

# Feasibility study on increasing the consumption of nutritionally-rich leafy vegetables by indigenous communities in Samoa, Solomon Islands and Northern Australia

## Introduction

### Epidemic of diet-related metabolic diseases

Since the 1940s the consumption of high-energy, low-nutrient foods, including white flour, sugar, polished rice, turkey tails and mutton rib flaps by Pacific Islanders and indigenous Australians, combined with reduced exercise, has resulted in alarming rates of obesity, heart disease, diabetes and certain cancers. These conditions were not present when traditional diets and lifestyles predominated.

### Value of leafy vegetables

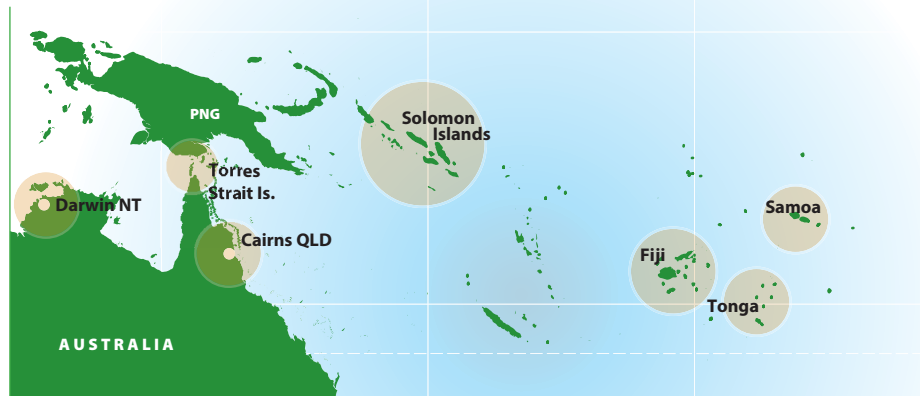
Many different types of leafy vegetables are grown and eaten in the Pacific region. When available, local vegetables are usually inexpensive and thus affordable to most people in both urban and rural areas; despite this, they can be overlooked, being sometimes regarded as “low status foods”. However, research has shown most leafy vegetables are valuable foods: they are nutritious and rich in protein, minerals, vitamins (e.g. A, B, C, K), beneficial phyto (plant) chemicals and fibre (for example, aibika/bele, drumstick tree, Ceylon spinach, kangkong).

Most leafy vegetables can be easily grown in home gardens, providing leaves daily for meals. Some crops usually grown for their corms/tubers/storage roots, for example, taro, sweetpotato and cassava, also have nutritious edible leaves. The leaves usually have higher concentrations of vitamins, minerals, fibre and other beneficial compounds than the roots, which are higher in carbohydrate/energy. Some leafy vegetables are found growing in the wild, sometimes as weeds or wayside plants, for example black-berried nightshade and cobbler's pegs.

Iron is an example of an important mineral nutrient found in leafy vegetables. Lack of iron can cause iron-deficiency anaemia, common in women, inducing fatigue and weakness, and in children, affecting growth, energy levels and learning ability. Aibika/bele, sweetleaf/boneo, taro leaf and kangkong are all good sources of iron.

A variety of foods, including various leafy greens, should be consumed to achieve optimum body and brain growth, development and maintenance, and general good health. It is recommended to eat around one and a half cupfuls or three handfuls (around 150 millilitres or grams) of leafy vegetables each day. Leaves, which reduce the glycaemic load when eaten with high-energy foods like bread and white rice, are an ideal weight loss food.

Leaves contain many plant chemicals, such as flavonoids, anthocyanins, polyphenols and carotenoids, which are



• Project location map in the Pacific Islands & Australia

beneficial to humans as antioxidants and anti-inflammatory agents in reducing the risk of diabetes, heart disease and cancers; for example, glucosinolates in drumstick leaves and anthocyanins in purple sweetpotato leaves. Certain carotenoids, notably beta- and alpha-carotene, are converted to vitamin A when eaten, especially if consumed with some oil (e.g. coconut cream). Others, notably lutein (which is often abundant in leafy vegetables) and zeaxanthin are important for eye health, including reducing the risk of cataracts.

Although this project focuses on the food/nutritional value of leafy green vegetables, traditionally many are used for specific medical applications, for example, aibika and sweetleaf for bone repair and osteoporosis, Ceylon spinach as an anti-inflammatory and drumstick as an antibacterial agent. In addition, leaves of sweetleaf, aibika and ete (*Polyscias*) are used to increase milk production in nursing mothers.

Furthermore, growing food to improve nutrition, such as leafy greens, sweetpotato, taro and cassava, also makes economic sense and can help to address the trade deficits associated with the high consumption of imported foods in the Pacific. In addition, increased food crop diversity enhances the resilience of food systems to climate change, and thus strengthens food security.

### How to eat these vegetables

Some green leaves can be eaten uncooked, for example kangkong, Ceylon spinach, drumstick, chilli, which preserves most vitamins. The optimum cooking methods include steaming, boiling in a little water, baking, stir fry in a little oil (ideally virgin coconut oil or coconut cream) for as short a time as possible to reduce nutrient loss. If making a soup, the leftover cooking water which contains some minerals and vitamins can be used; the exception being cassava or sweetleaf leaves.

Example of ingredients for tasty leaf soup: 3 handfuls of Ete/Ofenga leaves (or bele, Ceylon spinach, amaranth, drumstick, etc, leaves), 1 cup thinly sliced fish/meat, ½ teaspoon cassava flour, 1 teaspoon soy sauce, ½ teaspoon sugar, 1 tablespoon oil (ideally coconut), 1 onion (or several spring onions or a chilli), chopped, 2 teaspoons sliced ginger, 6 cups water, salt, pepper.

## The Project

### Aims of the project

- To identify leafy vegetables with the potential to improve human nutrition, and thus health
- To develop a strategy to raise awareness of the health benefits of leafy vegetables, to encourage increased production and consumption.

### Project personnel

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### Implementation

There has been some excellent research conducted, and information provided, on leafy vegetables in the Pacific (see Bibliography below). This 12 month project adds to this previous work in providing further information on levels of minerals, protein and carotenoids in a range of leafy vegetables collected in Samoa, Solomon Islands, Tonga, Torres Strait Islands and Queensland, growing on different soils. Nutritional analysis was carried out on species which were growing together on the same soil and across different sites. In addition to this introductory factsheet, 11 factsheets have been produced: one describes an exciting horticultural demonstration initiative on Thursday Island in the Torres Strait, and the other 10 feature the most nutritious leafy vegetables identified during this project...and they all taste good as well! Although not featured on factsheets, other leafy greens gave good results for the various nutrients, including sweetpotato leaves, cassava leaves, edible/sweet fern, watercress and various fig/ "sandpaper cabbage" leaves. Information on these will appear in the final report.



• Pele dish, Tonga

Leaf mineral and carotenoid data are presented in each factsheet in the form of a table which includes the featured leafy vegetable sampled at a particular representative site, compared with another leafy vegetable growing at the same site, and also compared with English cabbage (using average values of samples purchased at markets in the South Pacific).

The project continues both with the analysis of certain polyphenols in some samples and also in determining the most effective ways to promote production and consumption of leafy vegetables in the Pacific Islands and Northern Australia.

### Bibliography

Bailey JM 2012 The leaves we eat. SPC Handbook No. 31: Noumea, New Caledonia; Dignan C et al 2004 The Pacific Islands food composition tables. 2<sup>nd</sup> edition. Rome: FAO; Englberger L et al 2010 Carotenoid and riboflavin content of banana cultivars from Makira, Solomon Islands. *Journal of Food Composition & Analysis* 23(6): 624-632; French BR 2010 Leafy greens and vegetables in Solomon Islands: Devonport, Tasmania: Food Plants International ([www.learn-grow.org](http://www.learn-grow.org)); Oomen H and Grubben G 1978 Tropical leaf vegetables in human nutrition. Amsterdam: Royal Tropical Institute; SPC 2012 Green leaves leaflet No. 8: Noumea: New Caledonia.

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The factsheets are intended to provide information on some of the most nutritious leafy green vegetables suitable for growing in tropical areas.

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