EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

This initiative is supported by **PacWastePlus**-a 85 month project funded by the European Union (**EU**) and implemented by the Secretariat of the Pacific Regional Environment Programme (**SPREP**) **to sustainably and cost effectively improve regional management of waste and pollution.**

HOW DO I COMPOST?

A GUIDE FOR COMMUNITY COMPOSTING

April 2024

This guide is intended for communities, groups, or small-scale fruit and vegetable growers in the Pacific who seek to compost small quantities of organic materials (approximately 1-2 wheelbarrows per week) in a shared small-scale composting facility using simple tools and volunteer labour.

SPREP Library Cataloguing-in-Publication

How do I compost? a guide for community

composting. Apia, Samoa : SPREP, 2024.

18 p. 29 cm.

ISBN: 978-982-04-1299-6 (ecopy)

1. Recycling (Waste, etc.) – Technical reports

– Oceania. 2. Waste management – Refuse and

refuse disposal – Oceania. 3. Compost –

Environmental aspects – Oceania. I. Pacific Regional

Environment Programme (SPREP). II. Title.

363.728 20961

Disclaimer: This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of SPREP and do not necessarily reflect the views of the European Union. This document has been compiled in good faith, exercising all due care and attention. SPREP does not accept responsibility for inaccurate or incomplete information.

Secretariat of the Pacific Regional Environment Programme (SPREP)
PO Box 240 Apia, Samoa
www.sprep.org
sprep@sprep.org

Our vision: A resilient Pacific environment sustaining our livelihoods and natural heritage in harmony with our cultures.

PacWaste Plus Programme

The Pacific – European Union (EU) Waste Management Programme, PacWaste Plus, is a 72-month programme funded by the EU and implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) to improve regional management of waste and pollution sustainably and cost-effectively.

About PacWaste Plus

The impact of waste and pollution is taking its toll on the health of communities, degrading natural ecosystems, threatening food security, impeding resilience to climate change, and adversely impacting social and economic development of countries in the region. The PacWaste Plus programme will generate improved economic, social, health, and environmental benefits by enhancing existing activities and building capacity and sustainability into waste management practices for all participating countries.

Countries participating in the PacWaste Plus programme are: *Cook Islands, Democratic Republic of Timor-Leste, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu.*

KEY OBJECTIVES

Outcomes & Key Result Areas

The overall objective of PacWaste Plus is "to generate improved economic, social, health and environmental benefits arising from stronger regional economic integration and the sustainable management of natural resources and the environment".

The specific objective is "to ensure the safe and sustainable management of waste with due regard for the conservation of biodiversity, health and wellbeing of Pacific Island communities and climate change mitigation and adaptation requirements".

Key Result Areas

- Improved data collection, information sharing, and education awareness.
- Policy & Regulation - Policies and regulatory frameworks developed and implemented.
- Best Practices - Enhanced private sector engagement and infrastructure development implemented.
- Human Capacity - Enhanced human capacity.

Learn more about the PacWaste Plus programme by visiting:

EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

https://pacwasteplus.org/

Table of Contents

Introduction

This guide is intended for communities, groups, or small-scale fruit and vegetable growers in the Pacific who seek to compost small quantities of organic materials (*approximately 1-2 wheelbarrows per week*) in a shared small-scale composting facility using simple tools and volunteer labour.

Consumption patterns in the world today generally follow a linear "**buy, use,** and **throw**" model.

In the Pacific and Timor-Leste, this linear model is becoming more challenging with all "waste" items (including imported plastics, metals, and other material, along with locally grown food scraps and vegetation clippings from gardening and landscaping) being:

Disposed into rapidly overflowing landfills and dumps

Resulting in "anaerobic" decomposition (without oxygen) – contributing to climate change, and producing toxic leachate which can enter our waterways

Burnt in backyards

Resulting in release of dangerous carcinogens like dioxins and furans – contributing to climate change, and affecting our health and air quality

But what if…

… the largest component of the "waste" filling up your local dumpsite and burn-pits was not a "waste" at all, it was a beneficial product that was good for soils and increased our crop yields?

… and what if it was easy to convert that "waste" into a valuable **resource** in your backyard and community using familiar and low-tech methods?

It is true! The magic material is our EVERYDAY ORGANICS.

Organics are materials that were once part of a living thing. They include clippings from yard/community beautification projects, fallen palm fronds and flax/tree litter, peelings and scraps from food preparation, by-product from food production facilities, animal manure, and paper / cardboard.

Common organic materials found in the Pacific and Timor-Leste include:

Why Should I Compost?

Convert your yard, plantation, or kitchen "waste" into a valuable and nutrient rich soil to increase yield from your gardens. **Compost has many benefits for the sandy atoll or thick volcanic soils we have in the Pacific.**

Your rubbish bins will be cleaner, less smelly, and be less attractive to dogs, cats, rats, and insects.

You will make a large saving on pre-paid bags or waste collection (**an estimated 40% of household waste disposed is organic)** and reduce need to purchase imported soil conditioners and fertilizers.

HOW DO I COMPOST?

Composting in your community by following three steps:

1. **Estimate the size of the compost area you need**
2. **Make a compost bin[1] – from either new materials, or from "waste" items**
3. **Add materials to your pile, and providing the correct balance of Air, Water, and Food for the composting microbes**

Step 1 - Estimating the Required Size for Your Compost Area

Understanding the volume and type of materials you seek to process in your community composting system will enable you to build an appropriately size composting system. A 3 x 1m^3-bay composting system can typically process up to 1.5m^3 of organics per month (6 wheelbarrow loads), generally appropriate for about 50-60 households[2].

If you build your compost bin:

Too Small	Too Big
You may rapidly run out of space, and you will have to stockpile material in "anerobic" conditions which can result in unpleasant smells, leachate that can contaminate soil and water, or attract rats and insects.	You may not be able to pile the material in an appropriate manner to allow the material compost effectively with the right balance of Air, Water, and Food.

If you want to accurately calculate the quantity of organic materials you can expect as throughput to your compost system, you may like to undertake an Organics Materials Waste Audit using the template provided at the end of this guide.

[1] This guidance centers on a 3-bay composting system, a common and "tried and tested" system in the Pacific and Timor-Leste communities. There are other composting methods such as pile, windrow, or anerobic digestion that may be appropriate for your community. Steps 1, 3, and 4 of this guide may still be relevant for these composting methods or see the PacWastePlus organic resource page for more information.

[2] Average organic material generated in Pacific = 13.5 kg / household / month (by wight) or approximately 0.27m3 (by volume). A 3 x 1m3-bay composting system can typically process up to 1.5m3 of organics per month (by volume). Therefore 1.5m3 / 0.027 m3 = 56 households. Source: Consolidated data from 2020/21 Pacific Waste Audit Suite.

Assessing or calculating the quantity and type of organic materials you can expect at your facility will also help you:

- understand the "carbon" and "nitrogen" content of your materials.

  Carbon and Nitrogen illustrated in **Figure 1** below:

  - Items in brown are high in carbon, they are usually old, rigid, and dry.
  - Items in green are high in nitrogen, they are usually fresh, flexible, and moist.
  - Items in yellow are generally neutral – containing both carbon and nitrogen.
- understand the size of your input materials and what type of size reduction you may need

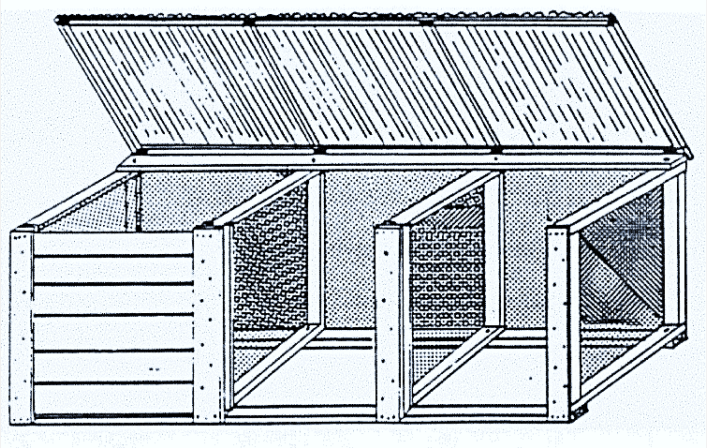
Carbon	Nitrogen	Neutral
Old, rigid, and dry	Fresh, flexible, and moist	Mixture (both rigid and fresh)
Examples: fallen, dry palm fronds and flax/tree litter, dead grass or clippings, paper / cardboard	Examples: fresh green material from yard / community clean-ups, or plantation harvest / weeding, peelings and food scraps, by-product from food production (noni, coffee),	Examples: mixed materials (rigid and fresh) from yard / community clean-ups or from plantation harvest / weeding

Figure 1: Carbon and Nitrogen content

Note: for more information to guide your Organics Materials Waste Audit you may also review the Waste Audit Methodology: A Common Approach. This guide is for completion of a large-scale waste audits, but parts may be useful, such as selecting PPE and equipment, and undertaking household interviews.

Step 2a – Make a Compost Bin from NEW MATERIALS

To guide the construction of a community-scale of a 3-bin composting facility using new materials, the following considerations are recommended. Design Drawings are available to assist. You can tailor these drawings to match your expected throughput and specific site conditions.



- Choose a flat easily accessible location with sufficient size allow for the 3 x $1m^3$ bins, clear a space to access to the bins, a water tank and tool shed if needed, and space to receive materials and store the finished compost. Typical site may be approximately 10-$30m^2$.
- It is advantageous to construct the bins using hardwood timber and galvanised iron.
  Note: ferrous metal will rust, and timber will rot over time in the composting environment.
- For small-scale composting (i.e., approx. $1m^3$ per month) it is suitable to have a solid, yet permeable base for the bins (i.e., made from paving stones, bricks, hardwood planks or (plastic) pallets). The base is recommended to be flat, so shovelling material is not hindered.
  Note: for larger composting systems it is necessary to have a non-permeable base (i.e., concrete pad), to enable capture of water runoff (leachate).
- To facilitate turning of the compost and moving it from one bin to the next, it is helpful if the front walls of the compost bin can be opened fully or partially.
- A roof or cover is recommended (tarp or rigid lid). If a rigid structure is used to protect the bin from rain, it is recommended to be secured so it does not blow away during a storm. If a hinged lid is used, it is recommended that it can be opened easily, and can be secured when open to avoid the risk of it falling onto somebody. The one lid design may be heavy for some people, you may consider constructing a lid for each bay.
- Consider if your site will need fencing to keep animals such as dogs and pigs out
- Consider water sources, if your site has no water supply you will need to capture rainwater – i.e., installing guttering and a water tank
- Consider the need for a small storage shed to store tools and equipment

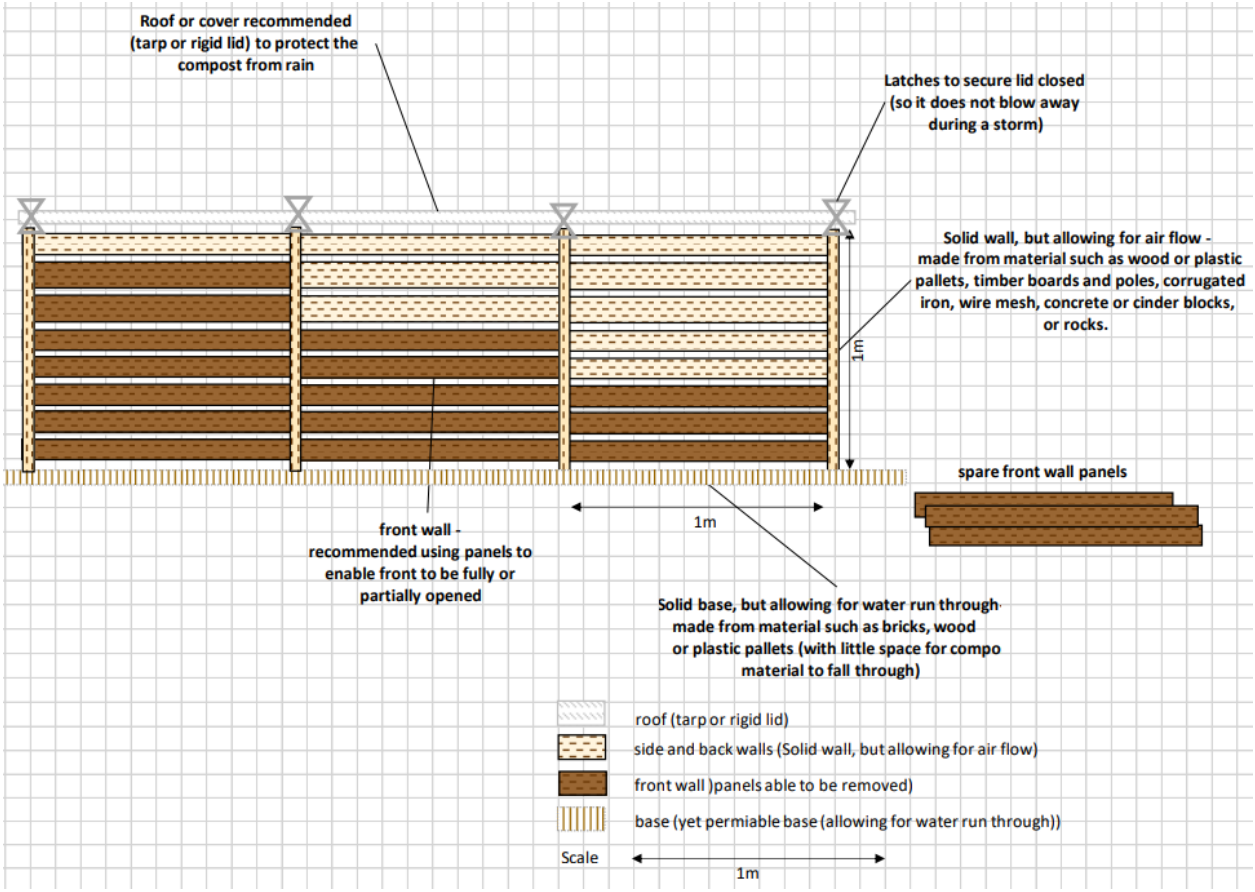
Depending on chosen design and materials, the following can be a guide for construction of a 3-bin composting facility:

Wood: • 2x4 planks: 25-30m • 1x4 planks: 90-100m • 2x2 planks: 10-12m **Other Materials:** • 1x3m corrugated iron roof • Paving stones, bricks, hardwood planks or (plastic) pallets to use as solid yet permeable base • Non-toxic wood sealer/preservative (optional) • Quick set concrete to secure corner posts into the ground **Hardware:** • Large box of 2"decking screws • 3x Hinges • 3x Handles • 4x Latches • Chain or cable to hold the lid open (make sure it is sturdy so it doesn't break!)	**Other considerations:** • Fence • Water tank and guttering (if you do not have another nearby water source) • Toolshed **Tools:** • Saw • Drill • Carpenter's square • Tape measure • Safety gear (gloves, glasses, ear plugs) • Level • Shovel

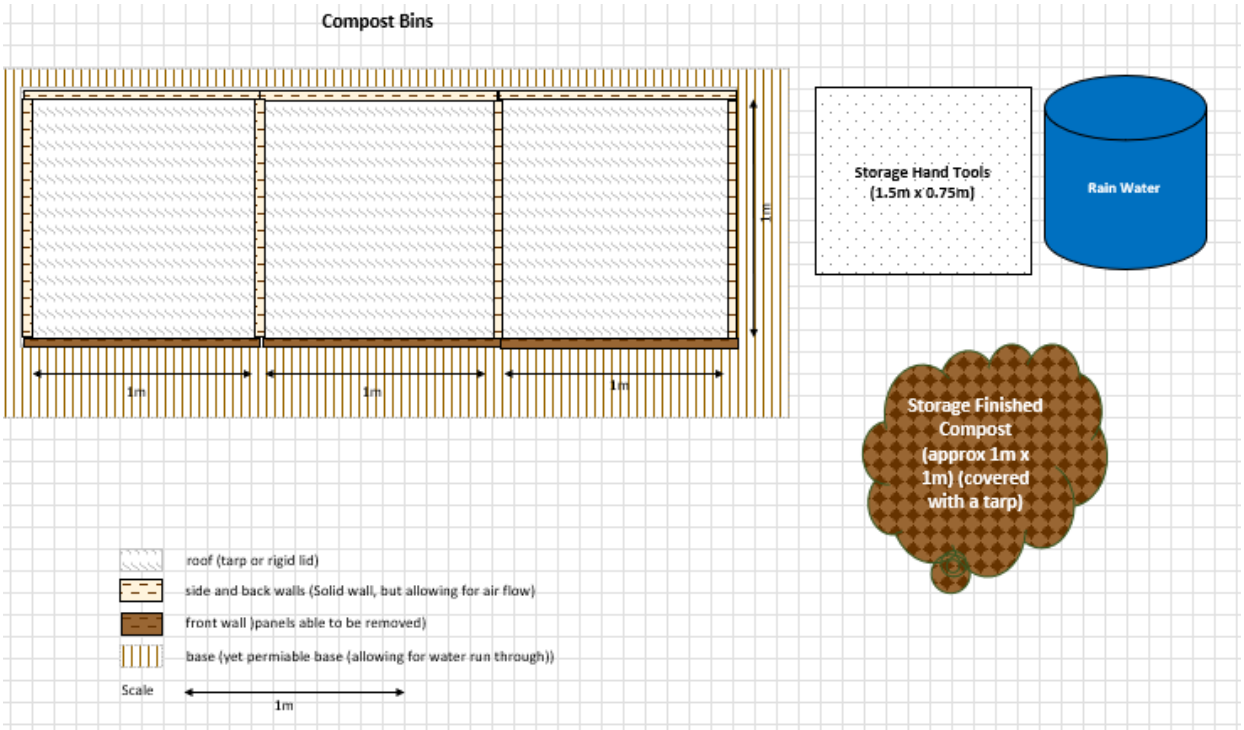
Indicative Design Drawings

Editable Facility Design Drawings (https://pacwasteplus.org/resources/small-scale-composting-framework-operations-plan-and-design-drawings/) are available:

Side View:



Top View:



Step 2b – Make a Compost Bin from "WASTE" Items

Alternatively, compost bins can be made using a variety of items that may be lying around – many of which are "waste materials" themselves (so we save them from the landfill too!).

These materials may include pellets, chicken wire, bricks, blocks, tyres, seed drums, tree branches/trunks, washing machine drums… **the options are almost never ending!**

Keep in mind the following:

- Make sure it is big enough to process your expected volume – you might need two or three?
- The compost will need oxygen (air flow) so make sure your bin is not completely sealed
- You will need to be able to turn your compost so make sure it is big enough to get a shovel in or can be shaken/turned
- You might need to keep your compost bin secure from animals - dogs, pigs, cats, and rats
- Untreated timber will rot over time in the composting environment so you may need to regularly replace these items (they can be added to the compost!)
- Car tyres and drums that previously contained chemicals may have residual hydrocarbons and other chemicals that may not be suitable for use in composting.

Step 3 – Adding Materials and Providing the Correct Balance of Air, Water, and Food

Composting mimics nature's method of decomposition, where creatures too small to see (microbes) process organic materials and convert it to a nutrient rich product, "compost". Microbes, like humans and animals, need three elements to live and thrive: Air, Water, and Food.

Air	Water	Food
Oxygen provides microbes air to breath. Oxygen makes the composting process work faster and more effectively, and it also reduces likelihood of a compost pile producing bad odour.	Water provides the microbes liquid to drink. Microbes will dehydrate if the compost pile is too dry but will drown if the compost pile is too wet, slowing down the microbes and producing bad odour.	Microbes eat organic material to create compost. Microbes need the right sort and balance of food to be effective at creating compost, the two key nutrients are "carbon" and "nitrogen".

For effective composting undertake the following steps:

1. Add your Carbon and Nitrogen materials (see **Figure 1** on Page 6) to Bay 1 daily or as they are received, ensuring the right balance of Food, Air, and Water:

Adding Food

- Your compost will need **1 part carbon rich material for every 1-part nitrogen rich material.** This rule of thumb helps you achieve the ideal carbon to nitrogen ration of 30:1 by weight.
- For every bucket full of "nitrogen rich" material you add, cover it with an equal amount of "carbon rich" materials. Items containing both carbon and nitrogen can be added without layering.
- The correct balance of carbon and nitrogen will provide nutrients for the microbes.

Adding Water

- Add water as needed to ensure your compost pile does not dry out. Your compost pile should be damp all the way though, but not be so wet that water leaks out the bottom.
- The correct moisture will provide water for the microbes to live.

Ensuring Airflow

- Your compost pile should contain a mix of small and large items, up to 1-5cm diameter . If your items are larger than this you may need to shred the material using a shared mobile shredder (preferred) or cut larger items (coconut fronds etc) with a machete.
- The correct mix of items will enable air to flow through, providing oxygen for the microbes.

2. Once Bay 1 is full (after approximately one month), turn the material into Bin 2 (and turn Bin 2 into Bin 3) and start the layering process again in Bay 1.
3. It may be useful to create a “Maturation Pile" next to the bays where the material turned from Bay 3 can be stored to continue the composting process for an additional 1-3 months until ready for use (see Step 4).
4. Complete daily **“self-assessment”** checks on all Bays and the Maturation Pile to monitor your compost and assess whether the "food, water, and air" is correct, and the composting process is effective
5. It may be useful to create a “maturation” stockpile next to the bays where the material from Bay 3 can be stored to continue the composting process for an additional 1-3 months until ready for use.

Self- Assessment – Checking the “Air, Water, and Food” of Your Compost

<table>
<tr><th>Air</th><th>Water</th><th colspan="2">Food</th></tr>
<tr><td>  </td><td>  </td><td colspan="2">  </td></tr>
<tr><td rowspan="2">Visually inspect the compost pile to confirm it has a mix of large and small items, with large pieces (enabling air to flow through). If there is a foul odour, it may indicate insufficient airflow.</td><td rowspan="2">Compost should be damp to the touch but not too wet. To assess water content, collect a handful of material and squeeze – if a just few drops of water are released the moisture content is about right. If there is a foul odour, it may indicate too much moisture (restricting airflow).</td><td colspan="2">Carbon and nitrogen should be used following the method described in the Composting Common Materials Handbook.</td></tr>
<tr><td>If there is too much nitrogen in the pile, the compost may appear wet and soggy (due to an excess of nitrates). There will also be a bad ammonia-like smell. Excessive nitrogen may also be detected through monitoring temperature, too much nitrogen will have a high temperature.</td><td>If there is too much carbon in the pile, the compost may be dry and be very slow to decompose. Excessive carbon may also be detected through monitoring temperature, too much carbon will have a low temperature.</td></tr>
<tr><td>If there is a foul odour and/or the compost material is clumped together restricting airflow, turn the pile and add additional items that are “Helpful for Aeration”*</td><td>If the compost is too dry, add water or additional items that are “Helpful for Water Retention” *

If the compost is too wet, turn the pile and add additional dry items that are “Helpful for Aeration”*</td><td>If there is a foul odour and/or a surplus of high-nitrogen materials (i.e., materials that are fresh, flexible, and moist), turn the pile and add additional items that are “High Carbon”*</td><td>If the composting process has stopped and there is a surplus of high-carbon (i.e., materials that are old, rigid, and dry), turn the pile and add additional items that are “High Nitrogen”*</td></tr>
<tr><td colspan="4">* see the Composting Common Materials Handbook (https://pacwasteplus.org/resources/composting-common-organic-materials-in-the-pacific-and-timor-leste-handbook-for-compost-operators/)</td></tr>
</table>

Step 4 Use Your Compost

In approximately 3 - 6 months, you should be able to use your compost.

Material in the final bay or in your maturation stockpile will be ready when it is **dark brown and crumbly and has an earthy smell**. You may shake this material though a 5mm sieve to remove the finer compost and leave any unfinished materials to continue decomposing.

How to use your compost?

- Mix compost with volcanic clay soil to soften the soil and provide additional nutrients
- Mix compost with sandy atoll soil to provide additional nutrients and increase water retention
- Mix compost in vegetable gardens to increase crop yield
- Use compost when planting seedlings to add additional nutrients
- Sell compost to the community in sacks

For more information:

Small Scale Composting Factsheet 3

Handbook for Composting Common Organic Materials in the Pacific and Timor-Leste

Simple Guide - Complete an Organics Materials Waste Audit

1. Determine Sample Size and Scope

- Undertake consultation to understand who is producing organics in your community – this might be households, growers' markets, plantations or growers, or other food processing facilities (noni-juicing, fish processing, or copra etc).

  Record information on a template like the below:

Who could be producing organics?	Number	How currently using organic material? or where currently disposing organic material?
Households		
Growers' markets		
Plantations or growers		
Other food processing facilities (i.e., noni-juicing, fish processing, or copra etc)		
Other		

- Choose whether to complete your waste audit at "source" (i.e., at households, markets, businesses, etc), or upon "disposal" (i.e., measuring material once disposed in unauthorised dumps (litter) or at formal dumpsite/landfill).
- Choose an appropriate sample size. A waste audit will provide a snapshot in time, and you can "extrapolate" the data to understand general monthly or annual quantities. A typical sample size may be to gather data from 50% of the households and businesses producing the material, over the course of 1 typical week.
- Choose how you will measure the volume of the material. This is typically done by filling up buckets or containers with a known volume and recording the information (e.g., a 20l bucket contain 0.02m^3). For large quantities of materials, you may be able to estimate the volume by calculating the size of the truck tray (length x width x height) delivering the material or size of the stockpile.
- Select enough volunteers to assist you to complete the selected sampling methodology.

You can also weigh the material using scales and record the results in kilograms. Typically, there is 500kg of organic materials in 1m^3 – so to convert kg into m^3, divide by 500.

e.g., you have 250kg of organic materials. To convert into m^3, divide by 500:
250kg / 500 = 0.5m^3

2. Consult with Households and Businesses

- Develop a flyer or visit households and businesses to let them know you will be completing the waste audit, how you will use the data, and what you seek to achieve for your community.
- It is recommended to let the households and businesses know the general timeline for when the audit will be conducted but not the exact dates. You do not want them to change their behaviour if they know you may be measuring!

3. Gather Equipment

Recommended items to undertake a waste audit:

- A space large enough to allow for spreading out the items
- Table or tarpaulin for sorting
- Various buckets or containers to categorise waste by type
- Gloves, masks, enclosed shoes, protective clothing, and other PPE
- Paper and pens to record findings

4. Gather Data

- Collect the organic material from households and businesses
- Tip the material onto the sorting table or tarpaulin and sort and separate the items into different types
- Place the material into piles or buckets/containers and measure volumes

5. Record Volumes

- Record volume of materials collected each day on a template like the below
- Complete samples as per the selected sampling methodology – i.e., collecting from 50% of households and businesses, over the course of 1 week

	Day 1				
	Volume of material collected (m3)				
	Sample 1	**Sample 2**	**Sample 3**	**…**	**TOTAL**
Food Organics					
Yard / Community					
Plantation / Harvest					
Paper & Cardboard					
Cooking Fire Ash					
Palm & Flax					
Coconut Husks					
Copra By-product					
Fish By-product					
Coffee By-product					
Beer By-product					
Noni By-product					
Sugarcane By-product					
Molasses					
Sawdust					
Animal Manure					
Other organics					
TOTAL					

6. Analyse Findings and Determine Needs

- Analyse your findings to calculate the expected monthly quantity of materials to process and determine an appropriate size of composting system you may need. A 3 x 1m^3-bay composting system can typically process up to 1.5m^3 of organics per month (6 wheelbarrow loads).

  Note: if you expect more material, you may need to either:

  - construct larger bays (for example – bays of 1.25m L,W,H = 2m^3 volume, can typically process 3m^3 of organics per month (12 wheelbarrow loads)
  - construct three extra 1m^3 bays – a 6 x 1m3-bay composting system can typically process 3m^3 of organics per month (12 wheelbarrow loads)
  - consider larger scale mechanical composting solutions, which are described on the PacWaste Plus website.

- Consider the "carbon" and "nitrogen" content of your materials* to ensure you have the correct balance of 1 part carbon material for every 1-part nitrogen material (i.e., for each bucket of carbon materials you need one bucket of nitrogen materials). If your waste audit finds your ratio of "carbon" and "nitrogen" items are not about even, you may need to secure additional input sources. See below in Step 3 for more information or review the Handbook for Composting Common Organic Materials in the Pacific and Timor-Leste.

* Items in brown in the table above are high in carbon, they are usually old, rigid, and dry. Items recorded in green are high in nitrogen, they are usually fresh, flexible, and moist. Items recorded in black are generally neutral – containing both carbon and nitrogen.

- Consider the size of your input materials. If any are larger than 1-5cm diameter and 5-10cm long they will need shredding or cutting prior to being added to a composting system. See below in Step 3 for more information.


EUROPEAN UNION


SPREP
Secretariat of the Pacific Regional
Environment Programme


PacWastePlus
PACIFIC WASTE MANAGEMENT