This initiative is supported by **PacWastePlus**-a 72 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.**

ORGANICS FACTSHEET

BAY COMPOSTING

Controlled aerobic decomposition of organic materials in covered bays, turned with machinery

December 2022

Organic materials make up almost half of waste disposed to landfills and dumps in the Pacific. In landfills, intermingled with other waste, organic materials decompose "anaerobically", without oxygen, resulting in production of greenhouse gases and leachate entering surrounding waterways.

By diverting this material away from landfill and into a compost process, many benefits can be achieved:

Reduction of a significant volume of **waste** to **landfills**, almost doubling their life

Reduction in **greenhouse gas emissions** and **leachate**

Production of compost which can **enrich** soil quality and **improve** crop yield, **increase** soil water retention, and **enhance** food security and climate **resilience** for local communities

Composting mimics nature's method of decomposition, allowing organic material to break down "aerobically", with oxygen. A review of successful compost facilities in the Pacific and other Small Island Developing States, and considering climate and economic context of the Pacific, identified the following three methods of composting as appropriate for consideration in the Pacific for managing the typical "medium scale" throughput:

Covered Bays – this factsheet
Organic material is composted in covered bays

Windrow Composting – Factsheet #7
Organic material is composted in long windrows

Aerated Static Pile Composting – Factsheet #8
Organic materials is composted in large piles aerated through perforated pipes

This factsheet is intended for decision-makers and entrepreneurs in the Pacific who seek to process approximately **1 tonne or 20 wheelbarrows/day** of organic material (*a common quantity in the Pacific*) at commercial, municipal, or on-farm facilities.

This publication is for considering the management of organics through the establishment of a **bay composting facility** and provides information on recommended conditions, design features, equipment, and an overview of typical operations.



A bay composting facility is an organics management solution most suited to a situation where:

- Medium quantities of organic material (*more than 1 tonne or 20 wheelbarrows/day*) are available and is currently being disposed, burnt, or otherwise discarded
- Approximately 200m^2 area of space is available (*for processing 1 tonne or 20 wheelbarrows/day of input material*)
- There is donor aid or investment capital available of approximately USD$100,000 to invest into facility construction, including:
  - Construction of compost facility, examples in attached **design drawings**
  - Machinery such as a chipper/shredder* and mechanical equipment to turn material (*i.e., a bobcat, frontend loader, or telehandler (highly recommended)*)
- Staff and resources are available for operating facility and maintaining machinery
- Water supply is available, preferably collected rainwater
- Finished compost can be stored under cover (*preferred*) and a use or buyers for compost has been identified

Note:

- if mechanical turner is available, 4 staff are recommended to operate a facility processing 1 tonne or 20 wheelbarrows/day.
- If no and mechanical equipment is available and manual turning of material is required, approximately 20 staff may be required to operate the facility.

*** The high fiberous vegetation in the Pacific requires careful selection of the type of mulch/chipper equipment to purchase. Research suggests that "drum style" chippers are better for processing this vegetation compared to disc/flywheel style chippers. Before selecting equipment, it is recommended to read operating manuals carefully and speak to suppliers and experts. If the manual only refers to wood as a suitable input or the manufacturer cannot supply evidence of the equipment managing high fiberous vegetation, further research may be required.**

Bay Composting System Overview

Organic Material Inputs

- Vegetation and garden organics, hedge clippings, branches and small untreated wood materials, including noxious weeds
- Food organics
- Paper and cardboard
- Manure from herbivore animals (*pigs, chickens, cows*)

Collection and Processing

- Households and businesses separate organics for collection or delivery to compost facility
- Larger items are shredded
- Organic materials is added to the first bin, either pre mixed or in layers of nitrogen (*food, fresh garden organics, manure*) and carbon (*old garden organics, shredded paper/cardboard*)
- Each month materials are turned - i.e., into the next bin
- Water is added as needed
- Composting process takes ~10 weeks

Product Outputs

- Pasteurised and composted soil conditioners and mulches
- Potting mix

Typical Buyers / Users

- Households, government or private sector landscaping companies, local growers

Process Overview

Suitable Organic Material Inputs	**Food organics** • Vegetation and garden organics, lawn clippings and hedge clippings, branches and untreated wood materials, noxious weeds • Paper and cardboard (*torn or shredded)* • Manure from herbivore animals (*pigs, chickens, cows*) • Biosolids / sewerage sludge* * **Note**: Biosolids can be composted in a bay composting facility with appropriate controls to manage pathogens (see the **Composting Standards**), but finished compost is not recommend to be used for growing food (in gardens or crop fields). A separate organic facility may need to be established to process this material.
Unsuitable Organic Material Inputs	• Treated timber and other building materials • Plastics and other household waste • Manure from carnivore animals (*dogs, cats*)
Product Output	• Compost, for supply to households, government or private sector landscaping companies, local growers • Fine compost can be sold as soil and potting mix
Speed	• ~10 weeks
Difficulty	• Difficult; specialist training required for equipment operation and maintenance, composting and compost
Typical Collection Sites	• Household, growers' markets, businesses, schools, community facilities
Processing throughput	• Suitable scale is limited by available staff and equipment but >500 kg/day recommended to justify capital investment • Preferred scale kg/day is 10,000 kg/day or 200 wheelbarrow
Space requirement for processing 1 tonne / day	• Guidance on facility size: – 1 tonne/day – 200 m^2 (*about 1 singles tennis court*) – 5 tonne/day – 500 m^2 about (*1 basketball court)* – 20 tonne/day – 1,500 m^2 (*about 1 50m pool)* • The facility footprint depends on the size and type of machinery used – i.e., bobcats may only be able to fill bays to 2m, whereas larger loaders and telehandlers may fill to 5m, increasing processing efficiencies. • Space is also required for: – Raw material blending, storage, and processing (*shredding*) – Storage and refining of finished compost – Traffic access and vehicle parking
Capital Cost $US	• US$>100,000 * *for purchase and construction of recommended equipment and facilities (discussed on the*
Typical operating costs US$/tonne	• US$50-100/tonne (*at preferred scale*)

Key Equipment / Requirements	Recommended Elements	Description
	Covered Bays	• A sufficient number of concrete bays to process expected throughput (*as detailed above*) • Each bay recommended to be approximately 3x3m and 2-5m high, depending on reach of equipment • Bays recommended to have concrete, asphalt, or other low permeability hardstand floor • Bays recommended to have a roof (*preferred*)
	Other facilities	• Space for storage, shredding, blending, and watering of raw materials • Capacity to add water to composting material, e.g., sprinklers, hose, or bucket • Space for covered maturation and storage of finished compost • Space for screening and packaging of finished compost (*if needed*) • Undercover storage for machinery, fuel and oil, and other equipment
	Equipment (recommended)	• Shredder/chipper • Bucket loader, such as a small front-end loader, a bobcat, a telehandler, or tractor to turn piles • Temperature probe • Water supply, hose with flow regulator, sprinkler/irrigator, shovels
	Equipment (optional)	• Screen • Carbon dioxide probe • Facility for bagging finished compost
	Signage	• Effective signage at compost facility to illustrate the process and requirements
	Education materials	• Education materials (flyers, posters) to educate households, businesses, and community facilities etc on how to separate organics correctly, and how to purchase and use locally produced compost
	Staff	• Staff required for collection and transport of organic items, operation of equipment, undertaking composting process
	Procedures and training	• Standard Operating Procedure for staff to comply with • Training required for operating equipment, collecting material, operating compost facility, delivering awareness messages

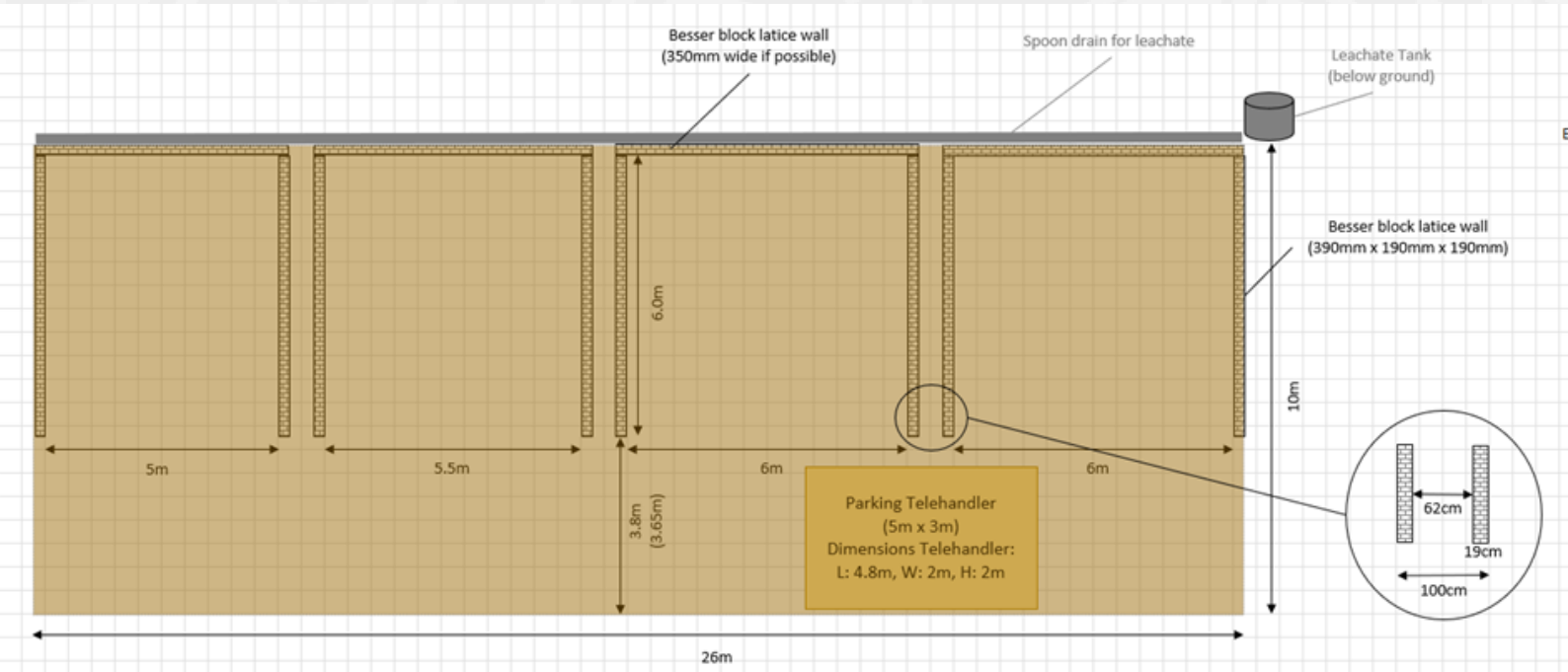
SWOT Analysis – Bay Composting

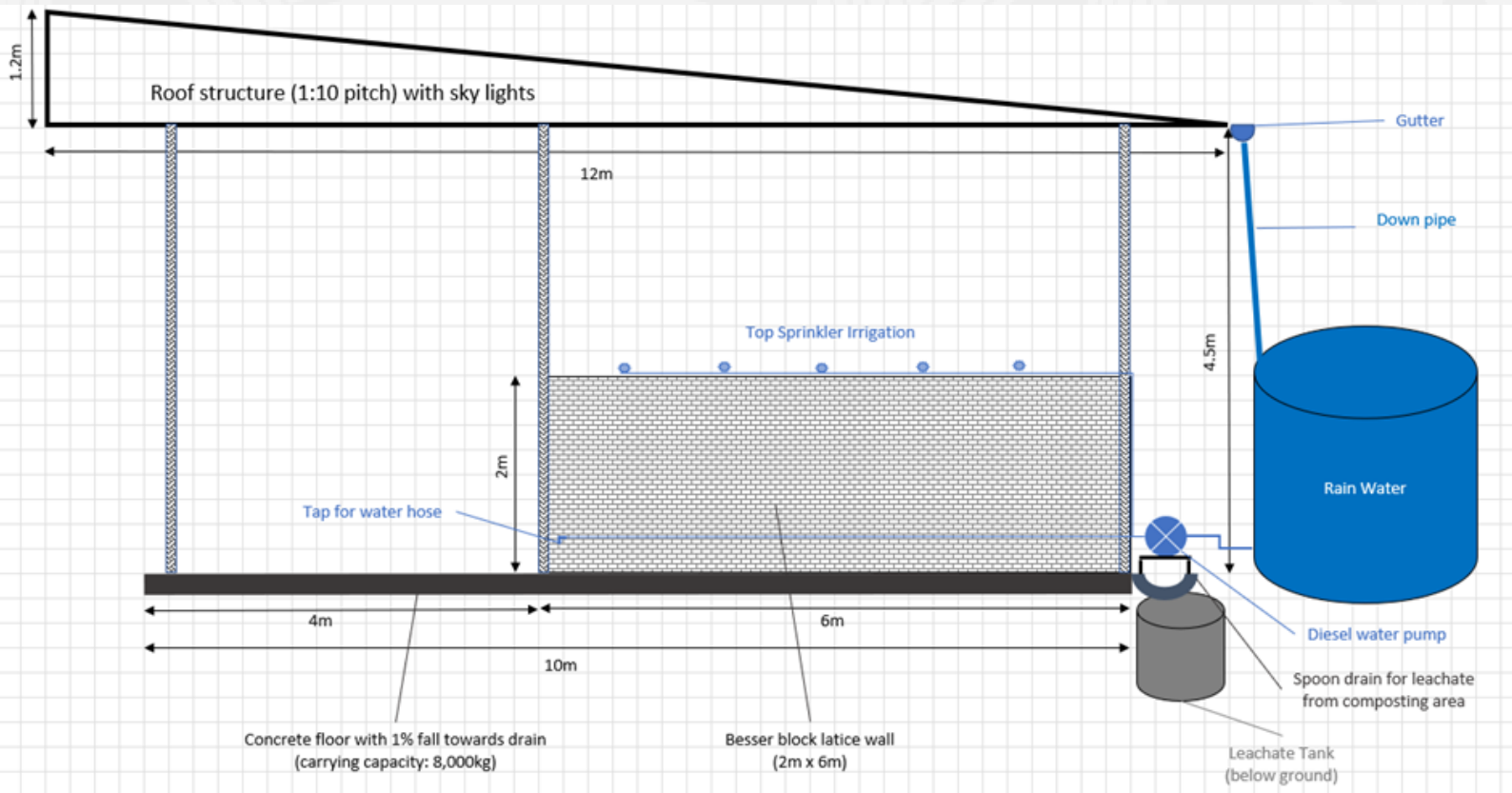
Strengths	Weaknesses
• Already a familiar practice in the Pacific • Well understood, proven technology, with extensive training materials available • Relatively low cost (*per tonne*) and high capacity form of commercial scale composting • Effectively manages risks of pathogens and plant propagules • Biosolids can be composted in a bay composting facility with controls to ensure pathogens are managed (**note**: *finished compost is not recommend to be used for growing food (in gardens or crop fields). A separate organic facility may need to be established to process this material*).	• Shredder/chipper, and mechanical turning equipment are expensive to purchase and maintain
Opportunities	**Threats**
• Increases food security and climate resilience for local communities • Scalable and easy to replicate where there are sufficient organics materials (such as on-farm at a grower co-op / association) and capital investment is available • Could be constructed on capped landfill sites to share hardstand and drainage infrastructure	• There may be cultural barriers to community purchasing compost • Requires behaviour change from community to separate organic materials for collection • Labour, transport, and operating costs mean composting facility is non-viable for amount of material available • Processing costs not covered by product sales and no gate fee available • Pollution of surface and groundwater due to poor design and operation • Odour complaints due to poor process design and operation • Equipment provided is not used, or is put to other uses

Indicative Facility Drawing

Editable Facility Design Drawings are provided to assist with the initial design and layout of a Bay Compost Facility, illustrating possible site layout and recommended infrastructure for a facility processing approximately 1 tonne / day of organic material. Tailer these drawings to match the expected throughput and specific site conditions (*driveway, slope, etc*).

Once tailored, these drawings may be provided to an architect or public works team to complete detailed design and costing of a proposed facility.





Operations Overview

Receive and Inspect

- Check incoming vehicles
- Reject loads with contaminants (*general waste, weeds, chemicals*) – send to landfill
- Received clean loads
- Tip in sorting area, remove remaining contaminants

Size Reduce

- Shred (*or cut with a machete*) materials >100mm

Mix Inputs and Fill Bays

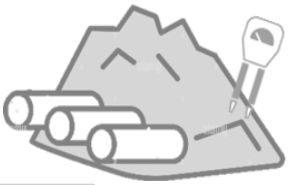
- Bay size: 3x3m, H ~2-5m

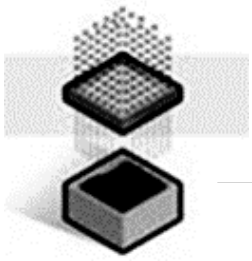
Composting - 42-56 days

Maturation - 21-28 days

Inspect and Monitor

- Monitor temperature and moisture throughout composting , keep records
- Monitor temperature and moisture, keep records



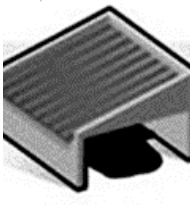


Screen

- To meet customer specification

Product Storage

- Undercover if possible



Product Release

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 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 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 kitchen scraps (food); garden cuttings, grass and branches; and paper. Combined data from 13 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. Fiji, FSM, RMI, and the Solomon Islands have chosen organics as a priority or secondary priority of their PacWastePlus country project. The Organics regional project will review 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
- on-line training package to guide the application of "decision guidance resource/tool"
- 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).

Learn more about our regional organics management programme by visiting

https://pacwasteplus.org/regional-project/organics-management/

For more information please contact:

The PacWastePlus team on pwp@sprep.org

Or visit - www.pacwasteplus.org

(post project please email-sprep@sprep.org)

Disclaimer

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