Food and Agriculture Organization of the United Nations

PRESERVE YOUR OWN FOOD

Promoting healthy eating through home food processing and preservation

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PREPARATION OF THIS DOCUMENT

This booklet is a practical guide to the simple methods and techniques used to preserve food at home and promotes the consumption of local starchy staples and dark green leafy vegetables. The first half of the booklet provides a general introduction to the basic principles of food preservation and spoilage. Methods of preservation are then defined, and the main points of spoilage specific to the method are covered. The other half introduces solar drying technique for the processing of Fijian local starchy staples and dark green leafy vegetables into flour and leafy green powder including the basics to making jams and chutneys.

ACKNOWLEDGEMENTS

The Food and Agriculture Organization of the United Nations (FAO) received the financial support of the European Union (EU) and the technical support of the Ministry of Agriculture in the development and finalization of the booklet. Trials and evaluation of the developed methods were carried out in two communities in the Ra province – Vunitogoloa village and Wairuku settlement with a pilot training conducted in Burenitu village. The pilot version of this booklet has been used in the facilitation of trainings of 107 project communities in the provinces of Bua, Nadroga/Navosa and Ra with the support of the respective Provincial Councils of the Ministry of iTaukei Affairs, including the Provincial Administration offices of the Ministry of Maritime and Rural Development.
INTRODUCTION

This “Preserve your own food” booklet introduces a solar drying technique in the processing of local starchy staples into flour and dark leafy green vegetables into powder. Majority of the food eaten by Fijians are either imported overseas or commercially processed. And most of Fiji’s fresh food production are on seasonal basis meaning they are only available on certain times of the year. A lot of our food produced are also wasted due to improper handling and storage during and after harvest and when bought from the market. Regular supply of a diversified and adequate food in terms of quantity (amount) and quality all year around is important for your family’s food security and nutrition well-being. Our population’s changing lifestyle and low agriculture production due to the negative impacts of climate change has contributed a lot to unhealthy food choices and eating habits. This is one of the main causes of the rapidly increasing rate of non-communicable diseases (NCDs) amongst Fijians. Home food processing and preservation is one the most simple and practical ways to fight this problem so that you and your family can still enjoy a variety of healthier food options all year around.
WHY PRESERVE FOOD AT HOME?

Food preservation means keeping food from going bad. Whether you’re growing your own food or buying in large amounts, preserving food at home helps your family enjoy food all year round. Home preserved foods add variety to meals and can be a healthy and cheap way to save up on food for later use especially during off-seasons and food shortages. Much of our food also go unused when plentiful in supply. Rather than simply letting these foods go to waste, preserve it.

What is food preservation?

Food preservation refers to a variety of methods used to prevent food from spoiling.

Food, especially vegetables and fruits, starts to go through changes as soon as they are harvested. These changes in the end lead to the rotting of food. This spoilage processes can be slowed down using different methods to extend the shelf-life of food. Before we learn these different methods, it is very important to understand what causes the changes in food until they spoil/rot.

History of traditional Fijian food preservation

Food preservation allowed early Fijians to cope during food shortages that may have been caused by seasonal availability of food and natural disasters like hurricanes and droughts. They used a variety of methods of preservations as reliable sources of food without having to go hungry at any time. These traditional preservation methods included drying, salting, smoking and fermentation. An example of this is fermented cassava called ‘Bila’ which is a speciality of Naita village in Tailevu province.
WHY DOES FOOD SPOIL?

Our food comes from the land (soil) and ocean. All living things go through a time of growth, maturity and in the end, they rot. As soon as you harvest food from land and ocean, they naturally begin to go through a process that starts changing them. If not stored properly, these foods begin to spoil/rot within few days.

So, after crops are harvested, there are three reasons they spoil:

1. **Germs**

Germs (micro-organisms which are too small to see including diseases) grow and reproduce making food unsafe to eat.

2. **Chemical-enzyme activity**

Chemicals and enzymes naturally present in food continue the life processes (e.g. fruits continue to ripe and then over-ripe until they rot).

3. **Physical damages**

Damages related to improper handling during and after harvest, and storage (e.g. when fruits and vegetables are damaged by falling or breaking).

When vegetables and fruit are damaged by falling or breaking, food releases enzymes that cause chemical reactions. The peel of a fruit or vegetable provides natural protection against germs, as soon as this shield is damaged by falling, crushing, cutting, peeling or cooking, the chance of spoilage increases. Insects and rodents also cause spoilage, they eat food and pass on germs and disease through their hair and droppings.

**What is food spoilage?**

Every change in food that causes it to lose its quality and eventually become unsafe to eat is called food spoilage or rotting.

To slow down spoilage, we need to avoid physical damages, reduce the growth of germs, and prevent chemical and enzyme activity by using different preservation methods. Before we learn these methods, let’s learn about germs to help you understand the steps required to safely preserve your food at home.
WHAT YOU NEED TO KNOW ABOUT GERMS

Germs (microorganisms) come in three different types – **bacteria, moulds, and yeasts**. These germs need five living conditions to survive:

1. **Enough water**
   
   Water is needed for keeping life processes in food happen. Most germs cannot grow where there is not enough water such as in dried split peas/ dhal. That is why drying is one way to slow down spoilage.

2. **Oxygen/ air**
   
   Most germs need oxygen. Bacteria cannot live or multiply if there is not enough oxygen. But some bacteria can live and grow without oxygen.

3. **Nutrients**
   
   Germs also need nutrients: sugars, proteins, fats, minerals and vitamins. These are found in all food products.

4. **The right temperature**
   
   Germs cannot grow well in hot and cold temperatures. Heating or boiling slowly kills some germs not all at the same time. Their growth also slows down under cold temperatures such as refrigeration or freezing. But they remain alive in the food until food is not cold and reaches room temperature, so they start to grow and multiply to spoil food.

5. **The right degree of acidity**
   
   Bacteria cannot grow in environment that is acidic or sour conditions such as in chillies in vinegar. Making food more sour or acidic is one way to slow down spoilage caused by bacteria.

When germs take nutrients from food, not only do they cause food to spoil but they release waste products that can have either a bad or good effect on the food itself and you when you eat the food.
Good effects of germs in food

- Certain substances released by some germs influence the taste and structure of the food products and generally increase their shelf-life.
- The products can be kept longer because the desired germs increased the level of acidity or because they are present in such huge numbers that other germs have no chance to grow.
- This use of germs for the preparation of food is called fermentation.
- Lactic acid bacteria, for example, are used to make cheese and yoghurt from milk, bila from cassava, and kota from grated coconut.
- Yeasts are used to make bread and beer.

Bad effects of germs in food

- Some germs cause food contamination. This occurs when a person consumes many living germs in a meal. The result is often diarrhoea and sometimes also bleeding.
- Certain germs can also cause poisoning. Food poisoning occurs when a person consumes food containing the bacteria or poisonous waste products released by the bacteria.
- There are some bacteria that reproduce by forming spores, and these spores are more resistant to heat treatments that can be dangerous because when they grow, they produce toxins/poison which can be harmful to human health.
- Read information about spore-forming bacteria provided on the right if you want to know more.

It is therefore very important to work as hygienically as possible when handling food to avoid the bad effects. Proper food handling prevents the transfer (cross-contamination) of bacteria to food from contaminated hands, surfaces or equipment and from other foods. Now let’s learn how to keep germs away from our food.

Important facts about spore-forming bacteria

- Some bacteria form spores to protect themselves from harsh environmental conditions in order to grow in food.
- The formation of the spore by the bacterium allows it to withstand heat, freezing, chemicals, and other adverse environments that our food undergoes during processing preparation and storage.
- They remain in this state until environmental condition (e.g. temperature, oxygen, acidity) in the food are suitable for them to germinate and grow.
- An example is the Bacillus species, they can either grow under mesophilic temperatures (meaning, they grow at 35°C but not at 55°C) or some grow under thermophilic temperatures (grow at 55°C but not at 35°C). These Bacillus species can cause food spoilage or some cause food-borne illnesses.
- Another example is the Clostridium species. They grow without oxygen and can grow at temperatures that are both mesophilic and thermophilic, depending on the species involved. They also cause food spoilage and some species cause food-borne disease.
- The most well-known food-borne disease caused by a Clostridium species is botulism. Botulism is a serious form of food poisoning that can cause death. Spores are found in soil, water, and intestinal contents of humans and animals; so they can find their way into foods. Because food contaminated by botulism may look and smell normal, you cannot tell by looking at the food whether it is poisoned by botulism bacteria.
- Food need to be chilled or frozen or their acidity increased with high acidic foods to avoid these spores from growing and producing toxins/poison that can be harmful to our health or cause death.
HOW DO WE KEEP GERMS FROM CONTAMINATING OUR FOOD

According to the World Health Organization, there are 5 key steps to safer foods:

**Step 1 Keep clean**

- Wash your hands before handling food and often during food preparation.
- Wash your hands after going to the toilet.
- Wash and sanitize all surfaces and equipment used for food preparation.
- Protect kitchen areas and food from insects, pests and other animals.

**Why?**

While most germs do not cause disease, dangerous microorganisms are widely found in soil, water, animals and people. These germs are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause foodborne diseases.

**Step 2 Separate raw and cooked**

- Separate raw meat, poultry and seafood from other foods.
- Use separate equipment and utensils such as knives and cutting boards for handling raw foods.
- Store food in containers to avoid contact between raw and prepared foods or simply wash them properly before using them for other foods.

**Why?**

Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous germs which may be transferred onto other foods during food preparation and storage.
Step 3 Cook thoroughly

- Cook food thoroughly, especially meat, poultry, eggs and seafood.
- Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry make sure that juices are clear, not pink. Ideally, use a thermometer.
- Reheat cooked food thoroughly.

Why?

Proper cooking kills almost all dangerous germs. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minced meats, rolled roasts, large joints of meat and whole poultry.

Step 4 Keep food at safe temperatures

- Do not leave cooked food at room temperature for more than 2 hours.
- Refrigerate promptly all cooked and perishable food (preferably below 5°C).
- Keep cooked food piping hot (more than 60°C) prior to serving.
- Do not store food too long even in the refrigerator.
- Do not thaw frozen food at room temperature.

Why?

Germs can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of microorganisms is slowed down or stopped. Some dangerous germs still grow below 5°C.

Step 5 Use safe water and raw materials

- Use safe water or treat it to make it safe.
- Select fresh and wholesome foods.
- Choose foods processed for safety, such as pasteurized milk.
- Wash fruits and vegetables, especially if eaten raw.
- Do not use food beyond its expiry date.

Why?

Raw materials, including water and ice, may be contaminated with dangerous germs and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Care in selection of raw materials and simple measures such as washing, and peeling may reduce the risk.
BILA

Bila is a Fijian delicacy that is traditionally produced in Naila village, its place of origin, from the province of Tailevu. This is simply a fermented product made from tavioka (cassava) soaked in water for a few days that is beaten and drained, mixed with grated coconut and a little sugar before steaming. The art of making bila is mostly practised in Naila and its neighbouring villages like Mokani.
SIMPLE FOOD PRESERVATION METHODS

1. Drying
Method removes water in food to reduce water activity slowing down growth of germs and chemical-enzyme action.

2. Preservation by salt
Method makes water in food tissues unsuitable for germs to grow in. Salt binds all available water making it difficult for germs to grow.

3. Preservation by sugar
Method makes water unavailable. Sugar removes water from the food tissues making it difficult for germs to grow.

4. Refrigeration
Method that slows the growth of germs between the temperatures 0°C - 5 °C (as in a refrigerator).

5. Freezing
Method that completely stops the growth of germs below the temperatures 0°C (as in a freezer) but germs remain alive and not active.

6. Preservation by heating
There are three different types of heat treatment and duration of time – pasteurisation, blanching, and sterilisation. The type of heat treatment used depends on the kind of food (you wish to preserve) and the germs you wish to kill (different germs are killed at different heating temperatures).

7. Preservation by smoking
Method removes most of the moisture (water) in food over hot smoke and done specially to preserve of meat, fish/seafood.

8. Preservation by acid/vinegar
Method increases the acidity or sourness of food making it difficult for germs to grow.

9. Fermentation
Method uses certain germs to increase the acidity or sourness of food, changing the taste and increasing nutrient quality of food.

In this booklet we will learn how to dry root crops, fruits and vegetables and how to make homemade flour and leafy green powder including simple jams and chutneys. Next, we learn specifically a drying technique, using a solar-dryer and how to construct a simple design.
KOTA

Kota is a Fijian delicacy that is commonly produced in the maritime islands of Lau province. This is simply a fermented product made from grated coconut soaked in seawater for several days, even months, and is consumed as an accompaniment to meals especially fish and seafood including vegetable salads like ota. The art of making kota is mostly practised in the Lau group and even some maritime islands in the Lomaiviti group including other parts of Fiji.
CONSTRUCTING A SIMPLE SOLAR DRYER

Solar drying is often the simplest and most environmentally friendly method of drying to preserve food. There are many different types of solar dryer designs you can use to dry food at home. However, a most basic design is all you need to start solar drying at home.

A square-frame solar dryer is one that uses the most basic design. It can be built in an hour with simple hand tools by someone with no carpentry experience.

What you need to build the square-frame dryer

- 4 x 75 cm untreated wood pieces;
- 4 x 53 cm untreated wood pieces;
- 4 x 30 cm braces that have 45° angle cut on both ends;
- nails (or stapling gun and stapling pins).

- saree material; metal or plastic mesh/ screen; or greenhouse cloth;
- greenhouse plastic or metal roofing iron (painted black);
- shiny metal or metal roofing iron (as reflector).

Step by step guide to building the square-frame solar dryer

1. Cut untreated wood that can make two identical 60 x 75 cm frames. Dryer smaller than this frame size do not get hot enough for efficient drying. Frames that are more than a metre on each side are difficult for one person to handle.

2. Nail or screw the frames together.

3. Cover one of the frames with the resistant screen/ mesh, greenhouse shade cloth or ¼ inch metal mesh topped with plastic screen/ saree material.
4. Nail or staple the screen onto the frame, pulling it tight then trim off the excess screen. Now, that’s your bottom dryer.

5. Then nail the four corner braces over the screen. This will reinforce the dryer and help to raise it up a bit to allow for better airflow.

6. Spread greenhouse grade polyethylene sheet over the other frame, the dryer top. This is a 6ml thick clear plastic that is treated to block ultraviolet rays from the sun. Do not use regular polyethylene plastic. This is important because UV radiation destroys Vitamin A in food especially leafy greens and it also quickly damages regular polyethylene or plastic. If greenhouse plastic is not available, the dryer top can be covered with old sheet metal roofing that’s painted flat black.

7. Staple the polyethylene plastic securely to the frame, wrap it over the sides of the frame and staple those as well. If you don’t have a staple gun, small nails will work. Try using either short roofing nails or finishing nails bent over resist to the plastic pulling loose.

8. Next, staple or nail a strip of screen onto all four sides of the dryer top. This should be 10 or 12 cm wide and will help keep flies and dust out of the dryer. Remember never to allow nails or staples to touch food especially when they get old and rusty.

Now you are ready to try out your dryer.

- Putting a sheet of plastic/iron roofing under the dryer will prevent moisture from the ground being absorbed by your food.
- Raising one side a bit will allow the sun’s rays to heat the dryer at a more direct angle and heat up more quickly. This also allow any unexpected rain to drain off the dryer.
- In cool or cloudy weather setting some shiny metal behind the dryer will reflect additional solar energy onto the dryer.
- Where ants are a problem, set the dryer up on short plastic legs that sit in cans full of water.

This solar design has been developed by the Leaf for Life Organization. For more information and videos visit their website on www.leafforlife.org
UTO (Breadfruit)

In Fiji, about ten species and 15 to 20 varieties are available, which bear fruit at different times of the year. Thus, breadfruit is available in Fiji for most of the year, with the most abundant months being February to mid-April. Breadfruit is an important energy food. Breadfruit is rich in fibre, which is important for a healthy digestive system. A diet rich in fibre also helps to control blood sugar in diabetics, reduce blood lipids (a risk for heart disease) and control weight. In addition to its nutritional value, breadfruit has other functional properties such as antioxidants and low levels of glycemic responses. Therefore, eating breadfruit is more beneficial than white bread and long grain Jasmine rice.
HOW TO MAKE HOMEMADE FLOUR

Most of our starchy staples go unused when supply is abundant. Making use of this extra supply will ensure that your family is not letting them go to waste. Processing your own flour at home using locally available starchy staples is one of the most practical ways to improve storage, reduce food waste and promote healthy eating.

What you need to make homemade flour

| • mature starchy staples – breadfruit, sweet potato, plantain, unripe bananas, yams, and other starchy staples; | • plastic buckets; |
| • clean water; | • trays and fine mesh; |
| • clean, sharp knives. | • a clean area, with raised working surfaces; |
| | • solar dryer, placed in a clean area in full sunshine; |
| | • plastic packaging bags (polythene); |
| | • simple maize grinder. |

Step-by-step guide to making homemade flour

Step 1. Choosing the starchy staple
Choose any starchy staple and any variety available. Make sure to use mature and undamaged root/tuber/fruit. Never use soft and ripe fruits, they are difficult to dry and mill into flour.

Step 2. Washing
On a raised clean surface, peel and clean the roots. Do not remove skin except for sweet potato, plantain, banana and breadfruit. Wash well with clean water and soak in saltwater for 20 minutes before scrubbing and rinsing with a clean rough sponge to wash off dirt from the skin or surfaces.

Step 3. Draining
After washing, place the washed roots/fruits on a clean raised rack or tray to air dry the surfaces.

Step 4. Cutting and slicing
On a clean chopping board or surface, cut the roots/fruits into small thin pieces or slices using a sharp knife. Cut into uniform size (3-6 mm thick as pictured on the left). Remember larger pieces will be difficult to dry and mill. You can use the inside core of breadfruit if you do not want to remove while cutting.

Step 5. Drying using solar dryer
Spread your cut starchy staple pieces on bottom dryer on a saree material and not directly on the metal mesh. Never place pieces on top of each other to allow uniform drying. It is best to dry food during the cool,
KUMALA (Sweet potato)

In Fiji, about 17 varieties are available, although only four major varieties are commonly eaten. These include vulatolu, papua, carrot and honiara. Basically, the different varieties can be distinguished by the colour of the flesh and skin of the tuber. Sweet potato is a starchy food, so it is a good source of energy. Yellow and orange varieties of sweet potato tubers contain a large amount of vitamin A. Sweet potato tubers have four major colours: white, yellow, orange and purple. In addition to its nutritional value, deep coloured sweet potato tubers also have antioxidant functions, which protects body cells from damage.
dry season. Dry for about 6 – 8 hours in a day and it should take 1 – 3 days in the solar dryer to fully dry your cut pieces. Never leave your crops overnight outside in the dryer, always pack in air-tight plastic bags after each drying day to avoid absorption of water from the air/ atmosphere. Dried root/ fruit must be hard and brittle. If not fully dry, it is very difficult to mill. You will know they are dry enough when you break a piece and it gives a similar sound as when breaking a chalk.

**Step 6. Milling/ grinding**

Mill your dried starchy staple using a hand-powered grinder. On average, you will need about 4kg of starchy staple to produce approximately 1 kg of flour. Flour with skin (including core – for breadfruit) has higher Dietary Fibre, Vitamin C, Potassium and Protein than the one without.

**Step 7. Packaging and labelling**

Packaging is very important. Make sure to pack your milled flour into clean and dry airtight containers/ glass jars or sealed water-proof plastic bags (or using burning candle to seal the bags as when packing snacks to sell in small canteens). If using plastic bags, place bags of flour in containers that does not allow light to pass through. Label your flour on the container/ plastics and you must also include the date of packing on the label.

**Step 8. Storage**

Storage is also very important. Store packed flour away safely in cool dry places or refrigerator. Flour can be stored for 6 months and this depends on how well you dry your crops in the solar dryer. If drying is not done well, flour cannot be stored for a long time as it will get mouldy which is not safe for consumption.

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**How to make Cassava Starch?**

1. It is best to grate your cassava instead of cutting and slicing before drying. This way you get to make two products – cassava flour and cassava starch.
2. Squeeze the grated cassava and place the liquid into a container/ basin.
3. Dry the already squeezed grated cassava as in step 5 until ready to mill into fine flour.
4. Allow the liquid in the container/basin to sit until all starch solid settle at the bottom.
5. Pour out the liquid in the container and collect the starch solids that has settled at the bottom.
6. Break the solids into small pieces and place the starch solid on a clean tray and direct sun dry for about one full day.
7. Dry the cassava starch until it reaches the same powder consistency of corn starch/ flour.
8. Collect the cassava starch powder and store in an air-tight container/ glass jar.
9. This can replace corn starch/ flour
10. You can do the same with sweet potato.
VUDI (Plantain)

Vudi (also known as cooking) are normally cooked when still green and they are generally eaten as a starchy vegetable. However, some are eaten in the half-ripe and ripe stages, in which case they are considered both ‘cooking’ and ‘dessert’ types. Cooking bananas, like dessert bananas, come in a great variety of shapes, sizes and colours. Green bananas have higher levels of starch than sugars. Bananas are also rich in vitamins and minerals, including vitamins A and C. In addition to the nutritional value, both types of bananas also exhibit other functional properties such as lower glycemic response and contain antioxidants such as polyphenols, carotenoids and flavonoids, which can protect cells from damage and lower the risk of cardiovascular diseases and cancer.
# Problems That May Happen With Home-Made Flour

<table>
<thead>
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<th>Problem 2</th>
<th>Problem 3</th>
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## Causes

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<th>Problem 1 Causes</th>
<th>Problem 2 Causes</th>
<th>Problem 3 Causes</th>
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</thead>
<tbody>
<tr>
<td>• Bruised and damaged roots/ fruits due to poor handling.</td>
<td>• Drying not complete due to:</td>
<td>• High moisture (water) content due to:</td>
</tr>
<tr>
<td>• Immature roots/ fruits.</td>
<td>• Mould growth.</td>
<td>• Poor drying of cut root/ fruit pieces.</td>
</tr>
<tr>
<td>• Improper storage after harvest.</td>
<td>• Different cut sizes.</td>
<td>• Dried roots/ fruits or flour absorbing moisture during storage.</td>
</tr>
<tr>
<td>• Delayed harvesting.</td>
<td>• Mixed varieties for certain roots/ fruits.</td>
<td></td>
</tr>
<tr>
<td>• Delayed processing.</td>
<td>Not using anti-browning agent.</td>
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## Solutions

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<thead>
<tr>
<th>Problem 1 Solutions</th>
<th>Problem 2 Solutions</th>
<th>Problem 3 Solutions</th>
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<tbody>
<tr>
<td>• Handle roots/ fruits carefully.</td>
<td>• Always dry on sunny days and not on cloudy days for 6-8 hours for 2-3 days.</td>
<td>• Make sure that cut roots/ fruits are well dried (to brittleness) before milling into flour.</td>
</tr>
<tr>
<td>• Store harvested roots/ fruits in a cool place.</td>
<td>• Cut roots/ fruits into uniform sizes.</td>
<td>• Store in dry conditions.</td>
</tr>
<tr>
<td>• Harvest roots/ fruits when fully mature.</td>
<td>• Never mix varieties when drying, different varieties may need different drying times. Dry each variety on separate trays and package them separately.</td>
<td>• Use new strong polyethylene bags during drying process and storage within a week of harvesting.</td>
</tr>
<tr>
<td>• Process roots/ fruits within a week of harvesting.</td>
<td>• Use anti-browning agent if available (optional).</td>
<td></td>
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UVI (Yam)

Yams are climbing vines with large roots, or tubers, which grow up to ten feet (3.3 metres) long. Yams are starchy root crops, so they are a good source of energy. Yams also contain reasonable amounts of vitamins A and C. Vitamin A helps protect eye health and Vitamin C helps to keep the body tissues strong, helps the body to use iron, and aids chemical actions in the body. Yams also provide bulk and some fibre, which are needed to make the intestines and bowels work properly. Yam tubers come in three major colours: white, yellow and purple. In addition to its nutritional value, they have other functional properties, especially the yellow and purple varieties. These functional properties include antioxidants, polyphenols and carotenoids in the form of β-carotene, which can provide health benefits such as protecting body cells from damage and lowering the risk of cardiovascular disease.
<table>
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<th><strong>Problem 4</strong></th>
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<tr>
<td>Bad or fermented smell of starchy staples/ flour.</td>
<td>Dried starchy staples that are rubbery.</td>
<td>Weevils and rodents, and loss of starchy staples/ flour.</td>
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<th><strong>Causes</strong></th>
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| Contamination due to:  
- Poor hygiene practices during processing.  
- Use of unclean water during processing.  
- Growth of microorganisms – bacteria, yeast and mould.  
- Not enough drying causing high moisture content for microorganisms to grow. |  
- High moisture content due to:  
  - Different cut sizes.  
  - Mixed varieties.  
  - Drying not complete.  
  - Packaging or bags that allow in moisture during storage. |  
- Storage in poor-quality packaging materials.  
- Storage of product on the ground. |

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<th><strong>Solutions</strong></th>
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| • Always practice good hygiene during processing.  
• Use a raised clean surface when handling roots/ fruits and during drying.  
• Make sure to use clean water during processing.  
• Make sure to dry the cut roots/ fruits well until brittle. |  
• Cut starchy staples pieces into uniform sizes (3–6 mm thick).  
• Dry each variety on separate trays and package them separately.  
• Always dry on sunny days and not on cloudy days for 6-8 hours for 2-3 days.  
• Use strong plastic bags that are waterproof. |  
• Make sure to use strong sealed bags.  
• Store bags of dried root/ fruit/ flour in cartons or containers on racks or raised surface.  
• Make sure that storage area is free pests and rodents.  
• Clean area around storage space regularly within a week of harvesting. |
### Problem 7
Orange coloration lost in orange-fleshed sweet potato varieties.

### Causes
- Over-exposure of roots to air and light during processing.
- Use of clear or transparent bags for storage.

### Solutions
- Dry orange sweet potato as soon as they are cut into pieces.
- Store the cut pieces away in plastic bags after drying each day and store in containers that do not allow light to pass through.
- Use black bags for storage once roots are dried to brittleness.

### Important Facts:
- Homemade flour made from starchy staples contain lower amounts of protein than wheat flour.
- It does not have the all the same properties as wheat flour during cooking.
- To get the best cooking product like bread, bun, roti, cakes, scones etc. you will mix this flour with wheat flour.
- Recipes with more homemade flour ratio than wheat will have cracks or crumble easily.
- Easiest way to start is to use less ratio of homemade flour to wheat flour when you are testing out your recipes. (e.g. when making roti you can mix 3 cups of homemade flour into 7 cups of wheat flour).
- You and your family will enjoy a variety of homemade flour products once you start learning to develop and perfect your own recipes.
- You can try using your homemade flour with a variety of products.
HOW TO MAKE LEAFY GREEN POWDER

Eating plenty of dark leafy green vegetables contribute to a healthy diet, but it is difficult to always include them in our meals because they have a very short shelf life, especially for those without refrigerators and freezers. Making your own leafy green powder is one of the most practical ways to reduce wastage when plentiful in supply and make them important part of your family meals at home.

What you need to make leafy green powder

- dark leafy green vegetables of your choice;
- airtight plastic bags.
- solar dryer;
- simple maize grinder.

Step-by-step guide to making leafy green powder

Step 1. Choosing leafy green
You can choose any dark leafy greens. Remember never dry different leafy greens together. Some leafy vegetables take longer time to dry than others.

Step 2. Washing and draining
Leaf crops well above ground level like bele and saijan leaves are much less likely to be contaminated by soil than lower growing crops like tubua (moca/chauraiya). Wash the leaves very well in clean water and drain on a clean rack.

Important Facts:

- Did you know that more than half of our population already suffer from iron-deficiency anaemia?
- Leafy greens are the cheapest source of iron in the diet amongst households in Fiji.
- Iron is needed to help with the transport of oxygen to all parts of the body.
- Our bodies cannot produce iron; therefore, we need to eat foods that are good sources of iron.
- Unlike animal sources of iron, like meat and liver, plant sources of iron need to be eaten with Vitamin C-rich foods for the iron to be easily absorbed into the body.
- Remember, when drying leafy greens most Vitamin C will be destroyed by the sun’s heat.
- It is important to always add leafy green powder with Vitamin C rich foods in your meals.
**Step 3. Cutting**
Cut the big leaves into pieces no more than 5 cm long.

**Step 4. Drying**
Now you are ready to put your dryer to use. Spread the cut leaves thinly on the dryer and put the cover on. You can spread more leaves on the dryer on a hot sunny day than on a cool cloudy one. You will have to adjust the amount of leaves, so they dry completely in one day. If you can reposition the drying leaves once in the middle of the day it will speed up the drying process. Never keep the dryer out overnight because leaves often absorb water which can form mould on the dried leaves.

**Step 5. Sifting**
When the leaves are completely dry, they should feel crisp and crumble easily when rubbed. Sift the leaves using the saree material from the dryer by removing as much stem manually with your hands. The sifted leaves can used as they are in soups and stews.

**Step 6. Grinding**
You can grind the sifted leaves with a grinder. Grinding the dried leaves into powder allows them to be used into a wider range of foods. Nutrients in finely ground leaf powder are better absorbed into the body than in less finely ground powder. There are many ways you can use leaf powders. You can add to your rice, roti dough etc.

**Step 7. Packaging and labelling**
Once you have dried and ground your leafy vegetables, pack them away in airtight plastics or glass jars. Label your leaf powder and you must also include the date of packing on the label.

**Step 8. Storage**
Store packed flour away safely in cool dry places away from sunlight.

A simple maize mill is best for grinding your dried leaves and dried starchy staples if you do not have a super blender or coffee grinder. This is very easy to use, but make sure to always clean your grinder before and after you use. Also see that the dryer is dry before grinding so no water is added to your flour or powder.

This instruction on making leafy green powder has been developed by the Leaf for Life Organization. For more information and videos visit their website on www.leafforlife.org
HOW TO MAKE JAM

Jamming is the most popular method of preserving fruits when plentiful in supply for example, during guava season. Jam is usually prepared by boiling fruit/vegetables with the correct amount of sugar added to it until you get a thick mixture. This method removes water from the food particles by binding them together and making it more concentrated. The process makes it difficult for germs that cause food spoilage to grow. It requires a lot of processes – selection of fruit, preparation of fruit, addition of sugar, addition of acid (citrus fruit juices), mixing, cooking, filling, closing, cooling and storage.

What you need to make jam?

- fruits;
- sugar;
- acid – lemon juice or any type of vinegar;
- clean water;
- a clean area, with raised working surfaces;
- clean, sharp knives;
- clean plastic bowl, basin or container.

- clean, sterilized glass jars with lids;
- kitchen towel;
- dish washing soap and a clean sponge;
- clean, big serrated spoon; teaspoon and a small plate;
- potato mash, optional;
- strainer, optional.

Step by step guide to making jam at home

Step 1. Choosing fruits and vegetables

You can choose a single fruit or a combination of two or more fruits. Use any fruits available around you. There are also some vegetables that are good for jamming like pumpkin, eggplant and tomatoes.

Step 2. Fruit preparation

Wash your fruits thoroughly with clean water to remove any dirt or soil on the skin. Make sure to peel your fruits.

On a clean chopping board cut your ripe fruits into small pieces. You can also grate any unripe or firm fruits. It is best to mash fruits as this makes measuring the amount of sugar needed more accurately than chopped fruits. Vegetables like eggplant and tomatoes are best chopped and pumpkin grated after peeling.

Step 3. Adding acid and cooking

Place mashed fruits into an appropriately sized pot and add lemon juice or any vinegar. Adding acids not only helps soften the sweetness, but it also helps activate the fruit’s natural occurring pectin which help jam thicken and jell. The amount of lemon juice or vinegar you use depends on the different fruit/vegetable used. It’s simple to use a standard tea mug to measure your fruit so simply start with 2 teaspoons of lemon juice or 1 teaspoon of vinegar for every mug of fruit, so the trick is to perfect your own jam recipes.

Remember some jam will be thicker than others because of the different pectin content depending on
fruit and ripeness of fruits used for jamming. Bring the mixture to a boil and continue stirring to avoid burning. For chopped/ grated fruits and vegetables add enough water to just cover them.

Step 4. Adding sugar
Add in the sugar you have measured into the pot all in one time as soon as the fruit comes to a boil. Continue to stir until all sugar has dissolved well. It is important to make sure that you always use the right amount of sugar. Use the ratio – 2: 1 i.e. for every 2 parts of mashed fruits you will need 1 part of sugar (a standard tea mug is an easy measure for your fruit to sugar parts). When you make any type of fruit jam, it tends to develop a foam on top, make sure to remove this foam as it will change the colour and the taste of your jam.

Step 5. Plate test
Lower your heat to medium and reduce your jam, stirring often and spooning off any foam that come to the top. Some jams need to be mashed using a potato mash to a desired consistency if they are chopped. Strain your jam if you like for a smoother consistency. Continue to cook to reduce the amount of water until the jam thickens. To test if its ready, spoon a small amount of jam on a cold plate then run your finger through the jam. If it leaves a streak, your jam is ready. If jam runs together with your finger, your jam needs to cook some more.

Step 6. Cleaning and sterilizing jars
You need to make sure that you wash your jars well in soap water. Do this with cold water with a clean sponge. Be sure to clean the jars very well. Then place the jars and lids into a pot and pour boiling water over them. This is very important to remove or kill any germs in and around the jar that can spoil your jam. Remove jar once water has cool down and air dry before filling them.

Step 7. Packaging (filling)
Fill your hot jam into clean glass jars leaving 1/2 inch of headspace from the top. Make sure to wipe away any jam on the mouth with a clean cloth. Put on the lid, close it tight using a kitchen towel. Cool the filled jars to room temperature.

Step 8. Labelling and storage
Label your jam and you must also include the date of packing on the label. Store away in a dry cool place or in a refrigerator.

What is Jelly?
Jelly is like jam. It is prepared by boiling a clear water strained from boiled fruit that contains pectin with the correct amount of sugar and acid (citrus fruit juices). Jelly should be clear, well set but not too stiff, and should have the original flavour of the fruit. It should not be gummy, sticky or syrupy or have crystallized sugar.

What is Marmalade?
Marmalade is a fruit jam made from slices of the citrus fruit, or its peels. Marmalades are usually made from citrus fruits like oranges, lemons and kumquats.

Nutrition Tip:
Jams contain a lot of sugar; they should be eaten in small amounts. Eating too much sugar and sugary foods daily will lead to dental carries, overweight and obesity, which can increase your risks of diabetes and other non-communicable diseases.
HOW TO MAKE CHUTNEYS/ SAUCES

Chutney is a mixture of fruit or vegetable with spices, salt and/or sugar, vinegar etc. A good chutney is smooth, tasty and attractive, and has the true single flavour of the fruit or the vegetable used for its preparation. Most popular chutneys are those from tomato, tamarind etc. On the other hand, sauces are sieved and as a result, are thinner and have smoother consistency than chutneys with no skin, seeds and stalks of fruits and/or vegetables. It also has an enjoyable taste and smell.

What you need to make chutney?

1. fruit or vegetable of your choice
2. sugar
3. vinegar
4. lemon juice
5. onions
6. salt
7. masala/ curry powder
8. cinnamon powder (optional)
9. ginger (optional)
10. chillies (optional)
11. clove (optional).

Step by step guide to making chutney

Step 1. Choosing fruits or vegetables
You can choose a single fruit or a combination of two or more fruits. Use any fruits available around you.

Step 2. Fruit/ vegetable preparation
Wash your fruits thoroughly with clean water to remove any dirt or soil on the skin. Make sure to peel your fruits or vegetable. On a clean chopping board cut your ripe fruits into small pieces. You can also grate any unripe or firm fruits.

Step 3. Cooking
In a pot mix together your fruit/ vegetable, vinegar, onions and salt. and stir over medium-high heat. Remember if you are using 10 standard mugs of fruit/ vegetables, add ½ a standard mug of vinegar and 1 levelled tablespoon of salt. Bring to a boil and cook until fruit/ vegetable begins to become soft, about 15-20 minutes. Add masala/curry powder, spices and herbs of your choices and lemon juice to your taste, add 1 standard mug of sugar and continue boiling until all sugar has dissolved then reduce heat to boil gently. Continue cooking to thicken and reduce chutney. This process can take anywhere from 30-45 minutes depending on how hard you cook the mixture. If you don’t want the unique flavours from other spices, you can leave them out. The chutney can be cooked to your desired thickness. To help thicken and break down the
fruit/ vegetable, use a potato mash throughout the cooking process to mash into desired consistency.

**Step 4. Cleaning and sterilizing jars**
You need to make sure that you wash your jars well in soap water. Do this with cold water with a clean sponge. Be sure to clean the jars very well. Then place the jars and lids into a pot and pour boiling water over them. This is very important to remove or kill any germs in and around the jar that can spoil your chutney. Remove jar once water has cool down and air dry before filling them.

**Step 5. Packaging (filling)**
Fill your hot chutney into clean glass jars leaving 1/2 inch of headspace from the top. Make sure to wipe away any chutney on the mouth with a clean cloth. Put on the lid, close it tight using a kitchen towel. Cool the filled jars to room temperature.

**Step 6. Labelling and storage**
Label your chutney and you must also include the date of packing on the label. Store away in a dry cool place or in a refrigerator.

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**Facts about Tamarind?**
Did you know that tamarind is an essential ingredient in Worcestershire sauce? In Fiji, it is better known for the pod pulp which is rich in vitamin C and contains tartaric, malic, and citric acids as well as sugars, has a sweet-sour flavor and is mostly used curries and chutneys. With the abundant supply of tamarind, tamarind chutney is one of the most popular home-processed products in Fijian households that are commonly consumed with meals specifically Indian and Indian-inspired dishes.

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**Nutrition Tip:**
Eat chutney/sauces in small amounts as they may have high salt and sugar content.
CASSAVA FLOUR

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