



SPREP
Secretariat of the Pacific Regional
Environment Programme



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

SMALL-SCALE ANAEROBIC DIGESTION (WET)

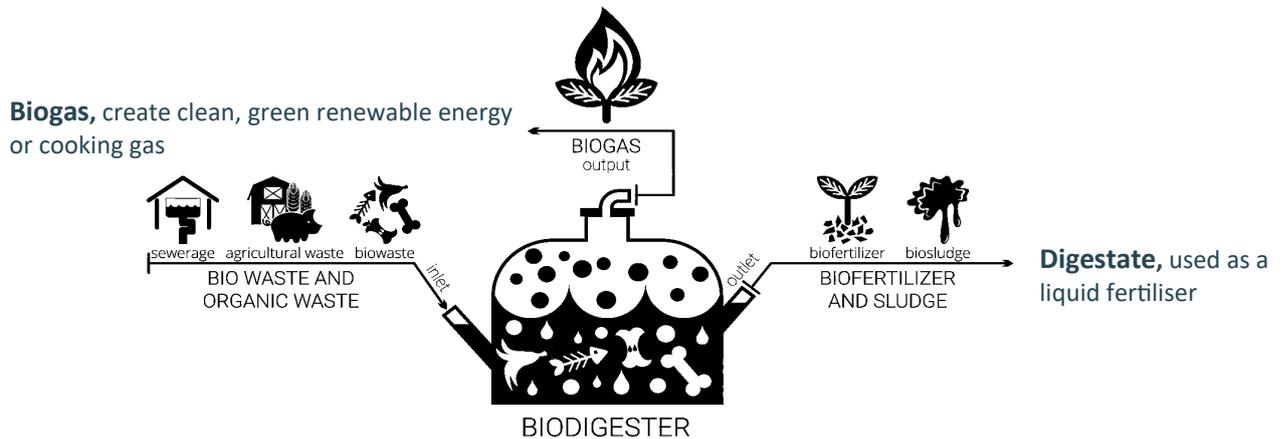


Controlled decomposition of organic materials without oxygen in a large, sealed bag or drum that produces biogas and liquid fertiliser

December 2022



As worldwide energy prices increase and globally we seek to move away from fossil fuel use, finding alternative renewable energy supplies are becoming increasingly important. Small-scale anaerobic digesters may provide an effective opportunity – converting locally produced organic materials such as food organics, animal manure, and, if desired, biosolids (*sewage sludge*) into two usable resources:



Small-scale anaerobic digestion may be suitable for digesting (*breaking down*) small quantities of organic materials (*less than 1 tonne or 20 wheelbarrows/day*) in a pre-fabricated digester with a $<10 \text{ m}^3$ total capacity and processing it into biogas and digestate. Small-scale anaerobic digestion may be appropriate in community facilities, local growers' markets, or at small businesses.

Small-scale anaerobic digestion can be supplied prefabricated or in kits with basic assembly required. Organic material is loaded and unloaded by hand. Biogas is stored in a bag or drum, filtered, and then piped to a burner for cooking or heating of water.

This factsheet is for households, communities, or small businesses considering the management of organics through the establishment of a **small-scale anaerobic digestion system**.

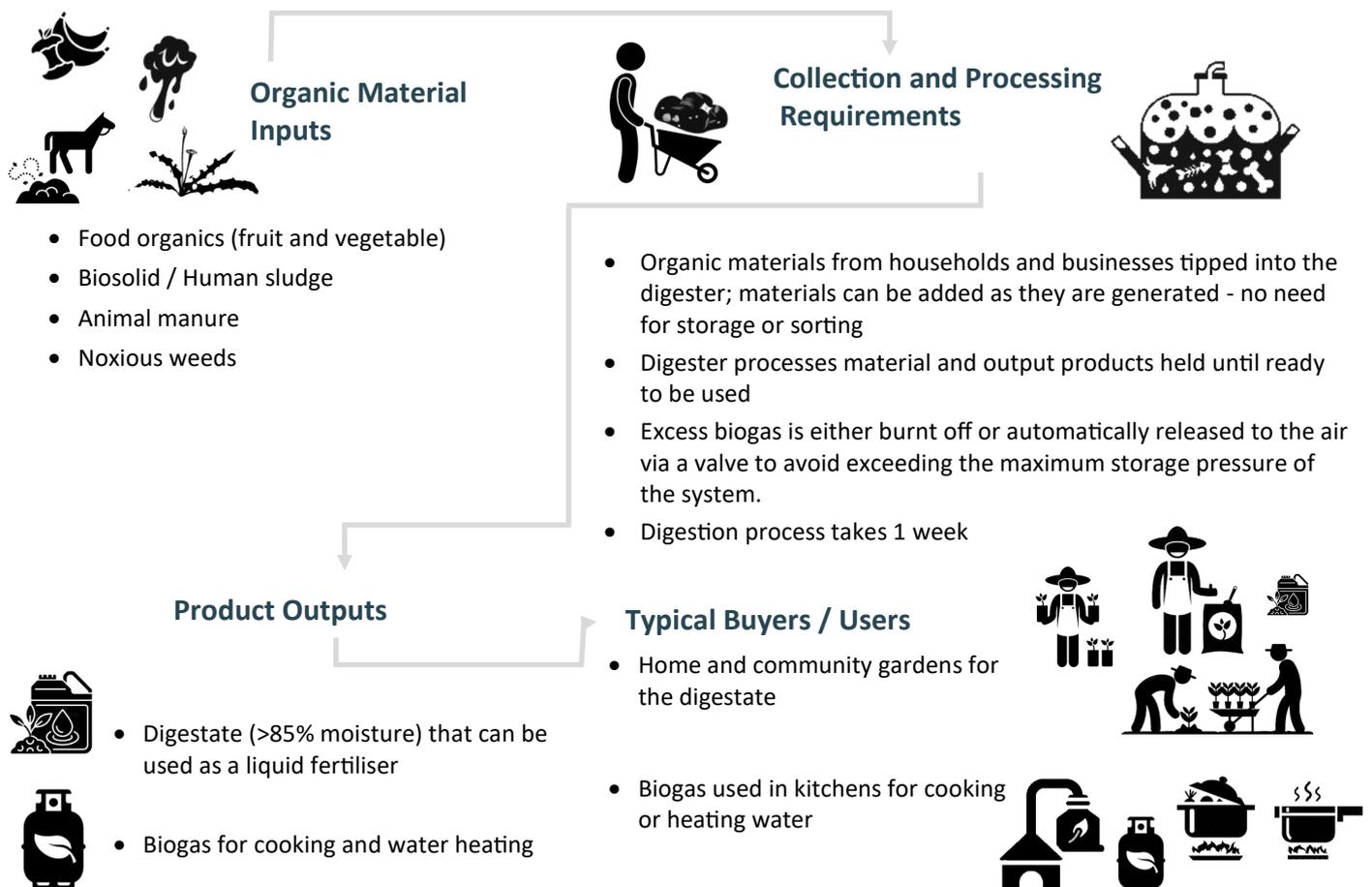
This publication provides information on recommended conditions, design features, equipment, and an overview of typical operations. This information is provided to enable an informed decision on whether this solution is appropriate.



A small-scale anaerobic digestion system is an organics management solution most suited to a situation where:

- Small quantities of organic material (*less than 1 tonne or 20 wheelbarrows/day*) are available and is currently being disposed, burnt, or otherwise discarded
- ‘Soft’ organic materials such as food and manure make up a large portion of waste being disposed
- There is donor aid or investment capital available of approximately USD\$1,000-10,000 to invest into a small-scale anaerobic digester
- A consistent use for the biogas in cooking or heating water is identified near where the equipment will be located
- A consistent use for the organic liquid fertiliser in gardens is identified near where the equipment will be located
- People are available and willing to perform the tasks required for the operation of the digester (*specified below*)
- People involved in generating the organic materials are available to operate the equipment
- 10-15m² area of space is available for establishment and operation of the digester, preferably under cover
- Water supply is available, preferably collected rainwater
- Several houses or businesses can cooperate to bring their organic materials to one place

Decentralised Small-Scale Composting System Overview



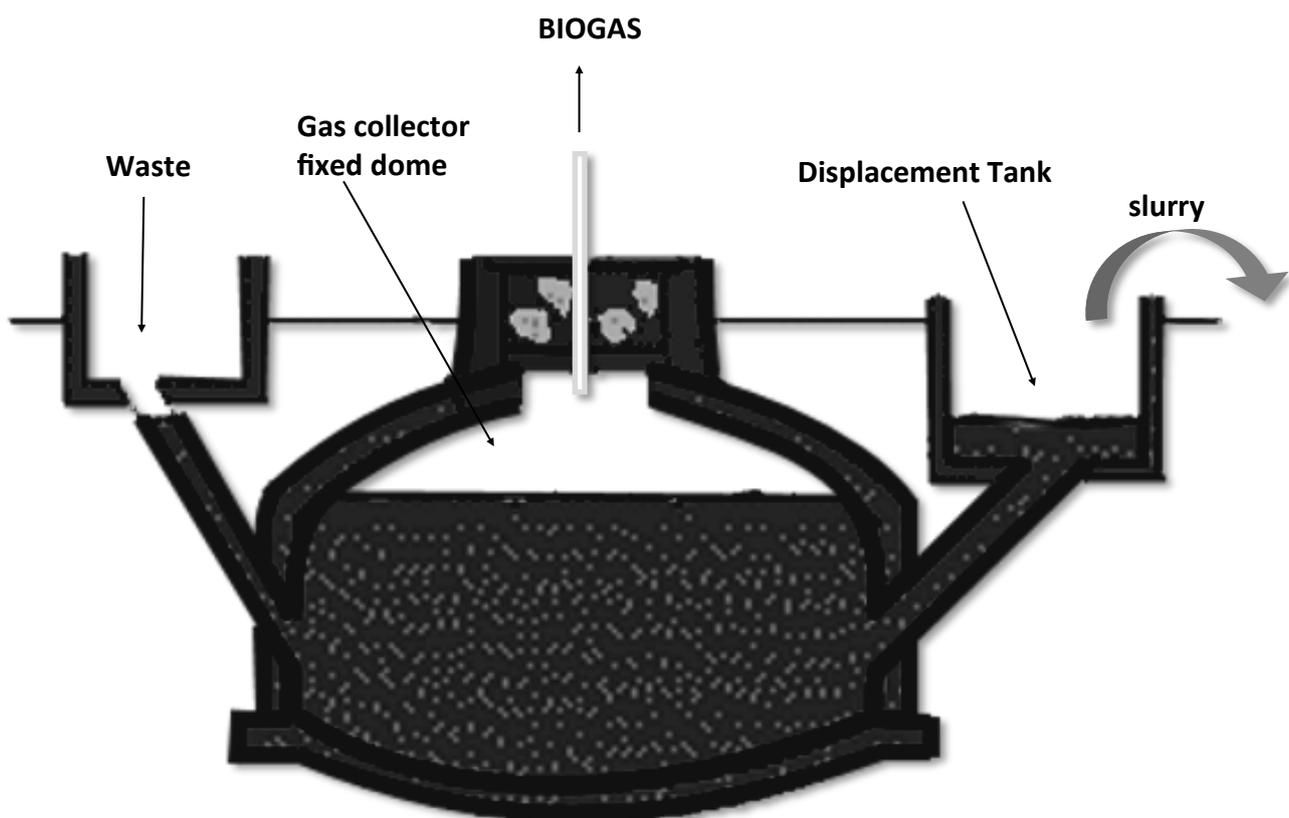
Process Overview

Suitable Organic Material Inputs	<ul style="list-style-type: none"> • Food organics (<i>fruit and vegetable</i>) • Biosolid / Human sludge • Animal manure • Noxious weeds or plants with disease 												
Unsuitable Organic Material	<ul style="list-style-type: none"> • Fibrous or woody garden organics • Plastics and other household waste 												
Product Output	<ul style="list-style-type: none"> • Home and community gardens for the digestate • Kitchens for biogas and heat 												
Speed	<ul style="list-style-type: none"> • 1 month 												
Difficulty	<ul style="list-style-type: none"> • Easy, no specialist training required but understanding of small-scale anaerobic digesting processing beneficial 												
Typical Collection Sites	<ul style="list-style-type: none"> • Household, growers' markets, schools, community facilities, small businesses 												
Processing throughput	<ul style="list-style-type: none"> • Limited by size of pre-fabricated system so usually <50kg / day • Preferred scale = 20kg / day 												
Space requirement for processing for processing preferred scale	<ul style="list-style-type: none"> • At least 5m² is preferred to allow easy access to the digesters to add waste and collect the liquid fertiliser. • The facility's footprint is determined by the expected volume of organic material to be processed and the digestion equipment selected. • No area is required for storing input organic materials or output products (<i>biogas and liquid fertiliser</i>). Materials are added as they are generated and held in the digester until ready to be used. The biogas builds up in the system until the user needs it. Excess biogas is either burnt off or automatically released to the air via a valve to avoid exceeding the maximum storage pressure of the system. 												
Capital Cost \$US	<ul style="list-style-type: none"> • US\$1,000 - 10,000 * <i>for purchase of recommended equipment and facilities (discussed on the following page); excluding site purchase</i> 												
Typical operating costs US\$/tonne	<ul style="list-style-type: none"> • US\$<100 (with voluntary labour) 												
Key Equipment / Requirements	Recommended Elements												
Key Equipment / Requirements	<table border="1"> <tr> <td>Digester</td> <td> <ul style="list-style-type: none"> • Small anaerobic digestion equipment package (<i>commercially available, pre-fabricated digestors with associated instructions and training</i>) • Select a digester that has proven to be effective and durable in other Pacific Islands or Small Island Developing States. Estimate the available organic materials to be processed and discuss with suppliers on the size of digester required. • Water supply and hose with flow regulator to add water to the system as required • Install gas connection hose from the digester to a gas burner designed for cooking or heating of water </td> </tr> <tr> <td>Optional</td> <td> <ul style="list-style-type: none"> • Watering can • Small buckets to collect organics • Macerator to mechanically soften and break up organic materials before loading </td> </tr> <tr> <td>Signage</td> <td> <ul style="list-style-type: none"> • Effective signage at digester to illustrate the process and requirements </td> </tr> <tr> <td>Education materials</td> <td> <ul style="list-style-type: none"> • Education materials (<i>flyers, posters</i>) to educate households and businesses using the digester on how to separate organics correctly, and how to use the biogas and digestate (<i>if available</i>) </td> </tr> <tr> <td>Staff</td> <td> <ul style="list-style-type: none"> • Volunteers to receive materials and operate digester </td> </tr> <tr> <td>Procedures and training</td> <td> <ul style="list-style-type: none"> • Standard Operating Procedure for volunteers to understand process </td> </tr> </table>	Digester	<ul style="list-style-type: none"> • Small anaerobic digestion equipment package (<i>commercially available, pre-fabricated digestors with associated instructions and training</i>) • Select a digester that has proven to be effective and durable in other Pacific Islands or Small Island Developing States. Estimate the available organic materials to be processed and discuss with suppliers on the size of digester required. • Water supply and hose with flow regulator to add water to the system as required • Install gas connection hose from the digester to a gas burner designed for cooking or heating of water 	Optional	<ul style="list-style-type: none"> • Watering can • Small buckets to collect organics • Macerator to mechanically soften and break up organic materials before loading 	Signage	<ul style="list-style-type: none"> • Effective signage at digester to illustrate the process and requirements 	Education materials	<ul style="list-style-type: none"> • Education materials (<i>flyers, posters</i>) to educate households and businesses using the digester on how to separate organics correctly, and how to use the biogas and digestate (<i>if available</i>) 	Staff	<ul style="list-style-type: none"> • Volunteers to receive materials and operate digester 	Procedures and training	<ul style="list-style-type: none"> • Standard Operating Procedure for volunteers to understand process
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SWOT Analysis – Small-Scale Anaerobic Digestion

Strengths	Weaknesses
<ul style="list-style-type: none"> • Community-led initiative • Relatively low capital and operational costs • Low requirements for space and formal training • Produces biogas suitable for cooking and water heating, could replace some diesel use on islands • Produces an organic liquid fertiliser with relatively high levels of available nutrients (<i>compared to compost</i>) • Users can see a direct link between separation, processing, and use of product, resulting in minimal contamination • No transport costs • Use of voluntary labour • Education and outreach may have an ongoing impact • Effective way of managing biosolids (<i>sewage sludge</i>) • Pre-fabricated systems are very easy to set up and operate 	<ul style="list-style-type: none"> • Many people may need to be educated but only some will volunteer their labour • Ongoing education and outreach may be needed • Landfill diversion outcomes usually limited and hard to measure • Not suitable for fibrous and woody vegetation wastes • Best for food organics and manure, of which very little is currently landfilled in the Pacific • Relies on imported equipment from limited range of suppliers
Opportunities	Threats
<ul style="list-style-type: none"> • Pre-fabricated units may be appropriate in areas where there is high concentrations of food organics (<i>e.g., commercial kitchen at a resort</i>) or in places where space is limited • Demonstrated value for outputs will encourage ongoing adoption 	<ul style="list-style-type: none"> • There may be cultural barriers for use of a biogas and digestate • Poor operation results in high GHG emissions (<i>methane</i>) • Voluntary effort can reduce over time without continued education and support • Digester is not used correctly

Indicative Facility Drawing



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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