



A large specimen of a banyan fig or Nabanga (*Ficus glandifera*), one of the many trees planted in Vanuatu, (see 'The tree gardens of paradise', pages 62 to 71); here converted to an unusual use and providing much needed shade. *Terminalia catappa* at bottom left.

The tree gardens of paradise

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Arboretum: noun [C]. Plural; arboreta or arboretums.

A large garden where many types of tree are grown, for people to look at and to be studied for scientific purposes.

One of the great things about being a dendrologist is that there always seems to be something new and interesting to find as we travel, be it a dramatic tree growing beside the road or a stately looking specimen growing in a public park. We have had the opportunity to visit many parts of the world, always drawn back to the paradise of the tropical South Pacific islands; there is just something about the lush and lively vegetation of those coastal strands that sits in the mind's eye long after the return home.

The trip which has proved to be undoubtedly the most beautiful, fascinating and at the same time extremely educational, was one made to the islands of Vanuatu, the one time New Hebrides. Perhaps because it has no great mineral wealth, as does its neighbour New Caledonia, the country has remained something of a backwater in some ways. Much of Vanuatu's economy still remains based around the old-style of tribal village life, so consequently much effort and time is put into the creation and maintenance of almost subsistence-level food production gardens. Nevertheless the benign climate, and the richness of volcanic soils means that a small amount of the native-grown products end up in the local markets.

The close relationship between the the villagers and their gardens highlights an extensive mix of vegetable offerings. As in British allotments perhaps, a deal of attention is given to the production of staple annuals, taro and yams provide starch-rich root crops, with *Abelmoschus manihot* (island cabbage) and *Amaranthus tricolor* (native spinach) in place of our cool-climate 'greens' such as broccoli. In addition the cordylines, citrus fruits including the huge shaddock (*Citrus maxima*) and a range of both plantain and sweet dwarf bananas, make for what must be some of the most colourful and interesting garden displays in the world. However, it is the way in which tropical *tree* species are used

Opposite, Port Resolution, Tanna, where Captain Cook moored in 1774 for two weeks, has changed very little. Botanist Georg Forster vividly described the village gardens behind this very beach as well as the pirogues. The tree on right is *Acacia simplex* whose astringent bark is used in traditional medicine.

Right, The archipelago of Vanuatu, formerly the New Hebrides. We have visited the islands of Efate, Tanna and Aneityum.

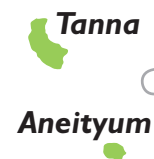


as a permanent arboreal crop that lends an extra component in the native gardens of Vanuatu.

To the definition of arboretum, I would add the complementary criterium, 'Where tree species are planted for the ongoing production of a food crop and/or other economic purpose.'

The Vanuatu Tree Gardens

Here we describe the situation where the various tree species are integrated fully into the agrarian yearly-cycle of food production. In this case the trees are not grown as they would be in a monocultural plantation, but rather as individual specimens which are deliberately incorporated into a garden in a planned way. On a sophisticated basis, a range of species are used to produce a series of different nut/fruit crops available for



picking throughout the year, or to allow for harvesting of a particular product at a convenient time. The villagers would almost to a person be encouraged to not only work in the family garden but to have a thorough knowledge of the plants they are dealing with; a complete horticultural education from almost leaving the cradle.

A comment on plant nomenclature. The native name given here in most cases is that accepted in the formal Bislama used throughout Vanuatu. Nearly all of the islands, or even areas of individual islands have completely different languages let alone dialects. For example, the Tahitian chestnut, *Inocarpus fagifer*, is called *Inmap* on Aneityum, *Nawuk* in western Tanna but *Namambe* in Bislama! It is also worth noting that the indigenous name is generally different in each island state of the Pacific.

At their best such gardens/arboretums can afford a delightful appearance with a range of foliage, textures and colours of the developing flowers or fruit. A browse through a village garden of Vanuatu can be breathtaking and a visit to the main market in Port Vila reveals the astonishing range of colourful tree-crops which are grown locally and offered there for sale. An exotic fruit such as an apple or pear would be expensive to import by airfreight, however, the ni-Van can readily enjoy munching on a rose apple (*Syzygium malaccense*), indigenous name *Nakavika*, or a hog plum (*Spondias dulcis*), i.e. *Naus*.

This description of the Vanuatu crop-producing 'arboretum' is somewhat generic. It is based on our visits to the gardens of many villages on the islands of Efate (sometimes Vate), Tanna and Aneityum (Anatom). However, what we saw in Anelcahaut Village on the latter island, which is the most southern of the archipelago, almost completely matches what is outlined below.

The trees used are selected with care and the majority of the species utilised have an indigenous name reflecting their common familiarity. Over hundreds of years of subsistence gardening, much hybridisation and/or propagation of chosen cultivars, has taken place and still continues. The Vanuatans are very capable horticulturists and have used the art of growing cuttings and layering for centuries. Most of the species mentioned here are available in many



A large shaddock fruit, *Citrus maxima*. This fruit tree which can grow to 12 metres in height, was undoubtedly a native plant carried through from S.E. Asia by early Melanesian migrants.

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Above, left, the tropical almond, *Terminalia catappa*, is a magnificent pan-tropical coastal tree and produces masses of edible nuts. Here growing naturally in the coastal strand of Moso Island.



Above, right, One of the native fig species, *Nabalango* (possibly *Ficus septica*), which produces its fruit on its trunk. Here at 200 metres asl. in natural forest near Mangaliliu village, Efate. Used by Vanuatans as a medicine for a range of complaints.

selected varieties. This rich extent of ni-Van arboriculture was revealed as long ago as 1786 by Georg Forster in his *De Plantis Esculentis Insularum Oceani Australis Commentio Botanica* and many of the species listed in here were first described in that volume, with some illustrated earlier in *Characteres Generum Plantarum* in 1775. The German botanist, together with his father had sailed with Captain Cook on his second voyage and some time had been spent exploring the island of Tanna in particular.

Although we have observed that most of the food-bearing trees are purposely planted into the native garden, there are also a number of species of wild origin, and spontaneously growing, left to flourish as they are intrinsically useful. These would include the magnificent tree *Terminalia catappa* (tropical almond, natapoa nut), *Sterculia vitiensis*, *Nasawas* and some fig species such as *Ficus scabra* which have edible fruits.

The use of food-bearing trees reflects centuries of accumulated experience gained by the ancestors of today's Vanuatu village gardeners, archaeological evidence suggesting that the original Melanesian Lapita people first arrived from New Guinea as long ago as 1400 BCE. There is also evidence that many crops were brought with them as native introductions. These not only included the starchy root crops such as taro and yams, but major tree species such as the rose apple, shaddock, and the vitally important breadfruit (*Artocarpus*

altilis), are all considered to have been carried by human hand along the island chains of the South Pacific, the latter three important food crops originating in Southeast Asia. The migrations which brought aboriginal peoples down through Melanesia are estimated to have started around 40,000 years ago as humans used the low sea-level of the ice age to cross the Wallace Line. There is firm evidence of extensive gardening in the highlands of Papua some 9,000 years ago, so there was plenty of time to bring a large range of food plants into Vanuatu. The breadfruit, the subject of Captain Bligh's ill-fated voyage, has been cultivated for so long that there now exists hundreds of varieties cultivated across the Pacific islands.

The sophistication in the way the crop arboreta were managed eventually reached a very high level. Formal rituals reflected 'Kastom', (custom) which governed territorial rights and access as well as controlling the seasonal planting and harvesting in the village gardens, resulted in a valuable, sustainable system which is maintained to this day. The land is still almost totally owned by native landowners which has to a large extent directed land-usage towards true subsistence level gardening as opposed to land clearing for large scale food cropping.

The process of horticulture in any situation has to take account of the environment and this certainly is a controlling factor in native gardens immediately adjacent to the coastal fringes. Among the range of wild-growing species which will cope with salt spray and extreme exposure to the elements are obviously the *Cocos nucifera*, coconut palm, and *Pandanus tectorius*, the screw-pine. These two monocot trees are extremely valuable for food production, both carrying edible seeds, and also for the uses to which their fibrous leaves can be applied. Importantly, they will grow immediately fronting the sea and many varieties have been developed. One major work on the subject illustrates some 20 types of coconut differing in both size and shape. Another common coastal strand tree that is allowed to flourish is *Cordia subcordata*, *Burao*, which is of use for its edible seeds. The above three species are essentially pan-tropical in distribution and served to provide a food source for both the Melanesians and Polynesians throughout the Pacific Ocean, especially so on the exposed beaches where the voyagers would have first arrived by canoe.

It is however, the range of species amenable to cultivation in the sheltered zone behind the immediate littoral zone, that greatly expands the range of useful canopy-reaching plants in the islands of Vanuatu. The coconut, that magnificent gift from nature growing by the seaside, provides many gifts for humans but it is to the habitat a little way inland that one must go to appreciate the full richness of the various tree species which provide for the sustenance of most Vanuatan villages. Behind the sandy beach or coraline limestone terraces, conditions are much less harsh, the air can maintain a level of humidity, the soil is richer in humic material and in the case of many of the Vanuatan islands is of a volcanic origin.

Generally the gardens are situated in the immediate or close proximity to the village. Plots may be communally managed, although in most cases individual family ownership of the land and therefore its cultivation is the practice. These gardens would definitely include a range of staple annual crops such as island cabbage, yams and manioc (*Manihot esculenta*), the latter generally thought to have been introduced to the Pacific Islands from Peru via the early Spanish influence in the Philippines. However, it is the deliberate addition of the permanent tree species, producing their crops year upon year, which turns this intensive land use into a system based on agroforestry. It must be emphasised that these trees are appropriately selected and deliberately planted in positions for their specific requirements.

Smaller species, for example the citrus and various varieties of banana or plantain trees, would be planted close to homes in the potager garden, with the larger-growing species located in the village outskirts forming the arboretum. In the latter, we see the deliberate utilisation of a large range of tree-crops selected for nut and fruit production, encompassing as much of the yearly cycle as possible, e.g. *namambe* in January/February, the natapoa nut covers March to June and the rose apple June to October.

The indigenous tree species not already mentioned would include *Dracontomelon vitiense* (Nakatambol, dragon plum), *Canarium indicum* (Nangai), *Hedycarya dorstenioides* (Nanini), *Pometia pinnata* (Nandao, Pacific litchee) and the stately palm, *Carpoxydon macrospermum*. We saw these frequently planted in village gardens. A personal favourite is certainly *Barringtonia procera* (Navele, cut nut), which not only gives a very tasty kernel, but is a dramatic flowering tree in its own right. As well as the fruiting trees, a number of species providing for other uses are also commonly planted. These include *Broussonetia papyrifera* (paper mulberry), *Santalum austrocaledonicum*,



The beautiful palm *Carpoxydon macrospermum* produces an edible seed. Endemic to Aneityum, here growing in Mele Village, Efate Island.



Above, *Barringtonia edulis* is a native of Vanuatu, here growing in Epao Village. Left, are the flowers that are pollinated by moths and bats and right, the fruit ready to harvest.

the renowned sandalwood of commerce, *Pangium edule* (Nabange), *Polyscias scutellaria* (Nalalas, Aralia), *Cycas seemannii* (Namele, cycad), *Endospermum medullosum* (whitewood), *Morinda citrifolia* (Noni, mulberry), *Evodia hortensis* (massing, musk), and the dramatic, monocarpic sago palm, *Metroxylon warburgii* (Natangura).

One small tree is much cultivated in the village environs, *Cordyline fruticosa* (Nangaria, or Ti tree), not only for its edible tuber, but also purely for its highly ornamental leaves which can range from deep red to exhibiting a very attractive green/cream variegation. A range of these beautiful plants was first introduced to cultivation in the UK as long ago as 1866 by John Gould Veitch while plant collecting across the South Sea islands as a guest on HMS *Curacoa*. Gould specifically recommended Aneityum island as offering a 'rich botanical field'.

Other ornamentals noted by Veitch and still much used in the native gardens are the spectacularly coloured-leaf forms of *Acalypha* species (*Nakobes* in Efate), *Polyscias guilfoylei* and *Alpinia novae-pommeraniae*. Curiously, these very selections, originally stovehouse plants, are now making a big comeback as indoor ornamentals sold in Australian plant centres, only with a fancy new name instead of the one used by the Pacific islanders. Not only do the ni-Van buy them from the local markets themselves, but it also seems that they

are still making new selections which can be esteemed gifts between local chiefs. Unexpectedly, we saw one example of familiar plant, an azalea-type rhododendron with pink/white variegated flower, at Mele village of Efate island.

Perhaps it is important to re-stress that these are *cultivated* tree species. Frequently, they have been propagated by the villagers from seed, and cuttings, particularly the various varieties of pandanus and the breadfruit. In other cases I have seen our guide dig up a particularly notable seedling from the bush and bring it home for re-planting in the home 'arboretum'. Spare plants may be also offered for sale locally, and we have seen coconut seedling cultivars being sold in the Port Vila market.

It also must be added that not all of the species being planted in the tree gardens are indigenous to Vanuatu. Some desirable tropical fruit trees such as a range of bananas, mangos, papaya and a range of citrus varieties are certainly introduced and used to a large extent.

Although not strictly incorporated into the village arboretum, we saw that a number of indigenous species near to habitation were earmarked for their particular use and protected from destruction (clearing land for cultivation) accordingly. These included *Agathis macrophylla* (Kauri), whereby the lower bark was continually scraped away to promote the release of the resin which is



This highly decorative form of a large *Pandanus tectorius* was seen growing in a garden at Mele village, Efate. This plant would have been propagated from large stem 'cuttings' and with the white variegation running down the centre of the leaf it could possibly be the selection known as *Pandanus 'Baptistii'* and offered for sale by nurseryman William Bull in the late nineteenth century.

The rare Ericaceae species, *Vaccinium macgillivrayi*, local name *Nijinga*. Here behind Anelcauhut village, Aneityum, flourishing in open ridge-line scrub at circa 150 metres asl. These fruits are delicious.

photograph © Alistair Watt



used as a gum and for making torches. Here we could also refer to *Myristica inutilis* var. *papuana*, (*Nandai*, wild nutmeg). Although related to the nutmeg of commerce, there appears to be no native recognition of its properties as a spice although it is used as a hallucinogenic/medicinal plant.

Word limitation just allows mention of a couple of species which are not quite a tree but which are of much ethnobotanical interest. We should record a rare plant we were lucky to locate on Aneityum island. This was the native blueberry, *Vaccinium macgillivrayi*, *Nijinga* (yes, a tropical growing blueberry and a migrant genus from the Northern Hemisphere to the Pacific islands). Reaching 5 m high on a red, degraded soil, we found it to be very tasty indeed, a great delicacy for local Anelcauhut village children when in season. Most unusually, it grew here accompanied by its below-the-equator relative in the Ericaceae, *Styphelia cymbulæ*. Another large shrub of note is the wild Kava, *Macropiper latifolium*, which is used as a medicinal plant. The closely-related species, *Piper methysticum*, is the one well known for producing the potent narcotic brew, Kava. The former is frequently found in forest conditions but the latter is strictly a cultivated plant.

In the markets

The Vanuatan markets are of a genuinely old-fashioned variety, almost all of the offerings are locally grown even in Port Vila, the capital of the nation. The fruit will have many blemishes, it will be peculiarly shaped or sized and will not be there in large and unlimited quantities. The tree gardens are of immense interest to the dendrologist, but the market will definitely enthrall those who are interested in seeds, nuts and fruits, as well as ornamental plants. There can be few scenes more fascinating than the Port Vila market, the range of products were quite astonishing. The way some of the nut-crops are presented for sale was brilliant. Skewered on a palm frond spine they looked just like shish kabobs. Prepared in this way they were considered to be quite a luxury and several species were being sold in this novel manner.

As well as the range of nut and fruit crops prepared and ready to eat, the market offered a cornucopia of vegetable products. Yams, taro, plantain or cooking bananas, and *Heliconia indica* var. *austroraledonica* leaves used

for cooking laplap, as well as cutting-grown breadfruit plants and coconut seedlings. Additionally, there was an extensive range of brilliantly-coloured ornamentals especially crotons (*Codiaeum variegatum*) as well as a large number of different varieties of cordyline. The number of non-local products were very limited, perhaps a couple of types of apple, and these would probably have been imported from New Zealand and destined for expatriate European consumption.

We have visited markets in other places in the Pacific such as New Caledonia and Fiji but nowhere matched the extent as that offered in Vanuatu. The market place of Port Vila could well be a compulsory field excursion for students of ethnobotany or agroforestry.

Conclusions

The Melanesians were great travellers, thousands of years before the era of the Polynesians their drive and desire to expand into the Western Pacific brought them and their traditional food plants south-eastwards to this group of fertile islands. The distances involved were not enormous and clearly they were able to transport many of their customly-grown tree species with them adding to the range as they travelled.

In addition, Nature is kind to the archipelago. The climate is generally benign and humid and most of the islands have a rich volcanic-origin soil. The geography is such that the island-chain has allowed for a high level of plant dispersal by natural vectors (such as pigeons and fruit bats) from Papua via the Solomon Islands so when the first Melanesian voyagers arrived by canoe many of the food producing plants were already familiar to them and there to be immediately used.

For about 3,500 years, the Melanesians developed their own complex rituals and systems of crop production and clearly learned to do this extremely well. Even during the 150 years or so of European colonisation, the ability to focus on food production in a local village economy was never lost. As a result, here in the twenty-first century, the legacy of millennia of horticultural experience can be seen in the very special tree gardens of Vanuatu.

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