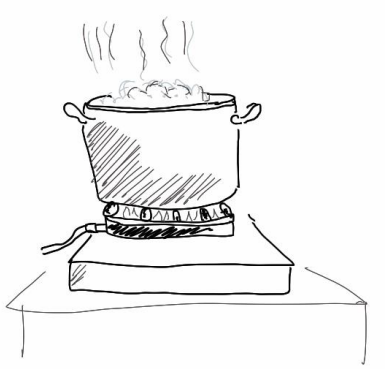
Making juices is a good way to prevent fruit from being wasted. However, unless the juice will be used immediately, a preservative needs to be added to keep the juice for longer (a preservative will usually mean that juice lasts up to a few weeks). Citric acid is one of several preservatives which can be added to fruit juice. It is present in lemon juice or can be purchased from chemists and pharmacies. It is important to check to find out permitted levels of different preservatives in your area.

**There are many ways of making juices, here is one simple method:**

Start with clean, washed, ripe fruit which is undamaged. Peel the fruit, removing the seeds.

Extract the juice by hand or using a hand press.

Separate the juice from the pulp by passing the liquid through a piece of clean cloth.



Mix the juice with sugar, a preservative and clean water. Heat treatment of the juice will destroy microorganisms that can make the juice go bad and cause sickness. Bring the fruit juice nearly to the boil (90°C) for 1 minute.

While it is still hot, pour it into clear glass bottles, wrap these in a damp cloth to prevent cracking, and cap. Be extremely careful that no one gets burnt when handling the hot liquid and glass.

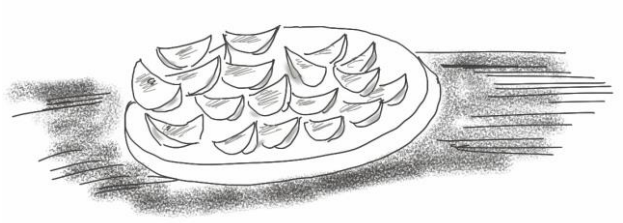
## Making jams, chutneys or pickles

Jams and chutneys preserve and add value to fruit and vegetables so they can sold as a new product.

**Jam**: many types of soft fruit can be used to make jam including mango, strawberries, pineapple and guava. The clean, ripe fruit should be chopped into small pieces and the stones and skin removed. Fruit is then gently boiled in water until it forms a soft pulp. Sugar, citric acid and other ingredients are added and the mixture is boiled again until it sets.

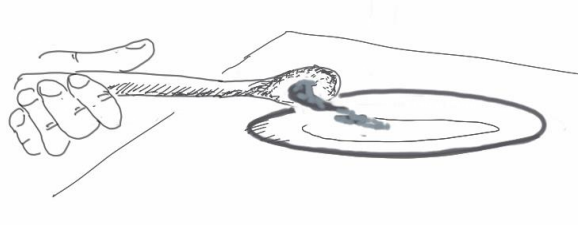
**How to make jam -** *This recipe is just a guide – there are many ways to make jam!*

1. Cut up your fruit. For every two cups of chopped fruit, use just a 1/2 cup of water (less if the fruit is very juicy like pineapple).



2. Cook the fruit in a large pan until very soft – usually about 15 to 20 minutes. Then add one cup of sugar for every cup of fruit.

3. Stir well and allow to boil for 15 to 20 minutes until it will set. If there is a lot of froth, add a small spoon of butter or margarine.



4. Test for setting by dropping a small amount of jam onto a cool plate. After a few minutes push it with your finger. If it wrinkles and forms a skin, it is ready. If it does not, continue boiling and add some more sugar.

5. Pour the hot jam into very clean, dry glass jars, first wrapping each jar in a damp cloth to prevent cracking. Cover with a clean lid.

Generally, soft fruit needs less cooking time and less water. It is better to use refined sugar. However unrefined sugar can be used for strong tasting fruits such as orange and lemon. Citrus fruits need longer cooking. For every two cups of chopped citrus fruit add ½ cup water and 1 ½ cups of sugar. Tie the citrus seeds into a piece of cotton and cook with the jam to improve setting.

*Source of text: Tearfund (2001) Pillars - Improving Food Security, p43*

**Chutney and pickle**: unlike jam, chutney or pickle can often be made with fruit or vegetables which are not yet ripe including tomatoes, green mangoes, papaya, onions and carrots. Both chutney and pickle are used to accompany meals. Chutneys are usually sweeter than pickles which are often more spicy and hot. To make chutney, cut the clean fruit and vegetables into small pieces and bring to boil. Mix in the other ingredients including sugar, vinegar and spices and boil for another 30-50 minutes stirring regularly.

### A recipe for chutney

This recipe is just a guide – there are many ways to make chutney!

***Ingredients:***

Ten cups of chopped vegetables (use a mixture of several)
One to two cups of chopped onion
Three cups of vinegar
Three cups of sugar
Three teaspoons each of ground ginger, mustard seeds, cinnamon or other similar spices
Salt and pepper

- Cook in a large pan.
- Bring to the boil and cook for 30–50 minutes, stirring regularly.
- Cool a little and pour into clean jars, first wrapping each jar in a damp cloth to prevent cracking.
- Use undamaged lids and, if possible, first cover with plastic to prevent the vinegar damaging the metal lids.
- For pickles add the same amount of vinegar but just one to two cups of sugar and plenty of chilli, mustard seeds, and other similar available spices.

*Source: Tearfund (2001) Improving Food Security, p45*

## Marketing produce

If the produce is being made for sale it is important to know whether there is a good market for the product. For example, do local people use jam or drink juices? What is the demand for preserved or processed fruit and vegetables? Is the demand local or further away? It is sensible to start making the new product in small batches until the technique and recipe have been perfected. Think about how the product will be packaged to make it look attractive to prospective buyers.

Please see **Tool C2 - Starting a business** for advice if you are planning on selling produce.

## Finding out more

- Practical Action (2009) Technical brief: A Simple solar dryer
  http://answers.practicalaction.org/our-resources/item/a-simple-solar-dryer
- Practical Action (2003) Technical brief: Small scale drying technologies
  http://answers.practicalaction.org/our-resources/item/small-scale-drying-technologies
- Practical Action (2002) Technical brief: Mixed Fruit Juice, small scale manufacture
  http://answers.practicalaction.org/our-resources/item/mixed-fruit-juice
- Practical Action (2008) Technical brief: Fruit juice processing
  http://answers.practicalaction.org/our-resources/item/fruit-juice-processing
- Practical Action (2012) Technical brief: Fermented Foods
  http://answers.practicalaction.org/our-resources/item/fermented-foods
- Tearfund (1994) *Footsteps 21: Technology*, article on Food drying
  http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_21-30/footsteps_21/
- Tearfund (1997) *Footsteps 32: Food security*, articles on Food storage and preservation and Fermentation
  http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_31-40/footsteps_32/
- Tearfund (2014) *Footsteps 94: Valuing food*, article on Fruit for every season
  http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_91-100/footsteps_94/
- Tearfund (2005) *Footsteps 65: Adding value to food*, article on Adding value to fruit
  http://tilz.tearfund.org/en/resources/publications/footsteps/footsteps_61-70/footsteps_65/
- Tearfund (2001) *Pillars: Improving food security*
  http://tilz.tearfund.org/en/resources/publications/pillars/improving_food_security/

**Related tools:**

- B – God's provision of healthy food (Bible study) *[B: Food & livelihoods-2]*
- C2 – Composting *[C2: Climate & environment-1]*
- C2 – Conservation agriculture *[C2: Food & livelihoods-5]*
- C2 – Developing urban home gardens *[C2: Food & livelihoods-9]*
- C2 – Developing rural home gardens *[C2: Food & livelihoods-8]*
- C2 – Starting a business *[C2: Food & livelihoods-6]*