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Case-Study:

Composting

Problem Being Solved

Food waste is easily managed in Rarotonga, with most families having access to pigs, chickens, and other animals.

Landscaping materials and clippings from households, hotels and growers, however, are not as easily managed, with most families and businesses choosing to burn this material.

The *Titikaveka Growers Association* was started as an informal association by local growers who understood there is a better way to use their "waste" material – by processing it into compost. Not all growers had the space or knowledge to make their own compost, so the association was established.

Over the years, the association evolved into a business mode of operation, now operating under *Down To Earth Compost N Machinery Ltd*.

Support from the New Zealand Development and Relief Agency was utilised to purchase equipment and upscale operations.

Titikaveka Growers Association
Down To Earth Compost
Mr Teava Iro – Managing Director

Design Details

- **Operation type:** Composting
- **Land area:** Half acre
- **Buildings:** 3x5m Workshop, 4x6m finished product storage bay
- **Services:** Water, power
- **Volume product received:** 15 t/ week
- **Type product received:** Primarily landscaping materials and clippings, by-product from fish processing
- **Product received from:** Hoteliers, fish processing, growers. Dropped off at facility.
- **Processing system employed:** Large pile open windrow
- **Volume product made:** 10 m3/ week (average)
- **Cost sale of product:** NZD$200/ m3
- **Who purchases product:** Home gardeners, flower orchards, hoteliers
- **Operating expenses:** Labour, diesel, oil, water, maintenance
- **Full list of equipment / cost:**
  - 8 tonne excavator, NZD$43,000
  - 12 inch chipper, NZD$60,000
  - Generator, NZD$43,000
  - Small plant such as temperature probe, chainsaws, tools, sprinkler system, slurry tank, NZD$10,000
- **Staff number:** 3
- **Community engagement:** Word of mouth
- **Donor support:** New Zealand Development and Relief Agency to set up facility, NZD$400,000
- **Government support:** None



Processing Method and Equipment:

The facility receives approximately 15 tonnes of organic material per week, mainly comprising of vegetation materials hotel / resort gardens and by-product from the fish processing facility.

Other items received include by-product from noni agriculture and processing, coconut fronds, whole cardboard boxes, weeds, and pig manure.

Items are dropped off free of charge. Some of the bigger logs and whole coconut are removed by operators, but generally material is placed in the piles 'as is' and are not chipped or shredded. The composition of materials and humid climate in the Cook Island allow for the bacteria and micro-organisms to break them down.

Compost is processed using a large pile open windrow, using a general ratio of 80% carbon (dried vegetation, cardboard) |20% nitrogen (fresh vegetation, fish bi-product).

To manage odour, fish is added at no more than 20% ratio placed carefully inside the heap, and ensuring the pile is kept aerated (through regular turning and keeping in some larger materials). Noxious weeds are processed by ensuring they are inside the heap and “well cooked” through monitoring the temperature.

The composting process is monitored through:

- Monitoring temperature weekly using a long temperature probe. Temperature is maintained at 65^{o} but can get up to 75 -80^{o}C.
- Monitoring moisture weekly using visual and “touch”. Water is added to the pile when needed through a sprinkler system.

The pile is turned approximately four times over six months using an eight tonne excavator. Currently the pile is approximately 50m long, 10m wide, and 5m high and takes two weeks to turn.

Other equipment in use at the facility includes a sieve to screen the material prior to sale, chainsaws, sprinklers, and a chipper (which is rented out instead of being used at the facility).

Why Monitor Temperature?

Temperatures within compost piles indicate microbial growth and activities, and influence the rate at which the raw materials decompose.

Higher temperatures result in faster breakdown of organic materials, destroy weed seeds, and kill pathogens.

The Australian Composting Standard AS 4454 standard requires compost processes to be above 55^{o}C for 3 days consecutively to ensure weed seeds and pathogens are destroyed.

Produced

After approximately six months, the compost is screened though a self-built sieve (constructed from thick wire and spare parts from machinery).

The finished compost is then stored out of the weather in a storage bay, ready for purchase.

The compost is sold by the trailer load, at NZD$200 / m^3, mainly to home growers, hoteliers, flower orchards, and households.

Previously, the compost was bagged and sold at local hardware stores, but the manager didn't like to bring in plastic bags for this purpose. The facility is considering to restart this using used seed sacks already in Rarotonga instead of new plastic bags, and developing a bag reuse / buy-back system..

"Barriers" – Challenges / Limitations to Operation

The largest biggest barrier to the operation is the lack of suitably sized equipment to manage the current throughput.

It takes the current eight tonne excavator two weeks turn the pile, whereas a twenty tonne excavator could do it in two days.

The self-built sieve to screen the end material is also undersized to handle the current throughput and creates a bottle-neck.

The other challenge is the plastic being dropped off with organic material. It is difficult to remove plastic once in the pile so better communications are needed to stop it being dropped off in the first place.

Other items like soil and even EOL vehicles are also dumped at the facility after hours.

"Opportunities" – Improvements for Operation

The facility seeks to continue to increase its role in providing a sustainable solution for waste management and organic agriculture in Rarotonga.

Organic waste to landfill is increasing, with the latest audit showing 21.1% of waste received is organic and 24.6% paper. An opportunity exists to partner with the government and have this material transported to the compost facility for processing.

Opportunities for the future also include finding solutions for items received but cannot be processed into compost (such as whole coconuts and large logs).

The manager would like to experiment processing the coconut flesh for bio-fuel, processing coconut husks into seedling trays and other garden items, and explore using the large logs to make bio-char to be used as a natural filtration.

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

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