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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.**

TRAINING RESOURCE

Operation of Medium-Scale Compost Facilities in the Pacific and Timor Leste

Guide for delivery of Training Course – speaking notes and guide to setup and facilitate hands-on exercises

This Training Resource is part of a range of resources to assist Pacific Island Countries and Timor-Leste to divert organic materials from landfill into a beneficial use.

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

PacWastePlus Programme

The Pacific – European Union (EU) Waste Management Programme, PacWastePlus, 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 PacWastePlus

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 PacWastePlus programme is generating 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 PacWastePlus 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 PacWastePlus 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

Our Regional Organics Project

Organic material is biodegradable matter such as vegetation from yard clean-ups, kitchen scraps (food); garden cuttings, grass, and branches, and paper. Combined data from waste audits in the Pacific found that approximately 40% of waste disposal to our landfills and dumps is organics.

When processed correctly (in an “aerobic” or oxygen-filled environment), organic materials can produce valuable nutrient rich products, such as compost, suitable for soil enhancement and food cultivation. However, when intermingled with other waste and disposed in a landfill or dump (an “anaerobic” environment), organic material can release toxic leachate and generate methane gas.

The purpose of this regional project is for Pacific stakeholders, now and into the future, to have practical and resources and decision-support needed to design and implement their own effective organics management solutions, appropriate for their own context and communities.

The Organics regional project reviewed existing Organic facilities from the region, undertake technical research, and adopt findings and resources from Country Projects to develop:

- A minimum standard technical framework for countries to have as a resource when designing and operating their own organics processing facility
- a decision guidance resource/tool – to guide informed decision making around processing system design/technologies, size and equipment requirements, operational processes, etc to suit any context and scale
- resources to communicate with and empower communities to convert their organic “waste” to a valuable “resource” using appropriate solutions available (i.e., backyard, on-farm, community-level, or national-level organics processing).

This **Training Resource** on the "**Operation of Medium-Scale Compost Facilities in the Pacific and Timor Lest**e" is part of a range of resources to assist Pacific Island Countries and Timor-Leste to divert organic materials from landfill into a beneficial use.

	RELATED RESOURCES
Use this **Training Resource** in combination with the other resources to guide all aspect of organics management, from choosing the appropriate management solution for your compost, operating your facility, and complying with recognised standards:	**Decision support tool** to support the selection of suitable organics management solution for the Pacific and Timor-Leste
	A **series of Factsheets in**troducing eight types of organics management solutions appropriate for the Pacific and Timor-Leste context
	Framework Operations Plans and editable **Design Drawings** to assist in the design of eight organics management facilities A **Composting Handbook** providing practical information for composting common organic materials found in the Pacific and Timor-Leste
	A **Composting Standard** providing minimum standards for accepting and processing organic inputs and the use of generated compost and digestate, specific for the Pacific and Timor-Leste context

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Glossary

Term	Description
Aerobic process	An aerobic process is a composting process with oxygen or air, as opposed to an anaerobic process that does not require it.
Anaerobic process	An anaerobic process is a composting process in which organic matter is degraded by micro-organisms in the absence of oxygen.
Bacteria	Bacteria are tony single-celled organisms, invisible to the naked eye, important for ecosystems.
Bioaerosol	Bacteria or fungi in drops of mist in the air.
Carbon	Carbon is an energy-element and is one of the basic building blocks of life. Plants are nearly half carbon. In composting, carbon provides an energy food that sustains the microbes. Some organic materials, like fallen palm fronds and flax/tree litter, dead clippings from yard/community beautification projects, and paper / cardboard, have a lot of carbon.
Carbon to Nitrogen (C:N) ratio	The proportion or ratio of the amount of carbon to the amount of nitrogen contained in organic materials. This ratio can be calculated for a mix of different materials to be composted. Carbon is the main ingredient in organic material. It is used for energy and building bodies by all living things. Nitrogen is an important ingredient in organic material. Used for building amino acids in living things that are used as building blocks in bodies.
Compost	Organic material that has been broken down during composting and now looks and smells like dark, fertile garden soil.
Composting	Composting is a natural biochemical process in which naturally occurring microorganisms transform raw organic materials into compost products. Although these processes are natural and will happen on their own, compost facility operators are recommended to understand and control the process to provide ideal environmental conditions for bacteria, fungi, and other decomposing organisms.
Composting facility	Facility that accepts compostable material, and processes this into a recycled organic product (compost) through either aerobic or anaerobic processes.
Compostable material	Material that was once part of a living thing. Includes: 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, manure, and paper / cardboard. Does not include petrochemicals. Has the same definition as organic material.
Fungi	A group of spore-producing organisms feeding on organic matter. Fungi include moulds, yeast, and mushrooms. Fungi are heterotrophs (cannot make their own food) and have important roles in nutrient cycling in an ecosystem.
Food organics	Residues from food, which can be from food preparation, such as fruit and vegetable peelings and trimmings, or leftover, unconsumed food. Spoiled food that is no longer fit for consumption. Note: References to composting food organics in this FOP also apply generally to other inputs that are moist and high in nitrogen, such as animal manures.

Term	Description
Front End Loader (FEL)	Tractor with hydraulic bucket on the front that mechanically lifts and moves large quantities of material. General term that also covers bobcats and telehandlers.
Garden organics	Vegetation residues from gardens, parks, or landscape management. Can include grass clippings, leaves, weeds, crop residues, twigs, branches, vines, palm fronds,
Leachate	Liquid that seeps out of a compost pile.
Microbes	Tiny living organisms including bacteria and fungi which process organic materials into compost.
Nitrogen	Nitrogen is a protein-element essential for growth and reproduction in both plants and animals. In composting, microbes use nitrogen to grow and reproduce. Some organic materials, like fresh clippings from yard/community beautification projects, peelings and scraps from food preparation, and manure, have a lot of nitrogen.
Organics / Organic Material	Organics or Organic Material are materials that were once part of a living thing. Includes: 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, manure, and paper / cardboard. Does not include petrochemicals. Has the same definition as compostable material.
Odour	Bad smells. In compost facilities they come from not enough oxygen, or too much nitrogen.
Palm Organics	Trunks and leaves (fronds) from palm trees and similar species. Contains tough fibres that can be hard to work with.
Parasite	A living thing that steals from another living thing to stay alive
Pathogen	A microorganism (bacteria, fungi, virus) that can cause disease or death in plants, animals, or humans.
Physical contaminants	Non-organic materials that cannot be composted, including all types of plastic, glass, metal, rubber, and stones.
Shredder	Machine designed to break up woody organic material into smaller pieces. While chippers produce a slightly different output a reference to a shredder in this FOP is also a reference to a chipper.
Turning	Mixing and fluffing up of composted material. Turning often involves moving of the material, (e.g., from one composting bin to another, or from the centre of a composting pile to the outside).
Virus	An ultramicroscopic, metabolically inert, infectious agent that replicates only within the cells of living hosts, mainly bacteria, plants, and animals. Many viruses cause diseases as part of their reproduction process.
Windrow	A long pile (row) of organic material undergoing the composting process

1. Introduction to the Compost Training Course

Average waste to landfill and dumps in the Pacific and Timor-Leste is approximately 40% organic material[1]. Organic materials are also commonly burnt or stockpiled in unmanaged pits or piles.

The awareness for improved organics management and composting is growing in the region as landfills reach capacity, knowledge increases regarding climate change/methane emissions and water/soil pollution, and local-scale farming is viewed as a way communities can increase climate resilience.

Typical compost systems in the Pacific and Timor-Leste are generally processing 1 tonne of organic material per day and commonly have limited mechanical support. Pacific vegetation is often high-fibrous (coconut fronds, banana leaves, and pandanus etc). Training resources available from other regions are typically aimed at either the home/community scale, or large-scale facilities (10+ tonnes per day) - and processing different organic material and with specialise equipment. Compost operators in the Pacific may not get value from other training resources.

The training course focuses on increasing the technical knowledge and capacity of participants (from governments and stakeholders) on how to operate a typical compost system in the Pacific and Timor Leste. The training course contains classroom and hands-on exercises.

The intent of the training is to provide composting site operators with an understanding of:

- Why organic processing such as composting is an important part of a waste management systems
- How composting works i.e. what is actually happening as materials are composted and the key factors that impact on effective composting
- What the key activities are for the composting operation.

The course may also be used by Policy/Regulators to increase capacity in understanding why organics management is beneficial, and how to monitor composting operations and assessing opportunities for improvement or key risks.

This training was specifically designed for the operation of typical compost facilities in the Pacific and Timor-Leste regions and took into consideration:

- Types of vegetation and other input materials
- Climate
- Mechanical support/equipment available
- Operational budgets.

[1] 1 PacWastePlus Regional Waste Audit Analysis Report 2023 https://pacwasteplus.org/resources/regional-waste-audit-analysisreport/

2. Purpose of this Training Resource

This Training Resource is designed to support users/trainers wishing to deliver the training course **"Operation of Medium-Scale Compost Facilities in the Pacific and Timor Leste**" to local participants.

The Training Resource provides the speaking notes and exercises to accompany the PowerPoint Presentation and data collection template (download slides and template separately).

The full training has been condensed into a 60-minute video (available on SPREP website) for users/trainers to view for extra information prior to delivering.

3. Training Approach

The Training Course is structured to include both 'classroom' learning and hands-on 'practical' activities at a composting facility:

- Classroom learning combines presentation of key concepts and supporting information with activities designed to consolidate learning through applying the concepts that are taught
- Hands-on activities which involve working with composting feedstock and include putting together a compost batch, monitoring composting activity and troubleshooting. The hands-on activities provide an opportunity to consolidate the concepts learnt in the classroom.

The training is designed to be delivered over two days – with 5.5hrs on day 1 dedicated to classroom and practical activities and 1-2hrs on day two to review the compost piles made during practical activities. Table 3-1 details a recommended training agenda and Table 3-2 an overview of the typical classroom session plan. A full training guide and example speaking notes are provided in Table 3-3.

Note: Each country in the Pacific is slightly different in terms of relevant feedstock (organic materials received), total throughput, infrastructure and equipment, and community needs. This Training Course was developed to be generalised to be applicable for the region as a whole, but it is recommended that the trainer understands the local context (i.e., current approaches to composting, local materials streams/feedstock, equipment and facilities, and existing capability) to reflect into training when delivered.

Table 3-1. Standard Training Agenda

Training Stage	Timing	Overview
Initial Planning	In the weeks prior	Several prior meetings scheduled online with in-country counterparts to discuss and confirm arrangements for the training.
Set-up	Day prior to training or morning of	Initial day onsite where the trainer would familiarise themselves with facility, and the site operator. The Trainer reviews current procedures and any existing compost batches, incoming material and product screening handling approach. If need the trainer establishes a batch (with local staff if possible) if there were no existing batches.
Training Day 1	5.5 hours (3.5 classroom; 2hr hands-on	General agenda: • An initial discussion at the composting facility on the current approach and familiarisation with the site (around one hour). • Classroom learning on key concepts for composting (around two hours). See Table 3-2 for a more in depth overview. • Additional hands-on learning at the composting facility including batch monitoring (temperature and moisture tests), establishing a batch, adjusting batch conditions (adding water, mixing covering) and recording batch information (one - two hours). • Classroom learning on managing a compost facility including safety and environmental management considerations (around one hour). See Table 3-2 for a more in depth overview.
Training Day 2	1-2 hours	Follow up session: • Checking on the compost batches made. • Recording batch information.
Remote Support	From end of training - ongoing	Remote support is recommended so the trainer an engage with participants after the initial training was delivered.

Table 3-2. Classroom Training Overview

Component	Summary/Outcome	Timing
Introduction	*Summary:* Why is composting a good idea and key benefits. *Outcome:* Participants are motivated to learn about and implement a composting programme.	15 mins
Composting principles	*Summary:* An overview of the science of composting and practical aspects of the composting process. *Outcome:* The participants have a good understanding and knowledge of the nutritional and environmental requirements for the microorganisms in the composting process. Participants discuss and apply troubleshooting in desktop exercise.	75 mins
Monitoring and reporting	*Summary:* An overview of the suggested monitoring and reporting approach and exercises to apply this to assist with troubleshooting. *Outcome:* the participants have a good understand of what to monitor, why this is important and how the information can be used to troubleshoot composting process issues.	60 mins
Managing your facility	*Summary:* An overview of key risks and considerations relating to safety and potential environmental impacts (including vermin, odour) for a composting facility. *Outcome:* Participants are knowledgeable about potential safety and environmental risks associated with managing a composting facility.	60 mins
	Total classroom time	**3.5 hours**

4. Resources Required

To deliver the "**Operation of Medium-Scale Compost Facilities in the Pacific and Timor Leste"** training course to local participants, the following resources are recommended:

Classroom:

- Meeting room venue preferably adjacent to compost facility so training can flow from indoor to outdoor easily
- Space and seating for all participants to sit down
- Ability to present PowerPoint slides
- Water / tea and coffee / lunch for participants

Hands-on:

- Compost facility (i.e., Bay, Windrow, or a flat site if no compost facility available)
- Ideally at lease $5m^2$ (or more) organics material – at a generally even amount of:
    - Carbon rich material (coconut fronds, old brown garden vegetation) (ideally shredded)
    - Nitrogen rich material (manure, food/market waste, green grass clippings)
- Water supply (hose, sprinkler, or buckets)
- Temperature probe (or clean machete or spade)
- Shovels – at least 1 per 4 participants
- Data Collection Templates and pens / clipboard
- Survey Questionnaires
- PPE recommended - masks, gloves, and foot and eye protection

5. Further Reading

PacWastePlus has developed several resources to assist decision making for improved organics management and design effective organics management solutions. It is recommended that trainers review and are familiar with these resources to share the information during training sessions.

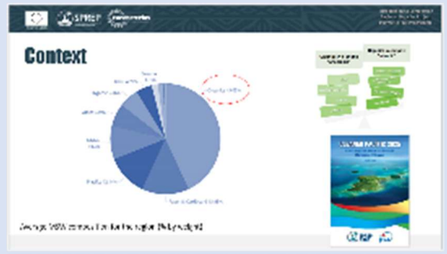
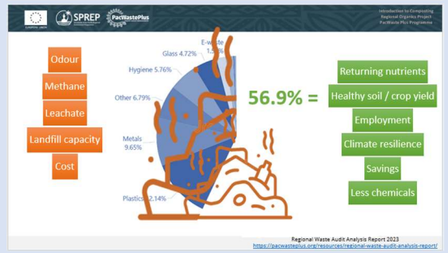
Resources include:

- Factsheets on recommended organic management solutions for the Pacific
- Factsheets on community and household composting
- Decision Support Tool for selecting organics management solution
- Handbook for Composting Common Materials
- Pacific Standards and Guidelines
- Framework Operations Plan for Bay, Windrow, Aerated Pile, and Small-Scale Composting
- Editable Design Drawings
- Framework Monitoring / Data Collection Templates
- Animations on community and composting, and completing daily air, water, food checks

All resources are available on the PacWastePlus and SPREP Organics Resources website.

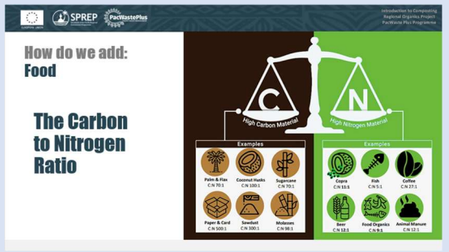
Table 5-1. Training Guide and Example Speaking Notes for Delivery of the Operation of Medium-Scale Compost Facilities in the Pacific and Timor Leste Training Course

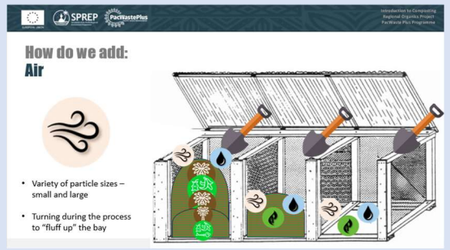
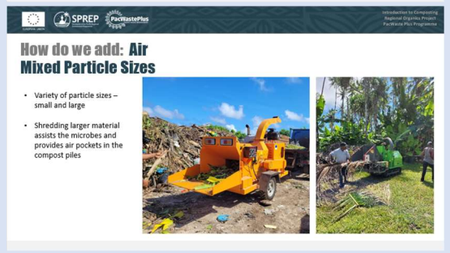
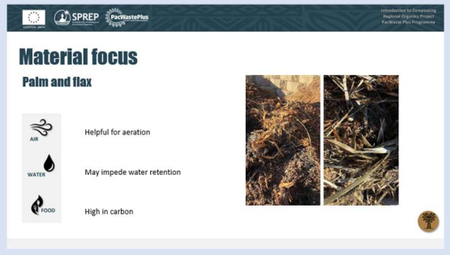
Agenda item	Detail & Speaker Notes	Relevant Slides
Set-up		
Hands-On Training	**Collect material:** Collect carbon rich material (garden vegetation) + Nitrogen rich material (market waste) For example: Approx. 3 – 4 m/yd3 of vegetation (chipped or chopped up) Approx. 1 m/yd3 of market waste (chopped up if needed) Ensure water supply – enough to make the mixture damp	NA
Participant Survey	Recommend capturing data at the beginning of the training on • Gender • Organisation • Role • Composting knowledge: 1. Knowledge of setting up a compost batch a. I do not have experience setting up a compost batch, and don't understand carbon and nitrogen b. I have some experience setting up a compost batch and understand a bit about carbon and nitrogen c. I have a lot of experience setting up a compost batch with correct carbon and nitrogen 2. Knowledge of monitoring a compost batch a. I do not know how to monitor a compost batch to ensure it is working well b. I have some idea of how to monitor a compost batch to ensure it is working well c. I am confident of how to monitor a compost batch to ensure it is working well 3. Relevant resources a. I do not know where to find relevant resources on composting b. I have some idea of where to find relevant resources on composting c. I am confident where to find relevant resources on composting	NA
Introduction **Introduce facilitators & the session ahead**	*Introduce facilitator/s and welcome group* *Give a brief overview of what the training will cover:* Will cover: • Principles for effective composting • The Carbon to Nitrogen ratio • Monitoring and reporting on your batch • Troubleshooting • Reporting and documenting composting process recommendations • Safe and effective management of your facility • Overview of further resources available	

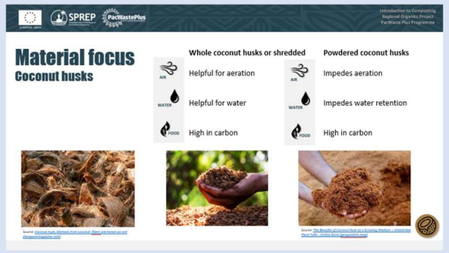
Agenda item	Detail & Speaker Notes	Relevant Slides
The Context	**Introduce the PacWaste Plus Programme** It is European Union (EU)'s Waste Management Programme for The Pacific. The aims are: • Improve economic, social, health, and environmental benefits. • Enhancing existing activities • Building capacity and sustainability into waste management practices. The programme is Funded by the EU, and is implemented by the Secretariat of the Pacific Regional Environment Programme SPREP.	
	The Broader Context The wider context for focussing on organic materials and composting includes: • The Broader context is the Cleaner Pacific Strategy which is a long-term strategy for integrated sustainable waste management and pollution prevention and control in the Pacific islands region until 2025. • It provides a strategic management framework to address waste, chemicals and pollutants that will reduce associated threats to sustainable development of the region. • Each region has a priority area identified for municipal solid waste, among other priority areas such as asbestos, e-waste etc. It also states the need to divert organic waste into organic waste recycling programmes (such as composting or anaerobic digestion) The pie chart depicts a typical solid waste composition for the region (% by weight). The most prevalent waste type is organic materials. *Issues:* • Organic material is the largest component of the waste sent to dumpsites and landfills across the pacific. • Many of the landfills across the Pacific are at capacity, and contributing to pollution in the land, sea and air. • If waste is burnt it can release dangerous carcinogens contributing to climate change and affecting our health. • When organic waste is intermingled with other waste and disposed of in a landfill or dump (an "anaerobic" environment), organic material can release toxic leachate and generate methane gas (a greenhouse gas). *Solution* • Increase the lifespan of a landfill • Produce compost which will enrich soil quality, improve crop yield, increase soil water retention, enhance food security, • Increase climate resilience for local communities • Composting can be undertaken in the Pacific with non-specialist methods and without expensive specialist equipment or reliance on overseas shipping, enabling a circular economy approach for waste management	 
	Where can we be? Diverting organics from landfills we can not only avoid further contributing to the problems but also benefit from it by turning it into a valuable resource - compost. • Improve soil quality and crop yields, increase soil water retention, enhance food security, climate resilience for local communities • Support local food production and healthy eating • Reduce water and pesticide use • Reduce reliance on imported fresh food.	

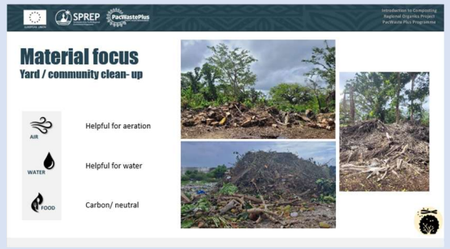
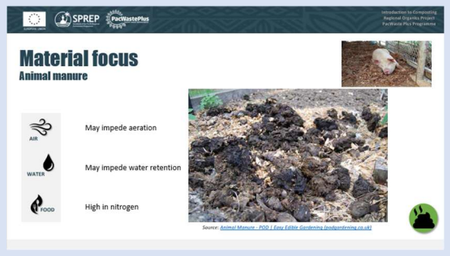
Agenda item	Detail & Speaker Notes	Relevant Slides
	• Reduction in greenhouse gas emissions and leachated	
	Activity: **Current Composting Process / Understanding Existing Knowledge** Visit existing compost facility and discuss current processes, discuss how staff receive material, mix material and set up a batch, understand material types, complete daily checks/monitoring, and record data	
Principles for effective composting	**Section transition**	
Terminology	**Compost Terminology** *Talk through the key terminology that will be used throughout the training* **Organics or Organic Material:** Materials that were once part of a living thing. Can include garden cuttings, grass and branches, food scraps **Mulch:** Woody and garden organic materials, once shredded, **but** before undergoing a composting process **Composting:** A natural biochemical process - naturally occurring microorganisms transform raw organic materials into compost– similar to soil. **Compost:** Organic material that has been broken down during composting, looks and smells like dark, fertile garden soil	
	Principles for effective composting • If you leave vegetation to breakdown naturally e.g. in the corner of a garden – over a long time this breakdown into soil (this is how soil is made). What we are trying to do with compost is to copy this natural process and if possible speed it up. • Compost is more than the sum of its parts; it is an ecosystem. • It is a natural biochemical process in which naturally occurring microorganisms transform the organic materials into a nutrient rich product, “compost”. • Our job is to help the organisms, ensure they have the right conditions to do their work.	

Agenda item	Detail & Speaker Notes	Relevant Slides
	Slide 9 Common Organic Materials found in the Pacific • We will focus our conversations on the common organic materials found in the Pacific. • These are the key materials you might be considering for composting. • The materials were determined from the audits conducted across the Islands • Depending on the methods used different materials can be processed or not • The brown and green colours refer to the carbon and nitrogen balance in each material, we will come back to that in a moment. In essence, we need to combine various materials to provide a balanced diet for the composting bugs.	
	Slide 10 Principles for effective composting – How does it work *Talking to the key elements that make up composting and the importance of balance for success.* • Understanding each element in the system – and how they balance together – is the foundation for building a healthy compost pile. • It is a natural biochemical process in which naturally occurring microorganisms transform the organic materials into a nutrient rich product, "compost". • Microbes, like humans and animals, need three elements to live and thrive [Refer to image] • Effective composting occurs when these three elements are operating in a balance, as microbes get the correct amount of air, water, and food to thrive. *Talk through the three elements:* • Air: Oxygen provide 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. If there is not enough air microbes that can work without oxygen take over. These are called anaerobic bacteria and one by-product of their activity is highly odorous compounds. Examples include the odour of rotting food and odours from animals manures (that come from the anaerobic gut). • Water: Water provides the microbes with hydration. Microbes will dehydrate if the compost pile is too dry but will drown if the compost pile is too wet. This will slow down the microbes and potential reduce access to air producing bad odour. • Food: 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.	
	Slide 11 • Combine these three elements and balance them over time, and you will create compost.	

Agenda item	Detail & Speaker Notes	Relevant Slides
	How to Add FOOD **The Carbon to Nitrogen Ratio** All organic matter includes both carbon and nitrogen; they just have a different make up of each. This is important to know because sometimes you can upset the balance in your compost even when you think you are adding nitrogen but because of the high overall carbon content in the materials you have used. *Use the slide to talk to an example* • A very high carbon content of your composting mix will result in slow composting. • A very high nitrogen content will result in fast composting, potentially using up air in the compost pile making it anaerobic and smelly.	
	The Carbon to Nitrogen Ratio The microbes in a compost pile use carbon as a source of energy and nitrogen for building cell structure. Which is why they need more carbon than nitrogen. Each material type has different carbon and nitrogen percentages, moisture content, and density. As such, the 30:1 C:N ratio is not related to material volume and cannot be achieved by simply adding 30 shovels of carbon material to 1 shovel of nitrogen material. Food is provided in the materials to be composted but needs to be the right recipe. a. woody material b. soft materials Too much nitrogen rich and the compost will get smelly Too little nitrogen rich and the composting will be very slow **To provide the right recipe some guidelines to follow are:** Start with around 5 parts of high carbon material (shredded vegetation, sawdust) and 1 part high nitrogen material (food scraps). With regular mixing to maintain air flow it may be possible to increase the nitrogen component but it is better to start with less material and increase to avoid generating bad odours. Your material streams will be unique, so it is important to experiment to get the most appropriate mix of your materials. We will talk about monitoring and troubleshooting so you can develop the right approach for your materials at your facility.	
	How to Add WATER • Add in “damp” materials e.g. leaves, food scraps • Add water at the start of the process • Add water during the process if the bay gets dry (results from daily checks) • Add water using bucket, hose, sprinklers, etc **Don’t forget to mix**	

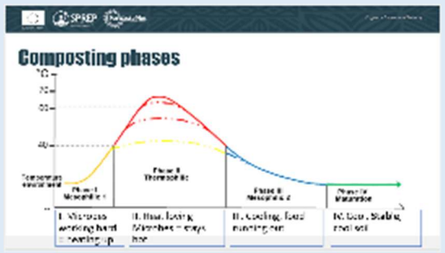
Agenda item	Detail & Speaker Notes	Relevant Slides
	How to Add AIR Variety of particle sizes – small such as grass clippings and medium/large such as woodchips to ensure air pockets / air flow (so microbes can breath) Turning during the process to “fluff up” the bay – layer materials with carbon/nitrogen and different particles and turn the batch once the first bay or pile is full Turning the bay or pile can be completed manually with spades and shovels or small equipment. If the facility does not have equipment, can consider renting weekly or fortnightly to complete turns Ensure the material on the outside of the Bay/Pile 1, goes into the middle of Bay/Pile 2	  
	Shredder selection **Recommendation of “Drum” Shredders over Disk Shredders to process Pacific vegetation** • Power and Durability: strong motors and durable components, less prone to wear and tear • Faster Processing: continuous and more efficient shredding • Safer Processing: drum blades do not get “caught up” with fibrous vegetation (common in disk shredders) – less need for staff to interact closely with the blades • Lower Maintenance: rugged design and fewer moving parts, requiring less frequent maintenance	
	Materials Focus ***Palm and Flax*** Woody Palm and Flax Material includes vegetation from coconut trees and fronds, banana tree leaves, and pandanus flaxes. These materials are very common items in landfills in Pacific and Timor-Leste. While from different plant families, vegetation from palm, stem-fibre, and flax have similar properties in that they are all woody and “high fibrous”, with tough fibres and a waterproof skin that is difficult to breakdown. **How will High Fibrous Palm and Flax Material ENHANCE or INHIBIT Composting?**	

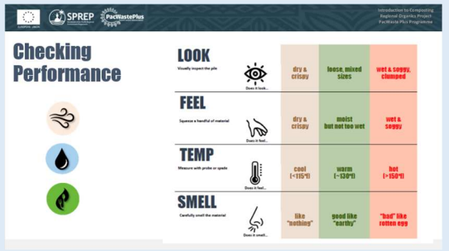
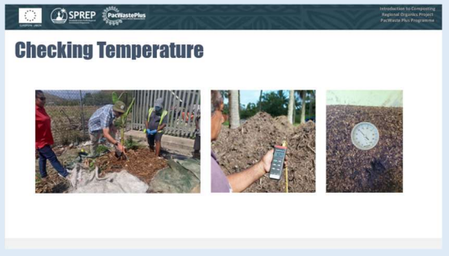
Agenda item	Detail & Speaker Notes	Relevant Slides
	Air - Helpful for aeration - High fibrous palm and flax material composts well if they are broken into smaller pieces. This is best done with a drum type chipper (see pop out box for details). Note: If you don't have access to a chipper, you can break fronds into 5cm pieces with a machete or saw. If the material cannot be cut, an option may be to put them aside in a pile to slowly degrade and add to the compost later when easier to cut with a machete. Chipping or shredding palm and flax materials will typically turn this material to a consistent particle size of <100mm. This material is bulky and therefore effective at increasing airflow into a compost pile. It is an excellent product to mix with materials with small pieces (such as fish organics or grass cuttings). For example, if fish organics and chipped woody palm and flax materials are blended, the material matrix will provide for airflow throughout the pile and significantly reduce odour from the fish. **Water - May impede water retention -** High fibrous palm and flax materials have tough fibres and a waterproof skin and can therefore take a while to soak up water in a compost pile. This material will usually be very dry when reaching a compost facility. It is a good material to mix with wet items such as fish organics. You may need to allow extra time for water to soak in. Note: If palm and flax organics haven't been through a chipper they may not take up water at all. **Food - High in carbon -** High fibrous palm and flax materials are a high carbon item. For effective composting, mix palm and flax with material with more nitrogen to get the C:N Ratio right. If palm and flax material is composted by itself, the process will run very slowly and may never finish.	
	Materials Focus ***Coconut Husks*** Coconut husks are the rough exterior shells of the coconut. It is also known as coir. The husk of a coconut comprises fibre and pith, with is a strong tissue to store water and sugar nutrients.. **How will Coconut Husks ENHANCE or INHIBIT Composting?** **Air - Helpful for aeration (when whole) / May impede aeration (when powdered)** When coconut husks are broken up in pieces of <250mm, they are very good at letting air into the pile and can be useful for helping to prevent odours. In a shredded or powdered form, the air holes of coconut husks are much smaller and when water is added to the pile it is easy for the air holes to get blocked. It is best to mix powdered coconut husks with another organic material with bigger pieces in it, such as shredded coconut, banana, pandanus. **Water - Helpful for water (when whole) / May impede water retention (when powdered)** Coconut husks can contain a lot of water in their broken open form. They will allow water to move easily through the compost pile as it will be hard to block air spaces in the pile. Coconut husks are a useful way to save water in composting if you don't have much water available. In powdered form, coconut husks can be much lower in water. It will take up water very easily but holes between the particles can easily be blocked. It will work better mixed with another material that has larger particle sizes like garden organics or whole coconut husks. **Food - High in carbon** Coconut husks are high in carbon. To compost effectively, they should be mixed with a high nitrogen material like manure, food organics, or copra meal.	

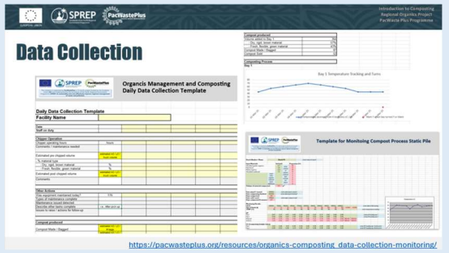
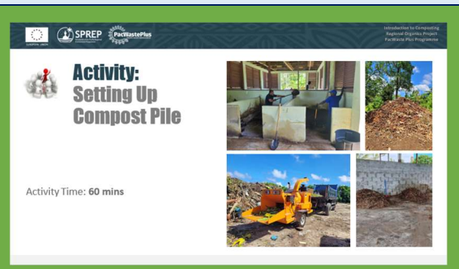
Agenda item	Detail & Speaker Notes	Relevant Slides
	Coconut husks can come in large pieces which can make them hard for microbes to break down. Coconut husks may compost better if they are put through a chipper to break them into smaller pieces. Drum chippers recommended for coconut, banana, pandanus organics should also work for chipping coconut husks.	
	Materials Focus ***Yard /Community Clean-up*** Organics from Yard /Community Clean-up include all the clippings, trimmings, and cut grass produced from yard or community beautification or clean-up activities. This may include fibrous vegetation like coconut fronds, banana leaves, and pandanus flaxes (see Section 3.1) that has fallen as tree litter, and branches, leaves and grass. It can come in big (branches, fronds, etc) and little pieces (grass, hedge trimmings, etc). Big pieces may need to be cut into smaller pieces with a woodchipper or machete to work well in a compost pile. **How will Organics from Yard /Community Clean-up ENHANCE or INHIBIT Composting?** **Air - Helpful for aeration -** Organics from yard /community clean-up come in a variety of sizes, usually mixed together. The material will compost better if it is broken into smaller pieces, either through a chipper, providing an ideal mix of particle sizes to allow good air flow, or cut to 5cm pieces with a machete or saw. If the material cannot be easily cut, an option may be to put them aside in a pile to slowly degrade and add to the compost later when they are easy to cut with a machete. Organics from Yard /Community Clean-up are a good choice for combining with a high nitrogen and high water organic material like fish organics. **Water Helpful for water -** Organics from yard /community clean-up usually take in water well and drain excess water easily, making it hard to have too much water in the compost pile. Without shredding, it may take some of the woody parts of the organic materials a while to soak up the water properly. **Food Carbon / Neutral -** Organics from yard /community clean-up usually come in a variety of dry and fresh materials. This material will compost without adding anything else, but it helps to add something with lots of nitrogen (fish by-product or manure) to get the composting process to work better.	
	Materials Focus ***Manure*** Manure is the decomposed form of dead plants and animals. It contains water and nutrients for helping plants grow and stay healthy. Manure can be spread on fields to return the nutrients that the animals ate back to the field. There is some risk that diseases can be spread from one group of animals to another by doing this. Manure recommended for use in compost are from herbivore animals such as chickens, cows, and pigs. Manure from carnivore animals (dogs and cats) are more likely to spread disease. Pig manure may carry pathogens which can impact human and soil health, it is recommended to have pig manure tested in a lab before using them in composting. It may not be recommend for compost made from pig manure to be used for growing food (in gardens or crop fields). A separate organic facility may need to be established to process this material. **How will Animal Manure ENHANCE or INHIBIT Composting?** **Air May impede aeration-** Manure tends to pack down a lot in a pile and may restrict air flow. It will help if manure is mixed with something with large pieces in it like garden organics. Manure can make microbes work very fast. If there is too much manure in the pile this can make them use up all the oxygen and produce odour.	

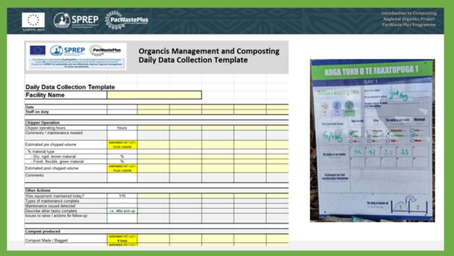
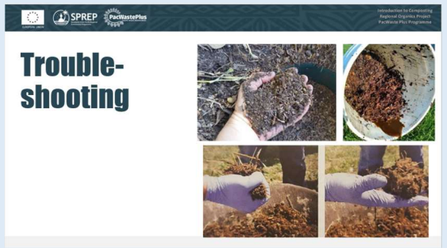
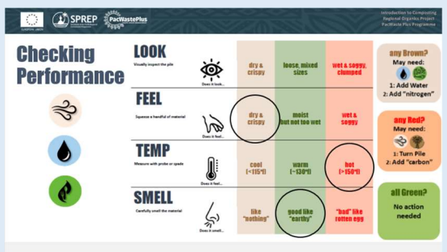
Agenda item	Detail & Speaker Notes	Relevant Slides
	Water May impede water retention (when wet) - Manure can be wet or dry, depending on if they come from a sludge pond or collected dry from a field. When they are wet the water can easily block the holes in the compost pile. Manures compost better when mixed with something that soaks up water (like sawdust or ground coconut coir) and has large particle sizes (like garden organics). **Food High in nitrogen -** Manure is high in nitrogen and very easy for microbes to digest. If there is too much manure in a compost pile it will get very hot. If there is a lot of manure and too much water the pile could run out of air and smell very bad. Manure works best when they are mixed with something low in nitrogen with large particle sizes, like garden organics. Some manures come mixed with animal bedding material like straw or wood chip. A manure-bedding mix is often a good mix to compost by itself.	
	Materials Focus ***Fish*** Fish Processing By-product is the bits left over from fish processing, including scales, bones, and guts. It has a lot of water and a lot of nitrogen that makes it likely to smell bad if left out for too long before processing. **How will Fish Organics ENHANCE or INHIBIT Composting?** **Air May impede aeration-** Fish Processing By-product are very easy for microbes to break down. They will use a lot of oxygen and it will be easy for the compost pile to run out. Fish Processing By-product should be mixed with a material with large particle sizes, like garden organics, to enable airflow to pass through the pile and facilitate microbe activity. To reduce potential for odour, it is recommended to compost fish organics as less than 10% of the volume of a compost pile and mix with larger particles. **Water Helpful for water** - Fish Processing By-product has a high water content, potentially providing the compost pile more moisture than it needs. Mixing fish organics with dry material like paper and cardboard will help balance out the water content of the mix. **Food High in nitrogen -** Fish Processing By-product has a lot of nitrogen in it. Fish organics will compost better if it is mixed with a material with low nitrogen (includes sawdust, paper and garden organics), working best with only a little bit of fish organics and a lot of low nitrogen material.	
Monitoring and Reporting	**Why monitor:** Monitoring helps to maintain favourable composting conditions by: • Identifying any issues in the balance of air, water, or food of each batch. • Addressing the issues through taking appropriate action. • Checking the issue has been fixed. There are signs and symptoms that indicate when the compost system is out of balance. Sometimes solutions are not straight forward and will take some trial & error and it is important to understand that the composter's attention is the best ingredient for making good compost. Careful monitoring will help to correct small issues before they become big problems and help refine your practices over time. Creating a record of the monitoring enables a reference point for what successes and learnings are occurring over time. Since monitoring informs good management decisions, more regular monitoring is always beneficial.	

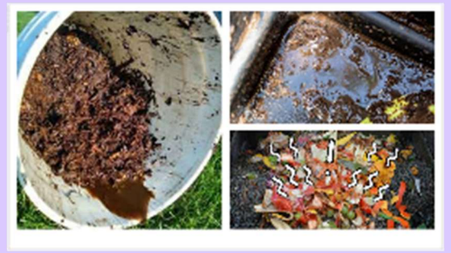
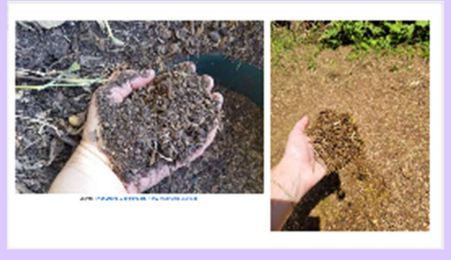
Agenda item	Detail & Speaker Notes	Relevant Slides
	What are you monitoring? Once the composting process has started, you are looking to ensure the air, water, and food are correctly balanced to enable the microbes to thrive. Daily checks are most effective. Recording your monitoring is best done by written logs, in a way that they can be referred back to. You have some critical tools for monitoring: • Your eyes – to observe the compost pile with a focus on whether it is too wet or dry. • Your nose – to check on whether there is any unpleasant odour (indicating the pile is anaerobic/doesn't have enough air). • Your hands – to feel whether the moisture content is 'about right' and to check on pile temperature.	
	Checking on Compost On average you should aim to check on your batch daily (at least 4-5 times a week) by monitoring the Air, Water, and Food. The daily checks look to ensure that the key elements of Air, Water, and Food are balanced to allow the microbes to do their best work. As noted previously, you should use your eyes, nose and hands to assess the composting material. Some signs and symptoms you may observe are: Odour – an indicator that the compost pile is anaerobic. This could be due to: • Too much water (restricting air flow) • Too much nitrogen in the compost mix, resulting in the composting bugs using up all available oxygen. • Insufficient mixing, resulting in low oxygen in the centre of the composting pile. These are all a problem because processing will be much slower (as well as smelly). The pile looks compacted/squashed down. This could be due to: • The pile being too wet. • Not enough mixing (to loosen up the pile) These are a problem because they may slow down the composting process. The pile looks wet or slimy. This could be due to: • Too much water in the composting pile. • Not enough air/oxygen – if the pile is anaerobic, it is likely to look slimy (and be smelly) These are a problem because processing will be much slower (and likely smelly) The pile looks dry. This is likely to be due to: • Not enough water in the compost pile • The compost mix materials being unable to hold water. This is a problem because the lack of water will slow down the composting process. At early and middle stages of composting the pile is cool. This could be due to: • A lack of oxygen • A lack of water These are an issue because the degradation process will be much slower.	

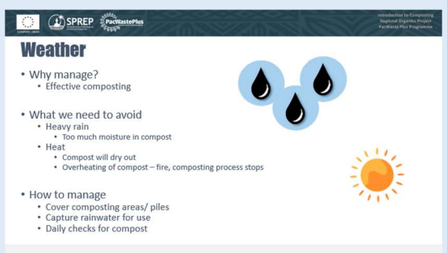
Agenda item	Detail & Speaker Notes	Relevant Slides
	Slide 16 Monitoring – temperature and moisture Monitoring temperature and moisture are just as important as the 3 elements as the environment the microbes are in is just as important in the food that is available to them. The best way to monitor the temperature is by using a temperature probe of some sort and record the trends of the temperature: • Place the probe as central to the batch as you can, and take a reading (refer to image on slide) • Initially you want to see it increase (No greater than 65 degrees C (150 F), otherwise too hot for the microbes) • Depending on the batch size and how much food, eventually it will start to cool off as the microbes have eaten everything to a point where the pile stabilises. We will go into more depth in the next slide If you don't have a probe, you can also use a machete or shovel that you can insert into the middle and test the temperature on the back of your hand. A good rule of thumb is if the metal is warm to the touch the temperature is 30-40 degrees C. If the metal is so hot it touch but not hold the metal the temperature is likely to be over around 55 degrees C. If the metal is hot to touch and hold the temperature is likely to be in the range 45 to 55 degrees C. If the pile is too hot, creating some airflow by turning it and adding water can help to bring the temperature down. If it is not heating up the same two actions apply, but it may also require more balance of good to encourage the right microbes. To monitor moisture, you are really just using your eyes and can conduct the squeeze test. 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). 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, like woody materials.	
	Slide 17 Composting phases The compost process goes through three stages of breaking down the material. These stages are determined by the different microbes doing their work. Understanding and tracking the stages is important for the pasteurisation of the material to ensure no weeds or pathogens survive. The stages are detailed below: *1. Initiation Phase:* As organic matter is discarded, microorganisms begin to rapidly break down the material. As they do so they produce heat that causes the temperature to rise. When it gets too hot they vacate but other heat loving microbes have already arrived. This process only takes days. *2. Thermophilic Phase:* The heat loving microbes thrive in the heat and continue to accelerate the break down of the material, including processing the material into finer pieces. The heat is good for assisting the break down and killing off harmful pathogens. Ideally the composting pile temperature will rise to 55 degrees C or higher and stay at a high temperature (with mixing) for an extended period. If the mix of materials is right and the pile has good air flow the temperature will start to drop once the materials have been through the thermophilic or high temperature phase of the composting. These microbes still have a limit though, and if too hot will die. Therefore, the heap requires aeration (mixing) and/or some water addition to help control the heat. Once they have eaten everything, they slow down and the temperature decreases. Eventually the composting material is no longer warm enough and they leave. This process can take days to months.	

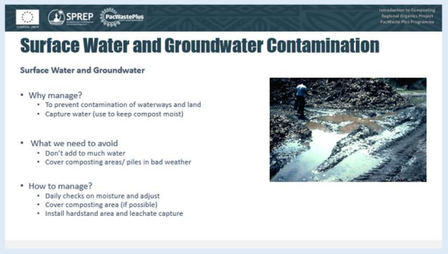
Agenda item	Detail & Speaker Notes	Relevant Slides
	3. Maturation Phase: Once the thermophilic microbes have left the microbes that like cool to warm temperatures return and continue the maturation and curing of the compost to its final stage. Once it is no longer heating up, it is finished.	
	Monitoring and reporting – hands on Use the Look, feel, smell technique, it only requires your eyes, nose and hands and provide you with good knowledge of your pile as you do it repeatedly. • Look: Looking at the pile structure and make up for any signs it does not look right; mixture of small and large materials, not too soggy or dry • Feel: Feeling the material make up for any signs it is not right; mixture is too wet or too dry will indicate an imbalance in air, water, food • Smell: Smell to notice a good or bad smell, a bad smell will indicate an imbalance in air, water, food Then using the knowledge you learn and resources available to troubleshoot and fix the issues.	 
	Checking Temperature Checking the temperature is important in composting process to ensure pathogens and weeds (seeds and cuttings) are pasteurised (“killed”) during the composting process – by the pile getting over 55°C and holds at this temperature for at least 3 days. The heat will kill the seeds and cuttings, Note: regular turning will ensure all of the compost pile gets fully pasteurised. Can check temperature with an analogue or digital probe, or simply insert a clean machete or shovel into the pile for 30 seconds. If it comes out warm (but not too hot to touch), the pile is about 55°C	
	Reporting / Documenting Composting Process • Creating a record of the monitoring enables a reference point for what successes and learnings are occurring over time. • A written/visual log is useful for others to also refer to and make necessary changes aligned to any you have. For reporting it is recommended that you record: • Volume in of materials • Date last turn • Date last Air, Water, Food check • What the look, smell, feel check showed about the batch • Any adjustments made e.g. watered.	

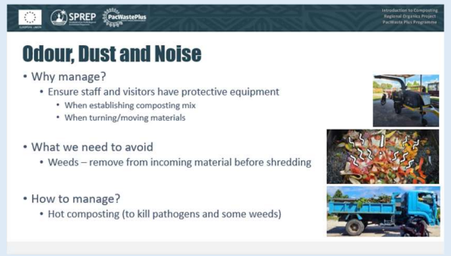
Agenda item	Detail & Speaker Notes	Relevant Slides
	• Volume out • Also consider any issues e.g. Noxious weeds, plastic, rocks present? Or perhaps vermin onsite. It is good practice to have a process for the reporting and get into the habit of using it, otherwise it is pointless.	
	Recording Data A Composting Data Collection and Monitoring Template is available on the PacWastePlus website Will support to record and monitor organics material diversion and materials throughput in compost operations and monitor composting processes – monitoring performance of different "recipes" (carbon/nitrogen balance) and recording temperature to understand pasteurisation. The template helps to track the temperature (and therefore pasteurisation) The template can also help to fulfil regional data collection requirements and be aligned with best-practise industry standards.	
	Activity: Setting up Compost Pile 1. Make your compost batch: • Layer of vegetation 1 – 2 yd2, 1 foot deep. • Layer of market waste 3 – 6 inches deep. • Repeat until all material is in the pile (1 - 1.5 yd high) • Mix • Add water to make the material 'damp' (like a damp sponge) 2. Use the Look, feel, smell technique: **Look:** Looking at the pile structure and make up for any signs it does not look right; mixture of small and large materials, not too soggy or dry **Feel:** Feeling the material make up for any signs it is not right; mixture is too wet or too dry will indicate an imbalance in air, water, food **Smell:** Smell to notice a good or bad smell, a bad smell will indicate an imbalance in air, water, food 3. For reporting it is recommended that you record: • Volume in of materials • Date last turn • Date last Air, Water, Food check • What the look, smell, feel check showed about the batch • Any adjustments made e.g. watered. • Volume out • Also consider any issues e.g. Noxious weeds, plastic, rocks present? Or perhaps vermin onsite.	

Agenda item	Detail & Speaker Notes	Relevant Slides
	Activity – Data Recording Record batch by completing the Data Monitoring Template as a group Reporting / Documenting Composting Process • Record input quantity and (carbon/nitrogen balance) • Equipment hours etc • track temperature Template available for download: https://pacwasteplus.org/resources/organics-composting_data-collection-monitoring/	
	Why monitor: There are signs and symptoms that indicate when the compost system is out of balance. Depending on the sign and symptom will be dependant on the problem & required solution. Sometimes it is not straight forward and will take some trial & error. The composter's attention is the best ingredient for making good compost. Diligent monitoring will help to correct small issues before they become big problems and help refine your practices over time. Creating a record of the monitoring enables a reference point for what successes and learnings are occurring over time. Since monitoring informs good management decisions, more regular monitoring is always beneficial. **What?** Once the composting process has started, you are looking to ensure the air, water, and food are correctly balanced to enable the microbes to thrive. Daily checks are most effective. Recording your monitoring – written logs.	
	Troubleshooting Troubleshooting can be simplified when remembering it is all about the air, water, food balance – it can be simple to understand the issue. Troubleshooting occurs with the daily checks Some troubleshooting will be more straight forward e.g. if it is dry, add moisture, if it is too wet turn the pile and add dry material. *Talk through the troubleshooting table and provide them the reference to the PacWaste Plus Composting Common Organic Materials in the Pacific and Timor-Leste: Handbook for Compost Operators*	

Agenda item	Detail & Speaker Notes	Relevant Slides
	Activity: **Group Discussion Compost Scenarios**	
Prior Preparation	**Troubleshooting Activity** QUESTION: Your compost pile has been left out and we are in the wet season, it's been a few weeks and you go and check it. It Looks like a soggy sludgy pile of plants and soil, it has flies around it. It Feels very damp, and moisture runs out, when squeezed. There is a foul Smell coming from it. What is wrong with this batch? a. Not enough moisture b. Too much food c. Too much moisture What action do we take to fix: a. Nothing it is fine b. Turn the pile and add additional dry items that are helpful for aeration **c.** Add more water Commentary: This batch has too much moisture (water running out) and likely too much nitrogen (foul smell) and lack of airflow (lacking a mix of small and larger items) so to address you want to , turn the pile and add additional dry items that are helpful for aeration. Adding dry high carbon materials would be most beneficial to balance the nitrogen and moisture.	
	Troubleshooting Activity QUESTION: Most of the materials arriving to site are dry, and we are in the middle of the dry season. The pile Looks dry and crusty. When you grab a handful it Feels crusty and crumbly. What is wrong with this batch? a. Too dry b. There is not enough moisture and variety in the materials for a good C:N balance. c. Too much moisture What action do we take to fix: a. Nothing it is fine b. As you turn the pile add water and additional items that are high nitorgen and helpful for water retention **c.** Add more water	

Agenda item	Detail & Speaker Notes	Relevant Slides
	Commentary: This batch is too dry, and lacking the materials that bring the C:N balance. To address it, you want to add water slowly, and over the whole pile until it looks damp, and turn in additional materials that are helpful for water retention and high nitrogen materials. Due to it being the dry season, evaporation will be a challenge so try to keep the batch as compact as possible and covered.	
	Troubleshooting Activity QUESTION: The pile has been composting, however lately it has started to slump and some of the material in it looks clumped together and there are undecomposed palm leaves and coconut shells throughout. What is wrong with this batch? d. Nothing it is fine. e. Too much moisture f. It has stopped composting, likely because of an imbalance of food, water and air What action do we take to fix: a. Nothing it is fine b. Turn the pile and add additional dry items that are helpful for aeration and structure. c. Add more water Commentary: It would appear that due to the slump and undecomposed palm leaves and coconut shells that the batch has slowed down or stopped composting, the clumps likely indicate it is also too wet. To address, the batch would benefit from a rebuild, as the C:N balance is likely out. Ensure the materials are shredded/chopped into inch size pieces, create a new mix with some dry nitrogen materials, and turn the pile frequently.	
Key time check		
Managing your facility	When managing your facility there are some key considerations to ensure your facility, people and compost is safe, healthy and effective. We will go through and discuss the key considerations, reasons why we manage them, what we are trying to avoid by managing them and how to manage.	
	Weather Why we manage: • For effective composting What to avoid: • Heavy rain - too much moisture in compost • Heat compost will dry out • Overheating of compost – fire, composting process stops	

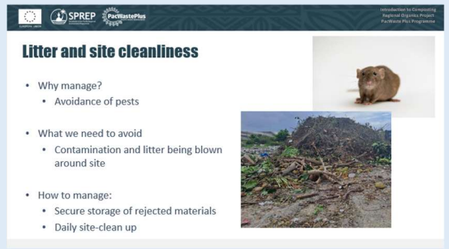
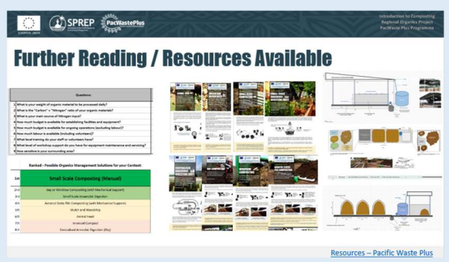
Agenda item	Detail & Speaker Notes	Relevant Slides
	How to Manage: • Cover composting areas/ piles • Capture rainwater for use • Daily checks for compost	
	Contamination – physical and chemical Why we manage: • Items that affect quality • Anything that will not compost or will compromise the nutrient rich organic make-up of the end material. • Health risks to workers What to avoid: • Foreign objects which could cause a health risk to handle: broken glass, needles, faeces, toxic chemicals • Large and oversized items • Pesticides • Plastics, metals, glass • Rocks & soil How to Manage: • Reject materials • Divert all foreign objects to landfill. • Use tools for handling where possible • Use gloves and face masks • Remove before shredding – create smaller pieces and more contamination in the compost or mulch. Stones, rocks – damage equipmentStockpile and allow to degrade before being able to cut up • Transfer to recycling or landfill	
	Surface water and groundwater Why manage? • To prevent contamination of waterways and land • Capture water (use to keep compost moist) • What we need to avoid • Don’t add to much water • Cover composting areas/ piles in bad weather How to manage? • Daily checks on moisture and adjust • Cover composting area (if possible) • Install hardstand area and leachate capture	

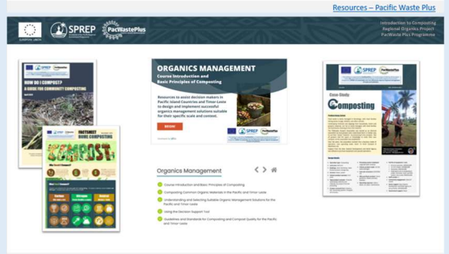
Agenda item	Detail & Speaker Notes	Relevant Slides
	Pathogens & weeds Why manage: • Noxious weeds • Harmful pathogens to humans What to avoid: • Weeds • Other contamination of materials e.g. dead animals How to manage: • Public education to avoid coming to site. • Remove noxious weeds from incoming material before shredding • Hot composting (to kill pathogens and some weeds) • Ensure staff and visitors have protective equipment (masks, gloves) • When establishing composting mix • When turning/moving materials **Further Considerations** NOXIOUS WEEDS Noxious weeds should be received at a compost facility only if the facility can certify they will be processed with temperatures over 55°C for at least 3 days. Noxious weeds are not suitable for composting if the required heat cannot be sustained for the required timeframe. It is recommended to ensure the weeds are not covered in weed killer such as paraquat. Before accepting weeds at your facility, confirm with the owner that the material is not covered in this spray. High temperatures in a composting process will kill pathogens and weeds. Most compostable materials, except for paper / cardboard, potentially contain weed seeds / viable plant parts, or human, animal, or plant pathogens. Human pathogens put public and worker health and safety at risk, while plant pathogens and weeds can cause damage to the environment. Pathogen and weed elimination must be a prime objective of every composting operation. Operators are recommended to closely monitor their composting process (temperature as specified in Table 4) and keep good records to demonstrate that good care was taken to ensure that finished compost has been pasteurised for a minimum number of days (Table 5) and therefore are free of weeds and show negligible pathogen counts. Most pathogens and weed propagules are more susceptible to high temperatures than the microorganisms that are active during the thermophilic stage of composting. The effect of heat is dependent on the length of exposure and moisture content of the surrounding compost as well as on the hardiness of the pathogen or weed seeds. Table 4 outlines the time / temperature / turning requirements for pasteurisation during composting.	
	Odour, Dust and Noise Why manage: • Community impacts from foul odour, dust spreading and loud, unpleasant noise. What to avoid: • Continuous odour sources (decaying feedstock, stockpiling materials too long) • Not well managed process producing offensive and prevalent volatile organic compounds • Odorous leachate, if it is allowed to stagnate. How to manage: • Avoid stockpiling material • Use correct recipe and manage compost process well	

Agenda item	Detail & Speaker Notes	Relevant Slides
	• Don't allow leachate to stagnate **Further commentary:** Odour is one of the most common causes of community impacts relating to composting operations. Odour can be generated from various sources at the facility, including: ***Continuous odour sources:*** • Raw organics – delivered feedstocks can be odorous if they have begun to decay • Product – when stockpiled, the products can become odorous if it is not well managed • Process – breakdown of organic material generates volatile organic compounds. If the recipe and the process is well managed the volatile organic compounds are less offensive and less prevalent. • Leachate - leachate storage can become odorous if it is allowed to stagnate. ***Turning, machinery, screening material – intermittent sources*** Noise – machinery – ability to concentrate, safety of operating around equipment, machinery, shredders etc. Noise nuisance from composting operations may arise from the use of both mobile and fixed machinery within the facility and from movements of transport vehicles servicing the facility. RECOMMENDED DESIGN AND OPERATIONAL MEASURES Compost facilities may use the following measures to reduce noise levels: • select and maintain appropriate equipment for the facility • fit and maintain appropriate mufflers on mobile equipment • enclose noisy equipment inside a facility, or construct a barrier or noise attenuation screen between sensitive areas • develop and implement noise control strategies in the environmental management plan, including limiting the hours that a facility is operating (i.e., avoiding certain operations before 7 am and after 6 pm on weekdays, before 7 am and after 1 pm on Saturdays and throughout Sundays and public holidays).	

	Fire
	Why manage:
	• Safety of staff and environment
	• High risk of self-combustion in windrows and compost piles
	
	What to avoid:
	• Overheating in compost piles
	  • Too large (heat can't escape)
	  • Too dry
	• Sparks ignition
	  • Lightening, equipment
	
	How to manage:
	• Contingency plan – what to do if a fire starts onsite? (workers safety paramount, if small and can address do, if growing fast call fire service immediately. To address, use water, remove fuel (spread or smother pile) extinguish.
	• Water onsite
	• Good composting practice
		

Agenda item	Detail & Speaker Notes	Relevant Slides
	Machinery Why manage: • Safety of staff and volunteers • Longevity of equipment and facilities What to avoid: • Stay clear of heavy moving vehicles How to manage: • Good communication • Regular maintenance **Further Commentary:** Organics processing machinery may be fixed or mobile, both present different health and safety risks. Fixed plant and equipment present potential safety risks to during operation and maintenance activities. Risks include but are not limited to: trapped limbs; clothes being snagged; and material being forcibly ejected. Risks can be minimised through appropriate design, including guarding and shielding equipment, good maintenance and safe operating procedures. Mobile plant and equipment are heavy, and drivers often have limited visibility. The working environment of this equipment can be slippery and confined, which requires careful manoeuvring. Operation of mobile equipment presents a risk to any personnel and pedestrians in the area. The segregation of vehicles and pedestrians in working areas are to be carefully considered. Methods for managing this risk could include site layout, traffic control measures, and barriers and guarding. Vehicles are recommended to be fitted with warning lights and reversing alarms. Shredding: • Remove all rocks & other contamination from material before shredding • Isolate (turn off) machine to clear any blockages • Avoid putting hands/face near moving parts • Clearly communicate with other workers when shredder is in use **Heavy machinery** • Stay clear of heavy vehicles when moving and operating • Make eye-contact with driver if near/assisting • Communicate vehicle's intentions onsite	

Agenda item	Detail & Speaker Notes	Relevant Slides
	General access and security Why manage: • Public safety • Security of equipment and facilities What to avoid: • General public access site and being exposed to safety risk How to manage: • Secure all gates at the end of each day • Clear signage for accessible areas • Secure all gates at the end of each day • Clear signage for accessible areas	
	Litter and Site Cleanliness Why manage: • Avoidance of pests What to avoid: • Contamination and litter being blown around site How to manage: • Secure storage of rejected materials • Daily site-clean up **Further commentary:** Litter, from contamination of feedstock, vehicles entering or leaving the facility, or from other sources, can be wind-blown into the surrounding areas and can impact on the local amenity. Windblown litter is recommended to be managed by: • Ensuring any rejected material or residual waste (plastic wraps, tape, packets etc) is collected and stored appropriately in bins (with lids when outside) and removed and recycled / disposed of appropriately • Installing fences and moveable litter screens around the site perimeter, ensuring these are relocated to account for prevailing wind direction. • Undertaking daily site clean-up to collect any waste items from around the facility which may become a windblown litter component. All litter is recommended to be cleaned up immediately.	
Further Reading	Further resources to refer to can be found on SPREP website – refer to link to provide further resources. These documents: • Combined data from 13 waste audits in the Pacific found that approximately 40% of waste disposal to our landfills and dumps is organics. • To provide participating nations the support to needed to design and implement their own effective organics management solutions, appropriate for their own context and communities • Have come out of The Organics regional project which have developed: • A “Minimum Standard” technical framework for countries to have as a resource when designing and operating their own organics processing facility	

Agenda item	Detail & Speaker Notes	Relevant Slides
	• A “decision guidance resource/tool” – to guide informed decision making around processing system design/technologies, size and equipment requirements, operational processes, etc to suit any context and scale • Resources to communicate with and empower communities to convert their organic “waste” to a valuable “resource” using appropriate solutions available (i.e., backyard, on-farm, community-level, or national-level organics processing).	 
Recap		
	Activity: Actively monitoring composting material (at end of session or ideally after 24 hrs) Use the Look, feel, smell technique, • Look: Looking at the pile structure and make up for any signs it does not look right; mixture of small and large materials, not too soggy or dry • Feel: Feeling the material make up for any signs it is not right; mixture is too wet or too dry will indicate an imbalance in air, water, food • Smell: Smell to notice a good or bad smell, a bad smell will indicate an imbalance in air, water, food Discuss ***Air Water Food check*** to assess performance: **Air** 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. If there is a foul odour and/or the compost material is clumped together, turn the pile and add additional items that are “Helpful for aeration” (from Section 3) **Water** 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).	

Agenda item	Detail & Speaker Notes	Relevant Slides
	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” **Food / Nitrogen** If too much nitrogen 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 be detected through monitoring temperature, too much nitrogen will have a high temperature. 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” **Food /Carbon** If too much carbon, the compost in the pile will 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. 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” (from Section 3) Test temperature – measuring using a shovel or machete Cool | Hot to touch = 100 - 110 F | Too hot to touch = > 120 F **Examples of issues** Very wet material that is slimy/smelly (e.g. a pile of wet market waste, covered with plastic) Very dry vegetation (cool) e.g. loose pile of dry vegetation	

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