Gardens of Oceania

Annie Walter | Vincent Lebot

Australian Government
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GARDENS OF OCEANIA

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with collaboration from Chanel Sam

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English translation by Paul Ferrar

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Preface

by Stephen Kalsakau
Minister of Agriculture
Vanuatu

The ni-Vanuatu people have a real passion for plants. Their relationship with the plant world is that of gardeners, aware of the rich but fragile biodiversity of their own islands, and inquiring as to what may be introduced and exploited from the modern world outside. They never stop experimenting with new species of food plants and ornamental species. Even though the genetic diversity of the indigenous species tends to become narrower, the number of different cultivated plants found within the traditional garden is at the same time increasing with the introduction of exotic species into the archipelago and their exploitation.

The population of Vanuatu is thought to have been close to a million people before the first contact with Europeans. Although little information is available, it is probable that the richness and the productivity of the soils allowed the inhabitants to meet their nutritional needs without much risk of malnutrition, despite the numerous and frequent climatic hazards. But this type of subsistence, though still possible, is not found any longer. The population of Vanuatu, decimated by introduced diseases and forced migration, was only about 110,000 inhabitants in 1980 at the time of Independence. A very high population growth rate has meant that today there are about 200,000 inhabitants, but this is a matter of some concern: the urban population is expected to double in the next ten years, and the total population of the country will double in the next 23 years and will reach one million in 2070. Provision of the necessities of life will then become quite difficult.

In these circumstances two approaches may be taken to satisfy the food needs of the population: the amount of local food production must expand rapidly, and farmers must increase their incomes through export of produce in order to be able to buy from overseas whatever cannot be produced locally.

It is this last strategy that has been favoured since Independence, with modest success. The geographical isolation of the country, far from the main trade routes, and the physical layout of the country – an archipelago – cause major problems for the trade in food products, which are often perishable. The constraints that agricultural exports must overcome are enormous. The distance of the major consumer markets make the staple food products uncompetitive. Conversely, the agriculture of this tiny country, suffering from the absence of any protective measures, is exposed to the full measure of global competition. The importers of agricultural commodities benefit from this

and are able to place on the local market impressive quantities of exotic, imported foods, which are even cheaper than the local products. The difficulties of exporting combined with the great ease of importation make for a serious imbalance in the balance of trade.

Since Independence the agricultural balance sheet of Vanuatu has been in deficit every year. The value of imported food commodities is regularly higher than the value of those exported. Worse still, food styles and preferences change very quickly. Per capita consumption of canned meat and fish, rice, flour and other processed foods is increasing continually. Nowadays young people prefer bread and rice to the local root crops, because they acquired the taste for them during their years of education, and because these foods are quicker to prepare and cheaper for a salaried population that buys its food and is short on time. These young people thus represent a potential consumer market for overseas cereal growers, and local producers suffer a steady decline in customers even though the local production of food crops remains high.

Aware of the dangers that this situation presents, the Government of the Republic of Vanuatu decided to declare the first year of the new century – 2001 – "the year of local produce", or "Yia blong Aelan Kakai" in Bislama. Through this simple slogan, this national campaign aims to remind citizens of the need to preserve the local in order to face the global. The ni-Vanuatu can be proud of their biological products, which are produced without pesticides or other chemical products. The diversity of these local products deserves to be valued, but being poorly known they are also poorly utilised.

In this context, this book is an important resource: it summarises available knowledge about numerous food plants that could and should be exploited commercially in the future, in order to assure the development of an agriculture that can produce sufficient to cope with the formidable population growth while at the same time preserving the island environment. It is thus intended for a very large public: producers, to be sure, but also the teachers who have the heavy responsibility of educating the younger generations, professionals in agriculture and related sectors, those with assorted roles in public life, and finally the decision makers. All these people may quickly find source information on the history of the food plants found nowadays in Vanuatu, their botanical descriptions, the variability found within the species, the general details of their cultivation, and finally complementary information on their main uses. This is a comprehensive guide that will allow everyone, whatever their interests or character, to have systematic access to important information, from the most basic to the most particular. The book thus covers the major plants, illustrated by numerous

photographs. It provides for each plant a list of references and a repeat of specific information that is developed further in the CD-ROM: the synonyms of the plant species, the herbarium reference specimens and the studies of intraspecific variability. The reader, having consulted the book for the main information on a particular plant species, may then refer to the CD-ROM to obtain complementary information if wished from the cited references for easy access to more detailed information.

The authors, Annie Walter and Vincent Lebot, have thus provided us with a work that comprehensively depicts our modern-day agriculture, with its ancestral plants and those that have come in additionally, giving information for all on the origin, the modes of cultivation, the variability and the practical usage of each species, and allowing specialists easy access to technical information that they may need. This is a difficult, not to say hazardous, task when one considers the remarkable diversity of plants in Oceania, but even if there may be a few errors and omissions, a thorough reading of this comprehensive and easy to access work can be recommended to all.

Acknowledgments

French edition

This book is the result of many long days spent in the gardens and the villages of Vanuatu. The list of people who have made direct contributions to this work, by letting us visit their garden plots or by giving us valuable information, is clearly too long for each to be recognised individually here. They are, nevertheless, the sources of the basic information that made up this book. It is with great admiration for their knowledge and sincere recognition of the time that they devoted to us that we convey our warm thanks to them all.

We wish to thank our collaborators in Vanuatu, in the government services, in the cultural centre of the National Museum of Arts, and in the Department of Agriculture and Forests for the discussions that we have had in the field during numerous trips undertaken around the archipelago, and for all the help that they gave us. The vendors in the markets of Luganville and Port Vila were never sparing with their time, nor ever lost their good humour, in answering our many questions whose naivety often caused great mirth among them. This book is thus naturally dedicated to the women and the men of agriculture in Vanuatu, whose knowledge through this work is translated into scientific terminology.

Also very numerous are the friends and colleagues who have helped in the realisation of this work. Chanel Sam, curator of the Port Vila Herbarium, identified the majority of the species and frequently accompanied us into the field. Alfred Mabonlala helped us throughout the production of this book. Delphine Greindl, of Luganville Market, and Fabienne Tzerikiantz, on the west coast of Santo, gathered valuable information on the methods of cultivation and preparation of the food plants. The former also provided us with numerous photographs. Elisabeth Pelegrin and her collaborators, in the Information Centre of IRD in Montpellier, helped to get for us many related publications that would otherwise have been hard for us to find. Deta Alimeck was most helpful in collating and sorting the relevant references. Pierre Cabalion, botanist at IRD, provided us with much complementary information gathered during his own studies in Vanuatu. Patricia Siméoni was kind enough to provide us with some of her own photographs. Laure Emperaire checked the section on cassava and Jean-Marie Bompard that on mango. To all of them we give our sincerest thanks, for their help, their support and their friendly comments.

Finally, we would like also to thank Jacques Florence and Francis Hallé who went through our manuscript with a fine tooth-comb, and whose comments, corrections and suggestions have greatly improved the initial draft of this text. It is of course understood that if any errors or misinformation remain, they are our responsibility.

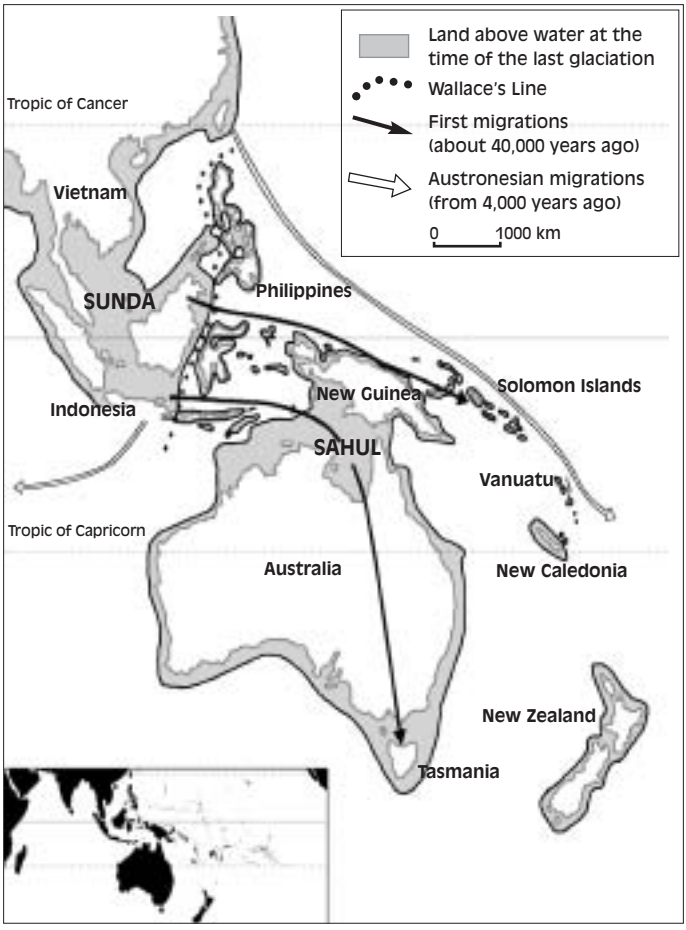
Note on English edition by translator

As translator of the fascinating earlier volume Fruits d'Océanie, I was excited to hear that a companion volume, Jardins d'Océanie, was to complete this study of the food plants of Vanuatu, and I offered my services again to translate the new work.

I was assisted with some particular French terms by my friend and former colleague Christine Moore, and also by one of the authors, Vincent Lebot, whose knowledge of English is far better than mine of French. I am most grateful to both of them, while acknowledging that any errors that remain are my responsibility.

IRD and CIRAD kindly made available a full electronic copy of the French text and all the illustrations, and permitted ACIAR to publish the English translation. I am also most grateful to my former colleague Robin Taylor (Publications Manager of ACIAR) for her encouragement and assistance with technical production of the work.

Paul Ferrar
Canberra



Migrations towards the Sahul continental plate before the last glaciation

Introduction

It is estimated that about 500,000 species of plants occur throughout the world, but only a small proportion of these have been identified, described and stored in herbaria, and many are disappearing before they have been classified.

Among these, about 30,000 species are edible and 7,000 have been cultivated or gathered by humans at one time or another in history. Several thousand species have thus been considered to be of use to human nutrition globally. Nowadays only thirty species feed the world and their cultivation provides 95% of the requirements of calories and proteins, with wheat, maize and rice alone supplying about half the energy obtained from plants. It is thus primarily on these three species, and then on the other 27 species, that the main efforts are made for improvement and conservation of genetic diversity. This shows the extent to which the nutrition of the planet is in the process of homogenisation, all the more because every time local food habits change, some species disappear – since they are no longer being used, they are no longer cultivated.

However, paradoxically in certain regions the diversity of food plants has never been all that great. The major explorations of the 16th to the 18th centuries, conversion to Christianity of the worlds discovered by Western nations, colonisation, the increase in tourist travel and the growth of international trade have contributed to the spread of local food species on a huge scale, and to the change of tastes in food materials. Nowadays, thanks to trade in seeds, to the development of supermarkets and the growth of shops selling exotic foods, and to increasing immigrant populations, in any given country one may find practically any ingredient for preparing a meal. It seems, therefore, that if one particular economic trend tends to reduce the number of food plants to a few species, another trend is tending to increase our choice of available foods. The world, finally, is seeing an era of great gastronomic exploration. Western countries are discovering, and will discover still more, unknown food plants for which they know neither the name nor the usage. Tropical countries have seen, and will see yet more, the arrival of food products of whose origin and utilisation they are often ignorant. The former countries purchase and taste; the latter countries often start to grow and sell. For each of these groups we have conceived this guide, to present to Western nations the food plants used in Oceania, and to show to the Oceanians the origin and utilisation of the plants that have been introduced to their region.

The work has as its setting Vanuatu – a small island nation in the South Pacific situated between the 14th and 16th parallels – and as its focus the food plants that are found there at the present time. The islands of Vanuatu are young islands, formed for the most part from the seismic convulsions that shake this part of the world where the Australo-Indian tectonic plate moves under the Pacific plate. These pieces of land have been colonised since their formation by plant species that have come from elsewhere, carried by winds, ocean currents or birds. When humans first arrived on these islands they certainly found edible species there, but at the same time they also brought with them their own familiar plants. The story of the food plants of Vanuatu is thus also the story of the human migrations that have populated these islands.

Before the last Ice Age, about 10,000 years ago, Papua New Guinea, mainland Australia and Tasmania were joined into a single large continent, the Sahul. Further east, what is now the archipelago of Solomon Islands was a single long strip of land, stretching from Buka (situated north of the island of Bougainville) to Guadalcanal. Between Sunda, the continental plate of Southeast Asia, and Sahul were various islands grouped under the name of Wallacea (see map p.12) because they were situated on the biogeographical line (named after Wallace) that separates these two major regions.

The climatic upheavals occurring during the Quaternary era encouraged the movement of populations from Sunda to Sahul. The first human of Sahul was probably a *Homo sapiens* as is shown by dating carried out in Australia. Before the last rise in sea levels, the continental islands were much larger landmasses. Java, Sumatra and Kalimantan, the great islands of Indonesia, were joined to the Indochinese peninsula, just as the Philippines were connected to Sunda by some tongues of land. Between Sunda and Sahul there were some chains of tall islands, visible from far away. By calculating the angles of inter-visibility between these islands, one can work out two possible routes that would allow people to pass from one continent to the other without ever losing sight of land. One route goes via Sulawesi and Halmahera, and the other – further south – via Flores and Timor. Once on Sahul, the first Australian people would have been able to reach Tasmania on foot. Humans would likewise have been able to go to the Solomon Islands while always having an island in sight to guide them. Thus in New Ireland the presence of humans is traced back for over 33,000 years from datings made at the sites of Matenkupkum and Buang Mebarak.

The origin of the cultivated plants of Oceania has been the subject of numerous studies, and it has for a long time been accepted that these plants were introduced from Asia with the first migrations. These conclusions are

based on archaeological digs that have found traces (grains or nutshells) of plant consumption at sites that can be accurately dated by carbon-14 or other objective measures. But while this approach is generally relevant for cereals and plants with seeds or fruits, it cannot be used for plants that multiply vegetatively, where the usable plant parts rapidly decompose into organic matter in humid tropical regions. This is why, although some ethnobotanists have for a long time been convinced that root and tuber crops and bananas are among the oldest plants domesticated and eaten, it has been necessary to wait for progress in molecular biology and dating techniques to understand that the domestication of endemic species spread very early in Sahul as the hunter-gatherers, originally from Sunda, crossed Wallacea. Nowadays there are sound findings from taxonomy, biogeography, molecular biology and archaeology that show that the first inhabitants of Sahul arrived without planting materials, but then domesticated the plants found locally to fulfil their needs. Over the subsequent millennia many domesticated tropical crops were spread more widely, towards the west as much as into the Pacific. Among the best known are certainly sugar cane, bananas and breadfruit, but it is also true of various Dioscoreaceae and Araceae as well as kava and many other food plants.

Although it is difficult to obtain accurate dates, numerous works agree in showing earlier dates for domestication of root crops than of cereals. The endemic yams of Australia, *Dioscorea hastifolia* and *D. transversa*, were domesticated by aborigines, and provided a regular food supply in a harsh region. In some wetter regions of northern Australia, taro (*Colocasia esculenta*) is endemic and was domesticated locally. It is known to have been eaten 28,000 years ago in Solomon Islands, because it has been possible to obtain accurate dating of starch grains found on grinding stones. Evidence has been found of cultivated gardens, dated as older than 9,000 years, at about 2,000 m altitude in the highlands of New Guinea. In comparison, the consumption of root and tuber crops in the New World appears to date back 5,000 to 7,000 years.

It thus follows that, although agriculture was first developed in the fertile crescent of the Middle East about 10,000 years ago, the use of vegetatively propagated plants saw the light of day on the continental platform of Sahul probably more than 20,000 years ago – at least that is what all the evidence shows.

For the peoples of Asia the use of vegetative plants is secondary in importance to the omnipresent cultivation of rice, although it does predominate among certain ethnic minorities of South and Southeast Asia (for example, the Indonesians of the Mentawai Islands off Sumatra, for whom taro is the staple food). In contrast, in Sahul only vegetative plants have been used.

The Austronesians, a mongoloid people who later colonised the rest of Oceania, introduced the use of vegetative plants to all of Polynesia, as far as the islands of Hawaii and Easter Island. According to linguists, certain groups of Austronesians from Southeast Kalimantan set off in the opposite direction over 3,000 years ago and colonised the large island of Madagascar. Their plants, loaded on catamarans and kept alive throughout the voyage, were spread in clonal form to places thousands of kilometres away. Bananas, taro and the yam *Dioscorea alata* thus reached Africa via Madagascar. Recent work has shown that banana was already grown in Central Africa more than 2,500 years ago.

The question of the introduction of sweet potato (*Ipomoea batatas*) to Papua New Guinea has used up a huge amount of ink, since it was already the staple food crop in the highlands before their "discovery" by European explorers, and was likewise already cultivated in the Hawaiian Islands before the arrival of Captain Cook. Melanesia is nowadays considered to be a second centre of diversification of this species. The diversity found in *I. batatas* in this region is greater than that found in the Peru-Ecuador region, which was not the origin of the Melanesian germplasm, and recent molecular studies suggest rather a Central American origin.

Contrary to commonly held theories which presume no Indo-Malayan centre of origin extending from the Indian Peninsula to Papua New Guinea, the Oceanian centre is clearly differentiated on the basis of factors that are as much biogeographical as human. The existence of a centre of domestication and diversification in the Sahul then raises some interesting questions on the originality of the forms that are cultivated there and their genetic distances with regard to other forms of the same species, or to related species, originating from Sunda. In certain cases, the intraspecific differentiation of pantropical species – *Dioscorea bulbifera*, for example – is very significant. In other cases, for example sugar cane, the hybridisation of distinct species originating from the two large landmasses of Sunda and Sahul has allowed remarkable genetic gains to be made.

Melanesia has a diversity of plants with vegetative propagation and with roots and tubers, that is unequalled anywhere else on Earth in numbers of genera, of species and of varieties cultivated within each species. The cultural diversity of this region, unique in the world (a tiny country like Vanuatu has 113 languages and Papua New Guinea has over 600), combined with island environments that favour differentiation, have produced spectacular variability. Populations coming from the Asian region, from New Guinea and from Solomon Islands, and later returning from Polynesia, stayed in the Oceanian region, continental or island, and worked on the plants endemic to the region, spreading them

from island to island, selecting them and improving them. To this base of local plants were also added American plants introduced by the great explorers of the 17th and 18th centuries, and then Asian and European plants. Leaving aside some omnipresent ones like cassava, sweet potato, tannia (cocoyam or macabo) and papaya, these plants are mainly cultivated in peri-urban villages for sale in markets, and the people of Melanesian origin use these imported crop plants less than they do their own indigenous species.

Like many islands of the Pacific, Vanuatu is a fertile country, traditional and agricultural, whose economy and nutrition are evolving in a dangerous direction. Importation of food products is increasing continually, nutrition is becoming worse in the towns; the local food plants, little known and poorly studied, are progressively giving way to foreign plants considered to be of more worth. But this is only one step in evolution, and we would wager that the country will soon realise that it must adapt its choices to the realities of daily life and economic circumstances, and that it will be able amongst other things to stabilise its own food species and itself grow the fresh products that are currently purchased in processed form.

This work (the book and the CD-ROM) is devoted to cultivated food plants, and we have presented in this book studies of the 84 species that are the most important for food and nutrition. Local species with fruits and nuts that are currently used have already been covered in a preceding work[1] and will not be repeated here. However, in order to give the reader a complete study of all the alimentary species of Vanuatu we have put in the CD-ROM a chapter on the local fruits and nuts and another on minor cultivated plants. Some readers may be surprised to see coffee and cocoa, grown commercially in Vanuatu, listed as minor species! But the ni-Vanuatu use them scarcely or not at all in their diet. The CD-ROM likewise contains a long list of foraged species whose leaves, fruits or leaves are eaten occasionally. This particular list is not exhaustive, and it is likely that other species are used for food by one community or another as the opportunity arises.

The 218 species cited or treated in this book and the accompanying CD-ROM represent the very great majority of food plants of Vanuatu. Not all have the same status, and while some are staple food plants, such as the yam (*Dioscorea* spp.), others are much rarer such as the carambola (*Averrhoa carambola*). We have chosen to present the alimentary species grouped according to their plant type – roots and tubers, trees, climbing plants and herbaceous crop plants. Within one genus the different species may belong to different plant types. For ease of reference and access to information, at each entry we have noted all species of the genus that are present

[1] A. Walter, C. Sam, 1999 – *Fruits d'Océanie*. Paris, IRD Éditions, 310 pp. English version: *Fruits of Oceania*, IRD Éditions, ACIAR.

in Vanuatu, giving the page on which each is treated. The index at the end of the work will also permit the reader to find any desired information.

This classification does not indicate the place that each species occupies within the system of cultivation and its spatial disposition among the gardens, the footpaths, the villages and the market stalls. To remedy this, the first part of the book indicates the different places where the plants are cultivated or found. Here too are covered the main aspects of the agriculture of Vanuatu, which remains based on the growing of root and tuber crops in the gardens, and trees in the villages or along pathways.

The second part of the book presents all the plant species that are cultivated for their edible roots or tubers, which is essentially the group of food plants that provides the main source of energy in the diet in Vanuatu.

The third part covers all woody species that are above 4 m in height. Among these are found trees and shrubs that provide for the most part fruits or edible seeds. Some, like *Ficus*, are also cultivated for their young leaves which are edible; others like the sago palm for the pith of their trunk. They are generally cultivated around the margins of villages or along roads and tracks. Shrubby trees, like the island cabbage (*Abelmoschus manihot*) or kava (*Piper methysticum*) are also covered in this section.

The fourth part includes all the climbing species, with stems that sprawl or cling. They provide for the most part leaves, fruits or edible pods that are eaten cooked as accompaniments to a meal. They are almost entirely grown in gardens, sometimes close to the houses.

Finally, part five encompasses all the herbaceous plants, whatever their size, from sugar cane to mint via maize and many others.

This type of work is not totally new, and there are available reference works and encyclopaedias that have comprehensively covered the main food plants grown and used throughout the world. But, because of the huge size of this subject, the local species of Oceania are scarcely or not at all represented in these works, and their size and degree of detail makes access difficult. In the present book we have attempted to present the products of a contemporary agriculture, with its local staple plants and the exotic plants introduced over the last two centuries or more, some fully adopted, some still marginal. With the practical aim of keeping the book concise and manageable, each plant is treated by way of a short dossier covering the important points – genus, family, species present, common names, description, morphological variability, culture and production, food

uses and other uses. Each dossier is accompanied by a list of the main bibliographic references that will allow the reader to obtain even more detailed information on the plant in question. We would like the book to be accessible to the greatest number of people, so we have kept technical terms to a minimum. Those that have been used are defined in a Glossary, located at the start of the work.

The CD-ROM that accompanies the book provides information in greater detail. First of all, as we have noted, it presents the entire range of alimentary plants of Vanuatu, including minor and foraged species. It then contains technical information essential for the specialist: a list of herbarium specimens, a list of synonyms, complete bibliographical references, etc. Finally, it provides a wealth of illustrations showing the variability of the species.

The combination of book and CD-ROM, together with the preceding work *Fruits d'Océanie* (published in English as *Fruits of Oceania*), thus provides amateur and specialist alike with full information on the alimentary plants of Vanuatu. We hope that for students of this country it will also be a reference work and a tool, through which they may in their turn increase the knowledge of these plants, and protect them and develop them.

References[2]

Barrau (1962, 1965), Bellwood (1978), Bretting (1990), Golson (1990), Gosden and Robertson (1991), Harlan (1970), Haudricourt and Hédin (1987), Jones (1990), Loy *et al.* (1992), Matthews (1990), Mbida Mindzie *et al.* (2001), Piperno and Pearsall (2000), Roach (1987), Rossel *et al.* (2001), Telford (1986), Terauchi *et al.* (1991), Tryon (1996), White and O'Connell (1982), Whitmore *et al.* (1981), Yen (1985, 1995).

[2] The full list of references is given in the Bibliography in the CD-ROM.

Glossary of terms

The glossary for the French text is taken mainly from Florence (1997)[3] and Boullard (1988)[4]. The glossary for the English translation has also drawn extensively on Willis (1904)[5]. Some terms, already defined in the text, are repeated below for the sake of completeness. Words in **bold type** in the text are defined in the Glossary below.

Acumen – a narrow or tapering point, variable in shape, at the tip of a leaf.

Acuminate – ending in an **acumen**, tapering progressively to a long, fine point.

Acute – pointed (for example of a leaf tip).

Adventitious roots – root-like structures on a plant that perform the functions of roots but are derived from stem or leaf tissue, i.e. are not true roots.

Aerial roots – roots or root-like structures arising above ground.

Allogamous – reproducing by cross-pollination, i.e. within one species, the flowers of an individual plant are fertilised by pollen from another plant (the alternative condition is **autogamous**).

Alternate – where leaves or organs are attached alternately along a stem, not opposite each other (the alternative condition to this is **opposite**).

Amylaceous – containing starch.

Anthocyanin – a pigment that colours plant cells (in fruits, flowers, stems or other parts). The colour varies from red to blue according to the medium in which the plant is growing, whether it is alkaline or acid.

Apex – the tip of a leaf, flower or fruit, away from the stalk or point of insertion.

Apical – relating to the **apex** or tip of an organ.

Aril – an exterior covering or appendage of a seed as an outgrowth that envelops the seed to a greater or lesser extent.

Autogamous – reproducing by self-pollination, i.e. within one species, the flowers of an individual plant are fertilised by pollen from the anthers of the same plant (the alternative condition is **allogamous**).

Axil – the interior angle between a leaf and the branch from which it arises.

Axillary – situated in, or growing from, the **axil** of a leaf or bract.

Bifurcating – dividing into two.

Bipinnate – see under **tripinnate**.

[3] Florence, J., 1997. Flore de la Polynésie française, Vol. 1. Paris, IRD Éditions, coll. Faune et flore tropicales 34, 394 pp.

[4] Boullard, B., 1988. Dictionnaire de botanique. Paris, Ellipses, 398pp.

[5] Willis, J.C., 1904. A Manual and Dictionary of the Flowering Plants and Ferns. Cambridge, University Press, 2nd Edition, 670 pp.

Blade – a broad, flattened part of any organ. Here, more specifically, it is the flat, green part of a leaf that is responsible for photosynthesis.

Bract – a leaf in whose **axil** an inflorescence arises. It is different in size and shape from the true leaves of the plant (see also **bracteole**).

Bracteole – a small leaf in whose axil is found each flower of an inflorescence (see also **bract**).

Bulblet – a small bulb rich in reserves that assures the vegetative propagation of certain plants by natural cloning.

Buttresses – broadened, basal expansions of a tree trunk, standing out as thickened supports.

Calyx – the outer envelope of the flower, comprising all the **sepals** either separate or joined.

Capitulum (plural **capitula**) – a group of **sessile** flowers clustered together into a single, tight head.

Carpel – the **gynoecium** (female component) of a flower, made up of a basal ovary containing the ovules, surmounted by a **style** and a **stigma**. Carpels may be separate, or fused into a **syncarp**.

Cauliflorous – (of flowers and fruits) – growing directly from the trunks or older branches of a tree (as opposed to growing out of leaf axils).

Compound – leaf in which the single leaf-stalk bears more than one separate leaflet (the opposite condition is **simple**).

Cordate – scalloped in the form of a heart or being heart-shaped.

Coriaceous – leathery.

Corm – the swollen base of a stem.

Corolla – the inner envelope of the flower, comprising all the **petals** either separate or joined.

Cortex – bark.

Cotyledons – the "seed leaves" which become the first leaf or leaves arising when an embryo germinates. Angiosperm seed plants are divided into the Dicotyledones (with two cotyledons per seed) and Monocotyledones (with one cotyledon per seed).

Crenate – (of leaf margin) – with rounded teeth and sharp notches between the teeth.

Crown – the head of foliage of a tree or shrub.

Cultivar – a cultivated plant obtained by human selection.

Cupule – part of a plant formed into a small cup, either as a single piece or made up of small scales.

Cyme – an inflorescence whose main axis terminates in the oldest, first-opening flower, and on which subsequent flowers develop later on one side or two sides of the main axis.

Daughter bulb – (also known as an offset bulb) – a small bulb produced at the base of a bulb that is fully developed and planted in the soil. Produces, as a consequence, segmentation of the bulb. An example is garlic.

Deciduous – of a plant where all the leaves fall from the plant at a particular time of year (e.g. in the dry season or in winter).

Decurrent – where a leaf expansion is continued as a wing down the stem.

Decussate – of leaves that are arranged in pairs, each at right angles to the pair above or below.

Dehiscent – (of a seed pod or container) – splitting open when ripe.

Dentate – (e.g. of leaf) with small teeth pointing outwards.

Dioecious – where male and female flowers are borne on separate plants (the opposite state is **monoecious**).

Drupe – a fleshy fruit containing one seed, the **endocarp** of which is hard (i.e. a nut).

Ellipsoidal – a solid object (e.g. a fruit) which is oval in cross-section when cut across any plane.

Elliptical – (of leaf) – tapering equally to base and tip, and somewhat narrow.

Emarginate – **apex** of leaf with a deep and marked notch.

Embossed – (of a surface) – having a raised design.

Endocarp – hard shell or stone inside a fruit and surrounding the seed, which is the innermost part of the **pericarp**.

Entire – (of leaf or leaflet) – without notches in the margin.

Epicarp – (also sometimes called **exocarp**) – the outer skin of a fruit that surrounds the seed and is the outermost part of the **pericarp**.

Epidermis – the outer layer of cells or skin (e.g. of a fruit).

Epiphytic – growing on other plants rather than directly in soil, but not parasitic on those plants.

Ethnobotany – study of the complex relationships between humans and their plants. Classifications, usages and modes of cultivation are always studied from the point of view of those who utilise the plants and according to the particular cultural contexts.

Exocarp – see **epicarp**.

Fluted – (of a tree trunk) – having a series of vertical furrows or grooves.

Follicle – a dry, dehiscent fruit consisting of one **carpel** and dehiscing along the ventral side only.

Frond – the assimilatory organ of a fern, equivalent to the leaf of a higher plant.

Fusiform – spindle-shaped.

Genotype – the totality of genes possessed by an individual plant.

Glabrous – without hairs.

Globular – roughly spherical, having the shape of a globe or ball.

Gynoecium – the female part of a flower comprising ovary, **style** and **stigma** (see also **carpel** and **pistil**).

Hermaphrodite – (of flowers) – having both male and female structures within the same flower.

Heterophyllous – having leaves of more than one form on the same plant.

Hilum – the scar-like point of attachment of the seed to the inside of the seed case.

Hypocotyl – the portion of the stem below the **cotyledons**. When it elongates it lifts the cotyledons out of the soil.

Imbricated – (of scales or bracts) – arranged in rows that partially overlap each other (e.g. like roof tiles).

Indehiscent – (of a seed pod or container) – having no natural splitting lines along which to open when ripe.

Inflorescence – a grouping of flowers on a plant.

Infrutescence – a grouping of fruits on a plant, deriving from an **inflorescence**.

Kava – a sedative, slightly intoxicating drink, obtained from the root of *Piper methysticum* and drunk by men at nightfall throughout the Pacific.

Lanceolate – (of leaf) – lance-shaped, i.e. narrowly oval, with the widest part of the leaf at the base.

Lap-lap – a type of thick cake made by cooking a puree of grated yam, taro, cassava, banana or breadfruit in leaves.

Latex – a milky, usually white and often sticky fluid that exudes from cut or damaged stems of leaves of a plant.

Leaf sheath – a sheath enclosing the young leaf during its development, before it expands.

Leaflets – the individual leaf-like structures of a **compound** leaf.

Lenticels – small respiratory pores in the stems of woody plants, appearing as a series of dots on the bark surface.

Lobate – see under **Lobe**.

Lobe – the rounded portion of a leaf between two shallow indentations on the leaf edge. The leaf is then described as **lobate**.

Luau – coconut milk salted with seawater and cooked in young taro leaves.

Marcotting – a procedure for vegetative multiplication of plants in which part of a branch of the plant (usually a tree) is put into contact with soil (often the soil is bound to the branch surface with plastic), and the branch roots into the soil before being detached from the parent plant.

Mesocarp – the central fleshy tissue of a fruit, between the outer skin (**epicarp**) and the hard shell or stone around the seed (**endocarp**) (see also under **pericarp**).

Monoecious – where male and female flowers are borne on the same plant (the opposite state is **dioecious**).

Morphotype – refers to the external shape or appearance of a particular plant.

Mucilage – a viscous plant material that swells on contact with water.

Nakamal – Bislama term indicating a building (clan hut) for men.

Nalots – small balls of breadfruit paste cooked in coconut milk.

Naturalised – when a plant is introduced to a new ecosystem and reproduces there without any further human intervention.

Ob- (applied to an adjective, it reverses the direction of tapering – see definitions below).

Oblanceolate – (of leaf) – about three times as long as broad, tapering gradually towards the base (in contrast to **lanceolate**, where the gradual tapering is towards the tip).

Oblong – (of leaf shape) – with sides parallel for some distance, the ends tapering rapidly.

Oboval – (of leaf) – egg-shaped, with the broader portion at the apex of the leaf (opposite condition is **oval,** where the broader part is at the base).

Obtuse – blunt, when applied to the shape of a leaf **apex**.

Opposite – where two leaves are attached opposite each other on a stem (the alternative condition to this is **alternate**).

Orbicular – (of leaf shape) – circular in outline.

Organoleptic – something that makes an impression on or has an effect on human sense organs, of taste, touch or smell.

Orthotropic – see under **plagiotropic**.

Ostiole – a small aperture found on the fruit (fig) in the family Moraceae.

Oval – (of leaf) – egg-shaped, with the broader portion at the base of the leaf (opposite condition is **oboval**).

Ovoid – (of a fruit) – egg-shaped.

Palmate – a **compound** leaf in which all the **leaflets** arise from a single point of insertion like the fingers of a hand (the opposite condition is **pinnate**).

Palmatilobate – a **palmate** leaf on which the indentations separating the lobes do not reach to the middle of the leaf blade.

Panicle – an **inflorescence** composed of clusters of flowers, themselves arranged in clusters on a central axis.

Paripinnate – a **pinnate** leaf with an equal number of **leaflets** on either side and without a single extra leaflet at the end.

Parthenocarpic – (of a fruit) – developing without needing to be fertilized.

Pedicel – a flower stalk.

Pedicellate – having a **pedicel**.

Peduncle – a fruit stalk.

Pedunculate – having a **peduncle** (opposite: **sessile**).

Peltate – a leaf in which the **petiole** is inserted in the middle of the leaf blade.

Pendulous – of an inflorescence that is sufficiently long to hang downwards from the branch on which it is situated.

Pericarp – the part of a fruit that covers the seed. May consist of an **epicarp** (outer skin), **mesocarp** (a fleshy mass of tissue under the outer skin) and an **endocarp** (a hard shell or stone around a seed).

Persistent – (of flowers or flower parts) – remaining unwithered on or around the fruit (as opposed to deciduous, where it shrivels and falls as the fruit develops).

Petals – the components of the **corolla**, or inner envelope of the flower; the petals may be either separate or joined.

Petiolate – having a petiole (opposite: **sessile**).

Petiole – a leaf stalk.

Petiolule – the stalk of a **leaflet**.

Photoperiodicity – when the relative lengths of day and night change and this change has an effect on the development of a plant.

Pinna – a **compound** leaf of very large size.

Pinnate – describing a **compound** leaf in which the **leaflets** arise from the sides of the central **rachis** (as in the leaf of a pea plant). The opposite condition is **palmate**.

Pistil – the female part of a flower comprising ovary, **style** and **stigma** (see also **carpel** and **gynoecium**).

Plagiotropic – describes branches that grow horizontally, perpendicular to a vertical axis which is described as **orthotropic**.

Polyembryonic – production of several individuals by division of a single egg.

Polygamous – a plant in which certain flowers are **hermaphrodite** (male and female) while others are either male alone or female alone.

Polymorphic – occurring in several distinct forms or shapes.

Pubescent – with fine, soft hairs.

Q

Quadrangular – four-sided.

R

Raceme – **inflorescence** made up of **pedicellate** flowers on an unbranched axis.

Rachis – the elongated axis of an **inflorescence**, or the main axis of a **composite** leaf that bears the **leaflets**.

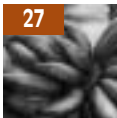
Ret – to leave something to macerate in water.

Rhizome – an underground stem or branch of a plant, often thickened and sometimes serving as a storage organ; looking like a root but distinguished from a true root by the presence of buds, nodes and often scale-like leaves.

Root rot – infection of the root system by a bacterial or fungal pathogen which leads to rotting of the roots and death of the plant.

Rosette – the shape in which a number of elements radiate symmetrically from a central point, particularly of leaves where all are inserted close to one another at the end of the stalk.

Rugose – ridged or wrinkled.



Sagittate – arrow-shaped (leaf).

Sepals – the components of the **calyx**, or outer envelope of the flower; the sepals may be either separate or joined.

Sessile – without a stalk, attached directly at base (of leaf or fruit; opposite conditions are **petiolate** or **pedunculate**).

Simple – a leaf with only one leaf on the leaf stalk (opposite condition is **compound**, where there are several **leaflets** on each leaf stalk).

Somatic – relating to the body (in this case the vegetative organs) of a plant, as opposed to the reproductive cells and genes.

Spadix – an inflorescence that is a fleshy or succulent spike, bearing flowers that are unisexual and **sessile**.

Spathe – a sheath that envelops a **spadix**.

Spherical – shaped like a sphere or ball.

Spike – an inflorescence where the **sessile** flowers (or groups of flowers known as **spikelets**) are spread along the length of a **rachis**.

Spikelet – one of a group of flowers making up a **spike**.

Stamen – the male part of a flower that produces the pollen.

Stigma – the part of the **pistil** of a flower that receives the pollen at fertilization.

Stipules – the pair of small leaflike appendages arising at the base of the leaf in many plants.

Stolon – a long, creeping stem differentiated from the roots and leaves, usually formed as an axillary branch on the main stem near the base, growing along the soil (or just beneath it) and rooting at the nodes.

Style – the part of the female flower connecting the **stigma** to the ovary. Generally tapering in the shape of a filament.

Sub- (as a prefix to any adjective) – nearly, e.g. subsessile = nearly sessile.

Subglobular – almost globular.

Sub-opposed – almost opposed.

Subsessile – nearly sessile (e.g. with a very short leaf or fruit stalk).

Sucker – a vigorous stem arising from the root of a tree, or more generally the underground stock of a plant.

Syncarp – a fruit arising from a **gynoecium** made up of fused **carpels** or a fruit made up of elements that are totally united into one.

Tapa – cloth made from tree bark beaten flat.

Tarodière – a taro garden, usually irrigated and comprising a series of small pits inside which flows water coming from a single source.

Tepal – name given to the pieces of a flower when the petals and sepals are completely identical.

Terminal – at the furthest point away from the point of attachment of anything. In the case of the crown of a tree, the uppermost part of the tree.

Trilobate – having three lobes.

Tripinnate – a leaf or frond composed of three **leaflets** or **pinnae** (called **bipinnate** when there are two leaflets or pinnae).

Tuber – a subterranean stem or part of a stem that is thickened and contains stored reserves of nutrient material.

Tuberised – describes thickened roots or stems that look like tubers.

Tubular – (e.g. of a corolla) – with the separate petals joined together to form a tube-like structure.

Umbel – an **inflorescence** composed of a number of flowers whose small **pedicels** (flower stalks) all arise from a single point and are the same length, giving the inflorescence a rounded shape.

Undulate – (of leaf margins) – wavy.

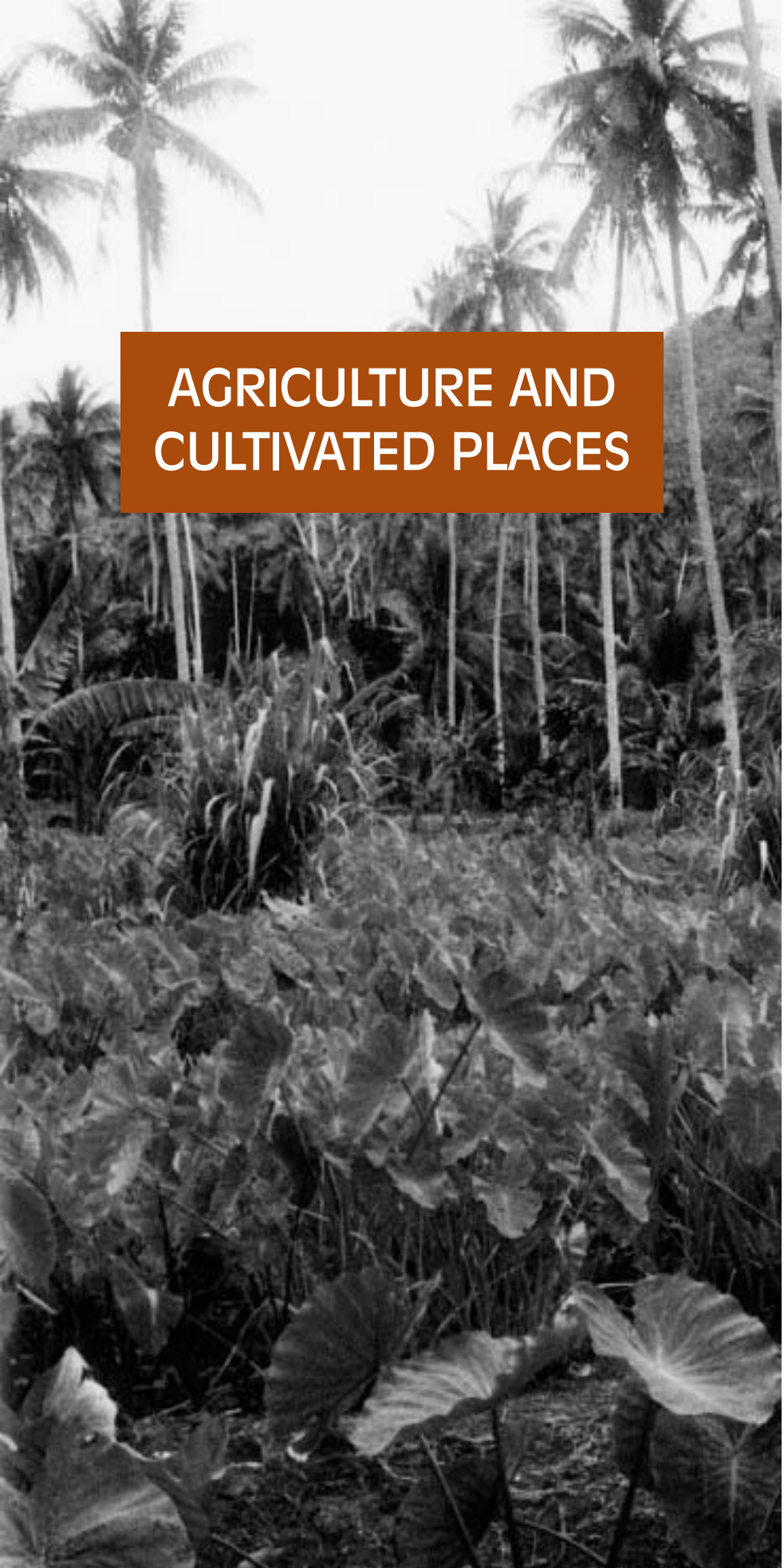
Vegeculture – cultivation and groups of plants multiplied entirely by vegetative propagation, using holes dug for planting and without tillage. [Note: Vegeculture is the French term but is not usually used in English. There is no specific English term other than 'vegetatively propagated plants'.]

Vegetative propagation – reproduction that does not involve any sexual process. Produces clones.

Vesicant – a plant that produces small blisters on the skin when touched.

Whorl – a number of leaves or flowers arranged in a circle around the same point on a stem or axis.

Wing – flattened, somewhat leaf-like expansions on certain organs (stem, fruit).



AGRICULTURE AND CULTIVATED PLACES

Agriculture has always been the main activity of the ni-Vanuatu – the one around which all other activities are ordered. Nowadays 80% of the population still leads a rural way of life, and among those, three quarters are engaged in agriculture.

This agriculture is first and foremost a subsistence horticulture[6] which provides the population with its staple foods for subsistence, with yam, taro, sweet potato and cassava being the four main cultivated root crops. Yam, which likes warmth and well-drained soils, is mainly grown on sunny banks and terraces in coastal areas. Taro, which likes humidity, is planted on the whole in inland areas, at least when it is not irrigated. Sweet potato and cassava, which are introduced plants that are less demanding, are grown equally in coastal or inland areas, generally on soils of moderate fertility. Each cultural group has available an area of land with varied environmental characteristics, and grows a wide range of food plants there. Nevertheless, the choice of staple food (taro or yam) depends on both environmental and sociocultural factors. One community may specialise in the cultivation of a root crop of high status, though not to the exclusion of all other root crops. The root crop of status is often the one that grows best in the land that they occupy. Thus people in leeward areas mostly grow yams, while those in windward and inland areas grow taro, whether or not they belong to the same cultural group.

Since earlier times, the plant with high status, which nowadays is not necessarily the one most eaten every day, is utilised in all the ceremonies and rituals of the community. These feasts provide an opportunity for huge quantities of root crops or their products to be brought forward, in amazing forms such as the elongate yams that can reach 2m in length. Those in the community who are able to offer either a large quantity of roots or roots of rare shapes are highly regarded, and although they do not become wealthy from this, they gain long-lasting prestige. These gifted agriculturalists, who bring honour to their entire community

[6] Barrau (1967: p.286) emphasises "the important contrast between horticulture and agriculture, between the enclosed area of the *hortus* or garden and the open expanse of the *ager*, between the agricultural crops sown by seeds and harvested with a scythe and the horticultural crops planted one by one, pricked out or propagated by suckers, and lavished with individual attention". This distinction has been criticised by many authors, particularly because the term horticulture may have a number of meanings and is also used for work undertaken in recreational areas in which it would not be practicable to produce subsistence crops. We use the term agriculture in a general and neutral sense, for the growing of domesticated plant species, and the term horticulture in the narrower sense of the cultivation of edible root crops within a garden. The term arboriculture will be used for the cultivation of trees.

and to the memory of their ancestors, profit greatly through their high social recognition.

Further, this plant of high status, the culture of which engages the full and careful attention of the entire community, becomes a sort of identifying mark of the village group and becomes a valuable asset for exchange. The networks for non-commercial exchange, around which food plants circulate, spread beyond the limits of a single island and may stretch over very long distances. The act of growing food plants is thus tightly linked to the foundations of society's culture, and beyond its function as food the plant plays a role in the political, social and economic spheres of the society. To be a grower of crops is thus not just a type of work, it is a career to which one devotes one's total work effort, energy, imagination, powers of adaptability and talent.

Because people live above all in an area of land that they organise and move around in according to their needs, their constraints, their use of time and their culture, we will present here their activities in producing food crops according to the types of space in which they have chosen to do that. The annual species, climbing plants and herbaceous species occupy the main part of the garden, while the perennial plants, shrubs and trees are spread around the gardens or along tracks. We should emphasise, however, that over the course of time one type of space will succeed another.

Gardens

Two main types of garden exist in Vanuatu: slash-and-burn gardens and irrigated gardens. The former are most often associated with yams and the latter with taro, though this division is not entirely fixed. In addition there are sweet potato gardens, banana plots and mixed gardens, not forgetting also the urban kitchen gardens.

Rainfed gardens and cultivation of burnt areas

Cultivation of burnt areas is the oldest system and the most frequently practised. In a given area of land whose boundaries are often rather vague, all the farmers who have the right to do so will each year clear an area of land that will be cultivated for three years, and then abandoned for a longer or shorter time before being once more cleared and cultivated. In the north of the archipelago this land is passed from generation to generation along a patrilineal line, i.e. from father to eldest son from the time of the first clearance. In the south a system of entitlement that is both flexible and intricate sees each man receive a parcel of land, the guardian or keeper of which is the most direct descendant of the first man to have settled on and utilised that land, in mythological times. In whichever case, it is not true

ownership of the land but usually a right of usage allocated in a proper manner among all members of the community. Within this general framework, rights to the land vary from one group to another according to diverse factors.

The typical crop on slash-and-burn land is the yam, one of the two most important ritual plants of Vanuatu together with taro. But this system of culture is also used for taro and for sweet potato.

The yam garden

Yams play a particular role in the calendar of communities because, in contrast to other crops in the garden, they have an internal biological clock which determines the rhythm of the associated cultural activities: preparation of the soil, planting, maintenance and harvesting. The tubers of these annual plants regularly go into dormancy, and the cycle of growing can only begin when the temperature becomes very warm and the tubers start shooting – generally from August to November which are the dates for planting them in soil in new gardens. This is followed by a phase of strong vegetative growth during which work on the crop is minimal, then a stage of harvesting which extends, according to variety and species, from April to July. This rhythm of the yams is also that of the traditional society which organises itself around these activities.

The parcel of land allocated to the head of a family is often subdivided into smaller lots that are cultivated by each member of the nuclear family – husband, wife and children near the end of their schooling. In certain islands, such as in the interior of Pentecost, this portion of land supports three to four cropping cycles, the first being obligatorily kept for yams, which require a rich soil. Elsewhere, such as in Torres, the piece of land is only cultivated for a single season. In such islands the land is then abandoned for more than thirty years, while the average fallow is ten or so years. Each individual simultaneously cultivates several patches of land of different types. Nowadays, when the land is more and more subdivided and the population is increasing, the size of family gardens has a tendency to decrease and the number of patches of land cultivated by each family tends to grow. Each community possesses semi-permanent areas for cultivation or short rotation, and spaces for cultivation that are somewhat moveable and are aimed at keeping alive the proprietary rights over that land.

Traditionally, each portion of land picked according to the appearance of its secondary vegetation is cleared of scrub and cleaned up in order to leave the soil as suitable as possible: tall trees are felled, or left in place to serve as supports for yams to grow on, and the brush-wood is cut with a machete and piled in small heaps around the field or patch of land. On very

steep land the trunks of large trees are placed along contour lines to prevent soil erosion. Barriers are then constructed to protect the crops from roaming wild pigs, though nowadays these are less and less used. When everything is dry the females scour the soil, clearing out large stones so as to leave bare soil. Then they burn it all and spread the ash over the whole plot of land. Cultivation can then start.

Preparation of the soil is minimal; it is broken up with a digging stick, but only in the centre of the garden where the ceremonial yams are planted, and in places at the edge where the women plant the subsistence yams. The planting of yams destined for rituals requires careful work. The hole is deep, enriched with compost and ash, and then covered over with a mound that may be a metre high as in Tanna or Malekula. The seed material is lightly buried in the top of this hillock. Round subsistence yams are easier to cultivate. The hole is much shallower, sometimes hardly a hole at all, and the height of the mound, if it exists, is only 20 cm or so. In the majority of islands, as soon as the vines begin to shoot the yams are staked with bamboo, slender lengths placed against the burnt tree-trunks or driven into the soil. The stakes for the greater yams, tall in size and made of wild canes, have a variable structure according to island. The finest and most elaborate are seen on Tanna. These are large, slanted structures skilfully made of reeds spliced together. In the centre of Pentecost yams are not staked and the vines run freely over the ground. In the northeast islands of Malekula and Malo and in various other parts of the archipelago, the tall trunks of dead trees (for example *Dracontomelon vitiense*, *Spondias cytherea*) are used as supports for certain species of yam (*Dioscorea nummularia* amongst others).

The new yam garden is then supplemented with other plants usually planted around the edge of the garden or between the bases of the current yams: kava (*Piper methysticum*), island cabbage (aibika or bele: *Abelmoschus manihot*), tannia (macabo or cocoyam; *Xanthosoma sagittifolium*), naviso or pitpit (*Saccharum edule*), maize and cassava. The spatial distribution of these species within the garden and the degree of mixing of the plants varies from one island to another and from one community to another, ranging from a strict monoculture of yams on Malo to no segregation of species at all on Malekula. So it is very difficult to paint a general picture of a Vanuatu garden, each farmer having his particular techniques and know-how. However, one can say that this first-year garden will be succeeded by gardens of the second and third years in which the diversity of plants will be greater.

The planting material used is whole, healthy and undamaged yams for the ceremonial yams, and small yams or even fragments

Village of Tassiriki (Santo).

OPEN AREAS AND CROPS

Village of Valeteruru (Santo).

Vanuatu family.

Water-filled pond planted with young taro plants. Maize is being grown on the banks.

On the west coast of Santo irrigated taro gardens are sometimes put in under coconuts.


© A. Walter

Yam garden (*Dioscorea alata*).


© V. Lebot

When they move to a new area of residence the ni-Vanuatu begin by planting trees, even before building their own dwelling.


© A. Walter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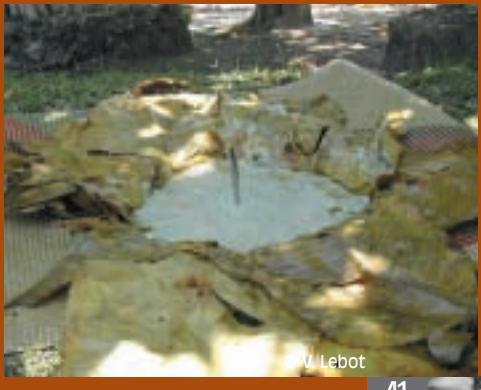
Stones are heated by a wood fire, and foods are then placed in this oven to cook.

Root crops, meat or a *lap-lap* are cooked in ovens of hot stones.

Lap-lap is a paste of root crop, breadfruit or banana, obtained after the plant material has been finely ground with a hand-made grater. This fresh paste is spread out on leaves of *lap-lap* (*Heliconia indica*), then carefully wrapped up before being cooked in a traditional oven of hot stones.

PREPARATION OF *LAP-LAP*, A NATIONAL DISH OF VANUATU



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Large leaves of *lap-lap* for sale in Port Vila market.

Port Vila and Luganville are the two large markets of Vanuatu.

Taro grown in Santo is sold in bunches in the Luganville market.

The big urban markets, such as this one in Port Vila, offer the majority of food plants that are produced in the country.

Small *lap-lap* parcels ready to cook.

In the market one may find all sorts of ready-prepared dishes, made and sold by the women of nearby villages.

A selection of different types of *lap-lap* for sale in the market.

Small parcels of *lap-lap* (*tuluk*) cooked in leaves of *Heliconia*.

of root for the others. Great variability may be seen even within a single garden. Different species lie next to one another, and even among those a great diversity of cultivars is utilised. Each community has its particular clones, with their own vernacular names, and each individual has his own particular collection. The shades of green and variations in shape of the leaves and the colour of the young shoots give the garden an attractive appearance. Planted in July, the yams begin to be harvested in April when the vines start to dry out. The average yield of ceremonial yams is about 25 tonnes per hectare and that of the day-to-day yams is about 15 tonnes per hectare. The yams do not keep in the soil, but are stored for several months in small huts constructed for the purpose (Pentecost) or on beds of bamboo (Santo). This seasonal cultivation is particularly prone to climatic hazards, especially cyclones which break the vines.

Taro gardens

Taro is grown in forest clearings prepared in the same way as those for yams. To prevent soil erosion, logs of wood are placed across the slope. The planting of rainfed taro takes place every three months, and on each occasion a new patch of land is cleared, each of which can support an average of three cropping cycles.

The taros are planted one by one with a digging stick in small holes about 1m apart. At the end of three months the area of land is weeded, and the hole around the plant is cleaned of small stones and undesirable detritus and then enriched with compost. After that any suckers are removed, and these are then replanted in a new patch of land. The suckers are not the only planting material utilised. The crown of a harvested taro plant is often replanted in the same hole or in another patch of land to make ready for a new harvest. The taro is thus grown and harvested over a period of a year, on one patch of land or another. As a general rule no other plants are cultivated in this garden, though island cabbage (*Abelmoschus manihot*) may be planted around its periphery. The yield from a garden of rainfed taro is about 10 tonnes per hectare, which is less than that of yams over a comparable growing period. Rainfed cultivation of taro is very widespread in Vanuatu, and is practised in all inland areas, to a lesser extent at higher altitudes.

Irrigated cultivation of taro

Irrigated cultivation of taro is practised in almost all the islands of Vanuatu, by various different methods. The most simple consists of planting small pieces of taro in the beds of little streams, at the points of emergence of springs or in the wet edges of watercourses. Some of these places may be artificially enlarged.

Boggy areas and low, swampy ground are likewise used for cultivation of taro (Pentecost). This is drained cultivation where the level of free ground water is controlled, whether in upland areas or in lower plains, in order to maintain the correct moisture levels in the raised beds. While taro grows well in moisture, it dies in stagnant waters because its roots rot. In this type of cultivation, the taro is planted in dry banks of earth separated by a complete network of drainage channels. The best clones – those that are reserved for ceremonial exchanges – are placed at the edges of these areas close to the channels, while the taro for everyday consumption is planted at the centre. The area is mulched and weeded three times between planting and harvest. Such an area supports on average two cropping cycles, the first a monoculture and the second mixed (with banana, kava and other plants). The planting material is suckers and crowns from taros planted in the same area or another one.

Large complexes of these *tarodières* or taro gardens with irrigated basins are established in the wet islands of the north (Torres and the west coast of Vanua Lava), Santo, Maewo, Pentecost and Ambae, as well as in the islands of Futuna and Anatom (Aneityum). Ready water is assured from a permanent river by constructing a dam of stones which diverts water into a main irrigation channel. This may either be cut into the soil or it may be an aerial channel made from bamboo. The channel carries water to the first basin, from where it flows from basin to basin down to the last at the bottom of the slope. Earth walls, tree trunks or stones demarcate the set of pits in the water, in the insides of which the taro planting material is set. The largest allow the taro growers to move around in them, and all are provided with openings to allow the water to flow from one basin to another.

The organisation of the hydraulic network may show several variations in regard to the topography of the area and the cultivation practices. The land on which such a taro garden is laid out belongs to one man who has the responsibility for upkeep of the hydraulic network. Each taro garden is used by several taro growers who progressively construct, cultivate and maintain their own basins, and each owns several basins in different taro gardens. New basins are planted with suckers previously set aside from other basins. Then, once the taros reach maturity they are harvested as they are needed, and the basins are immediately replanted with the crowns of the harvested taros. The cultivation of irrigated taro is thus a permanent cultivation, except in certain places where the seasonal availability of water leads to cultivation that is equally seasonal (Wusi on the west coast of Santo, for example). One of these taro gardens may be used continuously for a period of twenty or so years before being abandoned for a similar length of time, then restored. It is an area for poly-

culture with spatial separation of the species. In the interior of the basins is grown the taro; on the supporting walls all sorts of subsistence crop plants may grow, and some fruit trees: cut nut (*Barringtonia*), orange, banana, coconut. These last, planted along the lines of the walls, become after a number of years a sort of plantation. The yields of the irrigated taro gardens are high, and reach on average 25–30 tonnes per hectare — sometimes even more.

On Anatom a special type of taro garden is found, that consists of small furrows cut along the slope, between which the taro is planted. The water flow is thus divided at the point of intake of water into strip irrigation.

Other types of garden

Cultivation of sweet potato, which is not a prestigious root crop, is increasing in importance in the subsistence cropping systems of Vanuatu. It is easy to grow, and all families have several plots of this crop. In former times it was produced entirely for consumption in the home that grew it, but nowadays it tends to be produced for sale. It is adapted to various soils, climates and altitudes, and can thus be exploited virtually everywhere. The crop is planted in land that has been covered by secondary vegetation, then slashed and burned. It may also be replanted in patches of land in the second year after yams have been grown in the first year, or it may be mixed with other species in a garden of the second or third year. Multiplied by 20–40 cm long cuttings or by fragments of the tuber, it is planted directly into the soil or mounded up in small hummocks or ridges. According to variety, sweet potato reaches maturity after 3–6 months, is available throughout the year and requires little upkeep apart from frequent weeding when it is beginning to grow. A number of cultivars of sweet potato exist, but they are much less numerous than those of yams and taros. Sweet potato, which does not feature in any form of ritual, is always a secondary root crop except in the northeast region of Santo where, introduced around the 16th century, it has always been dominant.

Banana is an ancient crop of Vanuatu, augmented since European contact by numerous introduced varieties. The two local species are *Musa troglodytarum*, or fehi banana, and cultivars of *Musa* spp. (*M. acuminata* x *M. balbisiana*) that comprise plantains and bananas. These two species have always provided an important supplementary food and are nowadays sold as commercial crops in urban markets. Banana is adapted to different soils and altitudes, and likes exposure to sun, humidity and spaces that are protected from the wind. It is generally cultivated amongst other plants in the food garden, or around the gardens, in isolated semi-permanent plantations, or even planted sometimes in a patch of land cleared each

year (Pentecost) or grown during the second year after yams (southeast of Malo). Isolated clumps are also found near footpaths and in garden areas. The plant is propagated vegetatively, using young shoots that come up around the bases of full-grown plants. After one year the plant is mature, and growth continues for a number of years through successive maturity of suckers. Upkeep is minimal, and fruits are continually available. Each community has available from ten to twenty different cultivars. As the banana plots are small and always isolated one from another, transmission of pests and diseases is relatively well controlled, which is certainly not the case with the very large plantations grown commercially.

Yam, taro, sweet potato and banana are thus planted alone in particular gardens, even if numerous subsistence plants later come to grow alongside them. But in this case there is always a certain hierarchy to the plantings within the garden.

Traditionally, mixed gardens were established on plots of the second rotation after yams. In certain places, such as the northeast of Malekula, these gardens were always planted – right from the first year – alongside patches of yams in monoculture. Nowadays, through lack of space and also because yams have lost some of their ritual significance, these mixed gardens are becoming more and more frequent.

Fruit arboriculture[7]

Arboriculture in the broad sense, that is the planting and upkeep of trees of practical use, is the second cornerstone of Oceanian agriculture in general and Melanesian agriculture in particular. It appears to have developed first of all in Solomon Islands, then in Vanuatu, as groups of people progressively left the large landmass of New Guinea in order to penetrate island Oceania. In Melanesia it involves numerous species with sexual reproduction, while in Polynesia there is a smaller number of species, some with vegetative propagation such as breadfruit. Melanesia can be considered to have played a major role in the domestication of these species, and is still today an important storehouse of these genetic resources.

In Vanuatu, a tree belongs to the person who planted it. In that respect arboriculture does not differ significantly from horticulture. But a tree is a perennial plant that occupies the patch of soil in which it is growing for several generations, while the soil of a garden returns to the entire community after it has been used for a crop. This individual possession of a tree has led to a particular way of managing this type of cultivation, at the spatial level and in the development of a particular form of inheritance. A tree is thus used to identify a particular piece of land and serve as evidence

[7] This section has been extracted from the work of Walter and Sam (1999) – Fruits d'Océanie. Paris, IRD Éditions (English version – Fruits of Oceania. ACIAR Monograph 85, 2002). Here we reproduce the main points.

in disputes over land that are so common nowadays. This practice is unfortunately tending to increase thanks to coconut palms, whose shade and powerful root systems interfere with development of intercrops, particularly subsistence crops.

Trees of practical use, and particularly fruit trees, are planted as a priority in the private land belonging to a family: around the house and around the garden. They can thus continue to use the trees during periods of fallow and sometimes beyond if the land then has to be cultivated afresh. Trees are also planted in spaces situated near a village that are kept for that purpose. In this case the land used continues to be the property of the whole community. They are also grown along tracks, along footpaths leading to gardens and in large plantations of coconuts which themselves are nowadays mostly managed collectively. Fruit trees are also found in the forests, where they provide indications of ancient settlements or are markers of territory. Quite often the original ownership of these trees has been forgotten, and they then come to be the property of the whole community.

In earlier times, but only rarely nowadays, fruit trees of a dead person were partly destroyed by the descendants in order to avoid having the area of land locked up. Some farmers try to appropriate pieces of land by planting trees on them, but this practice, which is disapproved of by the community, generally leads to conflict over the land's ownership. It is thus very difficult for an individual to establish a small plantation of fruit trees for commercial purposes on any land whatsoever. This type of orchard when it is established generally belongs not to a single individual but to a family grouping or a group of individuals who are related and joined together by a social agreement (*"cooptation")*.

The harvest from a fruit tree as a rule belongs to the owner of the tree, but anyone may pick fruits as long as they are for their own consumption and not for sale. Commercial exploitation of fruit trees is contentious, even if the yield of the trees is enough to satisfy both domestic consumption and market supply. If the owner of some trees wishes to sell the harvest from those trees, he fastens leaves of *Cordyline* to the trunks to forbid anyone to pick any fruits. Such a ban is generally respected by all.

Regardless of this anyone may, at any time of day, pick for themselves a few fruits situated in their immediate proximity.

Trees of the village

Within a village, trees are planted in large numbers, creating a feeling of abundance and well-being that captivates and impresses a visitor. They add an aesthetic note to which the ni-Vanuatu are very sensitive. When a family or a group residing in a place decides to move to another site to dwell, they begin by

planting trees. Then they build one or more houses. Later the domestic area is augmented with new trees until they achieve the magnificent village orchards that may be seen in coastal areas and in the small islands.

Cultivated and selected species that are planted within the village are usually small and not bulky or obstructive. One may find cut nut (*Barringtonia*) trees, and orange, grapefruit and breadfruit trees. A little nearer the edge will be sea almond (*Terminalia catappa*), Tahitian chestnut, golden apple, mangoes and certainly coconuts. All these trees, with the exception of breadfruit and sometimes golden apple, are propagated by seeds or at least by transplantation of small seedlings that have germinated at the foot of adult trees. The seedlings are carefully weeded, sometimes watered, and protected from cavalcades of children and wandering domestic animals (chickens, dogs and even pigs). As soon as the tree has reached maturity, no further care is necessary apart from regular pruning to prevent the tree becoming too tall, which would make harvesting the fruits difficult. Later on it is no longer necessary to weed because the ground is constantly trampled by people picking the fruits.

The village and its immediate environs thus constitute a nutritious area with plentiful fresh fruits and nuts and also starchy fruits such as breadfruit. This storehouse of nutrition is intended in the first place for children who, when their parents are in the gardens, entertain themselves by picking nuts, cracking them with a stone and nibbling them. It is also useful for the community as a whole, who can on rainy days pick breadfruits and prepare meals without having to go into the gardens.

The village orchards also constitute good collections of varieties. Not everyone has a passion for plants, but the majority of ni-Vanuatu nevertheless harbour a desire to collect together different types of certain fruit trees on their own piece of land. One can thus find the majority of known cultivars in quite a restricted area. Each farmer plants one or two trees in the course of his life, except when a new village is being established. The multiplication of these individual small acts results in selection and protection of the better cultivars – those with the largest fruits, or the juiciest, sweetest and least fibrous, or whose nuts are tender and easy to open.

Paths and tracks

The edges of roads, pathways and tracks leading to gardens are the spaces that provide the greatest density of fruit trees. Trees planted here are smaller and have thirst-quenching fruits such as mandarins, oranges, grapefruits and golden apples. Mangoes with their large crowns give permanent shade and sweet fruits. They are particularly abundant on the dry, leeward coasts such as the west coast of Santo. Also found are numerous

self-sown papayas, normally used for feeding pigs because those intended for young children are grown in the gardens or near the houses. Finally custard apples, bullock's hearts and passionfruits are also planted in these much-frequented places. Nut trees such as canarium nut are also common along paths.

Some of these trees are planted; others appear spontaneously, but are looked after by those who utilise them. They are exploited for several consecutive years, because even though the cultivated plots of land may shift from year to year, the same footpath is used to access them. In going out to the garden or returning, the farmers, (particularly the women farmers) make frequent stops to peel some mangoes, shell some nuts or divide up a papaya. The gardens provide the staple foods, rich in starches, while the fruits that are cultivated or looked after provide essential vitamins, always eaten outside mealtimes.

Commercial plantations

Coconut

Since colonisation, certain fruiting trees have become the objects of commercial production. The best known among these is definitely the coconut[8], exploited for copra. Coconut is a local species, but before the establishment of the large coconut plantations it was not produced very abundantly in Vanuatu where people had plentiful sources of fresh water for drinking. It was nevertheless cultivated, but with little selection, among the other species on the land set aside for arboriculture. It was used for its nuts, nibbled just as they were, the milk of the nuts which was used in sauces, for its wood, or for its leaves which were used to make matting. It was certainly not planted in rows, nor grouped into big patches except perhaps on the coastline. When Vanuatu entered the world of commercial production, many communities brought together land that was available to them along the coastline, in order to plant and exploit the coconut that was able to provide them with a cash income. Nowadays there are huge coconut plantations whose profitability varies considerably from place to place. Copra, whose price has dropped, does however remain one of the main export commodities. For local people, coconut is an important tree for food, regularly used for its coconut water, its milk, its pulp and even its germinated seed. It also provides an important food for pigs, and it is estimated that several thousands of tonnes are eaten each year by humans and animals.

Coffee

This commercial crop, introduced by European colonists to satisfy export markets, was accompanied at Independence (1980) by numerous development projects. Arabica coffee grows mainly in

[8] This book is dedicated to food species of Vanuatu, and we will not present a long account of coconut and copra since some already exist – in particular Weightman (1989: 121-162) has provided comprehensive information.

the centre of the island of Tanna, whose low temperatures favour its expansion, and Robusta coffee is grown on the island of Santo. Vanuatu produced about 80 tonnes of coffee at Independence, but 20 years later, despite support from European development agencies, coffee is in jeopardy and does not enthuse the Melanesian horticulturists who find its cultivation calendar very constraining.

Cocoa

The history of cocoa in Vanuatu is similar to that of coffee; it was one of the major colonial crops destined for export and encouraged by multiple development projects financed by western agencies, but it does not seem to enthuse smallholders who find it has many constraints and poor financial returns. Production is decreasing and rats are devastating the plantations. One project is attempting to reverse the trend by finding markets for organic and aromatic cocoa. The perennial nature of the price speculation is a real constraint when pressure on land is great. The cultivation system based on a long fallow is nowadays greatly limited by population pressure. Access to new land is difficult because of the absence of roads into the interior of islands, and poor upkeep of tracks opened by forest exploitation.

Kava

The main source of income nowadays for farmers is kava. The great majority of the trade is in the domestic market, but an export market is also developing. It is a recent phenomenon, having begun at Independence thanks to a search for a Melanesian identity and to the acceptance by the people of a product that is ready to use: the fresh extract sold ready to drink in kava bars. Sales have nowadays reached about 10,000 tonnes per year, of which two thirds are consumed locally. This remarkable development has happened entirely through the private sector.

Many other plants, local and introduced but all part of the subsistence cropping system, are nowadays planted for commercial purposes. Alongside the annual crops such as ginger, peanut, pepper, vanilla, sweet potato and taro that supply the local markets and some export markets, certain trees also appear promising. Canarium nuts, cut nuts and sea almonds (*Terminalia catappa*) are sold in groceries as dried nuts, and international markets for these products appear to be opening up. All the crops that previously had market potential are now being grown for sale, but their development is often temporary and depends more on market demand than on the true potential for cultivation. Each certainly encounters cultivational or environmental constraints that are specific to them.

Urban markets and places for foraging

The towns and the forests are two other areas that are rich in food plants. In the former, markets and urban gardens allow town-dwellers to retain a diet that is based on local ingredients. The latter gives rural populations an important selection of plants to complement their diet and extra resources, carefully looked after, that can be utilised in case of food shortage caused by a natural disaster (consecutive droughts caused by the El Niño phenomenon and seasonal cyclones are the main ones).

Urban markets

Two large markets exist in Vanuatu – one in Luganville in Santo and the other in Port Vila in Efate. They are open every morning except Sunday, and through their operation they provide an opportunity, specific to the calendar of each town, for people from the villages of these islands to sell their produce. These are mainly women, who come year-round to offer the produce from their gardens on their stalls. The produce is grown without fertilisers or insecticides, and is seasonal, abundant and very fresh. In these markets may be found the entire range of food plants produced in the country, but because those who buy from the markets are urban dwellers and often from elsewhere, the main offerings in the market are introduced plants that are usually bought by Europeans and Asians. Sometimes the vendors say that they themselves do not know the taste of the products that they sell. Traditional products from the gardens may also be bought there, grown beyond the needs of a household in order to sell the surplus. Some, such as island cabbage (*Abelmoschus manihot*) and sweet potato, are sold throughout the year, while others, such as breadfruit and yam, are sold seasonally as they are harvested.

These products are not sold by weight but by the piece, in packets, small bags and bunches that are not of any standard size. The price per unit weight may thus vary greatly according to the nature of the unit purchased. On the other hand there is little competition between the sellers who, depending on the day, may be from the same village and agree beforehand on the price of a product. A cucumber, a bunch of chives or a basket of oranges all have approximately the same price on all the stalls. Purchases are most often made according to social relationships that the buyer may maintain with one or another of the sellers. Prices do not fluctuate according to the season, or with the time of day. Likewise strange is that prices do not appear to vary according to whether the product is abundant or scarce, or whether the market is just opening or near to closing.

In Port Vila, where the food products are regularly dearer than in Santo, a slight rise in cost may be seen on Saturdays which is the day when the central market is frequented by the majority of expatriates.

Town-dwellers may also buy ready prepared dishes, sold by women from nearby villages: all sorts of *lap-lap*[9], fritters and baked meats.

Urban gardens

Urban populations, in Luganville and even more in Port Vila regularly grow all sorts of food products around their houses or on land close by, without which they would certainly not be able to maintain a healthy diet. These gardens, worked during rest days or kept up by one member of the family, most often contain a range of vegetables and fruits essential for preparation of meals and not very costly. The families also buy rice, bread and other groceries as the main food, and then complete a meal with small dishes made from the products grown around the home. Many people say that without this home produce they would not be able to feed their family. Urban gardens have the greatest number of different plants, but the least number of varieties in each. Commercial seeds, imported every year by Chinese grocers, are very popular among the ni-Vanuatu, who quickly experiment with new arrivals according to what is received, with greater or lesser degrees of success.

Foraging

Finally, townspeople and villagers eat a great diversity of species collected from the forests. All are used in small quantities: ferns, *Ficus* leaves and wild fruits are continually eaten as snacks by children and adults. All these species also provide a reserve of foodstuffs that can be used in times of food scarcity, and they are therefore carefully maintained and protected. Exceptional trees are quickly noted, and although vegetative multiplication is not possible, any of their seedlings that come up in the wild are dug up and replanted somewhere more favourable where they can be watched over. Wherever they go, the rural dwellers of Vanuatu know that they will always be able to find something to eat when they roam freely through the great forests. One single spot may in turn be a garden, a patch of secondary forest, a village, then again a forest and so on. The cultivated spaces that we have just described are thus not fixed and immutable, and over a long period of time vegetable growing, arboriculture and foraging may all succeed one another at a single place. As a consequence, over two thousand years the primary forest has been reshaped by human activity, which has progressively replaced the wild species with species of practical use.

[9] A national dish of Vanuatu, *lap-lap* is a sort of thick cake or pudding made from plantain bananas, breadfruit or various roots and tubers, made by grating the root or fruit. The grated puree is then packaged up in strong and pliable leaves and cooked in an oven.

Note

The inventory that follows is presented by major botanical grouping: roots and tubers, trees, climbing plants and herbaceous species. Within each of these sections, the genera are presented in alphabetical order in the form of dossiers or capsule summaries on each.

An introductory box records he name of the family to which the genus belongs, indicates the number of species in the genus, and specifies those that are present and eaten in Vanuatu. For each genus the main references are given, cross-referenced to the main bibliography in the CD-ROM that accompanies this book. References in **bold type** indicate the latest revision of the genus or at least the most recent that we were able to consult. These references are very selective and essentially refer the reader to reference works that provide full bibliographies and botanical or ethnobotanical articles focused particularly on the Oceanian region.

Each species present in Vanuatu is then covered in alphabetical order, treated under the following headings: history, botanical description, morphological variability, cultivation and production, uses for food, and other uses.

The history of the plant indicates its origin, its utilisation by people in ancient times, its migrations and its arrival in Vanuatu.

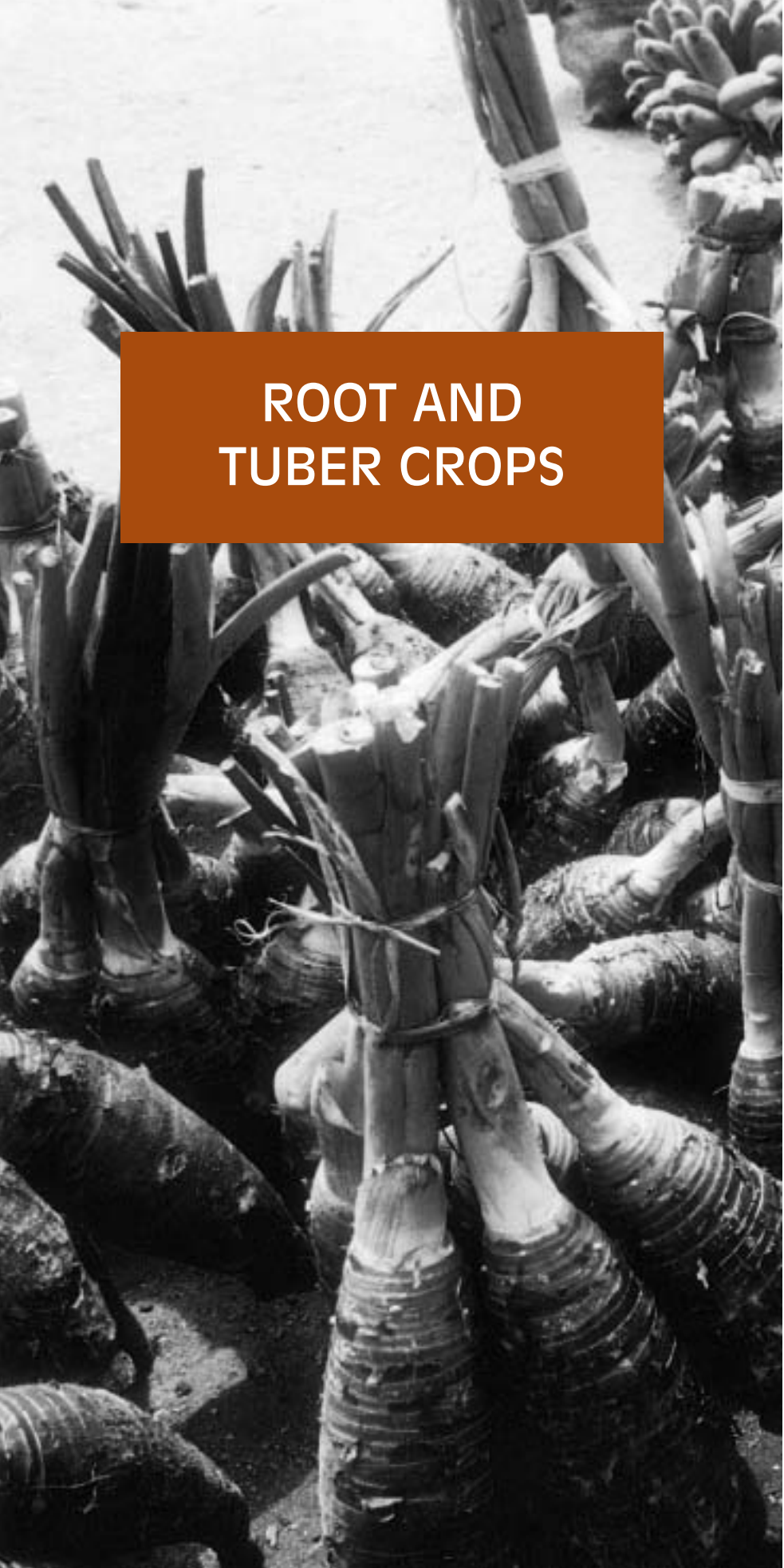
The botanical descriptions, all concise, allow quick identification of the plant. These are complemented by colour photos gathered together in the grouped colour plate sections.

The morphological variability is that which can be observed in Vanuatu. It can be very large for some species, such as yams and taros, and the reader will find abundant illustration of these in the CD-ROM.

Finally the book presents (in sequence) the manner in which the plant is grown in Vanuatu, its uses for food, and (where such exist) its other uses.

In addition, for each species the book classifies where the plant fits in the diet, as follows:

- staple food plant: eaten regularly and forming the main ingredient of a meal;
- complementary food plant: eaten frequently as an accompaniment to a meal;
- plant occasionally eaten: only rarely eaten;
- plant eaten in times of scarcity: only eaten in times of famine.



ROOT AND TUBER CROPS

Plants with edible roots and tubers, as we have seen, are those around which the agricultural cycle is centred. Taro and yams have been in Vanuatu since ancient times; sweet potato and cassava are introduced. But all form the basis of a ni-Vanuatu meal. Breadfruit and banana, plants with equally ancient ancestry, are also energy-providing foods that are regularly eaten. But the first of these is a tree and the second a herbaceous plant, so they are treated in different sections of the book. Some of the plants covered here are no longer eaten except in times of food shortage, such as *Pueraria* and *Cordyline*, but in earlier times they were important food plants of the first Oceanians.

Genus
Alocasia

Family
Araceae

The genus comprises about 60 species spread from South Asia to the Pacific islands and Australia. Many species are ornamental.

Species present
Alocasia macrorrhiza (L.) Schott.
Alocasia, elephant's ear, giant taro

Alocasia, a wild plant in Vanuatu, is sometimes cultivated in the gardens. But it is mainly a plant used in times of food scarcity, situated in moist places but not in free-standing water, whose sweet cultivars are sought after.

References
Bradbury & Holloway (1988), de Candolle (1883), Christophersen, ed. (1971), French (1986), Glassman, ed. (1971), **Hay (1990)**[10], Ivancic & Lebot (2000), Neal (1929), OMS (1998), Pétard (1986), Plucknett (1970), Purseglove (1988), Simmonds, ed. (1984), Weightman (1989), Wilson *et al.* (1988), Yuncker, ed. (1971, 1974), Zeven & de Wet (1982).

Plant used in times of food scarcity or famine, local

Alocasia macrorrhiza

Alocasia, elephant's ear, giant taro

History

The plant, originally from mainland Southeast Asia, Sri Lanka and India, has been cultivated since ancient times in tropical regions from Myanmar to Papua New Guinea and northern Australia. Subsequently it was spread by humans to all the islands of Oceania, as far as Polynesia, Hawaii and Japan. La Billardière, during his voyage of research with La Pérouse, observed it in a cultivated state in New Caledonia. Later it was also introduced to tropical America. In Vanuatu it was introduced by humans in ancient times, but it is little cultivated because of abundant crystals of calcium oxalate contained in its **corm**, which irritate the throat. It is a minor crop except in the islands of the central Pacific (Samoa, Tonga, Wallis and Futuna) where it is grown in abundance.

[10] A reference in **bold type** indicates the latest revision of the genus or the most recent that we were able to consult.

Description

Large herbaceous plant reaching 4 m in height. Long corm (20 cm in diameter and from 8–40 kg), cylindrical, concave, rising out of the soil for a height of a metre or more. Leaves erect, sagittate, oval, green, sometimes tinged with purple especially in cultivated forms, 1 m long; margins undulate; veins prominent; **petiole** longer than 1 metre. Inflorescence consisting of a **spadix** containing female flowers at the base and male flowers towards the tip; a sterile appendage that is as long as or longer than the section of male flowers. Fruits in a cluster, red; long **peduncle**; one to two seeds.

Morphological variability

The wild forms are not edible because of the presence of calcium oxalate. The forms cultivated for consumption contain little of this because they are the result of continual selection in favour of sweet **morphotypes**. Among these last, there are forms with a green petiole and others with a petiole tinged with purple or with grey, and forms with a red or a white corm. Populations that cultivate alocasia regularly, such as those of Samoa, Ponape, Niue and Tonga, have selected several varieties. In Vanuatu most cultivars are found on the island of Ambae. But the better varieties have been introduced by Wallisians working in plantations during the era of the Condominium of the New Hebrides.

Cultivation and production

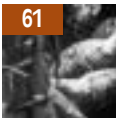
Alocasia is generally found in a wild state on banks of rivers and in places that are wet but not marshy because the plant dislikes excess water. When cultivated it is planted in dry soil to the top of the corm or the lateral shoots, spaced about 2 m apart. In Vanuatu alocasia is essentially a wild plant, but some communities such as those of Pentecost or Forari (Efate) grow a few stands in their gardens. It reaches maturity after about a year, but is harvested after two or three years and may be kept for over four years in the soil. The yields are impressive and regularly reach ten or more kilos per plant. No serious diseases or insect pests are known, but wild pigs may cause damage. It tends to expand in areas where the taro beetle (*Papuana* spp.) infests taro, because its solid corm situated above the soil is never attacked. With the increase in pressure on land, its cultivation is likely to increase in places such as Tonga, Samoa and Wallis and Futuna.

Alimentary uses

This is, at least in Vanuatu, a minor food crop that is also fed to pigs. However, the Wallisian community settled at Forari on the east of Efate regularly produces for its own consumption some very good, sweet cultivars that can occasionally also be found in the Port Vila market. Alocasia may be cooked with care in an oven of hot stones in order to eliminate the crystals that spoil the taste.

Other uses

The plant is used for medicinal purposes in Fiji and Papua New Guinea, but does not seem to have any such use in Vanuatu. Its large leaf is often used as an umbrella when an unforeseen rainstorm catches walkers unaware. A corrosive sap flows from the cut stem, and care must be taken to avoid letting this come into contact with the skin.



Genus
Amorphophallus

Family
Araceae

The genus comprises about a hundred species spread in Africa, the Indo-Malayan region and Australia. Vanuatu possesses one species.

Species present
Amorphophallus campanulatus (Roxb.) ex. Decne
Elephant foot yam

This ancient plant is little cultivated and therefore little eaten. But the wild forms are foods in times of famine, still used nowadays after a long period of preparation.

References
Barrau (1962), Christophersen, ed. (1971), **Hay (1990)**, Hedrick (1972), Henderson & Hancock (1989), Ivancic & Lebot (2000), Ochse & Bakhuizen van den Brink (1980), Pétard (1986), Purseglove (1988), Sastrapradja *et al.* (1984), Weightman (1989), Zeven & de Wet (1982).

Food in times of famine, local

Amorphophallus campanulatus

Elephant foot yam

History

This strange plant came a very long time ago from mainland Southeast Asia. It is found in the wild state in Java and in the Philippines, and in a spontaneously generated form in the Pacific islands; it is cultivated in Java, Papua New Guinea and Solomon Islands, and sometimes elsewhere. Its huge inflorescence is evil-smelling. The wild forms contain crystals of calcium oxalate which stop their consumption, but the rare sweet cultivars are very much appreciated by Asian consumers. Oceanians also grow some sweet forms of this species, quite low in oxalate. Nowadays its cultivation has almost disappeared, and its huge corm is only eaten in times of famine. The exact time of its introduction to Vanuatu is not really known, but there as elsewhere it is a spontaneously generated plant that is never cultivated.

Description

Single leaf (sometimes double), erect, composite, deeply lobed, with three main divisions each of which is then divided into

multiple, elongate segments, pale green; long (50 cm) and thick petiole, rugose and often spiny, greenish-grey or purplish, dotted with little whitish markings. When the leaf falls the inflorescence appears. This is a spadix 20–25 cm long comprising in order from bottom to top cylindrical female flowers, conical male flowers, and then a sterile appendage that is spongy, phallic, crumpled and adorned with purplish grooves. The stink of the inflorescence is reminiscent of rotting carrion, and it attracts flies. As it ages the **spathe** folds back to form a collar with wavy edges, yellow at the base and purplish at the apex. Numerous fruits stuck one to another, the size of small peas, red, 1 cm in diameter; peduncle erect. Seeds **polyembryonic**. Corm in the shape of a thick disc with a central depression, reddish-brown, irritant to the skin when it is young, 20–25 cm in diameter and can weigh up to 15 kg.

Morphological variability

There exists a wild form that cannot be eaten, which has a massive and very corrugated petiole, and a cultivated form that is edible and has a smoother petiole.

Cultivation and production

This plant is very rarely cultivated in Vanuatu. It may be seen in areas of fallow, shady places, pastures under coconut, and more generally in any place that suffers seasonal dryness, from sea level to 800 m altitude. The sweet forms are multiplied using small secondary corms, or cormelles, which are planted in fertile and well-drained soil. The corm, mature after about five months when the petiole falls, remains for several months in the ground. It is harvested after three years. The small shoots are used either for propagation or for food.

Alimentary uses

Only the cultivated form is eaten, and this only rarely. In case of absolute necessity the wild forms can be used, but at the expense of very careful preparation in order to eliminate the oxalate crystals that irritate the throat. Corms of small size are cooked. They are cut into pieces which are then **retted** (steeped in water) for a long time. Then they are baked in an oven of hot stones or boiled for ages. The cultivated form does not need retting, but must still be baked for a long time in the hot stone oven. This food, which was doubtless eaten regularly in earlier times, is nowadays only a food during famines, eaten by a few communities such as in Tanna and Santo.

Other uses

The sap of the plant is irritant, and the early Samoans whipped unfaithful wives with the leaves.

Genus
Colocasia

Family
Araceae

The genus contains seven species of which only one, *Colocasia esculenta*, is an important food plant. It is the only one present in Vanuatu.

Species present
Colocasia esculenta (L.) Schott.[11]
Taro

Taro, together with yam, is one of the two major food plants of Vanuatu. It is grown in every island, rainfed and irrigated. It is always served at feasts, and is harvested after a year.

References
Bown (2000), Bradbury & Holloway (1988), **Hay (1990)**, Ivancic & Lebot (2000), Lebot (1992), Lebot & Aradhya (1991), **Matthews (1990)**, Plucknett (1984), Wang (1983), Yen & Wheeler (1968).

Staple food plant, local

Colocasia esculenta

Taro

History

Taro originates from the Indo–Malayan region between Myanmar and Bangladesh. From there it spread eastwards to Asia and the Pacific and westwards to Madagascar and Africa, and then the West Indies and America. Recent research has built on this classic scenario. The area of distribution of this species in the wild state is much larger, and extends from Myanmar to Papua New Guinea and northern Australia, astride the two continental plates of Sahul and Sunda. It has certainly been domesticated for several millennia on one or other of these continental plates, i.e. in Southeast Asia and in Papua New Guinea. This domestication since ancient times has led to *Colocasia esculenta* having thousands of cultivars, some of which are unique to the Pacific. The distribution of the Oceanian forms, from Papua New Guinea to Polynesia, is poorly understood, however. But it is noticeable that all the Oceanian forms show quite narrow genetic variability, even more so when one looks at those of Polynesia. Thus, the genetic variability of taro in Vanuatu is less than that of Solomon Islands or Papua New Guinea, but more important

[11] The name taro is also applied – incorrectly – to other closely related plants that are used in the same manner (see pp 59, 69, 106).

than that of Polynesian taros. In Vanuatu, forms are found that flower naturally and even produce seeds spontaneously.

Description

Herbaceous plant 1–1.5 m in height. Subterranean stem (corm) **globular** to cylindrical, variable in size; epidermis smooth or scaly; flesh more or less fibrous, white, pink, yellowish, mauve or violet. Leaves **peltate** and **cordate**, light green to dark purple, 30–80 x 20–50 cm; petiole thick, variable in size and colour, uniform, speckled or striped.

Morphological variability

According to botanists, taro is a single species that encompasses two major varietal types, known under the names of Dasheen and Eddoe (or Eddo). Dasheen (derived from the French *de Chine* meaning "from China") have a large central corm surrounded by small lateral corms that are hardly developed; Eddoe has a small central corm surrounded by lateral corms that are well developed. Eddoe does not occur in Vanuatu. The morphological variability is nevertheless very important in Vanuatu, depending on the size and shape of the corm, the size and colour of the leaf and the petiole, the texture and colour of the corm, and the presence and number of **stolons**. Over 500 different morphotypes have been distinguished. The cultivars are recognised also on **organoleptic** criteria, which the farmers take into consideration when building up their personal collections. Certain taros in Vanuatu appear to be spontaneous wild forms, perhaps present on the islands before the arrival of humans. It may thus be that the remarkable variability found is of ancient origin, and results both from recombination through sexual reproduction, although this is rare, and selection of **somatic** mutations that are certainly more frequent.

Colocasia esculenta

Cultivation and production

Taro likes humid areas, and it is therefore dominant on the windward sides of islands and at altitude. It is also cultivated in water in the extremely sophisticated, irrigated taro gardens discussed earlier, that may be situated in leeward zones such as on the west coast of Santo and Maewo. It is these irrigated taros that produce the highest

yields, in the order of 60 tonnes per hectare per year, while the yields in the rainfed gardens vary from 15–30 tonnes.

Taro is above all cultivated for the swollen base of its stems. Unlike with other root crops, it is best to plant suckers or the crown of a corm at the bottom of a hole about 20–30 cm deep, where it will find the humidity that favours its vegetative increase during the first six months of its cycle. During the phase when the corm fills with starch, the above-ground part of the plant declines in vigour and in height in proportion to the swelling of the corm. The farmers know this phenomenon well and still maintain their gardens appropriately. The main pest is the taro beetle (*Papuana* spp.), which has a great taste for the corm and can ruin an entire taro crop. It is desirable to make some judicious rotations in order to control them. In Vanuatu no serious virus diseases are known, though Dasheen Mosaic Virus (DMV) is present.

Alimentary uses

Taro is, together with yam, the staple food of the ni-Vanuatu. It is prepared in numerous ways. It may simply be baked with a hot stone and then eaten hot or cold, or it may be cut into pieces and boiled. Above all it is used to prepare lap-lap, by grating the corm to a puree and wrapping this in an envelope of leaves and cooking in an oven of hot stones. Certain cultivars are too soft to be suited to this form of preparation. Others that contain crystals of calcium oxalate are sooner broiled on a hot stone or glowing embers. The young leaves of taro are eaten as vegetables, mixed with other leaves and often sprinkled with coconut milk. Finally, at the time of flowering the flowers are picked and cooked in small bamboo containers. Sprinkled with coconut milk, they make a delicious accompaniment to root crops. Taro is a very good source of calories provided by starch that is easily digested by virtue of the fineness of its grains. It is even used for making hypoallergenic foods for invalids suffering from gastric ulcers, and tiny pots for babies! It is also rich in fibre that helps intestinal movement, and in calcium and iron.

Other uses

Taro is a culturally important plant, present even in legend. It is also a good ritual plant distributed abundantly during the grand ceremonies.

Genus
Cordyline

Family
Agavaceae

Species present
Cordyline terminalis (L.) Knuth
Cordyline

Cordyline is one of the most important Oceanian plants. In earlier times its tuber was eaten and its leaves served as skirts for women on certain islands. Nowadays it is principally an ornamental plant, scarcely eaten except in times of famine.

References
Barrau (1962), Cox (1982), French (1986), Guillaumin (1946), Neal (1929), Ochse & Bakhuizen van den Brink (1980), OMS (1998), Parham (1972), Peekel (1984), Pétard (1946, 1986), Seeman (1873), Zeven & de Wet (1982).

Food in times of famine, local

Cordyline terminalis

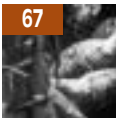
Cordyline

History

Cordyline originates from South-east Asia, northern Australia and Melanesia. It was certainly spread in Oceania by humans as they migrated through the region. In Vanuatu its ancient use as a food has almost disappeared, and villagers nowadays grow it as an ornamental plant. It does, however, retain some cultural value in certain communities. For example in Fanafo the Nagriamel movement, which amongst other things preaches a return to the traditional way of life, takes its name from cordyline (*nagaria*) and cycad (*namwele*).

Description

Plant 3–5 m tall; trunk long and narrow. The root swells into a large, fibrous tuber 10–20 cm in diameter. Leaves terminal, arranged in a spiral, smooth, thick and long (60 x 15 cm); veins fine and longitudinal. Inflorescence terminal, branching and long (30–60 cm); numerous small flowers with six lobes, white, purple or lilac. Fruits round, yellow or red, 1 cm in diameter.



Morphological variability

Numerous varieties exist according to the colour of the leaves. Wild forms found in the forest are usually green, while cultivated varieties have red, yellow, pink or feathery leaves. New varieties can appear as a result of sexual crossing, which though rare does occur naturally in gardens around the villages. Cultivars whose tubers are eaten have been selected for large tuber size, tenderness and least amount of fibre, while the ornamental plants have been selected for the appearance of their leaves.

Cultivation and production

The plant grows from sea level to 2,600 m altitude and is found in various different environments. It is propagated by cuttings of stems that are planted directly into the soil, and these grow again very quickly and easily. It becomes lignified and is perennial; it is often cut back with a machete to restore the vigour and increase the thickness of the plants. No serious pest or disease problems are recorded.

Alimentary uses

The tuber and the young leaves are edible, but in Vanuatu only the former was used. In earlier times it was eaten when food was scarce, after having been cooked for a long time in an oven of hot stones. In the centre of Santo an exclusively male ritual existed in which several communities came together around a dish of cordyline. The modes of preparation varied slightly from one island to another. In Erromango, Futuna and in the centre of Santo, the well-washed tuber was cooked whole in a large oven. In Erromango, and also in Pentecost and in Futuna, it was first peeled and cut before being cooked in an oven. In Tanna the tuber was peeled, cut into pieces and then grated. The resulting puree was then mixed with coconut milk and used to make small lap-laps, which after cooking were crushed in the hand before being eaten.

Cordyline, which is very hard and fibrous, is chewed like chewing gum when it is insufficiently cooked.

Other uses

Cordyline was cultivated in Santo for its coloured leaves from which women made skirts. A simple leafy sprig was spread from the base of the back and tied with a cord belt. The plant has a reputation for keeping away evil spirits, and it is always planted in cemeteries. It is also used for marking boundaries of patches of land in gardens and irrigated taro pits, and as a hedge around villages and houses.

Genus
Cyrtosperma

Family
Araceae

The genus is pantropical and contains 11 species. Only one species is present in Vanuatu.

Species present
Cyrtosperma chamissonis (Schott.) Merrill
Giant swamp taro

Giant swamp taro is little cultivated. It may sometimes be found in a garden, most often on the banks of a small watercourse. But it is present in Vanuatu, and people may turn to it for food in times of scarcity.

References
Barrau (1962), Bradbury & Holloway (1988), French (1986), **Hay (1990)**, Ivancic & Lebot (2000), Lambert (1982), Plucknett (1970), Purseglove (1988).

Local plant, eaten occasionally

Cyrtosperma chamissonis

Giant swamp taro

History

Originating from the coastal zones of Papua New Guinea, giant swamp taro has moved with humans throughout the islands of Oceania. This is a taro that is little cultivated except by inhabitants of Micronesian atolls.

Description

Large herbaceous plant 3–4 m tall. Large, almost cylindrical corm, from 20–40 kg. Leaves erect, **sagittate**, triangular, with three roughly equal lobes, the two lobes at the base being long and pointed; long, thick petiole, cylindrical, sometimes furnished with spines at the base. Thick, open spathe; spadix with **hermaphrodite** flowers.

Morphological variability

Varieties are very numerous according to shape, size and colour of leaves, and colour and size of the spathe. From an agronomic point of view cultivars vary according to their yield and their tolerance to salinity. It is hard to know the diversity of this plant in Vanuatu because it is not much cultivated there.

Cultivation and production

Giant swamp taro is grown in marshy areas, the beds of small watercourses, or the cultivation pits cut out by people in the coral islands of Micronesia and Polynesia. The plants are propagated vegetatively by planting pieces of corm or suckers in the soil. The corm reaches maturity in three to four years, sometimes two, and may stay in the soil for ten or so years.

Alimentary uses

The corm is peeled and cut into pieces, then boiled or baked. It is not much cultivated or eaten in Vanuatu.

Genus
Dioscorea

Family
Dioscoreaceae

The genus comprises 603 species, distributed throughout tropical regions and independently domesticated on three continents. Over 50 species are edible, and without doubt these were important food for the first humans. Vanuatu is home to seven species, five of which are local and two introduced since European contact.

Species present

Dioscorea alata L.
Winged yam, greater yam, water yam

Dioscorea bulbifera L.
Air potato, aerial yam, potato yam

Dioscorea esculenta (Lour.) Burkill.
Chinese yam, lesser yam, sweet yam

Dioscorea nummularia Lam.
Pacific yam, hard yam

Dioscorea pentaphylla L.
Five-fingered yam

Dioscorea rotundata Poir. and *D. cayenensis*
African yam, white yam

Dioscorea trifida L.
Cushcush, Indian yam

References

Adeleye & Ikotuu (1989), Alexander & Coursey (1969), Bahuchet *et al.* (1991), Bonnemaison (1991), Bourret (1973), Bradbury & Holloway (1988), **Burkill (1960)**, Coursey (1976, 1983), Dumont & Marti (1997), Hamon & Bakary (1990), Hamon *et al.* (1995), Lebot *et al.* (1998), Marchand & Girardot, eds (1998), Martin & Rhodes (1977), Ochse & Bakhuizen van den Brink (1980), Osagie (1992), Smartt & Simmonds, eds (1995), Weightman (1989), Wilson (1988).

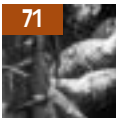
Staple food plant, local

Dioscorea alata

Winged yam, greater yam, water yam

History

The origin of this species remains a puzzle. It does not exist in the wild state, but recent work has confirmed its close relationship



Dioscorea alata

with *D. nummularia*, a species that is typically Melanesian and with which it shares a number of characters. It is certainly one of the most ancient of cultivated plants. Domesticated in New Guinea, which is also its centre of diversity, and then distributed throughout the tropical world, it is the best represented of the species of yams. It reached Vanuatu at a time that is still uncertain, probably with the people who made the Lapita pottery 2,500 years ago, but it may even be older than that. The winged yam, a seasonal plant, is used everywhere in customary exchanges, and is the staple food of coastal populations. The vegetative cycle of this yam sets the rhythm for the village life, for certain rituals and for the cultural calendar. Some communities, such as those on the west coast of Santo, gained access to these

yams relatively late, a short while before the advent of Europeans. Their culture and their utilisation of the yam for food are thus less developed than in the rest of Vanuatu.

Description

Climbing plant; stem smooth, square or winged, twining to the right. Leaves **opposite**, heart-shaped, more or less round or elongate according to cultivar, light green to dark green. Some **bulblets** in certain cultivars. Tubers extremely variable in shape, number and size; long tubers are usually single, round tubers usually three or four.

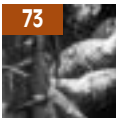
Morphological variability

The morphological variability of this species is very important, each community having its own special collection of cultivars and its own classification. Over 500 different varieties are known from Vanuatu. Numerous forms contain anthocyanin which colours the flesh pink, mauve or violet. They are most often grouped according to the local taxonomies. The shape of the tuber, often resembling human anatomy, may be round, cylindrical, very elongate, with a number of side branches, smooth or embossed, or recurved in a hook-shape, sometimes extravagantly so. The elongate yams are associated with men, the round ones with women. The size of the tuber is likewise very variable. Generally the cylindrical and very long yams, which are difficult to harvest, are the varieties destined for offerings and exchanges, while the short, round ones are the varieties for daily use. The above-ground parts, stems and leaves, also have very diverse morphology and colouring. The villagers distinguish their cultivars according to taste and cooking quality, and grow for example certain yams that are particularly soft for children and old people who no longer have teeth. Finally, certain cultivars are resistant to anthracnose[12]. The species is dioecious (separate male and female plants), but it is rare that the plants flower in Vanuatu and most of the ones that do are male.

Cultivation and production

This species is the most important in Vanuatu. It is grown annually on slopes that are very sunny and have fertile soil. Gardens are opened up each year between August and November. After the vegetation has been cut and burned, whole tubers or, more rarely, pieces of tubers are planted in the soil. The heavier the planting material, the greater the subsequent yield. The soil is generally buttressed around the tubers, but the size and shape of these mounds varies with the community. The most imposing are found in Malekula, where the round hillock is often high, and in Tanna where the yams are cultivated on long platforms. Once the stems emerge from the ground, the yam is staked. There again the types of stakes vary – a simple reed or bamboo stake,

[12] A fungal disease caused by *Colletotrichum gloeosporioides*, an epidemic of which can blacken the leaves so quickly that the farmers think that the damage has been caused by thunderbolts.



a trellis, or a long tree branch or trunk of a tree killed for the purpose. The yams are harvested between March and August, but the dates vary a little from north to south, planting and harvest being earlier in the north and later in the south. There are also some stands of *D. alata* maintained close to villages or along forest footpaths in sunny positions. The main disease is anthracnose.

Alimentary uses

Conveniently, yams keep for several months in shade and humidity as long as they have been harvested carefully and are undamaged. The tubers are laid out along bamboo beds, covered with leaves of *Heliconia* or shaded by small awnings built for this purpose in the gardens. They are eaten whole, baked over glowing embers, or cut in large pieces and baked in an oven of hot stones, or boiled in a *marmite*[13], or grated and used for *lap-lap*. Yams are sold seasonally in the markets, but it remains predominantly a food plant for home consumption, and is present in all feasts.

Other uses

Yam is, together with taro, one of the two ritual plants of Vanuatu. Its morphological plasticity has encouraged farmers to produce some tubers of extraordinary shapes, such as yams close to 2 m in length offered with great display during ceremonies that bring together several communities. Farmers who are able to grow such yams are accorded great prestige, which is also reflected on the community to which they belong. The growing of these yams is always carried out by men.

Complementary food plant, local

Dioscorea bulbifera

Air potato, aerial yam, potato yam

History

Originally from Asia, Africa and Oceania, this species was independently domesticated in all three regions. It reached Vanuatu in a time long ago, maybe even before the arrival of humans because it is not impossible that bulblets could be dispersed naturally from island to island through the agency of marine currents. It is a wild plant that occurs in a spontaneous state throughout Melanesia and in Australia.

Description

Stem round, twining to the left, without spines. Subterranean tuber small or absent, spongy. Leaves **alternate**, broad, round, heart-shaped; leaf blade embossed; veins well marked; petiole long and jointed at the base. Bulblets in the **axils** of leaves, abundant, round, sometimes large in size, epidermis pale, flesh yellow or reddish, sometimes toxic.

[13] A round iron cooking pot used particularly for stews.

The corm of alocasia (*Alocasia macrorrhiza*) grows up out of the ground. The ni-Vanuatu also call this large plant elephant's ear.

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ROOT AND TUBER CROPS

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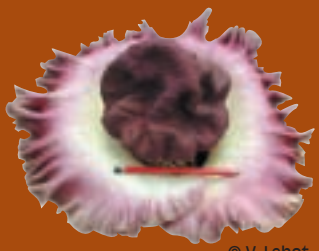

© V. Lebot

The inflorescence of *Amorphophallus campanulatus* gives off an evil-smelling odour.

Amorphophallus campanulatus. Wild form, irritant.

Roots and tubers are the major food plants, around which the agricultural cycle revolves.

Collection of taros (*Colocasia esculenta*) at the Chapuis Agricultural Station (Santo).

Colocasia esculenta. Over 500 cultivars of taro are known. The colour of the petiole, or of its point of attachment, the shape of the leaves, or the existence of red edging at the leaf margin, are among the characteristics for differentiating the cultivars. Here are some examples.

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In Luganville market taros are sold in bunches, tied together around their petioles.

Taros sold by the single piece, with the petiole removed.

Cordyline terminalis, an ornamental plant and a plant used in times of food scarcity, has great cultural significance.

Rare in Vanuatu, giant swamp taro (*Cyrtosperma chamissonis*) grows near small watercourses.

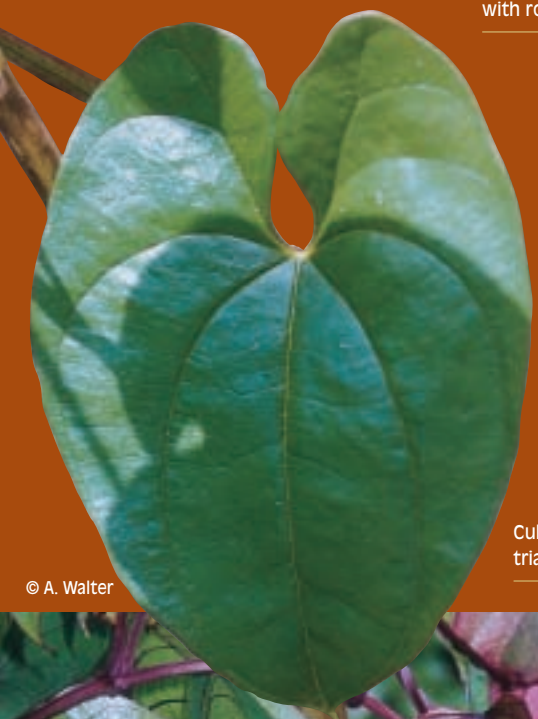
Dioscorea alata. The lush vines of the winged yam twine around their supporting stake.

Dioscorea alata, the winged or greater yam, is the most important species in Vanuatu. Like taro, it is one of the great ritual plants.

Male flower of *Dioscorea alata*.

The tubers of *Dioscorea alata* are variable in shape.

Cultivar of *Dioscorea alata* with rounded leaves.



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Like taro, the winged yam has several hundred cultivars, of which these are two examples.

Cultivar of *Dioscorea alata* with triangular leaves and mauve stems.

© F. Tzerikiantz

The toxic substances in *Dioscorea bulbifera* disappear after careful washing and cooking.

Supporting stake bearing vines of *Dioscorea bulbifera* in a garden.

Leaves of *Dioscorea esculenta*, the Chinese yam.

© A. Walter

Cultivar of *Dioscorea bulbifera* with purple leaf veins.

Tubers of *Dioscorea bulbifera*.

© D. Greindl

Tubers of *Dioscorea esculenta*.

© A. Walter

Leaves of *Dioscorea nummularia*, called the wild yam.

Baked, boiled or in a *lap-lap, Dioscorea nummularia* is very popular. It is a food during the transition between the two major yam harvests.

The cultivar Maro of *Dioscorea nummularia* is famous for the whiteness of its *lap-lap*.

The five-lobed leaves of *Dioscorea pentaphylla*.

© A. Walter

© A. Walter

The large tuber of *Dioscorea pentaphylla.*

Leaves (above) and tubers (below) of *Dioscorea rotundata-cayenensis,* the African yam.

© D. Greindl

Children like the sweet taste and soft flesh of *Dioscorea trifida*.

The winged stalk of *Dioscorea trifida*, introduced to Vanuatu.

The trilobate leaf of *Dioscorea trifida*, the cushcush or Indian yam.

Ipomoea batatas. Sweet potato with purple flesh (Santo).

© A. Walter

Sweet potato and cassava, two other staple food plants, were introduced to Vanuatu.

Violet sweet potato with white flesh, a form occurring in Vanuatu.

© A. Walter

White sweet potato.

Row of cassava plants (*Manihot esculenta*) in a garden.

The leaf of cassava *(Manihot esculenta).*

© V. Lebot

Lap-lap from cassava. The crusting comes from long cooking at low heat with coconut cream.

Pueraria lobata. Its tuber is still grown in some gardens.

Tannia or macabo (*Xanthosoma sagittifolium*) growing in a garden in the forest.

© V. Lebot

© A. Walter

Tannia, or macabo, is increasingly often replacing taro in the gardens and in the diet.

Xanthosoma sagittifolium: inflorescence.

Secondary corms or cormlets of tannia *(Xanthosoma sagittifolium)* for sale by the basket.

© D. Greindl

Morphological variability

The wild forms seem to be relatively homogeneous, but several dozen local cultivars are recognised according to the size and shape of the leaves and the bulblets, the colour of their skin and their flesh – white, yellow or mauve. Flowering is relatively common among these individuals.

Cultivation and production

This yam may be collected from the forest where certain stands of edible cultivars are protected and even tended. There are also some cultivated forms, propagated vegetatively in the gardens amongst other yams, by planting a bulblet as one plants a potato. The yield of these bulblets is impressive and may reach several kilos per plant, sold by the basketful at the market.

Alimentary uses

This species, when growing naturally, contains some toxic substances (alkaloids), which are soluble in water and are therefore destroyed by cooking. In earlier times these yams were grated and washed for a long time in flowing water before being eaten. It is generally the above-ground bulblets that are eaten, but some cultivated forms exist that produce edible tubers. Nowadays forms are grown in the gardens that are non-toxic, although they are slightly bitter when they have grown in full light. However, in times of food shortage these wild forms may be eaten after having been cooked in the ancient way, i.e. grated and carefully washed.

Other uses

The wild forms of *D. bulbifera* have been found by recent research to contain anti-fungal agents (dihydrodioscorine). Initial analyses carried out in scientific laboratories have been promising.

Staple food, introduced (or local?)

Dioscorea esculenta

Chinese yam, lesser yam, sweet yam

History

Originally from Southeast Asia, this species was spread around the Pacific by human migration. It is believed to have been relatively late arriving in Vanuatu. In Santo, the most ancient cultivars have been partially replaced by forms of better quality introduced from New Caledonia called *wovilé*.

Description

Round stem twining to the left, set with small spines along its entire length. Tubers numerous, oval, spiny, with white, pink or purple flesh. Leaves heart-shaped, almost round, pilose at the extremity of the stems, small in size; no bulblets.

Morphological variability

For an introduced species it has great importance; several dozen varieties exist that are distinguished by the size of the leaves, the number of tubers per plant and their shape, and by the colour of the flesh which varies from white to dull purple. Some varieties have very primitive characteristics such as the presence of spines on the roots which make their harvesting tricky. Few of the cultivars flower.

Cultivation and production

This species is cultivated in yam gardens alongside *D. alata*, and is planted after *D. alata*. In some cases it is planted in the same place and therefore needs little work. It is harvested 8–9 months later and its yields are very high. On research stations experiments have recorded yields of close to 100 tonnes per hectare. This species is hardy and resistant to anthracnose and viruses, and with a little care it produces some impressive yields. It is thus tending to increase in amount grown, even though its sweet taste is not really what the consumers prefer. Its tubers keep very well, and if it is damaged during transport its epidermis heals over very easily. It rarely rots, and it only dries out slowly.

Alimentary uses

This yam has a tuber that is less fibrous than those of other species, and a taste that is slightly sweet. It is mainly eaten baked or boiled, sprinkled with coconut milk, but its flesh is too watery to make *lap-lap*. It sells well in urban markets.

Complementary food plant, local

Dioscorea nummularia

Pacific yam, hard yam

History

A very ancient plant, this yam is native to Melanesia and does not occur in Asia. Its centre of diversity may be Papua New Guinea, but in Solomon Islands and Vanuatu spontaneous forms occur in the forest, and there are hundreds of cultivars. It always seems to have been domesticated, particularly in the island of Malekula.

Description

Stem round or with four or more angles, twining to the right, very spiny at the base; long lateral branches. Elongate tuber, sometimes of irregular shape and branched, covered with tiny roots, variable in size, with hard flesh, generally white but occasionally pink. Leaves cordate; bulblets absent.

Morphological variability

Less variable morphologically than *D. alata*, this species nevertheless contains a good hundred or so different cultivars. In certain regions such as Malekula and Santo, it is as important if not more important than the winged yam. Its true variability

is difficult to study because a good number of the forms are found in the forest where they are maintained by farmers. Some are cultivated annually, others are perennial plants that produce new stems every year.

Cultivation and production

This species is one of the yams that are called 'wild', which are cultivated minimally in forest areas but which may also be planted in yam gardens after *D. alata*. Certain communities such as those of Malo put aside a special garden for *D. nummularia*. It is planted between October and November, and is cultivated with less care than *D. alata* except on the patches of land that are reserved for it. It is harvested after the winged yam, but some cultivars may be left in the soil for two to three years. It thus plays an important role in strategies for food security, since it provides a transitional source of food between the main yam (*D. alata*) harvests and it provides something to eat throughout the year. The communities of Malo have developed production of this species for sale in the market of Luganville, which provides them with a useful cash income. However, farmers are becoming concerned at the increasing popularity of *D. nummularia*, because this yam is taking up a lot of land and requires the killing of many trees so that their trunks can serve as supports for the yam vines. In earlier times this yam was largely maintained in the forests in order to provide a food reserve that was rapidly available if needed. Its period of dormancy is relatively short, and the tubers produce new stems less than two months after harvest. No serious pest or disease problems are known and it is highly resistant to anthracnose, making it popular in areas where anthracnose is a dominant disease. Farmers of Mele (Efate) for example are nowadays cultivating this species. The yield is such that a plant may be partly harvested each year while being left in the ground to continue growing.

Alimentary uses

The taste of this yam is popular, and according to cultivar it is eaten baked, boiled or as *lap-lap*. The well-known cultivar Marou, originally from Malo, is very much favoured because of the whiteness of the *lap-lap* that can be made from it, which is a characteristic favoured by the consumers. The dry matter contents of the different cultivars are very high.

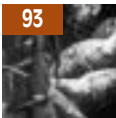
Food plant occasionally eaten, local

Dioscorea pentaphylla

Five-fingered yam

History

This wild species was without doubt distributed through the Pacific islands before the arrival of the first people. It is abundant in Vanuatu, available from the forest and in gardens where farmers often cultivate a few stands.



Description

Stem round, twining to the left, spiny. Tuber round, often flattened and compact. Leaves **palmate** with five leaflets; some small bulblets.

Morphological variability

The species has several cultivars which vary according to the production of bulblets (very abundant or absent), the ability to flower (some forms are sterile), and in the colour of the flesh of the tubers which can vary from white to purple.

Cultivation and production

Often considered to be a wild yam (along with *D. bulbifera* and *D. nummularia*), this species is harvested from or cultivated in the forest, without disturbance of the environment. After a shady spot has been chosen, close to a tree that can later serve as a support for the vine, the ground is lightly weeded, then a piece of tuber is planted in the soil in a shallow hole scooped out by hand. The spot is marked or remembered, and when the tuber reaches maturity it is harvested with great care. The crown is then immediately set apart and replanted in the same spot, together with secondary tubers that are too small to harvest. The density of the crop is low, ranging from a single stand up to twenty or so in the same area. The species is very resistant to disease, and certain cultivars can be propagated easily from bulblets.

Alimentary uses

This yam tastes like potato, and is very popular. It is eaten less now than in earlier times, but because of the increasing importance of anthracnose it is likely that this species will become increasingly popular.

Staple food plant, introduced

Dioscorea rotundata
Dioscorea cayenensis

African yam, white yam

History

The species appeared in West Africa through the crossing of *D. cayenensis* with other local species (*D. praehensilis* and/or *D. abyssinica*). The compound name of *Dioscorea cayenensis-rotundata* is used to cover the huge complex of forms resulting from this cross. It was introduced to Vanuatu about fifty years ago, from the east coast of New Caledonia and the town of Houailou (which is also used as a name for this yam – *wailu* in Bislama). In New Caledonia it is called 'martiniquaise' because of its origin from Martinique in the West Indies. It is becoming very popular, doubtless because of its rapid maturation and its resistance to anthracnose, even though its taste is relatively insipid.

Description

Small number of stems per plant, but many branches per stem. Canopy bushy, heavy and well developed. Stem round, light

green, waxy, twining to the right; slightly spiny at the base; short lateral branches. Tuber often single, skin light chestnut in colour, cylindrical, smooth, with white flesh. Tuber dormancy is shorter than that of other species of yam. Leaves cordate, elongate, dark green; no bulblets.

Morphological variability

There is great morphological heterogeneity in the area of origin of this yam complex. In Vanuatu it is very limited – two cultivars of *D. rotundata* with white flesh and some of *D. cayenensis* with yellow flesh. The variety called *Six manis* in Bislama is known for its short life cycle of *six months*, but its tuber tends to subdivide and its harvest is tricky.

Cultivation and production

This yam is cultivated like the winged yam, and the yield depends on the weight of the material that was used for planting. In contrast to *D. alata*, it does not do well without staking or other support and requires much work to be undertaken. Its harvest requires great care because the epidermis of the tuber copes less well with damage than other yam species. It is likewise necessary to be careful when transporting this yam because jolting can cause rapid rotting of affected tubers. It is also very susceptible to nematodes that damage the tubers and render them unsaleable.

Alimentary uses

This yam is suitable for making *lap-lap*, but people prefer to eat it boiled.

Food plant occasionally eaten, introduced

Dioscorea trifida

Cushcush, Indian yam

History

This species originates from America, where it was domesticated in the region of the frontier between Brazil and Guyana before being spread through the West Indies. It was introduced to Vanuatu quite late and it is not very common there, but is becoming increasingly popular.

Description

Stem twining to the left, quadrangular, winged, without spines. Small tubers 20 cm in length, grouped fifteen to twenty in the one stand; flesh white, yellow, pink or purple. Leaves with three or five lobes; bulblets absent.

Morphological variability

There is not much variability in Vanuatu. Only one clone is known, which has the strange name *Africa* in Bislama (strange since it is an American species). The species is spread around the archipelago, though in any one place there will only be a few stands grown.

Cultivation and production

It is planted like other yams but its vegetative cycle is relatively long, and it is brought to market in August and September. It is resistant to anthracnose but very susceptible to Yam Mosaic Virus (YMV) – however, at present this disease is absent from Vanuatu.

Alimentary uses

The small tubers are cooked like new potatoes, as boiled or steamed vegetables. It is very fragrant, and its sweet taste combined with its soft flesh makes it a popular yam with young children. It is not suitable for making *lap-lap* because it does not have much dry matter.

Genus
Ipomoea

Family
Convolvulaceae

This important genus comprises around 400—500 species, distributed throughout the tropical regions. It is divided into several sections, of which the section *Batatas* includes eleven species plus one hybrid and originates from America. Two species are present in Vanuatu.

Species present

Ipomoea aquatica Forskal
Water spinach, kangkong, swamp morning glory (cf. p. 200, climbing plants)

Ipomoea batatas (L.) Lam.
Sweet potato

Sweet potato is introduced, and has become one of the main food plants of Vanuatu.

References
Austin (1988), Barrau (1962), Cornelis (1985), Cornelis & Nugteren (1982), **Fosberg & Sachet (1977)**, French (1986), Lin *et al.* (1985), Nishiyama (1971), Ochse & Bakhuizen van den Brink (1980), Piperno & Pearsall (1998), PROSEA (1994), Purseglove (1991), Rubatzky & Yamagushi (1997), Sauer (1993), Smartt & Simmonds, eds (1995), Weightman (1989), Worsley & Oldfield (1988), Yen (1974, 1976, 1982).

Staple food plant, introduced

Ipomoea batatas

Sweet potato

History

Sweet potato (*Ipomoea batatas*) originates from Peru, Colombia and Ecuador. It was probably introduced during the 16th century to Papua New Guinea and all of Melanesia. This geographical region is home to thousands of cultivars and represents a second centre of diversification, interesting because of the high content of dry matter and low degree of sweetness of some of the cultivars. Various theories on how sweet potato reached the region are now discredited – that it was brought from Latin America by canoe piloted by Polynesians or Amerindians, that it was brought to New Zealand in prehistoric times or by the

first wave of explorers, that it was introduced to Melanesia by the ancient Polynesians a little before the arrival of the first Europeans, or that it was brought by the Europeans. One fact is certain – that it was already present in Hawaii before the arrival of Captain Cook. It seems certain that it reached Vanuatu relatively late, towards the end of the 17th century, arriving simultaneously in the north (Santo) and the south (Futuna). It is increasingly grown there and eaten very widely. Research on sweet potato and its improvement began in Vanuatu in the 1980s.

Description

Creeping plant whose stems have internodes from which roots arise. Just beneath the surface of the soil, thickening of the adventitious roots produces a dozen or so tubers, **fusiform** or **globular**, smooth or furrowed, white, yellow, orange, red or violet. Leaves simple, arranged in spirals, entire or deeply lobed, oval, green or with a violet hue, 15 x 15 cm; petiole 5–30 cm long. Flowers solitary, trumpet-shaped, purplish, 4 cm in diameter. Small fruits with 4 black seeds, sometimes not properly developed because pollination is incomplete.

Morphological variability

Fifty or so local cultivars occur in Vanuatu, distinguished according to the size, colour and texture of the tubers, the shape and colour of the leaves, and the length of the stem. The taste, consistency and cooking time of the flesh also vary. In places where the foliage of sweet potato is fed to pigs, varieties with perennial stalks that produce lots of leaves are prized. From an agronomic point of view, cultivars vary according to their time to reach maturity and their resistance to local diseases, the most serious of which are viruses and above all the sweet potato weevil (*Cylas* spp.). The northeast region of Santo is one of those where the diversity is greatest. However, over recent years new hybrid varieties have been introduced by the Department of Agriculture and compared with the local varieties.

Cultivation and production

Sweet potato is present from sea level to about 1,000 m altitude, in sunny areas. It is a perennial plant that is generally cultivated as an annual. It is propagated vegetatively by stem cuttings, or much more rarely by pieces of tuber. It is harvested after about 3–8 months, its productivity is high and its cultivation is easy. Further, when the fallow time is shortened and the area becomes grown over with vegetation, it is useful to plant some sweet potatoes whose vines restrain the vegetation regrowth. The two most serious diseases are a fungal disease, scab (*Elsinoe batatas*), which damages the young leaves, and a mycoplasma that causes their dwarfing. The scab is a real problem as cropping

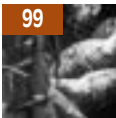
intensifies, and rotations are necessary to avoid a devastating build-up. From time to time farmers must make seedbeds, planting in them tubers which sprout and provide vines that are more vigorous for production of cuttings. For a single variety the yield may vary greatly according to the season. When it is hot and humid, sweet potato makes few tubers but many stems and leaves, and the opposite when it is cool and dry. It is thus best to grow it from May to December.

Alimentary uses

Sweet potato occupies an increasingly important place in the nutrition of the ni-Vanuatu. It is eaten baked or boiled in a *marmite*, but its flesh is too sweet to be made into lap-lap. Only the region of Port Orly is known for its lap-lap made from sweet potato, which makes a very good dessert. Sweet potato is available throughout the year, and is sold regularly and well in local markets. It may be kept for a few weeks in shaded and dry conditions. The tips of the stems are often used as a vegetable, and are sold as such in the markets. They may also be made – but not very often – into chips that are sold in groceries.

Other uses

The stems and secondary tubers are fed to pigs. Farmers value their ability to cover the soil and to keep plots of land neat and clean.



Genus
Manihot

Family
Euphorbiaceae

The genus comprises about a hundred species distributed from southern Arizona to Argentina, the two centres of diversity being Mexico and Brazil.

Species present
Manihot esculenta Crantz
Cassava, manioc, tapioca

References
Allem (1999), de Candolle (1883), Charrier *et al.*, eds (1997), Mathon (1981), McKey & Beckerman (1993), Nassar (1978), Ochse & Bakhuizen van den Brink (1980), Piperno & Pearsall (1998), Purseglove (1991), **Rogers & Appan (1973)**, Rogers & Fleming (1973), Sauer (1993), Silvestre & Arraudeau (1983), Smartt & Simmonds, eds (1995), Viard (1995), Weightman (1989), Zeven & de Wet (1982).

Staple food plant, introduced

Manihot esculenta

Cassava, manioc, tapioca

History

The most ancient traces of cassava (macrobotanical remains and grains of starch) have been found in the north of Peru, and have been dated as 8400–6000 years before our era. But the exact origin of this plant is not well understood, though its cultivation was already well developed in Latin America 4,000 years ago. The genus *Manihot* is considered to be a complex of species in which natural hybrids are numerous and common.

Domestication probably occurred with intra- and inter-specific hybrids in the Rio Negro region situated in the north of the Amazon Basin. Cassava (*Manihot esculenta*) is diploid, and emerged from successive hybridisations between wild species. Various studies suggest that the species involved were *M. flabellifolia*, *M. peruviana* and *M. glaziovii*. In the 16th century the Portuguese introduced cassava to the Gulf of Benin and the mouth of the River Congo. At the end of the 18th century the plant reached Réunion and Madagascar, then it spread throughout the rest of Africa, particularly during the 20th century. Nowadays Africa is the largest producer

Manihot esculenta

of cassava, and is considered together with Indonesia to be a second centre of diversification. Cassava doubtless spread to the Pacific via the Philippines, and was very quickly adopted by local populations. Cultivation of cassava continues to increase, and more and more its consumption rivals that of local root crops or rice. The history of the penetration of cassava into Vanuatu is still a mystery, and there are two possible modes of entry. The first could be from New Caledonia where the plant was introduced in about 1850 by immigrants coming from the island of Réunion. The second involves the region of Samoa and Tonga, from where cassava was introduced to New Caledonia, and from there to Anatom by James Paddon. Since the end of the 19th century cassava has been widely adopted by local people and is grown in all the gardens.

Description

Shrubby tree with a short life-span, reaching up to 7 m in height. Sturdy trunk, sometimes branching at the **apex**, with obvious leaf scars along its length. Tubers develop from swelling of secondary roots close to the main stem, and may reach 1 m in length by 10 cm in diameter. Epidermis smooth or wrinkled, brown, whitish, pink or red. Underlying **cortex** thin, white, sometimes tinged with red or brown. Flesh white, yellow or streaked with red. Leaves arranged in a spiral, palmate with three to nine deep lobes, oval or lanceolate, green or tinted with red, 4–20 x 2–6 cm; petiole green or red, 5–30 cm long. Inflorescence terminal, with male flowers and broader female flowers, both with a **calyx** with five triangular lobes. Fruit globular, 1.5 cm long, bearing six fine **wings**, containing three seeds that are explosively dispersed three to six months after pollination.

Morphological variability

A primary distinction is into cultivars with a short crop cycle, that reach maturity in six months and can be kept in the soil for nine to ten months, and those with a long crop cycle which take a minimum of a year to reach maturity, some of which can remain in the soil for three to four years. The former are mainly cultivars with sweet flesh, the latter with bitter flesh. In Vanuatu there are about fifteen varieties of sweet cassava, where cyanogens are not present in the epidermis, and the diversity is far less than that found in the Amazonian region. The varieties are principally distinguished on the basis of morphological characteristics (degree of erectness, leaf colour, shape of tubers, etc.). As a priority farmers also look for early-maturing genotypes and high yields. Selection is for strength of the stems, disease resistance, individual yields, and most of all quality – dry matter content and starch particularly. Many cultivars never flower, sometimes because of absence of floral initiation, sometimes because the flower buds always abort before becoming functional flowers. However, in Vanuatu flowering is frequent, and it is not impossible that some local varieties have come from seeds that have germinated in the field and the resulting wild plants have been cloned.

Cultivation and production

Cassava is not frost-tolerant, and is grown mainly in lowland tropical areas. It can survive periods of drought and will grow in any sort of soil – characteristics which make it a plant in times of need that is much appreciated. It is easy to grow in soils that have been impoverished by previous crops such as cocoa and coconut. It is propagated from stem cuttings, since plants resulting from spontaneous germination of seeds grow very slowly. Its cultivation in Vanuatu is increasing because it allows

depleted soils to recover, and it complements traditional root crops that are less easy to grow – important for a growing population. For this reason it is often used at the end of crop rotations in gardens just before the fallow, or it is planted at the edges of huts or tracks in poorly prepared land. No serious pests or diseases are known, except for pigs that cause a great deal of damage. The majority of varieties stand erect, which is convenient for cutting the stem into sections before the arrival of a cyclone that readily knocks down the plants and causes them to rot within a matter of days.

Alimentary uses

The roots are peeled and washed, then cut into pieces and boiled, sometimes twice in succession. It is eaten as it is, or flavoured with coconut milk. The raw root is often grated, sometimes flavoured with coconut milk, then baked in an oven of hot stones, or in small quantities in a section of bamboo. Finally, the plant is the main ingredient in the manufacture of *tuluk*: the root is cooked, pounded and then kneaded in to a paste and flavoured with coconut milk; the paste is then rolled into little puddings, stuffed with force-meat (often canned meat), then cooked again in a bamboo or *marmite*. In some parts of the world flour is made from cassava, but not in Vanuatu. The young leaves, although very rich in proteins, are not eaten, unlike in other tropical countries.

Other uses

Cassava is also used as a forage plant.

Genus
Pueraria

Family
Fabaceae

Species present
Pueraria lobata (Willd.) Ohwi
Kudzu, pueraria

Kudzu is no longer eaten regularly, though it undoubtedly was by the ancient Oceanians. But it is not rare, and it is sometimes found in gardens.

References
Barrau (1962, 1965), French (1986), Parham (1972), Peekel (1984), Purseglove (1991), Sillitoe (1983), Skerman (1977), Zeven & de Wet (1982).

Food plant occasionally eaten, local

Pueraria lobata

Kudzu, pueraria

History

Originally from Asia and Japan, kudzu is a very ancient plant in the Pacific, and was a staple food crop for Melanesian peoples before the arrival of sweet potato. Cultivated in Papua New Guinea and in New Caledonia, it is found from Vanuatu to Samoa.

Description

Climbing plant with a thick stem, flexible and hairy, able to root from nodes to produce secondary stems. Large, elongate tuber, horizontal, that can reach 1–2 m in length. Leaves pilose, leaflets entire or with slightly demarcated lobes, triangular; **stipules** elongate; long, pilose petioles (5-10 cm). Small flowers in groups, mauve or purple. Pods straight or slightly curved, cylindrical, flattened, pilose. Seeds oblong or square, brown, about 15 in number.

Morphological variability

Not studied in Vanuatu.

Cultivation and production

The plant is cultivated in the gardens of several communities in Vanuatu. It is propagated vegetatively by planting a top of a tuber attached to the stem.

It is mainly used as a cover plant for keeping patches of land clean, but once it establishes it is very difficult to get rid of it.

Alimentary uses

Nowadays this plant is rarely eaten, but a number of communities grow it in their gardens or in forest as a reserve in case of food shortage resulting from a cyclone. The tubers are generally cut into pieces and baked in a hot stone oven. Certain softer cultivars may be peeled and cut into pieces, then boiled and enhanced with coconut milk. In earlier times it was also used for making *lap-lap*. These fibrous tubers must be chewed for a long time and the fibres spat out.

Genus
Xanthosoma

Family
Araceae

The genus comprises about 40 species, all American. A single species is present in Vanuatu.

Species present
Xanthosoma sagittifolium (L.) Schott
Tannia

Introduced to Vanuatu, tannia is nowadays grown in all the gardens and replaces taro in areas where taro is difficult to grow. The ni-Vanuatu eat it to a major extent.

References
Barrau (1962), Bradbury & Holloway (1988), **Brücher (1989)**, Cable (1984), Ivancic & Lebot (2000), Lambert (1982), Onwueme (1978), Plucknett (1984), Purseglove (1988), Weightman (1989), Zeven & de Wet (1982).

Staple food plant, introduced

Xanthosoma sagittifolium

Tannia, new cocoyam, macabo cocoyam, arrowleaf elephant's ear, yautia

History

Originally from tropical America and the West Indies, tannia was spread during the 19th century to Africa and Asia and throughout the Pacific. It was probably brought to Vanuatu from Fiji, by ni-Vanuatu returning from work in plantations. Its cultivation has increased because it is robust, more resistant to drought and is less work to cultivate than taro.

Description

Herbaceous plant over 1 m in height, with a robust stem. Central subterranean stem (corm) surrounded by a dozen or so lateral cormlets. Leaves sagittate with wide but short basal lobes, 100 x 70 cm; marginal leaf veins very obvious; petiole about 1.5 m long. A group of two to three inflorescences that appear in succession; spathe green or purple; spadix with male flowers in the upper part and female flowers in the lower part, separated by a sterile zone.

Morphological variability

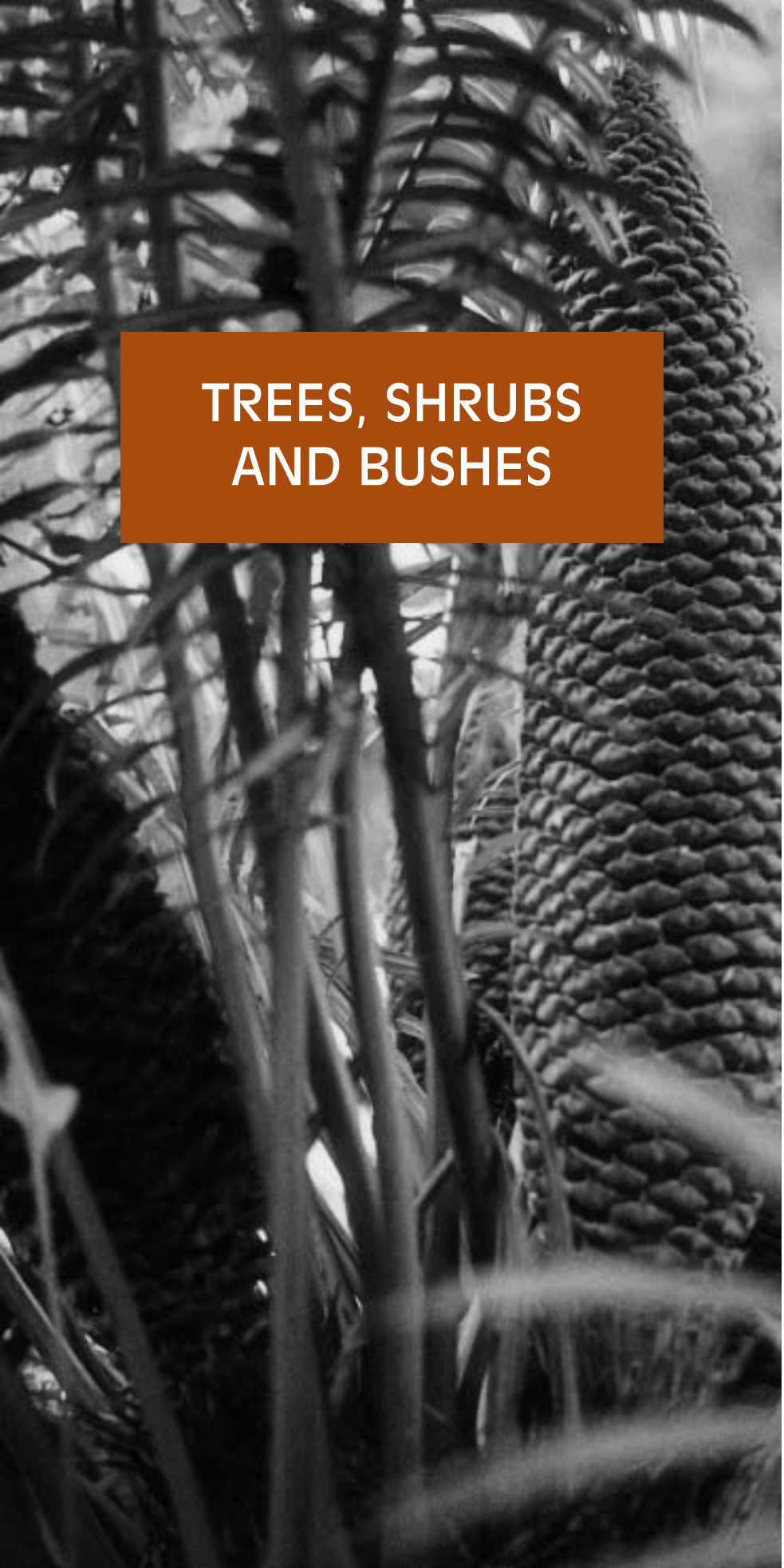
This introduced plant shows only a little variability in Vanuatu, in colour and size of the leaves, the shape of the corm and the pigmentation of the shoots. Twelve different cultivars are recognised in the whole country; they are distinguished by the colour of the petiole – light green to dark purple – and the colour of the flesh of the cormlets – white to purple.

Cultivation and production

Tannia is a plant of humid regions, but it tolerates drought better than taro. It is propagated vegetatively by planting of suckers at any time of the year, and it reaches maturity after nine months. The central corm, which is very acrid, is not harvested, but the lateral corms are harvested over a period of two to six years. Farmers put them in at a high crop density that totally covers the soil, removing any need to look after the plants. These areas of plants are visited regularly for collection of lateral corms. The main corm is too fibrous to be eaten by humans, and is cooked and given to pigs.

Alimentary uses

Tannia is eaten more and more frequently, especially in the dry islands where true taro grows poorly. Tannia thus complements yams. It is either baked or boiled, and sometimes sprinkled with coconut milk. The young leaves are sometimes used as vegetables. The main corm, which is very fibrous, is a choice food for pigs.



TREES, SHRUBS AND BUSHES

The tree is a lignified plant species, having a trunk and reaching a height of at least 7 m. Shrubs are smaller in size, and have a true trunk that branches above a certain height. If the plant is lignified but branched at its base (i.e. no true trunk), and does not grow higher than 4 m or so, it can be called a bush.

Cultivated trees are numerous in Vanuatu and are an integral part of the cultural systems. The best known among them is breadfruit, which very probably was first domesticated in this region of the world, and coconut which is a palm. Mango, which is present everywhere, was introduced at the very beginning of European contact, then papaya which is naturalised in the countryside, citrus of which there was already one autochthonous (or indigenous) species (*Citrus macroptera*), custard apple and its relatives, and avocado, to name but a few. Some, such as macadamia, are very recent introductions, and others such as lychee have never taken well.

The majority of bushes are likewise of ancient presence. Island cabbage (*Abelmoschus manihot*) is the main vegetable of Oceanians, while kava (*Piper methysticum*) and polyscias (*Polyscias* spp.) are ritual plants that are present in all gardens and villages.

Genus
Abelmoschus

Family
Malvaceae

The genus comprises about ten species, most originating from the Indo-Malayan region. *A. manihot* was present in Vanuatu before European contact.

Species present
Abelmoschus manihot (L.) Medik
Island cabbage, aibika, bele, edible hibiscus

This bush is one of the ancient plants of Vanuatu, diversified by local farmers and widely eaten in rural areas.

References
Barrau (1962), Borrell (1989), **Borssum-Waalkes (1966)**, Charrier (1984), French (1986), **Hamon & Van Sloten (1995)**, Henderson & Hancock (1989), Ochse & Bakhuizen van den Brink (1980), Peekel (1984), PROSEA (1994), Purseglove (1991), Smartt & Simmonds, eds (1995), Weightman (1989), Westwood & Kesavan (1982), Zeven & de Wet (1982).

Complementary food plant, local

Abelmoschus manihot

Island cabbage, aibika, bele, edible hibiscus

History

Island cabbage (aibika) is an ancient plant in the Melanesian subsistence crop complex. Originally from the Indo-Malayan region, it is found in southern China, from Malaysia to Fiji, and in New Caledonia where it is called *chou canaque* (Kanak cabbage). Curiously, it was only introduced to Polynesia quite late. In Vanuatu it is present in all types of garden, associated with other crops. It is sold in the markets throughout the year.

Description

Bush on average 1.5 m high, branched from the base. Leaves alternate, variable in shape and colour, with long green or red petioles. Flower solitary, broad, with five petals that are yellow with purple bases. **Style** separated into five small terminal branches with a purple base. The fruit is pear-shaped and is a five-sided capsule, measuring 4–6 cm x 2 cm and containing numerous seeds.

Abelmoschus manihot

Morphological variability

In each community in Vanuatu about a dozen varieties occur. Morphological variation is in petiole colour (red, white or green), leaf colour (light to dark green), and in the shape of the leaf blade which is dissected (cut into) to a greater or lesser extent. This variability is being preserved by vegetative means as farmers take cuttings from new forms that they find in the gardens. These new forms result from mutation of existing varieties or from recombination through sexual reproduction, and since the seeds germinate spontaneously in the gardens they thus provide new plants. As a result, in Vanuatu as a whole there are several hundred distinct morphological varieties, and further selection continues.

Cultivation and production

Island cabbage (aibika) likes humidity, fertile soils and low altitudes. It is an **autogamous** plant that is propagated by cuttings but can produce fertile seeds. Thus wild plants, escapes from ancient areas of cultivation, may come up again in newly cleared gardens. Usually two to three cuttings (30–60 cm) are planted in a hole, slightly sloped. Growth is very rapid, and after two months a number of leaves can be harvested each week. After one year the bush is fully developed and the leaves can be cut more often and more extensively, which increases the branching of the plant. Island cabbage is available throughout the year. It continues to grow beyond one year, but tends to develop too much vegetative growth after three years of age. It is then necessary either to prune it back where it is or to abandon it and replant elsewhere. It is often planted around the edges of gardens where it then serves as a hedge and a windbreak. Its two main pests are the Giant African Snail (*Achatina fulica*) which eats the buds of recently planted cuttings, and a small polyphagous beetle (*Adoretus versutus*) which likes the tender leaves and turns them into lacework full of holes.

Alimentary uses

Island cabbage (aibika), whose leaves become gluey after cooking, is the favourite vegetable of the ni-Vanuatu. They cook it in different ways. Most often it is cut into very thin strips, boiled in a little salted water and then flavoured with coconut milk. The broad leaves of certain cultivars are used as the outer covering of small *lap-laps* of banana or cassava, cooked in a *marmite*. The leaves may also be cooked with pieces of meat in an oven of hot stones. They are sometimes fried on the stove. Whatever mode of cooking is chosen, the leaves are rarely cooked by themselves and they mix well with onions, other green leaves, coconut milk, fish and meat. The leaves are rich in protein, calcium and vitamins A and C.

Other uses

It is sometimes used as a medicinal plant in Papua New Guinea, Indonesia and other Oceanian islands. In Vanuatu the hot stems are applied to fungal infections of the feet. Women in labour drink a decoction of aibika to ease labour, and it is also said to stimulate lactation.

Genus
Annona

Family
Annonaceae

The genus comprises about 50 species originally from tropical America, of which about a dozen have edible fruits. Three are present in Vanuatu.

Species present
Annona muricata L.
Soursop

Annona reticulata L.
Bullock's heart

Annona squamosa L.
Sweetsop, sugar apple

Of the three *Annona* species introduced to Vanuatu, only one – the soursop – is widely distributed in the archipelago and regularly eaten. The other two – the bullock's heart and the sweetsop – are much rarer and less popular, though their fruits are sometimes sold in markets.

References
Barrau (1962), Coronel (1994), French (1986), Hill (1952), Le Bellec & Renard (2001), Neal (1929), Ochse & Bakhuizen van den Brink (1980), OMS (1998), Pétard (1986), Purseglove (1991), Tate (2000), **Thakur & Singh (1967)**, Verheij & Coronel eds (1992), Viard (1995), Weightman (1989), Zeven & de Wet (1982).

Complementary food plant, introduced

Annona muricata

Soursop

History

This large green fruit originates from central America where it is grown up to the coastal valleys of Peru, then spread through the tropical world by early explorers. Europeans introduced it to Vanuatu at the end of the 18th century. Nowadays it is cultivated sporadically throughout the archipelago but there is no real commercial production, though the fruits are picked for sale in markets on a casual basis.

Description

Small tree not exceeding 8 m in height; branches low. Leaves simple, oblong, smooth, green and shiny. Flowers solitary or in pairs, **cauliflorous**, yellowish green; sepals dark green and thick, forming a globular cover around six large petals that have a characteristic odour, arranged in two rows, pale yellow. The fruit is an **ovoid syncarp**, slightly kidney-shaped, dark green, covered with curved protuberances that look like spines; fruit 15–35 cm long and weighing up to 2 kg; white, juicy flesh surrounding numerous black seeds.

Morphological variability

The degree of morphological variability in Vanuatu has not been studied in detail. Villagers distinguish forms with sweet and juicy fruits and those with drier fruits that are more acid.

Cultivation and production

In Vanuatu the soursop is present in villages, gardens and along paths leading to the gardens. The tree is very robust, thriving in poor soils and able to withstand cyclones and other inclement conditions. It often comes up spontaneously, but can be propagated with young plants that have come up spontaneously or through cuttings. The tree bears fruit from the third year onwards, and it fruits throughout the year.

No particular care is given to the trees but they still bear heavily, and it is not uncommon to find unpicked fruits that have dropped to the ground – to the delight of pigs which love to eat them, and disperse their seeds. The production from these spontaneous orchards is sometimes sold commercially.

Alimentary uses

This fruit benefits from being picked slightly before maturity. It is then placed where it can ripen over the next days until it becomes soft. It is peeled and cut into large quarters and eaten raw outside mealtimes. It is sold in urban markets. It can also be made into delicious ice creams, cordials and even jams.

Other uses

Medicinal properties are not known in Vanuatu.

Food plant occasionally eaten, introduced

Annona reticulata

Bullock's heart

History

Originally from the West Indies, distributed in tropical America and then throughout the tropical world, it was introduced to Vanuatu at the end of the 18th century by missionaries who no doubt brought it from Australia.

Description

Small tree not more than 10 m in height. Long, narrow leaves, light green. Flowers with thick petals, yellow-green. Fruit round, reddish green, with a smooth skin that is set with slight depressions; fruit 7-12 cm in diameter; pulp creamy in texture, with large brown seeds.

Morphological variability

What little variability there is relates to the size and texture of the fruits rather than their shape or colour.

Cultivation and production

The bullock's heart is less common than the soursop but occurs in all the islands, particularly in coastal areas. It grows well in poor or acid soils, but does not like high humidity. Even though it is not cultivated in the true sense, spontaneously growing plants are tended, and it is sometimes planted near villages. It is grown from seed or from young wild seedlings.

Alimentary uses

The taste is somewhat insipid and the fruit is not much sought after. It is eaten occasionally between meals. It can also be used for making sorbets. It is found regularly in urban markets.

Other uses

Medicinal properties are not known in Vanuatu.

Food plant occasionally eaten, introduced

Annona squamosa

Sweetsop, sugar apple

History

The sweetsop is originally from the West Indies but then spread through tropical America. The Spanish, who maintained contact between Mexico and the Philippines for 300 years, introduced the tree there, and the species finished up by reaching all tropical regions. James Paddon and the Presbyterian missionaries introduced it to Tanna in the years 1850–1860. It has doubtless been reintroduced a number of times since.

Description

Shrub less than 6 m in height. Leaves oblong, narrow and smaller than those of the bullock's heart. Flowers with thick petals, green with purple at the base, 2.5 cm long. Fruits heart-shaped or shaped like a pine cone, epidermis green-yellow, covered with fleshy scales which separate at maturity, 7–10 cm in diameter; pulp granular, creamy in texture and white in colour, surrounding very numerous brown seeds, glossy.

Morphological variability

In Vanuatu two varieties are distinguished: one with fruits that are light green when mature and the other with violet fruits. The latter is very fragrant.

Cultivation and production

The sweetsop is the least common of the *Annona* species present in Vanuatu. It likes dry climates and tolerates cyclones well. It is generally propagated from seed, preferably pre-germinated, and it grows slowly. These small trees, which fit well in the Melanesian garden, bear few fruits. It is thus recommended that they are planted at high densities and that the branches are pruned to increase the number of branches that can bear flowers and fruits.

Alimentary uses

The fruits are occasionally eaten between meals, mainly by women and children. They are very fresh tasting when they are just picked. Sorbets can also be made from them.

Genus
Artocarpus

Family
Moraceae

The genus comprises about 50 species, originally from Southeast Asia and the Pacific. Fewer than a dozen bear edible fruits. Two are present in Vanuatu.

Species present
Artocarpus altilis (Parkinson) Fosberg
Breadfruit

Artocarpus heterophyllus Lam
Jackfruit (minor species: see CD-ROM)

While jackfruit is an introduced tree that is very rare in Vanuatu, breadfruit is one of the most important local plants in Melanesian arboriculture. Its diversity is very great, the number of cultivars with seeds is greater than those without, and it is likely that Vanuatu played a key role in the process of diversification of this species.

References
Barrau (1962), de Candolle (1883), French (1986), Neal (1929), Ochse & Bakhuizen van den Brink (1980), Parham (1972), Purseglove (1991), Ragone (1988, 1991, 1997), Verheij & Coronel eds (1992), Viard (1995), Walter (1989), Walter & Sam (1999), Weightman (1989), Zeven & de Wet (1982).

Staple food plant, local

Artocarpus altilis

Breadfruit

History

This species without doubt originated in Papua New Guinea, and was spread by humans throughout the Pacific islands well before the European era. Breadfruit is one of the great plants that Oceania can offer to the world. The early explorers, fascinated by this fruit that they thought could feed the slaves in the first American colonies, introduced it very early on to the West Indies. The beginning of this dispersion proved difficult. An initial cargo destined for Jamaica and collected from Tahiti by the *Bounty* disappeared at the time of the well-known mutiny on the ship. A second happier voyage finally carried the species to the West Indies, but the slaves

didn't like its taste! Despite these early difficulties breadfruit was finally adopted into the life of the tropical regions, and nowadays it is widely grown. Vanuatu is an important centre of diversification of the species.

Description

Tree 15–20 m high, with a massive trunk. Leaves simple, rounded or oval, deeply divided into 6–9 lobes, dark green and glossy; petiole short and robust. Male inflorescences elongate, female inflorescences spherical or oblong. The breadfruit is a syncarp formed by fusion of fruits arising from each of the female flowers. The fruit is variable in size and colour, generally oval, plump and yellow. It exudes latex more or less abundantly, and contains large brown seeds, variable in number.

Morphological variability

The diversity is enormous. It is more pronounced in the northern islands (Banks, Maewo, Pentecost, Malekula, Epi) than in the southern ones. The morphological variability relates to the size of the tree, the colour and shape of the leaves and the degree to which they are divided into lobes, the shape, colour and size of the fruit, the texture of the epidermis, the colour of the flesh and the number of seeds. Agronomic variability further distinguishes varieties according to the number of seeds, the fruiting season, and the productivity. Finally, variability in usage distinguishes the fibre content and the pliability of the flesh, the time required for cooking, the taste and the length of time over which the fruit can be kept. Each community has its own collection comprising from 10 to 120 different cultivars. It is not impossible that some forms without seeds (aspermic), which are rare in Vanuatu, had been introduced from Polynesia by the people of Futuna or the Wallisians of Forari.

Cultivation and production

The species grows up to 600 m in altitude, in cleared and sunny places such as villages, coconut plantations, footpaths and gardens. Cultivars with seeds predominate in Vanuatu, and the species is propagated either by seeds or by transplantation of suckers. The latter method is preferred because it allows the characteristics of the mother tree to be preserved and carried on.

Alimentary uses

In season, breadfruit is eaten very much in Vanuatu. It is prepared and cooked in different ways according to the cultivar. Some are grilled on a wood fire and then eaten as they are, or peeled, cut and then pounded with a pestle after the seeds have been removed (because children like to nibble the seeds hot). Once mashed the pulp is spread out on a wooden platter and then sprinkled with coconut milk; this is a *nalot* which is most often made for a morning meal.

Other recipes also exist. For example, the mashed-up pulp is divided into small balls threaded together in a bamboo container and gently cooked again in coconut milk. In earlier times breadfruit was also preserved in different ways. In Banks it was dried. Elsewhere it was fermented in pits dug in the soil or in natural holes in the coralline crust. Nowadays these preservation practices are tending to disappear. The young leaves, rolled up and boiled, are eaten as vegetables.

Other uses

There are numerous uses for breadfruit. The latex is used to trap birds, caulk canoes and cover injuries to yams. The wood is chosen for making canoes, for oars and for balancing arms. It is also used for carving the magnificent drums of Ambrym. It is also good firewood. In earlier days the inner bark or bast was pounded flat in order to provide a textile called *tapa*. Finally, the leaves and bark have medicinal properties.

Genus
Averrhoa

Family
Oxalidaceae

The genus, originally from the Indo-Malayan region, contains two main species of which one is present in Vanuatu.

Species present
***Averrhoa carambola* L.**
Carambola, star fruit

The star-shaped, acid fruit is not eaten much in rural areas. It is mainly used by people of European or Asian descent in urban areas.

References
Barrau (1962), French (1986), **Hutchinson (1959)**, Neal (1929), Parham (1972), Pétard (1986), Popenoe (1974), Purseglove (1991), Verheij & Coronel, eds (1992), Viard (1995), Zeven & de Wet (1982).

Food plant occasionally eaten, introduced

Averrhoa carambola

Carambola, star fruit

History

Originally from the Indo-Malayan region, the species is nowadays present throughout the tropical world. Introduced to Oceania and Vanuatu at the end of the 19th century, it is rare nowadays.

Description

Small tree with a short trunk, 5–8 m tall, crown shaped like a parasol. Leaves composite, with 3–5 pairs of oval leaflets. Flowers in the shape of a small bell, pink or red, 8 mm long. Fruits smooth-skinned and slightly translucent, with five pronounced ribs, yellow-gold at maturity. When cut across the fruit looks like a five-pointed star, giving it one of its common names. Seeds oval, flattened, brown, about 1 cm.

Morphological variability

In Vanuatu carambola fruits have varying degrees of sweetness, without any real distinguishing of varieties.

Cultivation and production

The tree is propagated from seeds washed with soap, or from cuttings. It bears fruit after three years, and in the Pacific it fruits

once a year. A single tree can produce a harvest of several dozen kilos of fruits. These are very attractive and sell easily at the markets. They keep well after harvest – about ten days at ambient temperatures.

Alimentary uses

The fruit is eaten raw when fully ripe, though it is mainly used to decorate desserts or is mixed with other fruits in a fruit salad. It has a slightly acid but fragrant taste. The minority population of Asians also eat the immature fruit cooked. It is not much eaten by the ni-Vanuatu, and is seen most often on the tables of Europeans or served in international hotels in the capital. It may sometimes be bought in the Port Vila market.

Genus
Cajanus

Family
Fabaceae

The genus is distributed in Asia (18 species) and Africa (1 species) by way of Australia (15 species of which 13 are endemic). Only one species is present in Vanuatu.

Species present
Cajanus cajan (L.) Millsp.
Pigeonpea

References
De Candolle (1883), Neal (1929), Néné *et al.* eds (1990), Ochse & Bakhuizen van den Brink (1980), Parham (1972), Purseglove (1991), Smartt & Simmonds, eds (1995), **Van der Maesen (1986,** 1990), Viard (1995), Weightman (1989), Zeven & de Wet (1982).

Food plant occasionally eaten, introduced

Cajanus cajan

Pigeonpea

History

Originally from India, pigeonpea is undoubtedly descended from a wild ancestor [*Cajanus cajanifolius* (Haines) Van der Maesen]. It reached Asia via Syria early on, and was taken to the east coast of tropical Africa by the ancient Egyptians. It reached Australia and much later the Pacific. Widely cultivated in India, the plant has been the subject of genetic selection and agronomic studies throughout the world. It reached Vanuatu via Australia, and it is used for temporary shade because of its very rapid growth. Its seeds can also be eaten.

Description

Shrub with erect bearing, reaching 4 m in height. Leaves silvery on the undersides, trifoliate; leaflets lanceolate, **acuminate**, slightly downy; petiole grooved. Flowers yellow, sometimes tinged with red or violet, 2 cm long. The fruit is a brownish, flattened pod, with depressions between the seeds, pointed. Seeds from 2–8 in number, variable in shape, size and colour.

Morphological variability

The species comprises a number of cultivars varying in height and structure of the plant, the number

Cajanus cajan

of seeds per pod, and the size, colour and taste of the seeds. Some cultivars fruit synchronously. In Vanuatu the majority of morphotypes are of erect bearing and have yellow flowers, but some prostrate varieties have been introduced recently.

Cultivation and production

The shrub is easy to grow, and is propagated by sowing of seeds or by cuttings. The varieties in Vanuatu show very rapid growth, and can reach 3 m high in one year and produce fruit. They are susceptible to nematodes and to root rots, leaving them prone to being blown over in strong winds. According to variety the fruits reach maturity between five and twelve months, and the plant is productive for 4–5 years. The seeds do not keep well once they have been harvested, and are attacked by weevils that perforate the pods and feed on the **cotyledons**.

Alimentary uses

The seeds are harvested when mature and cooked in bamboo containers with a little salt, boiled or grilled in their pods to be eaten as they are, or as an accompaniment to a dish of root crops. This vegetable is sometimes sold in the markets. In other countries the young leaves and the young green pods are also eaten, and it is a good forage plant for horses, cattle and even silkworms. In Vanuatu it is only fed to chickens.

Other uses

Pigeonpea is often used as a shade tree, but it is frequently attacked by a fungal disease (*Corticum salmonicor*) and above all by nematodes. There is then a risk that these pests will invade cultivated crops such as cocoa and pepper.

Genus
Carica

Family
Caricaceae

The genus comprises more than 20 species, all originating from tropical America, six of which bear edible fruits. One species, which is important from an economic viewpoint, is present in Vanuatu.

Species present
***Carica papaya* L.**
Papaya, pawpaw

Papaya is a common fruit in Vanuatu. For a long time it had no great prestige among the local people, and it was used for feeding to pigs. The continual availability of the fruits and their nutritional value have, however, made papaya a valued food, which is eaten more and more often.

References
Badillo (1971), Barrau (1962), de Candolle (1883), *Encyclopédie des aliments* (1997), French (1986), Le Bellec & Renard (2001), Lebot (1986), Manshardt & Wenslaff (1989), Neal (1929), Ochse & Bakhuizen van den Brink (1980), Pétard (1986), Popenoe (1974), Purseglove (1991), Storey (1969), Verheij & Coronel, eds (1992), Viard (1995), Weightman (1989), Zeven & de Wet (1982).

Complementary food plant, introduced

Carica papaya

Papaya, pawpaw

History

Papaya has never been found in the wild state, and it is thought that it arose from hybridisation of species in the area from Mexico to Nicaragua. When it was found by the Spanish it had already been cultivated for a long time and had become diversified. In the 16th century the Spanish introduced it to Manila (Philippines), from where it reached Malacca and then India. Its spread throughout the tropical world has been rapid because it is easy to propagate from seed. In the 19th century it was already well established in Oceania, and it is a common plant nowadays in Vanuatu.

Description

Shrubby tree up to 6 m in height, without branches; long trunk covered with heart-shaped scars of leaf bases. Terminal cluster of simple leaves, arranged in spirals, palmate with 7–11 lobes deeply cut in; petiole narrow and long (25–100 cm). Plant dioecious (though some varieties are monoecious). Male inflorescence long, containing many tiny flowers; female inflorescence **axillary**, short and with few flowers. Flowers scented and trumpet-shaped, yellow or cream. Fruits cylindrical, pear-shaped or oval, large (7–50 cm long, and reaching up to 10 kg), dark yellow or orange when ripe, pulp thick, bright yellow or orange. Numerous seeds fastened to the inner wall of the central cavity, black and covered with **mucilage**.

Morphological variability

The majority of varieties are dioecious and cross-pollination is obligatory. The progeny are extremely variable in the shape of the fruit and the colour of the flesh. Towards the end of the 1970s, a program of genetic improvement at the University of Hawaii focused on hermaphrodite varieties, under the name of Solo, that produce 70% of plants that are completely hermaphrodite, and the rest female plants with fruits whose shape is not well-liked. The fruit of Solo is small and oblong or pear-shaped, with delicate and sweet flesh. Cultivars exist that have yellow or white flowers, and yellow or red flesh, these last being the most favoured. In Vanuatu the papaya has fruits that are pear-shaped or very elongate, with yellow or orange flesh, and also the Solo variety although that is rarer. The seeds of Solo Sunrise and Solo Waimanalo, the two commercial varieties most often grown, have to be imported regularly from Hawaii because the farmers do not bag the flowers, and cross-pollination with other varieties quickly leads to less desirable forms.

Cultivation and production

The plant likes sun and fertile soils, but is intolerant of frost and excessive moisture which leads to root rot produced by a species of *Phytophthora*. In Vanuatu the tree is spread by common mynahs (*merles de Moluques*) and by fruit bats which distribute the seeds. It is found everywhere along footpaths, in gardens and in villages, and a good part of the fruit that is produced rots *in situ* or is eaten by birds. Papaya is grown from seeds either broadcast or for preference planted in plastic bags in seedbeds. The young plants are planted two or three together in the same hole, and must be shaded and protected from wind. After six months, when the sex of the plant is apparent, female trees are removed in the case of Solo and some male plants are kept in the case of dioecious varieties. The fruits are harvested 8–14 months later, when traces of

orange appear on the green epidermis. A single papaya tree can produce 30–50 fruits per year, spread throughout the year. Trees can live for up to 25 years, but productivity declines with age and they are usually cut down after four or five years – or they fall over themselves because nematodes kill some of the roots. The fruits are picked with care because damage causes rapid rotting. Papayas are sold in markets throughout the year, but disappear in the months following a cyclone.

Alimentary uses

This delicious fruit is eaten in all tropical regions, just as it is, or with lemon or lime juice, or in a fruit salad, or it may be made into a drink, a jam, an ice or candied fruit. It is the same in Vanuatu where it is eaten raw when ripe, outside mealtimes. When the papaya is still green it is used like a vegetable, cut into pieces and then boiled or cooked in the oven. The flesh may also be grated or cut into pieces and served as a salad, dressed with vinaigrette or lime or lemon juice or mixed with grated coconut. In Santo, and no doubt elsewhere, it is cooked in a *marmite* with stewed chicken. When almost ripe the fruits may also be cooked directly in a wood fire or stuffed with canarium nuts and cooked in an oven of hot stones. Very ripe fruits are usually given to pigs. Papaya is recommended for young children because of its easy digestibility and its content of vitamin C, vitamin A and potassium.

Other uses

In Vanuatu pieces of meat are sometimes wrapped in leaves of papaya to tenderise them. Attempts at producing papain[14] have not been satisfactory because of the poor performance of the plant material available. The seeds have the reputation of being anthelminthic and of inducing abortions. The fibres in the trunk may be made into rope. The tree is also used to shade young pepper plants, or as a medicinal plant. Because of their short life span and vulnerability to cyclones, papaya trees are never used for demarcating boundaries of land.

[14] A proteolytic enzyme used for tenderising meat, in the manufacture of chewing gum and cosmetics, in the tanning of hides and in the manufacture of silk and wool.

Genus
Caryota

Family
Arecaceae

The genus comprises a dozen or so species distributed from India to Vanuatu. One species occurs in Vanuatu.

Species present
***Caryota ophiopelis* Dowe**
Caryota, snakeskin palm

This is a plant used in times of food scarcity by people in Tanna.

References
Cabalion (1989), **Dowe (1989)**, French (1986), Purseglove (1988), Stewart (1994).

Plant used in times of food scarcity, introduced

Caryota ophiopelis

Caryota, snakeskin palm

History
The species was introduced to the southern part of the archipelago (Anatom and Tanna) in the middle of the 19th century or even later.

Description
A medium-sized palm, 6–12 m high, with a smooth trunk. Leaves bipinnate, long (3 m in length); leaflets in the shape of a fish tail, upper margins dentate. Inflorescence in the centre of the crown, not branched, pendant, bearing groups of three flowers (2 male and 1 female). Fruits round, smooth and yellow, containing 1–3 seeds.

Morphological variability
Not known.

Cultivation and production
In earlier times this palm grew in the wild state in wet forests. Nowadays the communities of Tanna protect it and grow it to a limited extent from seed or by transplanting young seedlings. After Cyclone Uma, which caused great devastation to gardens in 1987, the elders of the island were able to teach the younger generations once more how to use this palm for food.

Alimentary uses
Caryota is entirely a plant for use when other food is not available. Flour is extracted from its trunk in a similar manner to sago. The flour is mixed into a paste with water, and this is then cooked on hot stones.

Other uses
Caryota is also an attractive ornamental plant.

Genus
Citrus

Family
Rutaceae

The taxonomy of *Citrus* is a very controversial subject, and depending on author it varies from 16 to 159 species. It is mainly distributed in Asia. Ten species of *Citrus* occur in Vanuatu, four of which produce fruits that are eaten as they are, and the others are used for juice.

Species present[15]

Citrus aurantiifolia (Christmann & Panzer) Swingle
Lime

Citrus aurantium L.
Bitter orange, Seville orange (minor tree, see CD-ROM)

Citrus grandis (L.) Osbeck
Pomelo

Citrus hystrix D.C.
Kaffir lime, Makrut, combava (minor tree, see CD-ROM)

Citrus limon (L.) Burm. F.
Lemon

Citrus macroptera Montrouzier
Local orange (foraged species, see CD-ROM)

Citrus medica L.
Citron (minor tree, see CD-ROM)

Citrus paradisi Macf.
Grapefruit

Citrus reticulata Blanco
Mandarin

Citrus sinensis (L.) Osbeck
Sweet orange

Citrus species, introduced to Vanuatu at the end of the 19th century, have almost all been adopted enthusiastically by local people. Lime, lemon, grapefruit, orange and mandarin have become an integral part of cultural systems, and their cultivation is increasing widely. These are the only species that have any real economic status. The others – bitter orange, pomelo and cumquat – are not widely distributed, though they appear regularly in markets. The Kaffir lime and citron are very rare.

[15] See also *Fortunella japonica* (Thunb.) Swingle: cumquat (minor tree, see CD-ROM).

References

Barrau (1962), de Candolle (1883), ***Encyclopédie des aliments* (1997)**, Gmitter & Hu (1990), **Jones (1990)**, Neal (1929), Ochse & Bakhuizen van den Brink (1980), Ollitrault & Luro (1997), Parham (1972), Pétard (1986), Purseglove (1991), Roose (1989), **Scora (1989)**, Smartt & Simmonds, eds (1995), **Swingle & Reece (1967)**, **Tanaka (1969)**, Verheij & Coronel, eds (1992), Viard (1995), Weightman (1989), Zeven & de Wet (1982).

Complementary food plant, introduced

Citrus aurantiifolia

Lime

History

Lime arose from hybridisation of two species of *Citrus* (*C. grandis* and *C. medica*), and is a species of *Microcitrus*. It originates from the north of India and surrounding regions. It is rare among *Citrus* species in that it appeared in a tropical region. It was brought to France and Italy in the 13th century by the Crusaders. From there the Spanish took it to tropical America and then it spread to all tropical regions. Although some tentative commercial production has been undertaken in Malekula, proper cultivation of this plant for export remains to be established.

Description

Bushy shrub, 5-6 m high, furnished with spines. Leaves small; margins dentate; petiole slightly winged. Inflorescences axillary; small, white, scented flowers. Fruits small (3-6 cm in diameter), round, green but becoming yellowish when fully ripe; skin thin and clinging closely to the flesh; pulp greenish, very acid and strongly scented, containing small, oval seeds.

Morphological variability

Several varieties exist, one of which (Tahiti) has large fruits.

Cultivation and production

The tree grows in poor soils and requires little attention. Pruning every year is recommended. It likes heat and grows best in coastal regions, but is found up to 2,000 m altitude. It reproduces by seeds and spontaneously, but it is preferable to propagate it by **marcotting**. Trees reach maturity quickly and fruit throughout the year. Main producers are Mexico, Jamaica, Dominica, Trinidad and Brazil.

Alimentary uses

Lime is a typical ingredient in Asian cuisine, and is mainly grown for its juice which is used to flavour food dishes, sauces,

marinades and cocktails. In Indonesia the young leaves may be finely chopped and mixed in satay sauce. In Vanuatu limes are sold in markets throughout the year, and their juice is used to flavour salads and various dishes. It is used less in rural areas, where it is only occasionally used in preparation of local dishes. Villagers use it to make a lime juice drink.

Other uses

The juice is sometimes used as a shampoo against head lice.

Plant eaten occasionally, introduced

Citrus grandis

Pomelo

History

Originally from Thailand, Malaysia and the Andaman Islands, this species spread early to China, India and Iran from where it reached Europe around the 12th century. The pomelo seems to have been present in certain Pacific islands such as Fiji before the arrival of Europeans, unless it was brought in by the very early Portuguese or Spanish navigators. It was brought to Vanuatu by the first missionaries at the end of the 19th century.

Description

Tree 8 m in height, with spiny branches. Leaves oval, broad (up to 12 x 20 cm), hairy underneath which distinguishes this from other *Citrus* species; petiole winged, 7 cm across. Flowers solitary or in small clusters, cream, large (3-7 cm in diameter). Fruits round, slightly flattened at either end, yellow, greenish or slightly rose-tinted, large in size (10-30 cm in diameter), **pericarp** thick, easily peeled away, smooth or wrinkled; pulp greenish or pale yellow, made up of large juicy vesicles. Large, yellowish seeds.

Morphological variability

According to cultivar the pulp may be more or less juicy, very sweet or acid, and contains a very variable number of seeds. For more than twenty years the agricultural station at Tagabe has been propagating and distributing varieties of the Sarawak type, which is sweet with white flesh, and Decumana varieties which have pinkish flesh and are more acid.

Cultivation and production

Nowadays plants originating from marcots are planted throughout the archipelago. Pomelo trees are regularly found in villages in Vanuatu, along footpaths or in areas of cultivation where they are ready to slake the thirst of those working in the gardens. The problem with vegetative propagation by marcotting is that in the absence of seed nurseries and strict phytosanitary controls, certain diseases such as tristeza have

been widely spread around the archipelago. Trees growing from marcots also tend to have most roots very near the soil surface, and the absence of a deep central root leaves the trees very vulnerable to cyclones.

Alimentary uses

Pomelos are eaten raw after being peeled and cut into segments. They are also used for juice, for fruit compotes and for sorbets, and the young leaves are sometimes infused to make a morning drink.

Complementary food plant, introduced

Citrus limon

Lemon

History

The exact centre of origin of lemon is still unknown. It is certainly found in the region of northern Myanmar, southern China and north-western India. Some authors have suggested that the lemon resulted from hybridisation between the lime (*Citrus aurantifolia*) and the citron (*Citrus medica*), or between *C. medica* and another species of *Citrus*. The species has been cultivated in China for 2,500 years. Arabs have known it since the 10th century, and they introduced it to Africa after spreading it around the entire Mediterranean region. It spread to the rest of Europe in the 12th or 13th century with the Crusaders, and Christopher Columbus carried it to Haiti on his second voyage. Later it spread throughout the world, and it was introduced quite early to the Pacific.

Description

Shrub 6 m high with thick spines. Leaves oval, not more than 10 cm long; dentate margins; petiole without wings, with a characteristic junction with the stem. Flowers solitary or in small clusters, recognisable by the pink colour of the buds and then the purple colour that tinges the undersides of the white petals. Fruits oval, with a small apical swelling, yellow when ripe; pericarp thick, adhering to the flesh, rugose; pulp yellow and acid, with oval seeds.

Morphological variability

Commercial cultivation and numerous genetic improvements to the species have produced several varieties, among which Eureka, Lisbon and Villafranca are the most widespread.

Cultivation and production

Commercial cultivation of the lemon began first of all in Italy and Spain. Since 1890 California has been an important producer, followed by Italy and Greece. In Vanuatu lemon is cultivated or grows spontaneously in all the villages, particularly along the paths leading to the garden areas. Wild seedlings are looked after so that their growth is encouraged.

Alimentary uses

Lemon is grown for its juice and the zest of its peel. It may be preserved in oil or pickled in brine, and it is made into marmalade, chutney and lemon butter. In Vanuatu lemon, which is very high in vitamin C, is sold throughout the year in the markets. It is mainly used for juice, which can be made into lemonade, or to flavour certain dishes. As with lime, it is not used much in traditional dishes.

Complementary food plant, introduced

Citrus paradisi

Grapefruit

History

The centre of origin of this species is not known. It has never been found in the wild state, and it appeared in the West Indies before the end of the 18th century. It is probably derived from pomelo, either by hybridisation with sweet orange or by genetic mutation. It was introduced to Florida where it quickly became a major commercial crop for the United States. It was introduced to the Pacific including Vanuatu in the 19th century, and since then has been grown on all the islands.

Description

Tree without spines, crown round, 6–8 m tall. Leaves intermediate in size between those of pomelo and orange (6 x 11 cm), petiole with broad wings. Flowers solitary or in small clusters, white, 4–5 cm in diameter. Fruits round, pale yellow or pink-tinted, large in size (8–15 cm in diameter), skin thick but not as much so as that of pomelo; pulp pale yellow, with segments that are difficult to separate, with small vesicles. Seeds white, **polyembryonic**.

Morphological variability

Cultivars are numerous. There are forms with yellow fruits and forms with pink fruits; forms with or without seeds. The best known is Marsh, with yellow flesh, containing fewer than 10 seeds per fruit. The cultivar Thompson or Pink Marsh is known as pink grapefruit. The varieties distributed by Tagabe agricultural station are Marsh and Shambar.

Cultivation and production

Grapefruit likes warmth and well-drained, sandy soils, since it is very susceptible to root rots. Marcotting and grafting are the most commonly used methods for propagation, and the tree bears fruit after four years. Annual pruning is necessary to remove suckers and shoots and to stimulate flowering. Its sale in markets is increasing.

Alimentary uses

Almost 60% of world production is used for juicing, and the remainder is sold as fresh fruit. Grapefruit, which is less common in

Vanuatu than pomelo, is eaten between meals. Westerners, particularly those of Anglo-Saxon origin, eat it in preference for breakfast or as an entrée.

Complementary food plant, introduced

Citrus reticulata

Mandarin

History

This species is one of the three ancestral species of *Citrus* (together with *C. grandis* and *C. medica*). Appearing first in southern China, the mandarin has for a long time been the most important citrus. It has been cultivated there for 4,000 years and has become greatly diversified. Its name comes from the term Mandarin as applied to humans. Some say that the colour of the fruit resembles that of the robes that were worn by these highborn nobles, while others say that in earlier times only Mandarins were allowed to eat this delicate fruit. It reached Europe quite late, at the very beginning of the 19th century, and the United States 50 or so years later. It later spread throughout the tropical and subtropical world, reaching Vanuatu at the end of the 19th century.

Description

Small tree less than 10 m in height, sometimes without spines. Leaves elliptical or lanceolate, narrow, glossy, small (6 x 3 cm); margins serrated; petiole very slightly winged. Small, white, axillary flowers. Fruit rounded, slightly flattened and depressed on the underside, yellow or orange when ripe, small in size (5–8 cm in diameter). Skin thin, slightly embossed, not adhering to the orange pulp which separates easily into segments. It contains small seeds.

Morphological variability

The numerous cultivars may be classed into several groups and several botanical varieties. Traditionally the following are distinguished:

- the Satsuma group cultivated in Japan;
- the Mandarin group with yellow-orange fruits of which the variety Imperial is cultivated in Australia;
- the Tangerine group with dark orange fruits, to which belongs the Algerian clementine.

In Vanuatu several varieties of mandarin occur, but the most common is Raiatea which was introduced by missionaries and can be recognised by its erect bearing in the shape of a cone.

Cultivation and production

The fruit is very popular in Vanuatu. It is found in all the villages, and is sold in large quantities in the markets. It is always propagated through seedlings not by marcotting,

and this makes it much more resistant to cyclones. It is quite tolerant of shade, and it has its place in traditional gardens as a border around the plots. It is a hardy plant and no serious diseases are known.

Alimentary uses

Most of the time mandarins are eaten raw, but they may also be made into marmalade. Chinese cuisine utilises the dried peel. The ni-Vanuatu, both adults and children, love this fruit, and eat it raw between meals. It is generally picked and put straight into bags, and left to ripen for a while inside the homes before being eaten. The leaves are infused to make a morning drink.

Complementary food plant, introduced

Citrus sinensis

Sweet orange

History

The orange is a native of southern China and northeast India, where it has been cultivated for over 4,000 years. It has not been found in the wild state, and is thought to be derived either from the bitter orange or from hybridisation between the mandarin and the pomelo (*C. grandis*). Europe has had varieties of orange of mediocre quality from as early as the end of the 14th century, since the Arabs spread the species from Persia to North Africa via Spain. However, it was the Portuguese at the beginning of the 16th century who collected better varieties from China, and grew them in orangeries to protect them from the harshness of the European climate. Christopher Columbus introduced orange seeds to Haiti on his second voyage. From there the species reached the United States, the West Indies and Mexico, and then the rest of the tropical and subtropical world. Captain Cook introduced it to Polynesia, and it reached Fiji in 1832. In 1840 the first Samoan missionaries carried it with them to Aniwa. Since then the species has proliferated in this island where it has become an important element of produce. It is widely cultivated throughout the archipelago.

Description

The tree, 6–8 m tall, has spiny branches set at an acute angle to the trunk, and a narrow crown. Leaves oval, dark green, of medium size (5–15 x 2–8 cm); margins slightly wavy; petioles with short, narrow wings. Flowers white, scented, small (2–3 cm in diameter). Fruits rounded, orange or green, 4–12 cm in diameter; skin 5 mm thick, adhering to the flesh which separates into segments. The number of seeds is very variable.

Morphological variability

The numerous cultivars can be separated into three broad groups: the traditional oranges that we have just described, the navel oranges which are seedless and originate from Brazil, and the

blood oranges with flesh that is red or red-streaked that appeared in Europe around 1850. The best known cultivars are Valencia, Maltese, Jaffa (Israel), Sunkist (United States) and Outspan (South Africa). In Vanuatu four varieties of orange are found: Late Valencia, with fruits that are relatively large but which only rarely turn orange and become yellow when they are exposed to strong light; Joppa, whose tree has an upright bearing and fruits of smaller size; and two navels (Washington and Thomas) whose flesh is quite yellow. They were introduced from Tahiti in 1960. The famous orange trees of Aniwa came from a population resulting from seedlings. In appearance the fruits are very like the variety Valencia and develop a good colour, the Aniwa fruits tending to be yellower than the Valencia which is more orange. When they grow in natural forest they have an upright stance which makes them difficult to harvest. Their longevity is not more than twenty years or so.

Cultivation and production

Orange trees nowadays grow spontaneously in the islands of Vanuatu where the species has become naturalised. They are also planted for demarcation of plots of land, along the edges of tracks and ways leading to gardens, and they appear in all the villages. In the 1980s, commercial cultivation of orange was attempted in order to provide a supply for the markets of the capital. The orchards of Aniwa were devastated by Cyclone Uma in 1987, but began to produce again some years later. In the meantime orchards were developed in Anatom, and they have been in full production since then.

Alimentary uses

Oranges are eaten between meals throughout Vanuatu. They are also used for juicing and for making marmalade and sorbets. In European and Asian cuisine they are used as ingredients. Finally, the leaves are regularly picked for infusion as a morning drink.

Genus
Cocos

Family
Arecaceae

The genus comprises a single species, present since ancient times in Vanuatu.

Species present
Cocos nucifera L.
Coconut

Together with breadfruit, coconut is one of the most important fruit trees of Vanuatu. First cultivated as a food, it became by the start of the 20th century one of the most important commercial crops of the country. Although the coconut is primarily a food plant and a commercial crop, it also has numerous other uses.

References
Child (1974), *Encyclopédie des aliments* (1997), French (1986), **Harries** (**1978**, 1990), Ochse & Bakhuizen van den Brink (1980), Purseglove (1991), Sauer (1993), Smartt & Simmonds, eds (1995), Spriggs (1993), Viard (1995), Ward & Brookfield (1992), Zeven & de Wet (1982), Zizumbo-Villareal & Quero (1998).

Staple food plant, local

Cocos nucifera

Coconut

History

The true ancestor of coconut arose millions of years ago on the shores of the Sea of Thetis[16]. When the supercontinent of Gondwana broke up and the resulting continental plates began to move apart, the floating nuts continued to colonise the shores of the continents, islands and archipelagos that were progressively created. It is naturally established in the islands of the Indo-Malayan region and the Pacific as far as the Marquesas Islands. Then humans began to protect the coconut palms and spread the species, gradually selecting forms to obtain the coconuts that we know today. Austronesian peoples carried the nuts to Madagascar, Arabs took them to the coasts of East Africa, the Portuguese to the coasts of West Africa (in 1498) and the Spanish from the Philippines to Mexico around 1540. Since the time of the great seafarers of the 16th century the coconut has been carried to every tropical shore and has become

[16] The ancient sea that separated the old Asian and Australian continents.

established there. The Pacific region possesses the greatest known diversity of coconuts, as well as the greatest diversity of insects associated with them. Carbon-14 dating has shown that the coconut existed in Vanuatu well before the arrival of the first humans, and it certainly would have contributed to the settlement of people in these islands. Nowadays coconut is a typical plant of the Vanuatu coastline, and since European contact the development of commercial plantations together with scientific research for genetic improvement has been substantial.

Description

Palm tree 20–30 m high; trunk sinuous, cylindrical, bearing scars left by the bases of the palm fronds, with a crown at the top consisting of 25–30 leaves of different ages; base swollen and surrounded by roots. Leaves growing from a terminal bud, lanceolate, entire when young but dividing down to the central leaf rib when adult. When fully grown each leaf frond measures 4–6 m and each leaflet 50–120 cm in length; petiole broad and stout. Inflorescence branched into about 20 **spikelets** appearing at the centre of a long spathe (1 m), each spikelet bearing about 30 small, pale yellow male flowers and some large female flowers. Cluster of fruits situated beneath the fronds, **drupes** 20-30 cm long and weighing up to 2 kg. Each comprises an hard **exocarp** (**epicarp**) which is smooth and variable in colour (green, brown, yellow or orange), a fibrous brown **mesocarp**, an ovoid **endocarp** which is hard and woody, dark brown and with three "eyes" at the base, and an oily white seed hollowed out in the middle into a cavity that contains the coconut water.

Morphological variability

Coconuts comprise homogeneous populations that can easily be differentiated on the basis of morphological and agronomic characters. There are three main groups: the Pacific, the Indo-Atlantic and the intermediate Indian Ocean types. The Pacific group, to which the Vanuatu coconut belongs, extends from Sumatra to French Polynesia, and it is very much diversified. Two other subdivisions of coconut are also recognised – the tall types (95% of the world population) that have trunks with swollen bases and the dwarf types that have bases that are not swollen. The dominant variety in Vanuatu is Vanuatu Tall or New Hebrides Tall. The genetic variability of coconuts in Vanuatu has been greatly underestimated, and recent collecting surveys have found over 20 distinct populations. Growers distinguish varieties by features such as the colour of the nuts, the height, the length and colour of the fronds, the colour of the inflorescences, etc. On average there are 12 different vernacular names per village. The uses are also quite diversified, some varieties being preferred for their coconut water while others are chosen for the aroma of their milk or the taste of their flesh.

Island cabbage or aibika (*Abelmoschus manihot*) planted in a garden.

© A. Walter

TREES, SHRUBS AND BUSHES

Island cabbage (aibika) for sale in the market: the vegetable par excellence of the ni-Vanuatu.

© D. Greindl

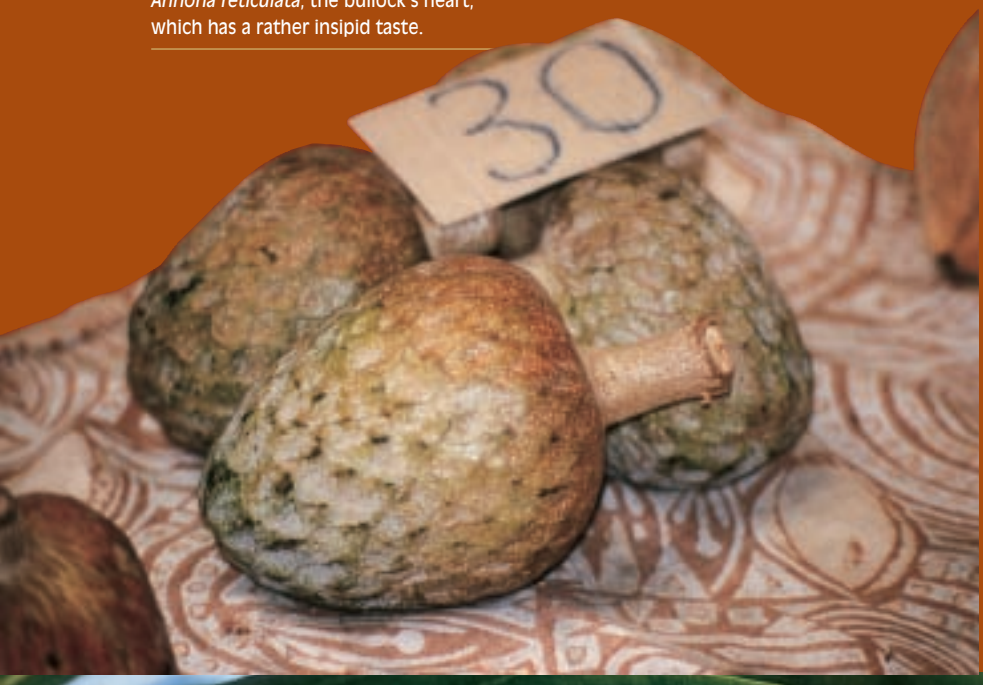
Annona muricata, the soursop, a very popular fruit.

© D. Greindl

Cultivar of island cabbage or aibika (*Abelmoschus manihot*) called "octopus fingers" because of its long, fine leaves.

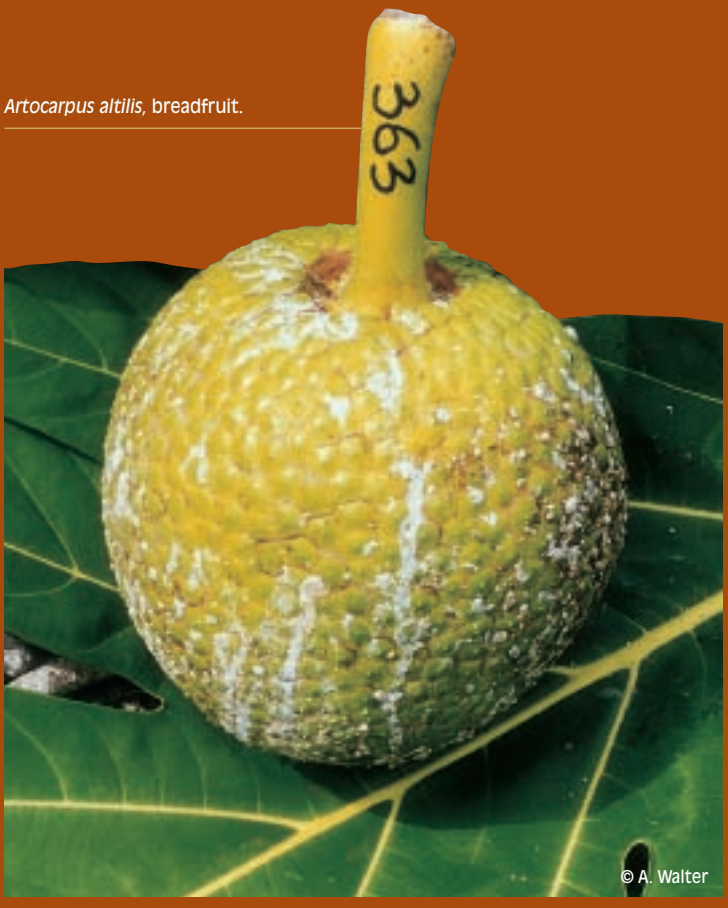
© D. Greindl

Annona reticulata, the bullock's heart, which has a rather insipid taste.



Annona squamosa, the sweetsop or custard apple, the least common of the Annona species in Vanuatu.

Artocarpus altilis, breadfruit.



Breadfruit is one of the most significant plants in Melanesian arboriculture. Its diversity is very great.

Breadfruits (*Artocarpus altilis*), baked on hot coals, to be eaten just as they are.

Parcels of *nalot* which are most often prepared for a morning meal. Breadfruit pulp is pounded, then sprinkled with coconut milk.

Artocarpus altilis, breadfruit tree.

Carambola or star fruit (*Averrhoa carambola*), a somewhat acid fruit.

Pods of *Cajanus cajan*, the pigeonpea.

© F. Tzerikiantz

Papaya or pawpaw *(Carica papaya).*

A common fruit in Vanuatu, the papaya is tasty and affordable.

Caryota ophiopelis: leaves and fruits

© V. Lebot

Citrus aurantifolia: lime.

Lime, lemon, grapefruit, orange and mandarin nowadays form part of the ni-Vanuatu cropping system, and their cultivation is increasing rapidly.

Citrus paradisi, grapefruit.

© D. Greindl

Citrus reticulata, mandarin, is very popular in Vanuatu.

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Citrus grandis, pomelo

Citrus sinensis, sweet orange, is found in all the villages.

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Coconut *(Cocos nucifera)*.

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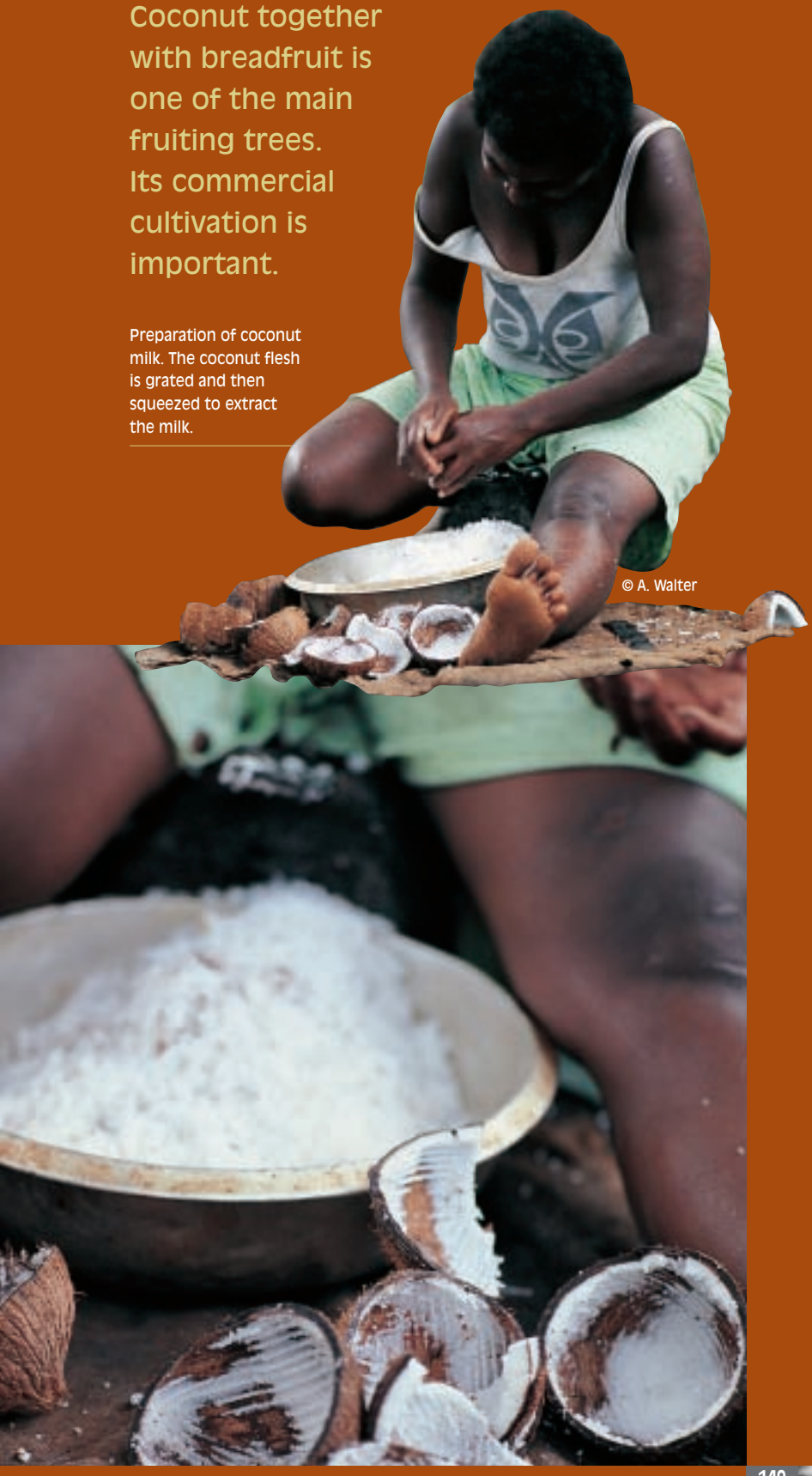
Young coconuts with their fibrous outer coat removed for sale.

Coconut together with breadfruit is one of the main fruiting trees. Its commercial cultivation is important.



Preparation of coconut milk. The coconut flesh is grated and then squeezed to extract the milk.

Cycas (*Cycas rumphii*) is a very ancient plant that is present throughout the archipelago.

The cycas, which is very toxic, is a plant for times of food scarcity that requires long preparation before it can be eaten.

Cycas, the symbol of Vanuatu, is one of the great ritual plants.

Litchi sinensis, a not very common tree in Vanuatu.

Basket of mangoes *(Mangifera indica)*.

Mango trees are much appreciated for their fruit and shade. The tree is found in abundance.

Sago palm fruits (*Metroxylon warburgii*). A starchy material is also extracted from the sago palm, which is used to prepare a traditional dish, sago.

Persea americana, avocado, is quite rare in villages.

Piper methysticum, used to make kava, the traditional drink of the Pacific.

Polyscias fruticosa, planted as a hedge.

Polyscias are ancient plants that adorn the surrounds of villages and houses.

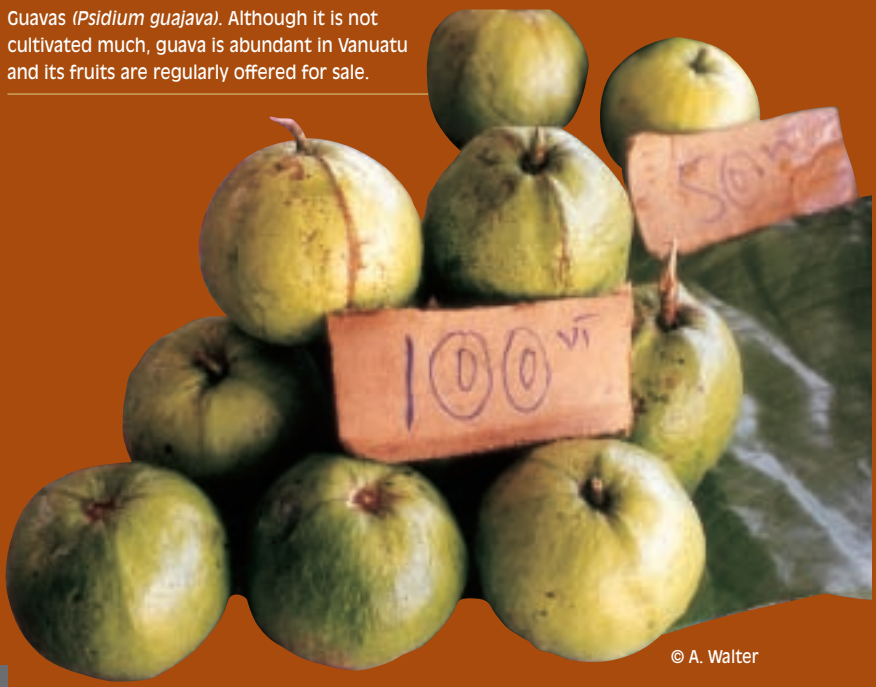
Polyscias scutellaria.

© F. Tzerikiantz

Above: *Pseuderanthemum pelagicum.*

Left: *Pseuderanthemum carruthersii.* Poorly known, these plants are very close to polyscias, with which they are mixed in hedges.

Guavas *(Psidium guajava).* Although it is not cultivated much, guava is abundant in Vanuatu and its fruits are regularly offered for sale.



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Cultivation and production

In ancient times coconuts would simply have been picked from the wild, but they were very quickly cultivated by the local populations. Even aboriginal peoples in Australia, who did not practise agriculture, from time to time planted coconuts. The tree grows up to 600 m altitude. In Vanuatu before the arrival of Europeans the species was part of the stock of fruiting trees that were planted along tracks or in areas set aside near villages. Nowadays in rural areas coconuts are still planted in these places and around gardens and houses, or even in forests at low altitudes for slaking the thirst of passers-by. It is more and more used for occupying land that is under legal dispute, and at the end of their cultivation cycle the farmers plant into their gardens young plants that identify the owner of the land. In earlier times the nuts were exchanged by people of coastal areas for taro or other products from inland areas. Finally, a modern practice in Vanuatu is to graze cattle under coconuts in plantations. Coconuts were first grown in a plantation in 1840, and from the end of the 19th century in Vanuatu. Nowadays coconut groves cover about 90,000 ha of which about 30% are used for eating and the remainder is made into copra when the price is good. The average yields are low, of the order of half a tonne of copra per hectare. This poor performance is attributed to little upkeep of the coconut plantations and low-yielding local varieties.

Although coconut yields poorly above 400 m altitude, it grows particularly well in the infertile coralline soils of the coast, where few other crops will grow. In contrast, growing it inland creates problems because of its dominant root system and its shade which inhibits good growth of various other crops. Although the coconut remains an important food crop, copra is a commodity heading rapidly to ruin and the coconut plantations are senescent. The number of coconut palms in need of replanting is estimated at over 600,000 per year in order to regenerate the existing coconut plantations.

In Vanuatu a viral disease called coconut foliar decay is endemic, and is transmitted by the insect *Myndus taffini*. It does not affect production of local cultivars which are totally resistant, but exotic cultivars suffer serious mortality. Many insects damage the leaf tissue, young and mature, reducing the photosynthetic capacity of the plant and hence its yield. Flying foxes, which are large, fruit-eating bats, cause serious damage when they eat the young inflorescences.

Alimentary uses

Coconuts are eaten at various stages of maturity. When they are still young and soft the rich flesh is given to children, and when they are mature they are eaten as they are, or grated in order to extract the coconut milk that is used for seasoning dishes. The milk may be cooked slightly (when it gets a clotted

appearance), or for a very long time in order to extract the oil. Both preparations may then be used as sauces to dress *lap-lap* and the small balls of breadfruit paste called *nalots*. The coconut water from the central cavity is drunk as it is. Finally the germinating nut, which becomes round and spongy, is nibbled between meals. The heart (i.e. the terminal bud) is edible. In Santo the spathe is completely burned to ash that contains mineral salts. This ash is then diluted with water and filtered, to provide a salty liquid for cooking.

Other uses

The non-food uses of coconut are numerous: lubricating oil, fats for making soap and cosmetics, fuelwood, ropes, brooms, timber for making artisanal objects, and so on. In Vanuatu the fronds are used for making roofs, matting for the ground, and baskets; the leaf ribs with the leaves removed are fastened in bundles to make brooms. The roots and bark have medicinal uses. The trunk is used in the construction of dwellings, and more recently for making small furniture and artisanal objects. The wadded fibre is sometimes used in canoe-making. The hard shell of the nut is used as a drinking vessel for kava, and sometimes for making spoons. The coconut flesh, dried in the sun or in drying ovens, provides copra whose oil is used in making margarine. Before being replaced by soybean oil in the 1960s, it was the main source of vegetable oil.

Genus
Cycas

Family
Cycadaceae

The genus comprises 40 or 50 species distributed from India to northern Australia, with some representatives in Madagascar and East Africa.

Species present
Cycas rumphii Miquel

Cycas, cycad

Cycas is only eaten in times of famine by the communities of Epi. But it is an ancient plant and one of the major ritual plants of Vanuatu.

References
Barrau (1962), Beck (1992), Brown (1951), French (1986), Glassman, ed. (1971), Henderson & Hancock (1989), Johnson (1959), Neal (1929), Ochse & Bakhuizen van den Brink (1980), Parham (1972), Peekel (1984), Safford (1905), **Stevenson (1990, 1992)**, Stevenson & Osborne (1993), Stewart (1994), Verheij & Coronel, eds (1992), Yuncker, ed. (1971, 1974).

Food plant in times of famine, local

Cycas rumphii

Cycas, cycad

History

A very ancient tree, fossilised traces of which have been found in ancient geological strata. *C. rumphii* is found in the wild or spontaneous state from Madagascar to Polynesia and Micronesia, via Southeast Asia and northern Australia. Native to Vanuatu or carried by the very first migrants in their canoes, the tree is present everywhere in the archipelago, generally in a cultivated state.

Description

Cycas rumphii resembles a palm tree, with a cylindrical, woody trunk 5 m in height. Leaves **pinnate**, grouped at the top of the trunk, long, made up of 50–150 pairs of narrow leaflets, smooth, shiny green, 25 cm x 1.5 cm. Plant **dioecious**. Male flowers arranged in a long cone, thick and yellow, arising annually. The female plant produces modified brown leaves (sporophylls) and a row of oval structures (ovules) producing oval seeds at maturity, red or orange, 3–4 cm in diameter.

Morphological variability

Unknown.

Cultivation and production

The trees are planted as isolated individuals, by transplanting young shoots. The young plant grows very slowly, and therefore needs regular attention so that it is not overgrown by weeds.

Alimentary uses

C. rumphii is highly toxic, but despite this it is used as a food plant in times of famine by many communities, from Papua New Guinea to Fiji and Guam. In order to make it safely edible, it requires long preparation. The pith of the trunk and the seeds may be used. With both of these it is necessary first to grate the plant material, then wrap it in leaves and macerate it in water for several days, with regular changes of water. The resulting flour is collected by straining, and is dried and then cooked in an oven of hot stones to make a type of pudding. In Vanuatu the seeds are not used, and the trunk very little (by some communities, such as in Epi, following Cyclone Uma). It is only a food plant for times of famine.

Other uses

In Solomon Islands the plant is used in medicine for treatment of yaws and tropical ulcers, and in the Philippines for sores, itching and skin disorders. Its seeds threaded on to a string make a toy for children. A symbol of Vanuatu that is present on its flag, *Cycas rumphii* is one of the symbols that a man of high rank must buy in order to attain a still higher position. He pays with pigs with recurved tusks, and plants it close to the *nakamal*[17] during a grand ceremony. In forests or close to villages, lines of cycads or isolated plants may be observed. The tree is also very decorative. In earlier times its fronds were used as a calendar. When a meeting was scheduled each participant in the meeting would detach, from one side of the leaf, a leaflet each day until the day marked as that of the appointment. Likewise the large leaves were used to count the number of guests during a customary feast, by pulling off one leaflet for each person present. And when a place is to be declared taboo and access is to be forbidden, two crossed cycad leaves are placed across the entrance (a ban whose symbol is respected by all).

[17] Bislama term for a building (clan hut) for men.

Genus
Litchi

Family
Sapindaceae

The genus, which is monospecific, is originally from the northern part of Southeast Asia, but has been diversified in China.

Species present
Litchi sinensis Sonnerat
Lychee, litchi

Although its fruits are very popular the tree is not very common in Vanuatu, where it grows poorly. Some fine specimens nevertheless produce fruits which may be sold in the markets. However, harvesting is mainly restricted to family and friends.

References
Bose *et al.* (1999), *Encyclopédie des aliments* (1997), Menzel (1983, 1984, 1990), Mitra (1999), Popenoe (1974), Verheij & Coronel, eds (1992), Viard (1995), Weightman (1989), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Litchi sinensis

Lychee, litchi

History

The lychee is originally from the northern part of Southeast Asia, and has been cultivated there for around 2000 years. Introduced to China[18] a long time ago, this delicious fruit is highly valued there. It was customary for the mandarins to offer this fruit to their ruler. Lychee travels very poorly, and it took until the end of the 19th century to reach other tropical regions such as Vanuatu. Its perishable seed does not survive long times in transit, and the climatic requirements of the plant make its fruiting problematical. It is nowadays found in many regions, up to slight altitude.

Description

Tree 10–15 m in height. Leaves composite with two to four pairs of elliptical leaflets, **coriaceous**, 12 x 3.5 cm. Flowers grouped in large **panicles**, yellow-green, small in size. Fruits rounded, 3 cm in diameter; epidermis thick and **rugose**, green or pink; **aril** translucent with a fragrant taste; the nut is brown and elongate.

[18] It is often stated that it originated there.

Morphological variability

Numerous cultivars exist, and are distinguished by the shape and size of the fruits, or of the trees that bear them. There has been much crossing of the genetic diversity in research stations in attempts to produce new varieties. The trend particularly is to select small nut size and varieties that are early or late.

Cultivation and production

In the tropics the tree does not bear well unless the dry season is cool but without frost. Its flowering is often much greater than its fruiting. The lychee likes heavy and humid soils. It is propagated by cuttings and bears fruit after 4–6 years. In Vanuatu the tree is planted in ornamental gardens of urban homes, and scattered around the rural villages where it is less common. Production is usually just for home consumption, and few fruits reach the markets. It is worth noting that the lychee is a tree that is long-lived, and in certain countries can produce high yields (150 kg of fruits per year).

Alimentary uses

The fruits are eaten raw after the thick outer coat has been removed.

Genus
Mangifera

Family
Anacardiaceae

The genus comprises about 60 species distributed from Sri Lanka to Micronesia. In Vanuatu there is one species.

Species present
***Mangifera indica* L.**
Mango

Mango, introduced early into the archipelago, has been widely adopted by the local people. Nowadays it is a common tree that grows abundantly in all the islands, near the sea, within the villages, along tracks, around gardens and in plantations.

References
Bompard (1993), **Bompard & Schnell (1997)**, de Candolle (1883), Kostermans & Bompard (1993), de Laroussilhe (1980), Mukherjee (1949, 1972), Popenoe (1974), Purseglove (1991), Schnell & Knight (1993), Singh (1960), Verheij & Coronel, eds (1992), Viard (1995), Weightman (1989), Zeven & de Wet (1982).

Complementary food plant, introduced

Mangifera indica

Mango

History

Mango grows in the wild state in the foothills of northeast India, Myanmar and Bangladesh, probably also in the foothills of the Himalayas in Sikkim, and in Southeast Asia. It was domesticated independently in Myanmar and in northeast India by divergent processes of domestication. The Indian forms, the great majority of which are monoembryonic, were selected and propagated by vegetative means during the Mogul era (1526–1858). The Indians took them to neighbouring countries, the Malayan Peninsula and the Philippines, but also to the Hindu states of Southeast Asia. However, the polyembryonic native forms undoubtedly existed in Southeast Asia even before the introduction of the Indian forms, and these forms were also ones that were domesticated in the region. The Persians introduced the mango to East Africa in the 10th century AD. Then, during the era of great exploration, the Portuguese discovered the fruit and spread it to West Africa, the Pacific and then Mexico in the

18th century. Mango was introduced to Vanuatu from the island of Réunion and New Caledonia, and then reintroduced several times by missionaries, by people returning from working in plantations, and by seafarers. The most important populations of mangoes are found in Tanna, Malekula and on the west coast of Santo.

Description

Large tree 20–40 m in height, with a dense crown. Leaves produced by vegetative shoots, arranged in spirals, simple, elliptical or lanceolate, red in the juvenile state then green and shiny, coriaceous, 8–40 x 2–10 cm; petiole thick, expanded at the base. Panicle terminal, branched, long (6–40 cm, bearing subsessile, polygamous flowers, scented, calyx yellowish, 5 creamy petals streaked with yellow or purple, then rosy. Fruits variable in shape and size, orange. Endocarp, or nut, flattened, fibrous, woody and large in size.

Morphological variability

The number of cultivars is significant and each region of the world has chosen its own range according to the shape, the size and the taste of the fruits. These are generally rounded or ovoid, to some degree flattened, varying from yellow-orange to orange-red, spotted with brown or not, according to cultivar. The flesh is more or less thick, juicy or fibrous. The greatest diversity is found in India, Southeast Asia and the Philippines. Four groups are customarily distinguished:

- a group with polyembryonic seeds and oblong fruits, common in Southeast Asia
- a group with mono-embryonic seeds and round fruits, common in India
- a group intermediate in shape, also common in India
- a group known under the name of Sandersha-Haden encompassing hybrids developed in Florida and Hawaii

Apart from these groups, numerous varieties exist as a result of local selection or selections made during agronomic research. In Vanuatu there is great morphological variability, but many are trees that have not been selected and are of poor quality, and the variability has not been studied in any detail. There is a potential market, including exports, for varieties of good quality – non-fibrous, sweet and of good size.

Cultivation and production

Although mango is mainly a plant of the lowland tropics, it can grow at altitude as long as it is not subject to frost. It prefers regions with clearly marked seasons, including a dry season which favours flowering and fruiting. For this reason it is particularly adapted to the

leeward coasts of the islands of Vanuatu. It tolerates a wide variety of soils as long as they are neither too alkaline nor too acid. Propagation of mango is by planting the entire nut, or the seed removed from the endocarp. It may also be by marcotting or grafting. The young seedlings are transplanted into pots when the first leaves have become green, and then into the chosen piece of ground six months later. In Vanuatu the nut is sometimes planted directly into the soil, or more often wild seedlings that are well developed are transplanted. A very good crop is generally borne every three or four years, although this varies according to cultivar. The tree is grown on the sea-coast, on the edges of villages and around the gardens.

Alimentary uses

In Vanuatu the fruits are eaten raw when they begin to ripen and when they are fully ripe, after being peeled. The flesh is often sucked out of a small hole made in the epicarp. During the season the consumption of these fruits is high, and large quantities are found in the markets. The young leaves are also used to make infusions. Some local enterprises are beginning to sell dried mangoes or mangoes preserved in sugar syrup.

Other uses

In some countries the seeds are fed to cattle. In Vanuatu this tree with its attractive crown is often grown as a shade tree. Small wooden benches are constructed at the foot of the tree, and the villagers can chat there shaded from the sun.

Genus
Metroxylon

Family
Arecaceae

The genus comprises five species distributed from Thailand to Samoa. One edible species is present in Vanuatu.

Species present
Metroxylon warburgii (Heim.) Beccari
Sago palm, sago

In earlier times used by a number of communities, such as those in Santo, sago is nowadays only prepared as food in times of food scarcity.

References
Barrau (1958, 1959, 1962), Christophersen, ed. (1971), Connell & Hamnet (1978), Dowe (1989), McClatchey & Cox (1992), **Rauwerdink (1986)**.

Plant in times of famine, local

Metroxylon warburgii

Sago palm, sago

History

This palm is found from Santa Cruz to Samoa, but its centre of origin is limited to Indonesia and Papua New Guinea. It was almost certainly introduced to Vanuatu in ancient times, and it is rare from Vanuatu onwards. It was introduced to Rotuma by the Melanesians, and from there it spread to the central islands of Polynesia.

Description

Monoecious, arborescent palm, trunk 7 m long. Leaves composite, long (3 m); leaflets straight, narrow and long; petiole with a broad, concave base, furnished with large spines on its outer surface. Large, erect inflorescence at the top of the palm; its primary branches enclosed in a spathe, and its secondary branches bearing alternate **spikes** set with pairs of flowers, one male and one female. Fruits pear-shaped, 10 x 7 cm, covered with overlapping scales; base depressed.

Morphological variability

This cultivated species has several cultivars according to the height of the tree and the size of the fruits.

Cultivation and production

The sago palm is found in small groups in areas that are slightly marshy or are close to water-courses. It is propagated by its fruits or by transplanting young shoots. The tree grows for at least eight years before producing one single inflorescence. The fruits reach maturity after three years, and the tree then dies, having only the single growing axis.

Alimentary uses

Before the inflorescence appears, the trunk of the sago palm is filled with starchy matter which is extracted for the preparation of sago. To do this it is necessary to fell the tree, cut the trunk down the middle and scrape out the inside to obtain a dense powder which is washed with water. The flour thus obtained after sedimentation is dried. It is then cooked in an oven with hot stones or made into *lap-lap*. In earlier times this food was prepared in the centre of Santo, in Torres, in Banks and no doubt in other places. Nowadays only a few elderly people still know sago, which can be used as a foodstuff in times of food scarcity.

Other uses

In Vanuatu the sago palm is most of all grown for its leaves, which are used for making 'tiles' of plant material that are used to cover the roofs of traditional houses. Its fruit is used for making the bowls of pipes.

Genus
Persea

Family
Lauraceae

The genus comprises about 50 species, most originating from Latin America. Ten or so bear edible fruits. A single species is present in Vanuatu.

Species present
Persea americana Miller
Avocado

Introduced at the same time as other fruits, avocado does not enjoy the same popularity with the local people. It is very common in urban and peri-urban areas and is sold in large quantities in the local markets, but it is much less common in the villages where it is only eaten occasionally.

References
Bergh (1969, 1986, 1992), Coronel (1994), Ochse *et al.* (1961), Purseglove (1991), Schroeder (1958), **Scora & Bergh (1992)**, Smartt & Simmonds, eds (1995), Storey *et al.* (1986), Verheij & Coronel, eds (1992), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Persea americana

Avocado

History

This strange fruit, not juicy but with oily flesh, appeared in Central America. Some think that it was spread 10,000 years ago by large herbivores that fed on its flesh and then passed out the large seeds in their droppings. This extinct fauna has left behind it a fruit that has been used by the native populations for 8,000 years. They progressively selected better cultivars. Although the fruit was taken to southern Spain in 1610, it was not spread around the tropical world before the end of the 19th century. Doubtless some adaptation was needed for people to take to this fruit with fatty flesh and such a characteristic taste. Introduced to Vanuatu at the beginning of the last century, avocado has still not spread much through the islands, and remains concentrated around towns, most often in the gardens of expatriates. Nevertheless, the local populations are now cultivating it increasingly for sale in the markets.

Description

Tree 10–20 m in height. Leaves arising in successive bursts of growth, arranged in spirals towards the ends of branches, oblong, variable in colour and size. Inflorescences with numerous flowers, each with a calyx of six pale yellow **tepals**, arranged in two rows. Fruits pear-shaped or globular, variable in size (7–20 cm long), with an epicarp that is more or less thick, variable in colour (from light to dark green, chestnut brown or purple), with oily flesh varying from yellow to green, containing a large, round, brown seed.

Morphological variability

Three sub-species of avocado have been distinguished:

- Mexican (subspecies *drymifolia*): native to mountain regions of Mexico, it is adapted to high altitude (1,500–3,000 m) and very resistant to cold. Bears small, very fatty fruits, with a big seed that is loose inside a large cavity; skin fine and smooth; reaching maturity 6-9 months after flowering;
- Guatemalan (subspecies *guatemalensis*): native to the chain of mountains of Central America, it is adapted to medium altitude (1,000–2,000 m). Bears large, less fatty fruits, with a small seed that adheres to the flesh and with a thick and rugose skin; reaching maturity 9-12 months after flowering; peduncle long;
- West Indian (subspecies *americana*): despite its name it did not originate in the West Indies but in lowland areas of Central America. It is adapted to sea-coasts and is fairly tolerant to salinity. It bears big fruits with a large seed that is loose inside a central cavity, and has a fairly thick but smooth skin. The peduncle is short.

The differentiation of these three subspecies is not very clear. Moreover, the subspecies *guatemalensis* may have resulted from hybridisation between two wild species of *Persea*. Hybrids are obtained by crossing these three subspecies, and about 700 cultivars of avocado exist around the world, either selected locally by indigenous populations or created in agricultural research stations.

In Vanuatu, several varieties of avocado exist according to the size and the shape of the fruit and the colour and the taste of the flesh. At the beginning of the 1980s the Tagabé Agriculture Station introduced selected varieties (Duke, Hass, Gottfried, Dickinson, Anaheim, etc.) that were well adapted to local conditions, and distributed them to the farmers of Efate. Since then the fruits have appeared in the Port Vila markets.

Cultivation and production

Fruiting is irregular and depends on whether or not there are heavy rains that knock off the tiny

flowers before the fruits are set. No serious diseases are known in Vanuatu. However, the fruits must be picked carefully to avoid mechanical damage and bruising. In orchards the trees are planted 9 m apart, in a triangular pattern, to maximise development of good vegetative growth. The production seasons are relatively short, and it is therefore necessary to grow several varieties, early and late, to extend the period of harvest.

Alimentary uses

Avocado is eaten raw after being peeled or by scooping the flesh directly out of a fruit cut in half. It may be improved with various dressings, mixed with salads, added to soups or used as a butter to spread on sandwiches. It can also be used for making sauces or even sorbets flavoured with lemon juice. On the other hand it does not cook at all well. Its nutritional qualities are great and well recognised: it contains about a dozen vitamins and mineral salts, dietary fibre and mono-unsaturated lipids (intake of which protects against cardio-vascular problems). It is a good food for weaning children.

Genus
Piper

Family
Piperaceae

The genus, which is pantropical, comprises close to 1,200 species, the majority of which originate from the New World. On the other hand the majority of species of pepper come originally from Southeast Asia. Two alimentary species of *Piper* occur in Vanuatu – an introduced pepper and a native species that provides a calming beverage.

Species present
Piper methysticum Forst. f.
Kava

Piper nigrum L.
Pepper (minor climbing plant: see CD-ROM)

Kava is one of the most ancient cultivated plants of Vanuatu where it has been domesticated, while pepper is a recent introduction. While not strictly a food plant, kava provides a ritual beverage that bears the same name.

References
Chew Wee-Lek (1972), Hubert (1987), Lebot & Aradhya (1992), PROSEA (1999), Purseglove (1991), Smartt & Simmonds, eds (1995), Waard & Zeven (1969), Zeven & de Wet (1982).

Complementary food plant, local

Piper methysticum

Kava

History

Kava was domesticated from a wild ancestor, *Piper wichmannii*, in the north of the Vanuatu archipelago. It was probably in the province of Penama that the first varieties, improved by vegetative means, were selected and distributed throughout the archipelago. Kava was later found by Polynesian seafarers and spread to all the islands that they colonised. It is also found in Ponape and in some isolated places in Papua New Guinea. Missionaries and colonial administrators never ceased trying to forbid its consumption[19], but achievement of Independence by the various nations using kava and a desire to reaffirm cultural identity has led to restoration of its use, and nowadays its consumption is increasing rapidly. Kava is henceforth the traditional beverage of the Pacific.

[19] The colonial authorities stigmatised the plant itself, suspecting it of being a drug, and seeing it also as a ritual symbol of a traditional culture.

Description

Bushy or shrubby plant, from 1–4 m in height according to variety. Leaves alternate, simple, delicate, **entire**, heart-shaped, 8–25 cm long; petiole 2–6 cm. Species dioecious. Inflorescences opposite to the leaves. Flowers unisexual, small, without either calyx or corolla, sessile. No fruits or seeds.

Morphological variability

In Oceania 115 distinct morphotypes have been counted, 82 of which are in Vanuatu. The cultivars are distinguished according to their growth habit, the length of the internodes, the thickness and colour of the stems (light green to purple and almost black), and the shape and colour of the leaves. But it is the functional characteristic of the plant – the kavalactone content – that provides the variability of greatest significance.

Cultivation and production

Kava is sterile and is therefore propagated by cuttings of stems placed directly into the ground after the soil has been quickly dug over. Plants are set 1–3 m apart in all directions, and are often intercropped with subsistence crops. Upkeep is limited to weeding (especially when the plants are young), to mounding up once or twice a year to put more soil around the plant base and thus promote growth of young stalks, and to pruning of senescent or suckering stems. Harvesting takes place after three years, and care is taken to minimise damage to the roots which are richest in kavalactones. Kava dieback is caused by a virus (CMV) together with some co-factors that have not yet been identified. It is best to grow the kava in very fertile patches of soil because weak plants are vulnerable to the disease. It is necessary to prune the stems regularly, once or twice per year, to promote branching. No other serious problems are known, but the nutritional needs of the plant are important. Regular composting is advised.

Alimentary uses

The fresh root is ground up, mixed with water, then squeezed and filtered in order to obtain a fresh extract which oxidises and deteriorates quite quickly. This kava extract is drunk each evening in the hundreds of *nakamals* and kava bars that are spread around the country. It is rich in fibre, starch, minerals (K, Ca, Mg, Fe, Zn, Mn) and in protein (3.6%), and it is low in calories. The kavalactones have a relaxing effect.

Other uses

The active principles of kava provide a veritable panacea in traditional medicine. It is used to treat rheumatism, influenza, aches and pains and other afflictions.

Genus
Polyscias

Family
Araliaceae

The genus comprises 150 species present in the Old World tropics, mainly in the Pacific islands. Vanuatu is home to 8 species.

Species present
Polyscias cissodendron (C. Moore & F. Mueller) Harms

Polyscias cumingiana (K. Presl.) Fernandez-Villar.

Polyscias fruticosa (L.) Harms

Polyscias guilfoylei (Bull.) Bailey

Polyscias multijuga (A. Gray) Harms

Polyscias samoensis (A. Gray) Harms

Polyscias schmidii Lowry

Polyscias scutellaria (Burman f.) Fosberg

In Vanuatu the polyscias are ancient plants, present well before European contact. They are regularly seen planted as hedges around villages and houses. They provide a source of edible leaves that are readily to hand, and are usually eaten within the family. A few bunches are sometimes found in markets. The village people do not make any particular distinction between the different species although they recognise them as different forms. We thus treat all the species together here.

References
Brown (1935), Henderson & Hancock (1989), **Lowry (1989)**, Lowry *et al.* (1986), Ochse & Bakhuizen van den Brink (1980), Philipson (1979), PROSEA (1994), Smith (1985), Smith & Stone (1968), Stone (1965a, b), Womersley (1978), Yuncker, ed. (1971).

Plants occasionally eaten, local or introduced

Polyscias spp.

Polyscias

History

The polyscias of Vanuatu reflect the relationship that the flora of that country has with the floras of neighbouring countries. Thus *P. schmidii* comes from New

Polyscias fructicosa

Caledonia, *P. samoensis* from Samoa, *P. multijuga* almost certainly from Fiji and Tonga, while *P. cissodendron*, *P. cumingiana* and *P. fruticosa* are spread from the Malayan Region to the western Pacific and *P. scutellaria* is almost certainly native to Vanuatu and Solomon Islands. Present in all the villages, the majority are cultivated for their edible leaves and as ornamental plants.

Description

Shrubby trees 2–5 m in height, branched at the base, with jointed stems. Leaves composite, entire or greatly dissected. Inflorescence **apical**, in the form of an **umbel** carrying flowers that are hermaphrodite or unisexual. Fruit fleshy, surmounted by a persistent calyx. The distinction of the species is principally according to whether the leaves are unipinnate or

bipinnate (or even **tripinnate**). Among the species with bipinnate or tripinnate leaves are:

- *P. guilfoylei*: leaflets elliptical, very weakly dentate, dark green or yellow, marked with white on the margins;
- *P. fruticosa*: leaflets markedly dentate or completely divided, sometimes giving them the appearance of a feather duster, very elongate (up to 30 cm). Flowers in bunches, small, yellowish.

All the other species are unipinnate, and are separated into species with a smooth petiole and no sheath at the base and those with a sheath at the base.

In the group without a sheath are found:

- *P. cissodendron*: leaves not exceeding 40 cm in length, composed of about ten oval leaflets, dark green. Fruits joined for more than half their length;
- *P. schmidii*: large leaves reaching 90 cm in length, made up of about 20 oval leaflets, almost sickle-shaped. Fruits not joined, flattened and elliptical.

The group with a sheath includes:

- *P. multijuga*: long leaves (50–100 cm) made up of about 20 oblong leaflets. Small flowers, sessile, with two styles, arranged in bunches on a long **raceme**. Small purple fruits, laterally flattened;
- *P. samoensis*: very close to *P. multijuga*, distinguished by its flowers and fruits that are pedicellate (longer than 7 mm);
- *P. scutellaria*: leaves (13–40 cm) composed of three to five oblong leaflets whose margins are often curled over, dark green; sheath at the base of the petiole. Small flowers with three to five styles, grouped in racemes. Small, round fruits which are rare;
- *P. cumingiana*: long leaves (40–75 cm) made up of 5–15 green leaflets, or golden yellow leaves that are completely dissected.
- *P. guilfoylei*, which is a cultivated species, can sometimes have unipinnate leaves with leaflets that are very dissected.

Morphological variability

The variability of each species is very great, amplified by cultivation and selection. When planted in the shade polyscias are usually green; when planted in the sun, as they usually are, the foliage becomes pale yellow, golden yellow or red in certain forms. The village people do not distinguish between the different species, but they do recognise numerous cultivars within the overall group.

Cultivation and production

The plants are cultivated everywhere, planted in hedges in the villages, on the low walls of the irrigated taro pits and around the gardens. They are propagated by cuttings, and with continual pruning they come to form thick barriers of vegetation around the villages and large thickets close to the houses.

Alimentary uses

Since all the species are grouped together by the villagers under a single vernacular name, it is quite difficult to know exactly which are eaten and which not. However, *P. fruticosa* and *P. scutellaria*, followed by *P. guilfoylei* and *P. samoensis*, are the ones that are found most often being cultivated for alimentary use. The young leaves add flavour to meat cooked in an oven of hot stones, or to fish. They are also boiled in small bamboo containers or in *marmites* and then seasoned with coconut milk. They are also added to certain soups. Fish and pork are sometimes wrapped in polyscias leaves before being cooked. Available throughout the year, and though eaten in small quantities it is nevertheless an important vegetable.

Other uses

The plant is ornamental, and promotes lactation. It is used for treatment of certain illnesses such as ciguatera poisoning.

Genus
Pseuderanthemum

Family
Acanthaceae

Species present
Pseuderanthemum carruthersii (Seem.) Guillaumin

Pseuderanthemum longifolium (Forst. f.) Guillaumin

Pseuderanthemum pelagicum Seem.

Pseuderanthemum repandum (Forst. f.) Guillaumin (not a food plant)

Pseuderanthemum tubercula Radek (not a food plant)

Pseuderanthemum whartonianum Hemsley

Very close to the polyscias with which they are mixed in the hedges and used in the same manner, the *Pseuderanthemum* species are very poorly known. The various species are treated together here.

References
Henderson & Hancock (1989), Parham (1972), Peekel (1984).

Plants occasionally eaten, introduced and local

Pseuderanthemum spp.

History

Numerous species of *Pseuderanthemum* exist. Many among them are endemic to restricted regions, while others have moved with human migrations. They are poorly known.

Description

Bushy plant. Leaves lanceolate, green, red or bicoloured according to cultivar, variable in size; margins entire or dentate, even wavy. Terminal spike bearing white or mauve flowers, bell-shaped with a long neck, the lower lip often spotted with red. Cylindrical capsule bearing a beak-like structure, constricted between the seeds.

Morphological variability

It is at least as large as that of *Polyscias* species.

Cultivation and production

The cultivation and production of *Pseuderanthemum* is identical to that of *Polyscias*.

Alimentary uses

Only *P. carruthersii*, *P. longifolium*, *P. pelagicum* and *P. whartonianum* appear to be eaten. The tops of the stems and the young leaves are occasionally picked in all the villages. They are never cooked in the oven but may be boiled or fried to go with taro, the association of these two foods being much valued. They may also be munched raw, or mixed with cooked taro leaves. Women who are about to give birth eat them regularly with baked taro; they must never be salted (or the quality will deteriorate).

Other uses

Pseuderanthemum species are used as hedge plants and ornamentals, and also provide wood for making rods for pulling hot stones out of traditional ovens. The leaves and bark of *P. whartonianum* are medicinal.

Genus
Psidium

Family
Myrtaceae

The genus comprises 100–150 species. Two are present in Vanuatu.

Species present
Psidium guajava L.
Guava

Psidium cattleianum Sabine
Strawberry guava (foraged species; see CD-ROM)

Introduced to Vanuatu, the guava is little cultivated but a few spontaneously growing species may be found everywhere. The fruits are regularly eaten and are sold in the markets. Here, like everywhere else, it is a pest in grazing areas and among crops. The strawberry guava is present in Vanuatu but is very rare.

References
Bourgeois *et al.* (1998), Coronel (1994), **Ellshoff (1994)**, Ellshoff *et al.* (1996), Ochse *et al.* (1961), Purseglove (1991), Rehm & Espig (1984), Ruehle (1948), Swarbrick (1997), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Psidium guajava

Guava

History

Guava is originally from tropical America, probably Brazil; it was cultivated early on and improved in the West Indies. At the beginning of the 16th century the Portuguese introduced it throughout the Pacific as far as the Philippines, and the Spanish took it to India. It then spread and became naturalised throughout the tropical world. In Vanuatu it is abundant, especially in the southern islands, and it has become a problem for many farmers because its vigorous and uncontrolled growth is hard to eradicate.

Description

Shrub or tree 6–8 m in height, branching from the base of the trunk. Leaves opposite, elliptical, pubescent on their lower surfaces, about 11 x 5 cm; petiole 1 cm in length. Flowers solitary, white, small; calyx persistent; stamens very numerous, 1–2 cm long. Fruits globular, ovoid, greenish or bright yellow, variable

in size (4–12 cm long); flesh white, yellow, pink or red. The seeds are enclosed in the flesh, and are hard, small and very numerous.

Morphological variability

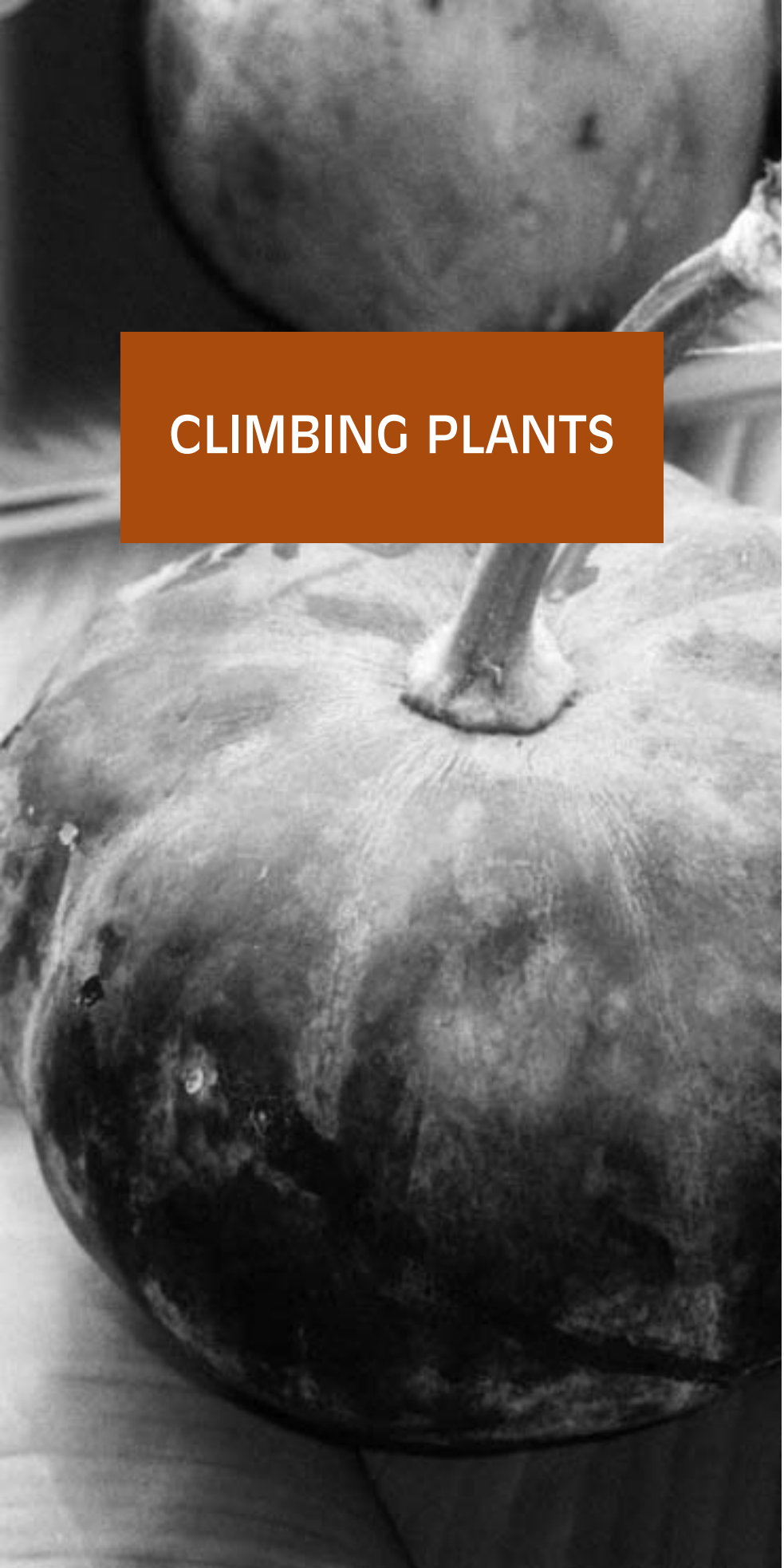
There are about 150 varieties known around the world, according to the size of the fruit, the colour and taste of the flesh and even the vitamin C content. Numerous wild and cultivated morphotypes exist in Vanuatu.

Cultivation and production

Guava is a hardy plant that requires little attention, and is suited to various climate and soil types. It is not very resistant to frost but tolerates high humidity. It is grown from seed or by vegetative propagation. The seeds, which remain viable for up to a year, are sown in seedbeds and then transplanted after 7–8 months. Vegetative propagation is by marcotting and by suckers obtained by injuring the roots or grafts. The first fruits are produced 3–4 years after sowing; they require protection against various phytosanitary problems to which they are very susceptible. The trees may produce for around 30 years. In Vanuatu guava grows most often in a spontaneous state.

Alimentary uses

Guava is a fruit that can be eaten raw or cooked. It can be made into jam, jelly, and the famous guava paste that is made by gently cooking the de-seeded flesh with sugar. The fruit is five times higher in vitamin C than an orange. In Vanuatu guava is mainly eaten raw between meals. In Tanna the people use it as a staple food in times of food scarcity. The sweetest guavas provide excellent juice for children after a little boiled water has been added to it. It is a delicious fruit that is low in calories and high in potassium and in vitamin C.



CLIMBING PLANTS

Climbers are plant species with long, clinging stems, sometimes lignified, while herbaceous plants are not lignified and are plants whose aerial portion is most often annual. While climbers by definition have a clinging stem, herbaceous plants may possess all sorts of stems – erect, clinging or creeping. We have grouped together in this chapter all the plants, whether climbers or herbaceous, that have a long stem that is either creeping or clinging. In Vanuatu the most important plants in this group are yam and sweet potato, but these have been treated in the earlier section on root crops because they are cultivated for their roots.

Before the 16th century few climbing plants were cultivated in Vanuatu. There was, however, the gourd *Lagenaria siceraria*. All the others have been introduced. Some, such as the cucumber, watermelon and choko, have been integrated into the cultivation systems in the rural areas and are found in all the gardens. Others, such as the giant squash and the hairy melon, are mainly grown close to urban areas for sale in the markets.

Note for English translation

Many of the following species have a variety of English names, not always consistently applied. The names given here are those most commonly used.

Genus
Benincasa

Family
Cucurbitaceae

The genus comprises only one species, which is present in Vanuatu.

Species present
Benincasa hispida (Thunb.) Cogn.
Hairy melon, Chinese winter melon, wax gourd

Cheap and delicious, the hairy melon appears more and more often on the market stalls and in local cuisine. Its fruits are most often cylindrical and of medium size.

References
Barrau (1962), de Candolle (1883), French (1986), Ochse & Bakhuizen van den Brink (1980), Parham (1972), Philipps & Dahlen (1985), PROSEA (1993), Purseglove (1991), Smartt & Simmonds, eds (1995), Viard (1995), Walters & Decker-Walters (1989), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Benincasa hispida

Hairy melon

History

This hairy melon is mainly cultivated in India and throughout tropical Asia. Because it becomes naturalised in places easily, it is hard to work out its true centre of origin and domestication. Most authors propose Java as the cradle of this Asian vegetable. The Chinese mentioned it in 500 BC, but said that it came from the south. Introduced into the Pacific by Europeans, the hairy melon is nowadays cultivated in all tropical, subtropical and even temperate regions. It is eaten increasingly often in Vanuatu.

Description

Climbing herbaceous plant with a long, robust stalk, crenellate (i.e. with repeated indentations) and hairy; tendrils opposite to the petioles. Leaves large and simple, heart-shaped, with five not very distinct lobes, hairy (10 x 20 cm); long yellowish petiole, **stipule** oval. Large, solitary, yellow flower, hairy. Fruits cylindrical or globular, dark green, covered with silky hairs and waxiness, variable in length. Flesh thick, white, crisp but spongy in the centre. Numerous flat seeds, elliptical, yellow-brown.

Morphological variability

Forms exist with ovoid fruits, cylindrical fruits and fruits that are almost round. In the Pacific some authors have reported the presence of a form with small fruits, resembling those of *Lagenaria*. The cultivated forms can be divided into four groups: Unridged Winter Melon, with long, dark green fruits 1 m long; Ridged Winter Melon, identical to the previous form except that it has crenellate seeds; Fuzzy Gourd, with small, green, cylindrical fruits that do not exceed 30 cm in length, and with crenellate seeds; and Wax Gourd, with oblong fruits, flattened at both ends, light green. The forms in Vanuatu belong to this last group.

Cultivation and production

The plant prefers dry, lowland zones. It is grown from seeds in nursery beds. The vine is supported by a solid trellis because the fruits are heavy (up to 8 kg). They may also be left to lie on the soil, but this then tends to damage the smooth appearance of the epidermis. They reach maturity in 3–5 months. In Vanuatu cultivation is mostly aimed at the Asian population, which buys these melons in the markets. Yields are high, and no serious pests or diseases are known. It is thus a cheap and tasty vegetable that is finding an ever-increasing place in the green belts of Port Vila and Luganville.

Alimentary uses

The fruits and the young leaves are eaten. The fine and soft flesh has a delicate taste, especially in the young fruits. It is generally cut into small cubes, then incorporated in the preparation of numerous dishes. The hairy melon may also be cooked whole with meat or with prawns. The flowers and the seeds are edible, the latter being fried and served as an appetiser. In Java the Chinese cut the flesh while it is still green into small sticks which they cook in sugar. The ni-Vanuatu only use this vegetable a little, cut into pieces and then boiled.

Genus
Citrullus

Family
Cucurbitaceae

The genus comprises three species (possibly four) originating from tropical Africa, one of which is edible. This edible species is present in Vanuatu.

Species present
Citrullus lanatus (Thunb.) Matsum. & Nakai
Watermelon

Watermelon was introduced to Vanuatu as early as the first half of the 19th century by ni-Vanuatu returning from plantations in Fiji and Australia. It is nowadays found in all the gardens where it is planted after yams. It is a very popular fruit that is also sold in the markets.

References
Herklots (1972), Jeffrey (1980, 1990), **Jeffrey *et al.* (1986)**, Pangalo (1944), Purseglove (1991), Robinson & Decker-Walters (1997), Singh & Yadava (1977), Smartt & Simmonds, eds (1995), Walters (1989), de Winter (1990), Yang & Walters (1992), Zeven & de Wet (1982), Zohary & Hopf (1994).

Complementary food plant, introduced

Citrullus lanatus

Watermelon

History

Watermelon is originally from Southwest Africa, where a form with small, bitter fruits still exists. According to a recent hypothesis it may have arisen from *C. colocynthis*, with which it is able to produce fertile hybrids. Whatever the situation, the watermelon as we know it has resulted from selection and domestication of sweet forms from a wild species with bitter fruits, and this domestication probably occurred in Hindustan. From ancient times it has been cultivated and domesticated in Egypt, around the Mediterranean coast and in India. China received it around the 10th century via Xinjiang, and explorers introduced it to America. After further improvement it has now reached the entire tropical world, including Vanuatu. It is grown from commercially imported seeds.

Description

Scrambling herbaceous plant with a long, thin stem, crenellate and hairy, tendrils bifid. Leaves lobed (3–4 pairs), with divided lobes; margins dentate; petiole 10 cm long. Flowers unisexual, axillary, solitary, with five pale yellow petals. Fruits large, smooth, shiny, variable in shape, colour and size, exocarp thick but relatively flexible. Flesh watery, red or yellow, containing black, green, white or reddish seeds.

Morphological variability

The number of cultivars of watermelon is significant, and the Chinese recognise four ecological types according to whether they grow in the north, the east, the northwest or the south of the country. From a morphological point of view they vary in shape (round or cylindrical) and in size of the fruit, in colour (cream, light or dark green, with the colour solid, flecked or striped), and the thickness of the exocarp, the colour (red, yellow, green or white) and the texture of the flesh, and the size, number and colour (black, reddish, yellow or white) of the seeds. The Japanese have also developed seedless cultivars.

Cultivation and production

Watermelon likes dry climates and sunny locations in which it can develop a high sugar content in the fruits. It is a popular plant and is grown in gardens both for family consumption and for sale in markets. It is cultivated most on the leeward sides of the islands, and particularly in young volcanic soils whose texture allows rapid drainage. The large seeds of the watermelon can be kept from one year to the next. They are planted in seed holes three at a time and germinate quickly. After thinning, care is taken to protect the young seedlings from weeds. Later on their growth is vigorous, and their crawling habit allows them to cover the soil quickly. If the plants are planted in 2 metre squares, control of weeds becomes quick and easy. The plant cannot survive in soils saturated with water because the excess water suffocates the root system and encourages development of rots. Consequently the farmers of Ambrym, the island that offers the best conditions for watermelon cultivation, have embarked on commercial production to supply the markets of Port Vila.

Alimentary uses

When mature, watermelons are eaten raw as they are picked, and are a drink as much as a food. They are cut into quarters or fat round slices, and then the flesh of each slice is cut away from the skin and cut up further. It is eaten as a snack or at the end of a meal.

Genus
Cucumis

Family
Cucurbitaceae

The genus comprises 32 species, most originating from Africa, some of which are cultivated or gathered for their fruits or for their seeds. Vanuatu has two species.

Species present
***Cucumis sativus* L.**
Cucumber

***Cucumis melo* L.**
Melon (imported from overseas and rarely grown in Vanuatu)

Cucumber is nowadays a common plant in Vanuatu gardens, cultivated for family consumption as well as for sale in markets, where it may be purchased throughout the year. Melon is imported from Australia, although a few farmers grow it with some success in Vanuatu.

References
De Candolle (1883), French (1986), Helbaek (1966), Jeffrey (1980), **Kirkbride (1993)**, Leppik (1966), Ochse & Bakhuizen van den Brink (1980), PROSEA (1994), Purseglove (1991), Sauer (1993), Singh (1990), Smartt & Simmonds, eds (1995), Viard (1995), Yang & Walters (1992), Zeven & de Wet (1982), Zohary & Hopf (1994).

Complementary food plant, introduced

Cucumis sativus

Cucumber

History

Cucumber, which does not exist in the wild state, is originally from the foothills of the Himalayas. Domesticated from a wild ancestor in northern India, it reached the Mediterranean region via Iran in 600 BC. Known by the Hebrews, the Greeks and the Romans, it reached China relatively late along the Silk Road, about 200 BC. Present in the 8th century on the tables of Charlemagne, it was introduced by the Spanish to America where it spread very quickly. It is found nowadays throughout the entire world. The first missionaries brought it to Vanuatu, where it spread quickly.

Description

Climbing herbaceous plant with a quadrangular stem. Leaves triangular, rugose, with three to five not very well defined lobes; margins dentate; veins palmate. Cluster of bell-shaped flowers with five pilose (hairy) petals, yellow. Fruit pendulous, variable in shape, colour and size. Flesh pale green, containing numerous flat, white seeds.

Morphological variability

This species contains numerous varieties according to the shape, colour and size of the fruit, the thickness and the colour of the skin, and the presence or absence of spines. The main varieties distinguished are:

- varieties with spines, *Cucumis sativus sensu stricto*, grown in Vanuatu, whose fruits are relatively squat, yellow or green, sometimes white. They tend to be picked fairly large for the local markets, and when they have become yellow. Over several decades farmers have developed the type Vanuatu through simple selection among their plants, collecting the seeds of the selected plants. This local type is very large, squat, and has a very yellow skin.
- varieties with long, green, smooth-skinned fruits (over 50 cm long), seedless, grown in greenhouses, *Cucumis sativus* var. *anglicus*, which are very hard to grow in Vanuatu. They are imported from Australia or Europe.

Cultivation and production

Cucumber does not like cold and grows poorly at higher altitudes. It is propagated from seeds planted into small seed-holes, then thinned out after germination. It is easily intercropped with other plants in traditional gardens, but is unfortunately the host of cucumber mosaic virus (CMV) which also affects other species such as kava in which it causes dieback, a very serious disease. It is better, therefore, to grow these plants at some distance from others that might become infected.

Alimentary uses

The flesh of the locally grown varieties is very watery (less than 5% dry matter), and slices are very popular in kava bars for removing the disagreeable taste of the kava drink from the mouth. Often munched raw between meals, cucumber is also cooked in a *marmite* like a vegetable. It is then served as an accompaniment to dishes of root crops, or is used as an ingredient in casseroles, most often of chicken. The young leaves and the growing tips are likewise eaten, and the raw seeds are nibbled by children.

Other uses

The plant, known from ancient times for its cosmetic properties, can also serve as a diuretic and a sedative. However, in Vanuatu it does not seem to be used medicinally.

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Benincasa hispida, the hairy melon.

CLIMBING PLANTS

Citrullus lanatus, watermelon.

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Cucurbita maxima, the giant squash. It is difficult to grow in Vanuatu.

Raw or cooked, popular in kava bars, cucumber is nowadays a common vegetable in gardens in Vanuatu.

Vanuatu cucumber *(Cucumis sativus)* is short and squat.

Cucurbita moschata, butternut pumpkin, the most often grown of the three *Cucurbita* species present in Vanuatu.

Butternut pumpkin keeps for quite a long time if its skin is not damaged.

Leaves of *Cucurbita moschata* are eaten as a vegetable.

Two different cultivars of *Cucurbita pepo*.

Ipomoea aquatica, water spinach or kangkong, is a prized vegetable.

Water spinach, gourd, bitter melon... colourful words and colourful products.

Lagenaria siceraria, the gourd, is probably the oldest cultivated plant in the world.

Small fruits of *Momordica charantia,* bitter melon.

Lablab purpureus, hyacinth bean.

Phaseolus vulgaris, green bean.

Four species of beans introduced to Vanuatu.

Bunches of mauve winged bean *(Psophocarpus tetragonolobus)*.

Yard-long bean or snake bean (*Vigna unguiculata*) is the bean most often eaten by the ni-Vanuatu.

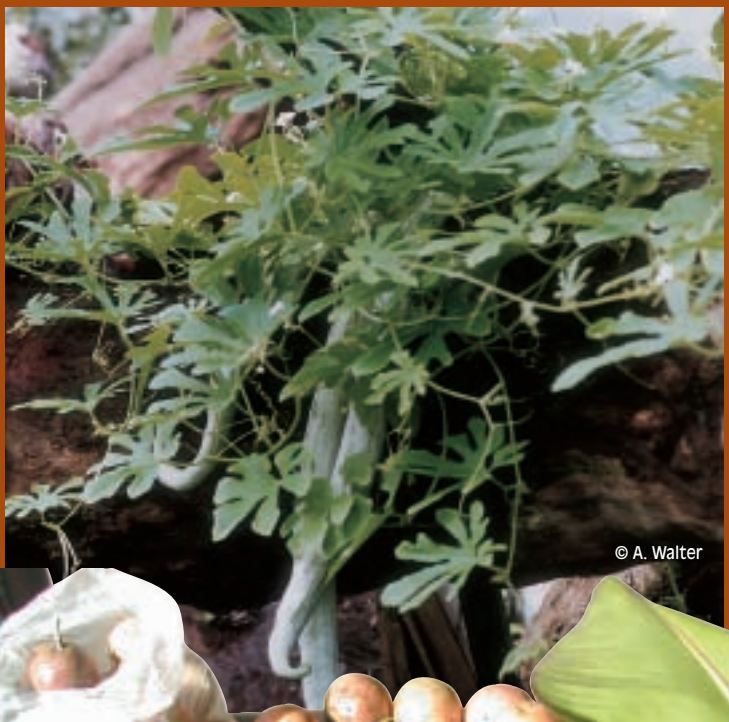
White choko.

Choko, a familiar plant in gardens in Vanuatu.

Leaves of choko (*Sechium edule*).

© D. Greindl

Trichosanthes cucumerina, the snake gourd.



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Yellow and purple passionfruits *(Passiflora edulis)*.

Genus
Cucurbita

Family
Cucurbitaceae

The genus comprises close to 25 species (reduced to 13 by Nee, 1990). All originate from America (mostly from Central America). Five are cultivated and many are edible. Three species are present in Vanuatu.

Species present

Cucurbita maxima Duchesne ex. Lamk
Giant squash, Hubbard squash

Cucurbita moschata (Duchesne ex. Lamk) Duchesne ex. Poiret
Winter squash, butternut pumpkin

Cucurbita pepo L.
Pumpkin, squash, courgette, zucchini, vegetable marrow

Coming from the continent of America (Mexico and Southwest United States), *Cucurbita* species were first of all grown for their seeds, and not for their flesh which was bitter. Over time, varieties with dense and tastier flesh were progressively selected and spread throughout tropical regions. In Vanuatu the main species cultivated is the butternut pumpkin, which is better adapted than the other species to lowland tropics.

References

De Candolle (1883), Decker-Walters (1990), French (1986), Heiser (1989), Jeffrey (1980), **Lira-Saade (1995)**, Messiaen (1998), **Nee (1990)**, Ochse & Bakhuizen van den Brink (1980), Paris (1989), Piperno & Pearsall (1998), PROSEA (1994), Purseglove (1991), Sauer (1993), Singh (1990), Smartt & Simmonds, eds (1995), Viard (1995), Whitaker & Bennis (1975), Yang & Walters (1992), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Cucurbita maxima

Giant squash, Hubbard squash

History

Cucurbita maxima, a species with very large fruit, arose first in the lowlands between the Andes Mountains and the Pacific, from a wild ancestor (*C. andreana*).

Its seeds have been recovered from sites in Peru dating back to 2600–2000 BC. The Portuguese brought it to Europe and then spread it to Asia and Africa. The species is nowadays present throughout the world. In relation to Vanuatu, Queiros planted giant squash in 1606 in Santo, in the Big Bay region. The species was reintroduced several times by the first missionaries, voyagers and subsequent settlers.

Description

Plant with a creeping stalk that is round, hairy and flexible. Leaves flexible, cordate, not lobed or only slightly lobed. Flowers with a lobed corolla (5 lobes), bright yellow. Fruit variable in shape and size, with a weak and spongy peduncle, widened at its point of attachment; flesh pale yellow. Numerous white or brown seeds.

Morphological variability

Among the numerous varieties are recognised:

- the Mammoth squash (var. *maxima*), with an enormous rounded fruit, slightly flattened, white or dark green, sometimes blue-green or orange. It may weigh up to 65 kg;
- the Turban or Giraumon squash (var. *turbaniformis*), with a round fruit surmounted by a large, rounded bulge.

Cultivation and production

The species is grown from seed, sometimes collected from ripe fruits and sometimes purchased commercially. The fruit reaches maturity in 3–4 months. It is hard to grow in Vanuatu.

Alimentary uses

The giant squash is eaten as a vegetable, cooked in a *marmite* and sprinkled with coconut milk, or even cooked in an oven of hot stones together with root crops to which it contributes a flavour. In towns westerners use it to make soups. The fresh growing tips and the young leaves are eaten boiled. Fruits and leaves are regularly sold in the urban markets. Finally, the seeds are edible and are nibbled as they are or roasted, but the ni-Vanuatu do not eat many of them.

Complementary food plant, introduced

Cucurbita moschata

Butternut pumpkin, winter squash

History

The butternut pumpkin is a species from coastal regions of Central America. The wild ancestor from which it arose is not known, but recent research suggests that its domestication occurred on the Pacific coast of Panama and Central America. It was subsequently spread north-

wards and southwards. The first voyagers carried it to Africa and tropical Asia. It was from Asia, which had become a secondary centre for the species, that it reached Europe at the end of the 17th century. The butternut pumpkin, which tolerates heat better than other *Cucurbita* species, is the most common in the tropical world and thus also in Vanuatu.

Description

Plant with a creeping stalk, round or sometimes with five angles, slightly hairy and hard. Leaves rounded with a cordate base, slightly lobed. Large flowers with a corolla that is dark yellow or orange. Fruits bottle-shaped, cylindrical, round and flattened or ovoid; peduncle hard, marked with grooves expanding at the point of attachment; pericarp pliable, colour pale and mottled, marked with grooves; flesh orange with numerous seeds.

Morphological variability

This is the species of pumpkin best adapted and thus most frequent in Vanuatu. There are numerous morphotypes resulting from the diversity of the seeds purchased in shops and also cross-fertilization between the plants from previously sown seeds. The squashes or pumpkins of Vanuatu may be divided into two major morphological groups resulting from distinct series of introductions. Varieties with very large fruits (40–50 cm in diameter) – the first to be introduced – were selected locally from seeds collected from plants that the farmers found to be of interest. The varieties with small fruits (20–30 cm in diameter) came from commercial seeds introduced by New Zealand companies at the end of the 1980s with a view to supplying the Japanese market with squash in the off-season.

Cultivation and production

It is grown from seed. In Vanuatu, commercial cultivation of squash for export to the Japanese market has been jeopardised by the very high inputs required, but certain varieties are always grown and sold in the markets. The plants reach maturity in three months and bear fruits whose skin is very vulnerable to attack by piercing insects. In commercial cultivation small paper supports are placed under each fruit so that their appearance is not spoiled by punctures and abrasions. In traditional cultivation upkeep is limited to simple weeding to allow this creeping plant to become established as an intercrop among other cultivated species. It is not uncommon to find wild escapes from cultivation that keep growing in the natural state thanks to their ability to compete with weeds and other plants.

Alimentary uses

This common pumpkin, attractive in colour, keeps for quite a long time if its skin is not damaged. It is prepared by boiling, and laced with coconut milk and cooked in an oven of hot stones. The young leaves and the tender growing tips are eaten as vegetables to accompany a dish of meat or root crops.

Plant occasionally eaten, introduced

Cucurbita pepo

Pumpkin, squash, courgette, zucchini, vegetable marrow

History

Cucurbita pepo, originally from Mexico and present in archaeological sites dating back more than seven thousand years, is one of the most ancient of cultivated plants. Its wild ancestry is not known exactly, but it is possible that it was domesticated independently in the United States (from *C. texana*) and in Mexico (from *C. fraterna*). Even before the Spanish conquest the species had given rise to numerous cultivars, some of which had been produced for their flesh, some for their hard outer skins which made excellent containers, some for their ornamental qualities, and some for their oily seeds. The plant reached Europe during the decades that followed the discovery of America by Christopher Columbus, and then Africa and Asia. The plant, which survives in cold climates, is less common than other *Cucurbita* species in tropical regions and in Vanuatu.

Description

Plant with a robust stalk, creeping across open soil or fastening itself to and climbing up lattices (except for certain varieties whose stalks have very short internodes), with five clearly-marked angles, hairy. Leaves triangular, cordate at the base, with five lobes; ribs palmate. Flowers with a yellow corolla. Fruits very variable in shape, size and colour; peduncle with deep grooves, not expanded at the base.

Morphological variability

This is the species with the greatest variability. It provides vegetables that are as different in appearance as pumpkin, marrow and squash. Given the impressive size of the flowers, hybridisation between varieties is within the capacity of amateurs, and numerous crossings have produced a great variety of forms. All the varieties are found occasionally in the markets. The *coucouzelle* squash is an elongate squash with a broad apex and a base furnished with longitudinal ridges. It may be dark green or almost white, sometimes striped. Its skin is rough and thick. The squash (*C. pepo* var. *melopepo*) is a small squash in the shape of a swollen disc (8-10 cm in diameter), surmounted by a wavy crown, pale

green or golden yellow. It is cultivated on a small scale by a local market gardener. The squash with a twisted neck (crookneck squash) is elongate, and as the name suggests has a recurved apex. Its skin is thick, furnished with grooves and small protuberances. The zucchini (or courgette or marrow), which appeared in Italy, is elongate, with thin, smooth skin, green or yellow, mottled or streaked. It is not grown in Vanuatu, but is imported and may be purchased in supermarkets.

Cultivation and production

C. pepo, propagated by seeds, is grown like all cucurbits in open fields or intercropped with other species, because of their exceptional ability to cover the ground and thus keep it weed-free. Also, like all cucurbits, it is prone to fungal diseases of the leaves, which greatly reduce their capacity for photosynthesis and reduce their yields. *Cucurbita* species are also susceptible to CMV (cucumber mosaic virus) which produces spectacular mosaic patterns on their broad leaves.

Alimentary uses

The squash, much less common than the pumpkin and the butternut, is prepared in the same manner. Squash and zucchini are mainly eaten by the expatriate community.

Other uses

Some varieties are ornamental.

Genus
Ipomoea

Family
Convolvulaceae

This important genus contains about 400–500 species, spread throughout tropical regions. Two species are present in Vanuatu.

Species present

Ipomoea aquatica Forskal

Water spinach, kangkong, Chinese water spinach, swamp morning glory, water bindweed

Ipomoea batatas (L.) Lam

Sweet potato (see page 97, root and tuber crops)

Water spinach, with soft and stringy leaves, is sold in markets throughout the year, tied up in large bunches. It is used more often in Asian cuisine than in traditional dishes of Vanuatu, but it is a valued vegetable.

References

Austin (1988), Barrau (1962), Cornelis (1985), Cornelis & Nugteren (1982), **Fosberg & Sachet (1977)**, French (1986), Lin *et al.* (1985), Nishiyama (1971), Ochse & Bakhuizen van den Brink (1980), Philipps & Dahlen (1985), Piperno & Pearsall (1998), PROSEA (1994), Purseglove (1991), Rubatzky & Yamagushi (1997), Sauer (1993), Smartt & Simmonds, eds (1995), Weightman (1989), Worsley & Oldfield (1988), Yen (1974, 1976, 1982).

Complementary food plant, introduced

Ipomoea aquatica

Water spinach, kangkong, Chinese water spinach, swamp morning glory, water bindweed

History

Originally from tropical Asia, water spinach is spread throughout the tropical world. Grown and eaten regularly in Southeast Asia and southern China, it is less utilised in Vanuatu to where it was introduced by the Asian population. It is grown in urban areas for sale in markets.

Description

Hardy aquatic herbaceous plant with a hollow, floating stalk, the roots of which appear at the nodes of the stem and do not produce a tuber. Leaves simple, lanceolate or triangular, bright

green, soft, 2.5–15 cm long; petiole thin, long and erect, standing up out of the water, pale green or purplish. Flowers in the shape of a **cupule** (small cup), pink or mauve, 4 cm in diameter. Small fruits containing two to four seeds.

Morphological variability

Many varieties of water spinach exist in Asia according to the colour of the stalks (green or reddish) and the size and shape of the leaves. As the species is sometimes grown from commercial seed, it is hard to know how many varieties occur in Vanuatu, but there does not seem to be much variability.

Cultivation and production

The species propagates itself spontaneously or is grown from cuttings of stems or from seeds on the banks of rivers, ponds and small lakes. Development is at first slow but then speeds up. The plant grows fast; it is harvested after two to three months, and regularly thereafter.

Alimentary uses

The tips of the stems and the young leaves are eaten as a vegetable. They are boiled in salted water, sometimes dressed with coconut milk, and served as an accompaniment to dishes of root crops. Asiatic cuisine uses water spinach mixed into various dishes, and sometimes uses it fried.

Other uses

In Asia water spinach is fed to livestock, to pigs and in aquaculture for fish rearing.

Genus
Lablab

Family
Fabaceae

The genus, which is monospecific, occurs in Vanuatu.

Species present
Lablab purpureus (L.) Sweet

Hyacinth bean (also lablab, bonavist and various other names)

This species is one of a number of beans eaten in the country and sometimes sold in the markets. The young pods boiled are the part most often eaten.

References
Barrau (1962), Duke (1983), French (1986), Maréchal *et al.* (1978), Mathon (1981), Messiaen (1998), Ochse & Bakhuizen van den Brink (1980), PROSEA (1989), Purseglove (1991), Rivals (1953), Skerman (1977), **Verdcourt (1970**, 1979), Von Schaaffhausen (1963), Westphal (1974).

Complementary food plant, local and introduced

Lablab purpureus

Hyacinth bean (also lablab, bonavist and various other names)

History

Hyacinth bean is found in the wild state in East Africa, Abyssinia (Ethiopia), Transvaal (northern South Africa) and Asia (from Sri Lanka to the Himalayas and Myanmar). It is not cultivated much in Africa, and was without doubt domesticated in Asia where its cultivation varies according to region. The diversity of well-differentiated varieties in Asia is greater than that found in Africa.

Hyacinth bean is also cultivated in China and Japan. Nowadays the plant is found in all tropical regions. The presence of Asian varieties in Melanesia seems to go back to ancient times, but it has undoubtedly been introduced a number of times to Vanuatu, and commercial seeds are imported every year.

Description

Climbing plant, winding and branched. Leaves trifoliate, leaflets oval, pointed at the tips, 10 x 10 cm; petiole thin, slightly flattened, grooved. Long inflorescence (30 cm) with numerous flowers, white, sometimes blue or red; calyx persistent. Pods

subsessile, variable in shape and colour, flattened and curved, 5 cm long; style persistent as a beak-like extension; 3–6 seeds, variable in size and colour (white, cream, reddish, brown or black), some plain and some speckled; **hilum** projecting, white.

Morphological variability

Around the world numerous varieties are distinguished according to morphological characters of the pods, the seeds or the flowers. They are grouped into three categories:

Lablab group: seeds with the suture perpendicular to the main axis, not filling the pod completely;

Ensiformis group: suture oblique in relation to the main axis; seeds filling the pod completely. Mainly Asian varieties;

Bengalensis group: suture parallel to the main axis; seeds filling the pod almost completely.

Some forms are toxic. The varieties in the first group are found in Africa and in Asia, while those in the *Ensiformis* and *Bengalensis* groups are mainly Asian.

Cultivation and production

The plant is grown from seeds sown six to ten at a time in small seed-holes. The plants are thinned after one month, and then require staking. Pods are harvested five months later, and seeds after seven months. The plant can continue producing for several years, but is often treated as an annual.

Alimentary uses

The young pods, seeds and leaves are eaten boiled; the water in which they were cooked must be thrown out afterwards. In Vanuatu the young pods are eaten while still green, and the young seeds, both after cooking. The seed coat is a little tough. The seeds may be dried and stored for later use, though this is not done much in Vanuatu. Likewise the ni-Vanuatu do not seem to use the young leaves or the flowers which are eaten in Indonesia.

Other uses

The plant may be grown as green manure, as a cover plant during periods of fallow, and as forage for livestock.

Genus
Lagenaria

Family
Cucurbitaceae

The genus comprises six species, five of which grow in the wild state in Africa. The cultivated species grows in Africa, America and Asia.

Species present
Lagenaria siceraria (Molina) Standl.

Bottle gourd, calabash, spaghetti squash

Only the immature fruits of this ancient gourd are eaten, and sometimes the growing tips and the young leaves. It is not used much as a container in Vanuatu.

References
Barrau (1962), de Candolle (1883), Heiser (1989), Herklots (1972), **Jeffrey (1980)**, King (1985), Ochse & Bakhuizen van den Brink (1980), Parham (1972), Peekel (1984), Richardson (1972), **Robinson & Decker-Walters (1997)**, Purseglove (1991), Rubatzky & Yamagushi (1997), Smartt & Simmonds, eds (1995), Viard (1995), Walters (1989), Zeven & de Wet (1982).

Plant occasionally eaten, local

Lagenaria siceraria

Gourd

History

This gourd is without doubt the oldest cultivated plant in the world, and the one that is most widespread. It is present in the Old and New Worlds, and was in the New World before the discovery of this region by the Spanish. The oldest traces of it have been found in Mexican and Peruvian sites dating back to 5700–3000 BC (at the latest), and in Egyptian tombs dating from 3500 BC. It is present in Papua New Guinea, and it is found in the wild state in Malabar, the Moluccas (Maluku) and Abyssinia (Ethiopia). The fruits of the gourd float remarkably well, all the while retaining the viability of the seeds. The species, still wild or maybe already cultivated, probably spread from Africa to the New World by sea currents. However, it may also – and later – have been spread by humans in the course of migrations. It has been present since ancient times in Asia and Indonesia, and quite early on reached the islands of the Pacific as far as

Polynesia. It is utilised as a receptacle and for its edible seeds more than it is used for the flesh of the fruit.

Description

Climbing herbaceous plant with a hairy stem, grooved, foul-smelling. Leaves simple, rounded with a cordate base, forming barely distinguishable lobes, 10–30 cm wide; margins dentate; petiole almost as long as the leaf blade. Flowers solitary, with a white colour that is characteristic of the species, male and female on different branches, with five rounded petals, 4–5 cm long and broad; calyx cup-shaped with five triangular sepals; petiole of the male flowers long and of the female flowers short and stout. Fleshy fruits very variable in shape, with a thick epidermis, smooth and hard, pale green and then orange, variable in size (10–100 cm long); long peduncle. Numerous flattened, white or brown seeds.

Morphological variability

Numerous cultivars exist in the world according to the shape of the fruit and the taste of the flesh. The gourds may be round and surmounted by a recurved peduncle (siphon gourd), the size of a pear (powder gourd and snuffbox gourd), in the shape of a bottle with a constricted neck (pilgrim's gourd), long and thick (Hercules' club gourd or trumpet gourd), broad and slightly constricted (calabash), variable in shape with a very elongate neck (*coucourde*) or flattened neck (Corsican gourd). Selection of the fruits has tended to be for their use as containers, and thus the various forms with a thick epidermis have been most valued. Later on forms with soft flesh were also selected. A distinction is made between varieties from Africa and America (ssp. *siceraria*), and from Asia (ssp. *asiatica*) which are the forms found in Vanuatu.

Cultivation and production

In Vanuatu this plant is cultivated but is also found growing spontaneously as a garden escape. It is grown from seeds collected from ripe fruits, and is generally planted around houses. The seeds must be sown two or three at a time in small mounds enriched with organic matter. Only the strongest plant is left to continue developing. The plant is then provided with a strong stake that is capable of supporting the heavy and long fruits. The vine fruits after three months, and the fruits are picked while they are still young and tender. If it is intended that the fruit be used as a receptacle, it is only picked when it is fully ripe. All sorts of shapes may be obtained by binding or tying the immature fruit while it is still in place.

Alimentary uses

The flesh of the fruit is often too bitter to be eaten, apart from some cultivars that have sweet flesh. These last, picked before

maturity while the epidermis is still soft, are peeled, cut into pieces and then boiled. The young leaves and growing tips are sometimes cooked as a vegetable. The oil extracted from the seeds may be used in cooking, but this usage is not found in Vanuatu.

Other uses

This gourd with a hard shell is usually used as a container: bottle, jug, plate, box or musical instrument. The fruit is cut near the neck, the flesh is removed completely without damaging the skin, and then the gourd is left to rot in order to remove any residual flesh. After cleaning and drying in the sun, the resulting receptacle is hung over a fire to complete the drying. The gourds may be used also as floats for fishnets. However, these uses are uncommon in Vanuatu where this gourd was mainly used in earlier times as a penis sheath.

Genus
Momordica

Family
Cucurbitaceae

The genus comprises about 45 species, seven of which originate from Asia and the rest from Africa. A single species is present in Vanuatu.

Species present
Momordica charantia L.

Bitter melon, Chinese bitter melon, balsam pear

Bitter melon is an Asian plant that is mostly found in the markets, though not abundantly. It is also grown in rural areas where the children regularly nibble the small fruits when they are the size of a gherkin.

References
Barrau (1962), Chakravarty (1990), **Jeffrey *et al*. (1986)**, Morton (1967), Ochse & Bakhuizen van den Brink (1980), PROSEA (1994), Purseglove (1991), Robinson & Decker-Walters (1997), Smartt & Simmonds, eds (1995), Triverdi & Roy (1972), Walters & Decker-Walters (1988), Williams & Ng (1976), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Momordica charantia

Bitter melon

History

Origin unknown but probably the Indo-Himalayan region. The plant is nowadays distributed and naturalised in the majority of tropical regions. It was spread by humans, and also by birds. This is the species most often cultivated in the genus.

Description

Climbing plant with a five-angled stem; tendrils bifid or simple. Leaves rounded and palmate, with five to nine clearly marked lobes each further dissected at the edge, 5–17 cm in diameter. Flowers with five petals, yellow and scented, 3 cm in diameter; thin hairy peduncle. Fruits pendulous, **fusiform**, furnished with deep longitudinal grooves and numerous protuberances, green and then orange when mature, 5–25 cm long, containing many white or brown seeds covered with a red **aril**. The fruit opens at maturity.

Morphological variability

The very numerous cultivars have been classified into several groups but the distinctions are superficial. In Vanuatu the varieties change with the arrival of new seed shipments.

Cultivation and production

This gourd is mainly cultivated in India, Indonesia and by the Chinese in Singapore. It is grown from seed sown in a seedbed. The fruits are harvested about a month and a half after planting. In Vanuatu it is regularly found in gardens and cultivated close to houses, as well as in the local markets.

Alimentary uses

The fruits are bitter when fully mature, and can sometimes be toxic. In Pentecost, Santo and Erromango children nibble the very young fruits raw. In addition, the immature young fruits are cleansed with salt and lemon juice, then cooked and served as vegetables. Later it is necessary first to treat the fruit to reduce the bitterness. Sprinkled with salt or immersed in well-salted water, it is then de-seeded and squeezed. It is then cooked with other vegetables or with meat. It may also simply be fried or baked. When fully ripe, i.e. when quite yellow, the fruit becomes too bitter to be eaten. The fruits and the young leaves are a good source of vitamin C.

Genus
Passiflora

Family
Passifloraceae

The genus comprises 400 species, about 60 of which bear edible fruits. Three species with edible fruits are found in Vanuatu.

Species present

Passiflora edulis Sims.
Passionfruit

Passiflora foetida L.
Wild passionfruit (foraged species; see CD-ROM)

Passiflora maliformis L.
(foraged species; see CD-ROM)

Of all the passionfruits introduced to Vanuatu, only *P. edulis* has any real food importance. It is mainly a plant of villages and home gardens, though it is also sold in the markets. It is cultivated, but wild garden escapes are also found.

References
Coppens d'Eeckenbrugge *et al.* (1997b), **Escobar (1992)**, Holm-Nielsen *et al.* (1988), Knight (1992), Purseglove (1991), Vanderplanks (1991), Verheij & Coronel, eds (1992), Winks *et al.* (1988), Zeven & de Wet (1982).

Complementary food plant, introduced

Passiflora edulis

Passionfruit

History

This fruit, originally from South America, was spread to other tropical regions during the 19th century. Present in Australia before 1880, it was then taken to Hawaii where it is now naturalised. Its commercial production started in those two countries, and afterwards in Florida. Introduced to Vanuatu, the species is nowadays abundant there.

Description

A shrubby and vigorous vine, with smooth, woody stems. Leaves with three lobes, 12 x 18 cm; margins dentate; stipules lanceolate, 1 cm long; petioles glabrous, fluted. Flowers solitary and scented, with a tubular calyx that divides into five thick, incurved lobes,

white, alternating with five petals, violet–white; five rows of filaments, white and violet. Fruits ovoid or globular, purple or yellow, 4–6 cm long; pericarp thick, with a central cavity containing numerous flattened black seeds surrounded by an edible aril.

Morphological variability

Traditionally two types are recognised:

- one with small, rounded, purple fruits, sweet in taste (*P. edulis* f. *edulis*);
- the other with yellow fruits, larger and with a slightly acid taste (*P. edulis* f. *flavicarpa*). It grows better at low altitude than the former variety, and therefore very much predominates in Vanuatu. The yellow passionfruit is more vigorous than the purple one, more resistant to *Fusarium* diseases, and is sometimes used as a rootstock for grafting of the purple passionfruit. Spontaneous or cultivated hybrids are also found.

Cultivation and production

The plant is customarily grown from seeds, planted while they are still surrounded by the aril. They germinate easily in two to four weeks, and the young plants are then supported on stakes. The plant is grown commercially in the countries of South America, Australia, Florida, Hawaii and South Africa. In Vanuatu the species is grown around dwellings, the plants supporting themselves on the beams of verandas or on the roofs of the houses. It also grows spontaneously in the wild, but the fruits are then of poorer quality, smaller and more acid. The fruits develop better and are more luscious when the flowers are pollinated by hand.

Alimentary uses

The fruits are eaten raw throughout Vanuatu, most often between meals, or sometimes as an accompaniment to a dish of taro which is considered to go well with the slightly acid tang of a fruit. In urban areas they are mixed in fruit salads or made into jams, juices and ice creams. They are also used as a flavour in many pastries.

Genus
Phaseolus

Family
Fabaceae

The genus comprises 50 species, five of which are cultivated. They are all distributed in Mexico and Central America. One species is present in Vanuatu.

Species present
***Phaseolus vulgaris* L.**
Green bean, common bean, French bean, field bean

Although the species is present in Vanuatu and is often planted in kitchen gardens and other gardens (from seeds bought commercially), the Asian varieties of beans are often preferred.

References
Baudet (1977), **Debouck (1991)**, Debouck *et al.* (1993), **Delgado Salinas (1985)**, Gepts (1996), Gepts & Debouck (1991), Koenig *et al.* (1990), **Maréchal *et al.* (1978)**, Piperno & Pearsall (1998), PROSEA (1989), Purseglove (1991), Smartt & Simmonds, eds (1995), Singh *et al.* (1991), Tohme *et al.* (1995), Westphal (1974), Zeven & de Wet (1982).

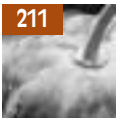
Plant occasionally eaten, introduced

Phaseolus vulgaris

Green bean, common bean, French bean, field bean

History

The green bean originated in Central America, from a wild ancestor distributed from Mexico to northern Argentina. After this ancestor became differentiated into two distinct groups, one in Central America and one in the Andean region, it was independently domesticated in two or three different locations in Central America. The cultivated beans then spread and crossed with the wild beans that occurred at each location. The plants with small seeds seem originally to have come from Mexico and those with large seeds from the Andes. Introduced to Europe and Africa in the 16th century by the Spanish and the Portuguese, and then to China, the plant was very quickly adopted by both tropical and temperate regions. A second centre of diversity subsequently appeared in China, but the rest of Asia did not like these forms as much. In Vanuatu it is also a complementary bean, utilised to a moderate extent.



Description

Plant with an erect or climbing stalk. Leaves trifoliate, leaflets entire. Flowers not very numerous, white, cream, violet or red, 1 cm in diameter; large **bracts** longer than the calyx. Pods slender, smooth, slightly curved. About a dozen oblong seeds, variable in colour (uniform, streaked or speckled), and 15 mm long at the most.

Morphological variability

This extremely polymorphic species has given rise to hundreds of cultivars, selected locally or in agricultural stations. The principal distinction is into bushy varieties that do not need staking and climbing varieties that require support. Some varieties have been selected for consumption of their pods, flat, swollen or round among the green beans; others have been selected for consumption of their seeds whose shape, size and colour may then vary (white, pink or red; hilum coloured or not coloured; longer or shorter than 1 cm; rounded or kidney-shaped, etc.).

Cultivation and production

Beans are not demanding in terms of soil quality, but they do not tolerate frost or excessive rain. In the humid tropics it is easier to grow the forms with edible pods than those with edible seeds, these latter requiring a degree of dryness. Propagation is by seeds, which remain viable for close to two years and germinate quickly. The seeds are planted in the soil three at a time, in holes 30–50 cm apart for plants with bushy forms, or every metre in the case of climbing forms so that there is room for them to be staked. The immature pods (or green beans) are harvested about seven or eight weeks after sowing, the seed beans when the pods become yellow.

Alimentary uses

Beans are eaten before they are mature, as a green vegetable. They are cut in pieces and mixed with canned meat, or boiled in a soup with other leaves. Once the seeds begin to swell up, and a little before they reach full maturity, the pods are shelled and the beans nibbled raw by children. They are often cooked with a little salt in small bamboo containers and served at times as a snack, or sometimes to accompany a dish of root crops.

Genus
Psophocarpus

Family
Fabaceae

The genus comprises nine species originating from Africa and one from tropical Asia. This last is present and eaten in Vanuatu.

Species present
Psophocarpus tetragonolobus (L.) D.C.
Winged bean

Although the winged bean was present in Papua New Guinea before the first contact with Europeans, the species appeared only quite recently in Vanuatu. It is grown in the villages for its edible pod, and is often seen in the markets though only in small quantities.

References
Eagleton *et al.* (1985), Harder (1996), Harder & Smartt (1992), Harder *et al.* (1990), Hymowitz & Boyd (1977), Khan (1976), **Maxted (1990)**, PROSEA (1994), Purseglove (1991), Smartt & Simmonds, eds (1995), Strathern (1978), Valicek (1989), **Verdcourt & Halliday (1978)**, Zeven & de Wet (1982).

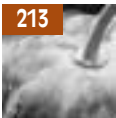
Complementary food plant, introduced

Psophocarpus tetragonolobus

Winged bean

History

The origin of the genus is Central Africa and Madagascar, where all the species of *Psophocarpus* may be found. Only *P. tetragonolobus* is present in Asia, the main centres of diversity being Indonesia and Papua New Guinea. It has never been seen in the wild state, becomes naturalised easily, and is nowadays so widely cultivated that it is hard to say where its centre of origin is. Did it arise from an Asian ancestor that has since disappeared, or did it come from one of the presumed African progenitors? It reached Vanuatu at a date that is unclear, but it was certainly quite recent. Since 1975 a great deal of agronomic research has gone into this plant which is high in protein, and a study of its diversity is in progress.



Description

Climbing herbaceous plant with a smooth stem, green or purple. Roots thickened to form tubers. Leaves trifoliate, triangular or lanceolate, smooth, 10–15 cm long; stipules lanceolate; petiole long, striped. Inflorescence with few flowers, broad, furnished with a beak-like structure at right angles, mauve, blue or white; style with tufts of hairs, thickened near the ovary; long peduncle. Pods oblong with four longitudinal wings, green or yellow sometimes tinged with purple, 6–40 cm long, 5–21 round seeds, white, yellow, brown or black, without a raised median line.

Morphological variability

Several thousand varieties are known around the world. In some regions they have been selected for their tubers (Papua New Guinea), in others for their pods (Indonesia). These varieties are distinguished by the colours of the stem, the flowers, the pods and the seeds; by the morphology of the leaves, the pods and the seeds; by the number of seeds per pod; and by the size of the roots. The cultivars also vary in the speed at which they germinate and grow, in their photoperiodicity, in their ability to produce tubers and in their resistance to disease.

Cultivation and production

This plant likes hot, humid climates. It is sometimes grown under irrigation, in slightly raised beds with the root tips just into the irrigation water but not waterlogged. It is grown from seeds, which take a long time to germinate, and the pods are harvested year-round. It is necessary to wait at least eight months before the swollen root can be harvested. In Vanuatu the villagers grow some winged bean plants in their gardens. The pods are sometimes sold in the markets, tied up in small bundles.

Alimentary uses

Every part of this bean is eaten. The young pods are cut into segments and boiled; the leaves, flowers and stem tips are eaten as vegetables. In Myanmar and Papua New Guinea, the **tuberised** roots, five times higher in protein than yams, are eaten raw, or are boiled as are the mature seeds. Immature young pods are the richest of all in protein, calcium, iron and vitamin A. This is an excellent food that is insufficiently utilised. In Vanuatu the pods and the seeds are kept for eating within the family.

Other uses

This bean may be planted as forage, as a groundcover or for restoring soil fertility after a cropping cycle.

Genus
Sechium

Family
Cucurbitaceae

The genus comprises ten species, all originating from Central America. A single species is present and grown in Vanuatu.

Species present
Sechium edule (Jacq.) Swartz
Choko, chayote

This plant, which is introduced, has been adopted by the ni-Vanuatu who grow it in all their gardens and regularly eat the cooked fruits, stem tips and young leaves.

References
Aung *et al.* (1990), Bailey (1992), Chakravarty (1990), Jeffrey (1978, 1980, 1990), **Lira Saade (1995)**, Newstrom (1990, 1991), PROSEA (1994), Purseglove (1991), Rubatzky & Yamagushi (1997), Smartt & Simmonds, eds (1995).

Complementary food plant, introduced

Sechium edule

Choko, chayote

History

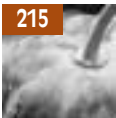
Originally from Mexico and Guatemala where it had been domesticated, choko was used by the Aztecs before the arrival of the Spanish conquistadors. It is nowadays spread throughout the tropical world. It was introduced to Vanuatu where it has become very popular, present in all the islands and sometimes naturalised.

Description

Climbing plant reaching 12 m in length; tendrils divided into 2–5 parts. Leaves simple, triangular, oval or slightly lobed, broad (10–25 cm in diameter). Flowers with five cream-coloured petals. Fruits pear-shaped or ovoid, with longitudinal grooves, smooth or rugose, white or pale green, 10–20 cm long. Single seed, large and flat, white.

Morphological variability

The variability is great and ever increasing, affecting all the morphological characters so that it is difficult to separate out individuals among the groups



Sechium edule

of cultivars. From a commercial point of view a distinction is made between chokos of medium size, pale green and pear-shaped, and chokos that are small in size, white and globular. Both are found in Vanuatu.

Cultivation and production

Choko likes humidity and suffers from winds. It becomes naturalised easily, and one also finds plants that have grown spontaneously and are looked after by people as well as ones that are being specifically cultivated. It is grown by planting the fruit vertically in the soil. The plant is not staked, but climbs on the surrounding vegetation. Harvesting of the fruits begins after 3–5 months and continues for several months more. Production is interrupted during the hottest months. During the remainder of the year the fruits are sold regularly and abundantly in the markets, and stem tips are occasionally also on sale, in bunches wrapped in *Heliconia* leaves.

Alimentary uses

The tips of the stems and the young leaves of choko are picked regularly, to be cooked and served as vegetables. They are cooked in small bamboo containers, fried quickly and lightly on the stove or boiled. The fruits are cooked in the same manner, after they have been peeled and deseeded and cut into slices. They are sometimes flavoured with coconut milk or added to chicken casseroles. Once cooked, they can also be made into very good salads. In Vanuatu the tuber is not eaten.

Genus
Trichosanthes

Family
Cucurbitaceae

The genus, which is poorly known, contains 40 or so species that originate from an area stretching from east Asia to Australia and Fiji. At least two species are present in Vanuatu.

Species present

Trichosanthes cucumerina var. *anguina* (L.) Haines
Snake gourd

Trichosanthes dienensis Merr & Perry
(Foraged species; see CD-ROM)

Trichosanthes ovigera Blume
(Foraged species; see CD-ROM)

The introduced snake gourd is the species which is eaten most. The two foraged species, which are protected by the local communities, have been present in Vanuatu since ancient times.

References

Chakravarty (1990), **Jeffrey (1980)**, PROSEA (1994), Purseglove (1991), **Robinson & Decker-Walters (1997)**, Rubatzky & Yamagushi (1997), Singh (1990), Singh & Roy (1979), Walters (1989).

Complementary food plant, introduced

Trichosanthes cucumerina var. *anguina*

Snake gourd

History

Native and domesticated in India, this gourd is nowadays grown in all tropical regions.

Description

Climbing herbaceous plant with a long, perennial stalk, ribbed, 5-angled; tendrils bifid or trifid. Leaves with five lobes, downy. Flowers broad, the female flower solitary, the male flowers in racemes, scented, white, opening in the evenings. Fruits cylindrical, elongate and slender, twisted, 60 cm on average but able to reach 1.5 m in length; epidermis grey-green with white streaks then red at maturity; flesh white, fibrous, containing wrinkled brown seeds.

Trichosanthes cucumerina

Morphological variability

This has not been observed in Vanuatu, and is not very important anywhere for this species.

Cultivation and production

This gourd is widely grown, in both rural and urban areas. It is planted at the beginning of the wet season, using seeds extracted from fruits or bought commercially. The perennial vine must be fastened to a support, or grown close to a tree, a house or a trellis specially constructed to hold it. The fruits are harvested after two months, while they are still immature and measure about 50 cm.

Alimentary uses

This popular vegetable is eaten while it is still young, because it becomes fibrous and bitter when mature. After it has been washed it is cut into pieces and boiled. It is then seasoned with coconut milk and served with a dish of root crops. It may also be minced finely and cooked in a type of soup with coconut milk to accompany a dish of rice.

Genus
Vigna

Family
Fabaceae

The genus, which is broad and very variable, has been the subject of numerous revisions. According to the latest it comprises 84 species, only one of which is present in Vanuatu.

Species present
Vigna unguiculata subsp. *unguiculata* (L.) Verde, group *sesquipedalis*

Yard-long bean, snake bean, asparagus bean

The yard-long bean or snake bean is the main representative of the species *Vigna unguiculata* in Vanuatu. Its famous parent, the cowpea (*niébé* in French), has also been introduced to Vanuatu but it is less common and is eaten like a green bean. The yard-long bean is the bean that is most often eaten by the local people.

References
Maréchal *et al.* (1978), Ng & Maréchal (1985), **Padulosi & Ng (1997)**, Panella *et al.* (1993), **Pasquet (1993**, 1997, 1998, 2000), PROSEA (1989), Purseglove (1991), Smartt & Simmonds, eds (1995), Steele *et al.* (1985), Summerfield & Roberts (1985).

Complementary food plant, introduced

Vigna unguiculata subsp. *unguiculata group sesquipedalis*

Yard-long bean, snake bean, asparagus bean

History
Vigna unguiculata originates from Africa where it has been domesticated since ancient times, probably in the northeast of the continent. It reached India via East Africa, then Asia and then the Mediterranean region. Its main centre of diversity is in Africa. However, the main centre of diversity of the cultivars belonging to the group called *sesquipedalis* is Southeast Asia. In the 16th century this group was taken to the New World, and in the 19th century to the islands of the Pacific.

Description
Climbing or semi-erect herbaceous plant. Leaves trifoliate; leaflets oval, asymmetrical; stipules oval; petiole 5–25 cm. Raceme of several violet or white

flowers. Pod pendant, fleshy, swollen and then narrowed and crumpled-looking when mature, 15–90 cm long, containing kidney-shaped seeds that are variable in size, separated one from another.

Morphological variability

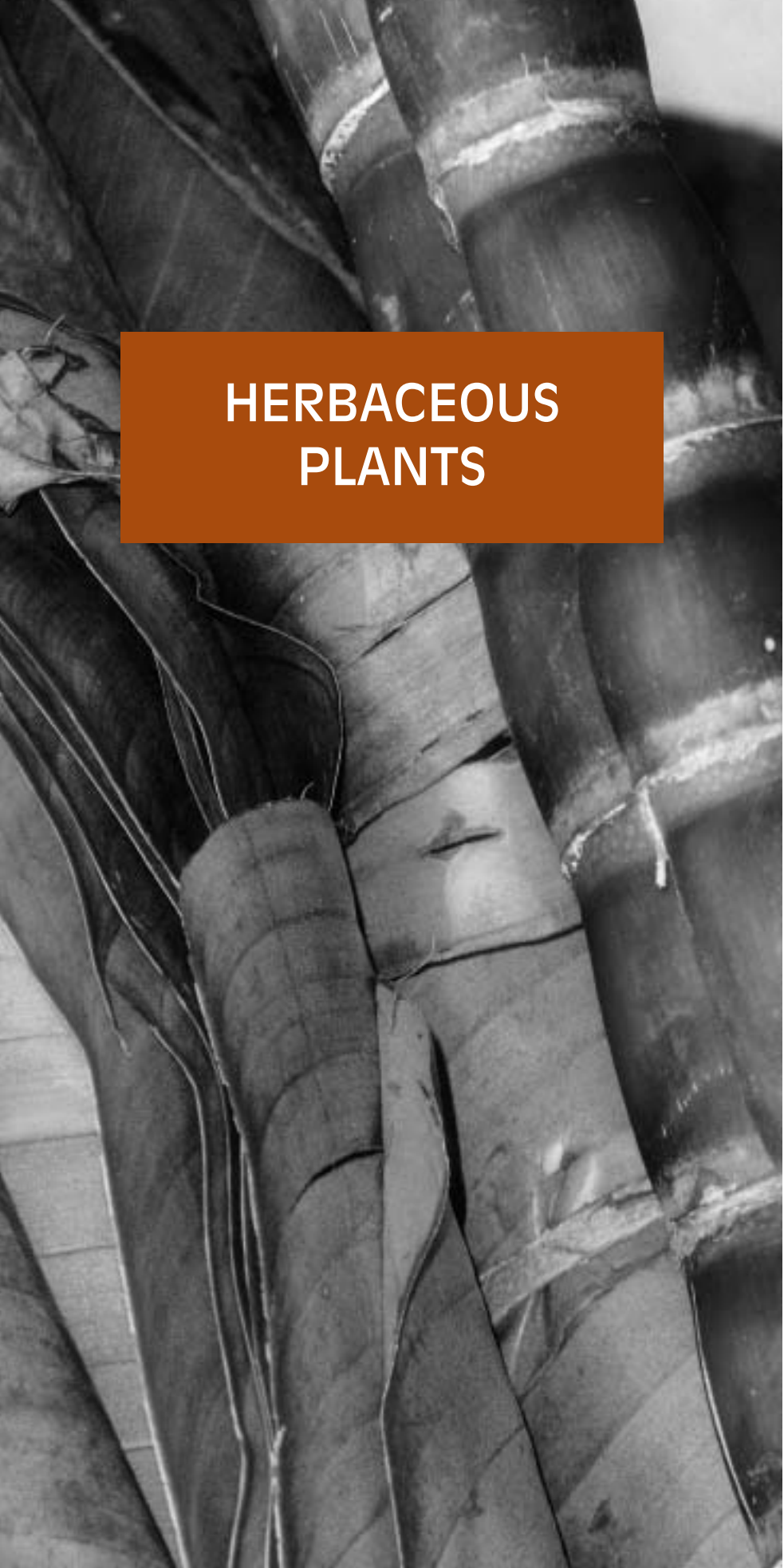
The species is a complex of wild and cultivated forms whose classification is very difficult. At the last revision *Vigna unguiculata* was divided into two subspecies, one encompassing the cultivated forms and the other the wild forms. The cultivated forms were given the name of *V. unguiculata* subsp. *unguiculata*. This subspecies is itself divided into four groups, all forms of which can hybridise with each other and with the wild subspecies. The species in Vanuatu belongs to the group *sesquipedalis* and is itself very variable. It is characterised by the expression of several recessive genes. Green and purple yard-long beans occur.

Cultivation and production

The plant is propagated from seeds collected from mature pods, or bought commercially from Asian sources. They are sown directly into the soil in groups of three, the groups being spaced about 1 m apart. Growth is rapid, and the plant is a climber that requires staking. The plant flowers abundantly after a vegetative period of only six weeks, and at fruit-set it generally produces numerous pods 50 cm long. They are harvested when still immature to avoid them becoming fibrous.

Alimentary uses

Sold in the markets tied together in small bunches, these beans are eaten whole. It is desirable to choose pods that are well swollen and tender. These are cut into small pieces, and boiled in salty water or added to all sorts of stews of meats or vegetables. They are grown in small quantities but are frequently found, on the market stalls as much as on the tables of the local people.



HERBACEOUS PLANTS

Herbaceous plants cultivated by the ni-Vanuatu before European contact were few, and the majority of herbaceous species cultivated nowadays, such as onions, chives, carrots and radishes, have been introduced. They are generally propagated from commercially purchased seed for subsequent sale in markets. However, we draw attention to the existence of two major herbaceous food plants that are local: sugar cane (*Saccharum officinarum*) and pitpit (*Saccharum edule*).

Genus
Allium

Family
Liliaceae

The genus comprises over 600 species spread through the temperate regions of the northern hemisphere. Among these 25 species are edible and eight are of economic importance. Five species are present in Vanuatu.

Species present

Allium ampeloprasum L. var. *porrum* (L.) J. Gay
Leek (minor species; see CD-ROM)

Allium cepa L. var. *ascalonicum* Backer
Shallot, eschalot (aggregatum group)

Allium cepa L. var. *cepa* L.
Onion (common onion group)

Allium fistulosum L.
Spring onion, bunching onion

Allium sativum L.
Garlic

Allium tuberosum Rottler ex. Sprengler
Garlic chive, Chinese chive

Of all the introduced *Allium* species onion is the most valued. Garlic is very uncommon, and garlic chives (or Chinese chives) are mainly eaten by the Asian population.

References

De Candolle (1883), *Encyclopédie des aliments* (1997), French (1986), **Hanelt (1990)**, Ochse & Bakhuizen van den Brink (1980), Phillipps (1982), Rabinowitch & Brewster, eds (1990), Smartt & Simmonds, eds (1995), Viard (1995), Weightman (1989), Zeven & de Wet (1982), Zohary & Hopf (1994). *A. fistulosum*: the above references plus: Inden & Asahira (1990), PROSEA (1994), Täckholm & Drar (1954). *A. sativum*: the above references plus: Jayaweera (1981), Philipps & Dahlen (1985).

Complementary food plant, introduced

Allium cepa (*aggregatum* group and common onion group)

Onion, shallot, eschalot

History

The onion appeared in the centre of Asia, probably in Turkestan and more widely in a region encompassing Afghanistan, Uzbekistan and the Tien Shan region of Kyrgyzstan. From there it spread to the Mediterranean region very early on. It is one of the most ancient of cultivated plants. The Greeks and the Romans acquired it, and their morning snacks then were often raw onion and bread. Charlemagne, who held the onion in high regard, ordered that it be planted throughout his lands. In the 12th century the eschalot appeared in France, derived from the onion. Nowadays the onion and the eschalot are cultivated in numerous countries. They were introduced to Vanuatu at the end of the 19th century, and although the majority of the onions that are consumed are still imported, the Department of Agriculture is encouraging its cultivation, particularly in the southern islands where it grows best, as do all the other *Allium* species.

Description

Herbaceous plant with an edible bulb, made up from the bases of leaves rolled around each other. Bulbs very variable in shape, size and colour. Leaves (three to eight) cylindrical and hollow, slightly flattened in cross section, 30–50 cm long. Spherical umbel on a long, erect stalk that can reach 1 m in length, bearing 50–2000 greenish or purple flowers. Fruits globular, tiny (0.5 cm in diameter), containing six black seeds. The eschalot is distinguished by having several tiny bulbs closely joined to each other instead of a single bulb, and by flowers that are always greenish.

Morphological variability

The intraspecific variability of the species is such that it has not been possible to develop a classification of the varieties that are found. The common onion (var. *cepa*) can be distinguished from the eschalot (var. *ascalonicum*). Both of these groups are themselves very variable. Around the world a great diversity of onions exists, according to bulb shape (elongate or round), colour (yellow, red, white, straw-coloured) and taste (mild or pungent). For example, there is the Italian red onion (a large red onion, quite strong, which keeps well), the Spanish onion (coppery yellow, with a mild and sweet taste) and the white onion (quite mild). The variability of the eschalot is also very great. Moreover, numerous onions produced nowadays in North America, Europe and Japan are hybrids. Since some local businesses in Vanuatu import commercial seed,

the ni-Vanuatu plant a variety of seed each year according to what has just arrived.

Cultivation and production

Vanuatu, like all tropical countries, imports the majority of the onions that are eaten there, even though the plant is cultivated in the gardens, mixed among other plants, from the second year after the harvest of the yams. The Department of Agriculture in Tanna set up demonstration plots to promote the cultivation of onion. After Independence it continued to encourage onion growing, suggesting in particular the varieties Red Creole, Tropic Red and Yellow Granex. However, even these varieties which are described as 'tropical' have great difficulty in forming bulbs, and a mistake in the growing schedule (for example a delay in the date of sowing) can bring disaster to the crop, which is really only possible to grow in winter. The onions resulting from seeds can also be multiplied by vegetative means. The eschalot is also propagated vegetatively by transplanting the lateral bulbs.

Alimentary uses

On an international scale the onion is undoubtedly the species that is most widely produced and most eaten of all the *Allium* species. The plant is very popular in Vanuatu, and above all is an ingredient in the preparation of new dishes, corned beef stews, curries and other casseroles.

The plant is very rich in vitamin C. Recent studies have shown that regular consumption of onions reduces the risk of atherosclerosis. Mature bulbs of eschalot are not used much. On the other hand the leaves, sold with their immature bulbs, are much sought after. They are sold under the name of 'green onion'.

Food plant occasionally eaten, introduced

Allium fistulosum

Spring onion, bunching onion

History

This is a cultivar from an unknown wild species, originally from Siberia and central China where it was domesticated. The first mention of it is in a Chinese book dating back to 100 BC. It was introduced to Japan around 700 AD. Since then it has been the main onion in Asian gardens, used as a condiment and even as a vegetable in certain dishes. The spring onion reached Europe via Russia in the Middle Ages. It was introduced to Vanuatu by missionaries.

Description

Perennial herbaceous plant with a bulb that is not very clearly differentiated. Bulb not very distinct, protected by thin, papery membranes, reddish. Leaves cylindrical and hollow, circular in cross section, pointed at their tips, 30–50 cm long. Umbel almost spherical, bloom centrifugal,

3–7 cm in diameter, bearing small greenish or white flowers, without bracts, 0.5–1 cm. Fruits round, 0.5 cm in diameter, with minute black seeds.

Morphological variability

The spring onion has two main varieties: the common spring onion, which has a slight swelling at the base of the leaves, and the St Jacques spring onion which has numerous elongate bulbs that are brownish in colour. In Indonesia and Japan several forms are distinguished according to the width and colour of the leaves. The numerous Japanese cultivars are also classified according to the type of environment to which they are adapted. Finally, *A. fistulosum* has been crossed with *A. cepa* to produce fertile hybrids that are propagated by seeds.

Cultivation and production

The spring onion tolerates heat very well and yields quite well in the northern islands, especially Santo. It is grown from seed or vegetatively. Sowing is followed by thinning out of the seedlings, and then earthing up in such a way as to produce long, whitened stalks. The total duration of the growing cycle from sowing to harvest of the bulbs varies from 140–170 days. No serious diseases occur in Vanuatu, where spring onions may be grown throughout the year intercropped with root and tuber crops.

Alimentary uses

In Vanuatu the leaves with or without the bulbs are sold in small bundles under the name of 'green onion' (*oignon vert*), like *A. cepa* var. *aggregatum* and *A. cepa* var. *ascalonicum*. However, they are quite uncommon. They are added to soups and sauced dishes, and they may replace coriander in salads. They are often used in Asian cuisine but not much in others.

Other uses

The spring onion is used very much in Chinese medicine, but does not seem to be used this way by the people of Vanuatu.

Plant occasionally eaten, introduced

Allium sativum

Garlic

History

Garlic is not found in the wild state apart perhaps from in the deserts of Kyrgyzstan. It is believed to have come from an ancient species (*A. longicuspis* Regel) which originated in central Asia. In the earliest times it spread to the eastern Mediterranean. Dried garlic was found in the tomb of Tutankhamen (1325 BC) and carbonised bulbs in sites in Iraq dating back to 2000 BC. The Egyptians, Greeks and Romans used the plant as a therapeutic food, and it has been grown for an equally long time in India and

China. The Crusaders introduced the plant and its therapeutic uses to France, but although its use spread around the countries in the Mediterranean ring, it was not similarly adopted by the Anglo-Saxon world. It was thus probably the French and the Vietnamese who introduced it to Vanuatu. It is still little used in rural areas, even though the country as a whole uses over ten tonnes per year.

Description

Herbaceous plant 30–60 cm tall. Bulb (or 'head' of garlic) rounded, 2–7 cm in diameter, covered with a thin, papery membrane, white or rosy; made up of 10–16 cloves, ovoid, packed tightly together and themselves covered by a thin white outer skin. Leaves flat or folded into a V-shape, with two veins that meet together at the tip, bright green. Flower stalk 1 m long, with a round umbel (2 cm in diameter) at the top, bearing numerous small, rose or purple coloured flowers. Fruits mauve, often sterile, sometimes containing black seeds.

Morphological variability

There are more than 30 varieties of garlic in the world, the best known of which are the white garlic and the rose-coloured garlic. Each region of the world has its own particular varieties.

Cultivation and production

This frost-resistant plant likes cool climates. Since the seeds are sterile, garlic is propagated using fractions of the bulb (cloves). The garlic cloves are planted with the pale green sprouting tip pointing upwards and flush with the soil surface, 20 cm apart. Growth takes 60–100 days, but it is necessary to avoid the summer months with heavy rain that rots the bulbs before they are fully developed. As with the eschalot, there is a direct relationship between the weight of the clove planted and the yield obtained. After Vanuatu's Independence, the Department of Agriculture encouraged commercial production of this plant, which stores well. It was developed in the centre of Tanna during the 1980s, and in 1983 four tonnes were exported to the market in Port Vila. Nowadays, however, it appears that these initial steps have failed, and apart from a few scattered and sparse crops in some gardens, the bulk of the garlic is imported.

Alimentary uses

The bulb is used as a condiment to give extra flavour to all sorts of dishes. It may be crushed, cut into small slivers, chopped, or used whole with or without its membrane. The leaves, which are milder in flavour, are sometimes preferred by the local people.

Other uses

Garlic is a well-known medicinal plant, and was widely used in ancient times. Nowadays it is recognised that garlic guards against atherosclerosis by reducing the amount of fats and lipids in the blood. However, in order to achieve this it is necessary to eat over 20 cloves a day! It also possesses antibiotic properties thanks to the allyl sulphides that it contains.

Plant occasionally eaten, introduced

Allium tuberosum

Garlic chive, Chinese chive

History

This species returns so quickly to the wild state that it is impossible to determine its centre of origin with any certainty. Nowadays it is found from Mongolia to Japan in the east, to the Philippines in the southeast and to India in the southwest. It is an Asian condiment, cultivated for a very long time in China. It was doubtless introduced to Vanuatu by the Vietnamese and Chinese communities.

Description

Herbaceous plant growing in large clumps, furnished with a **rhizome** from which the roots emerge. The bulb is almost absent. Leaves flat, 13–45 cm long. Umbel, 3–5 cm in diameter, bearing numerous star-shaped flowers, white, scented, with petals 5 mm long. Fruits ovoid, with small black seeds.

Morphological variability

One variety exists with green leaves and another with yellow-green leaves. Numerous other cultivars have been produced in the regions where the plant is cultivated.

Cultivation and production

The seeds of the garlic chive are not viable, and it is propagated by fragments of stem-base or pieces of rhizome. The leaves are picked after three to four months, until they become too cramped together. The plant is then pulled up and replanted. The garlic chive, or Chinese chive, does well in the north of the archipelago throughout the year. In summer there is a risk of fungal and/or bacterial diseases.

Alimentary uses

In Asia the small flowers and the leaves, which have a slight taste of garlic, are used to flavour salads or hot dishes. In Vanuatu the plant is very popular among Vietnamese and Chinese cooks, who use it in the same way. It is sold in small bundles, without the bulbs.

Genus
Ananas

Family
Bromeliaceae

The genus comprises seven species, all originating from South America. One species is present in Vanuatu.

Species present
Ananas comosus **(L.) Merr.**
Pineapple

This fruit, introduced to Vanuatu at the beginning of the 19th century, rapidly spread throughout the country. It is nowadays a common seasonal plant in rural gardens, grown as much for family consumption as for sale in the markets.

References
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Complementary food plant, introduced

Ananas comosus

Pineapple

History

Pineapple is originally from the Orinoco Basin of Venezuela and Guyana. Domestication, by vegetative reproduction and selection of mutants, has influenced the appearance and quality of the fruit. The growers have favoured types that have few spines or none at all. When the Europeans arrived, *Ananas comosus* was already widely distributed and diversified in tropical America. The companions of Christopher Columbus discovered it in Guadeloupe in 1493. Such an attractive fruit was rapidly spread by the first voyagers throughout the tropical world. It reached the Philippines by 1558, Cook planted it in Tahiti, and it entered Australia in 1839. In the 1850s James Paddon introduced pineapple to Anatom, and it was found a little later (1870) being grown in a plantation in Tanna. Several subsequent reintroductions brought in different varieties. The development of commercial cultivation of pineapple in Vanuatu seems feasible.

Description

Herbaceous plant about 1 m high. **Rosette** of leaves in a spiral, variable in length (50–200 cm), with smooth or spiny margins. Flowers numerous (100–200), pale violet in colour. **Syncarp** formed by fusion of all these little flowers and their bracts; shape of syncarp (roughly cylindrical) and colour (yellow-green or orange-yellow) varying according to cultivar. It is surmounted by a crown of young leaves which continue growing until the fruit is mature. Seeds small in size and dark brown in colour, generally absent from cultivated forms, but very numerous when the fruit has resulted from pollination.

Morphological variability

A large number of cultivars exist around the world, but over 90% of world production derives from cultivation of a single clone: smooth Cayenne. The cultivars Cayenne, Queen, Spanish and Abacaxi are found in Vanuatu. Despite its somewhat insipid taste, Cayenne has been chosen as the priority clone for promotion because of its high yield. Selected a very long time ago by the Maipure Indians of Venezuela, this cultivar was subsequently distributed to Europe, Australia (1858) and then to Hawaii (1885–1895). The edges of its long, dark leaves are smooth, the flowers are fairly pale violet-blue, and the cylindrical fruit turns from dark grey-green to yellow and green as it ripens, from the base upwards. The eyes of the fruit are not very protuberant, and the flesh is firm, juicy and pale yellow. It weighs around 2 kg. Queen is an ancient cultivar in Australia and South Africa. The edges of its short, silvery leaves have small spines. The smaller fruit (1 kg) is golden yellow in colour and has protuberant eyes. Its flesh is golden yellow and its taste exquisite, less acid and less sweet than that of Cayenne. Red Spanish is mainly grown in the Caribbean and Mexico. Its long leaves have spiny margins. Its fruit, intermediate in size between Cayenne and Queen, is almost square, orange-red, and has eyes that are not very numerous but are broad. Its flesh is pale yellow or golden yellow, fibrous, and has a slightly spicy taste. Abacaxi is grown mainly in Mexico. Its leaves have spiny margins. The pyramidal fruit weighs on average 1.5 kg and bears small eyes. Its flesh is very pale yellow, contains small fibres and has a mild flavour. Finally we mention Victoria, which comes from the islands of La Réunion and Mauritius. Its apical crown is made up of long leaves with spiny margins. The fruit is small, almost round, and furnished with protuberant eyes, strongly yellow in colour. The flesh is likewise quite yellow.

Cultivation and production

Resistant to drought, pineapple grows in acid and well-drained soils. In Vanuatu it is grown by all households, within the mixed gardens or in small, individual fields. Mainly geared to producing fruit for fresh consumption, pineapple has become an important crop, and the number of small commercial plantations is increasing in periurban areas. Wild escapes from ancient crops are sometimes found in open forest areas. Propagation is by vegetative means, using offsets, small shoots produced at the base of the stem close to the soil, or (most often) the crown of leaves cut from the apex of the syncarp. These propagating materials are left to dry for several weeks upside down, and are then replanted. Harvesting takes place between one and two years after planting according to the weight of the material planted and the season when planted. Large shoots provide fruits faster than small ones, but the plant is sensitive to **photoperiodicity**. It is thus important to induce flowering artificially with the aid of hormones (ethrel) in order to obtain fruits year-round. This technique is hardly used at all in Vanuatu, with the result that the markets of Port Vila and Luganville are saturated with fruits during the harvesting period, while the hotels and restaurants complain about the lack of pineapples at other times of year. No serious diseases are known, but large fruits sometimes suffer from sunburn which turns their fibrous centres brown.

Alimentary uses

Pineapple is very popular in Vanuatu, and is eaten regularly and everywhere when it is in season. The huge production allows the local population to eat this sweet fruit in abundance, to such a point that it is sometimes used as the base food of a meal, as in Pentecost. In Santo it is also cut into pieces and then boiled in salted water, as an accompaniment to a dish of root crops.

Other uses

In certain countries (the Philippines, Taiwan and China), two year-old leaves are used for extraction of excellent quality fibres – white, pliable and strong. Joined end to end, then woven, they produce a material that is strong and much sought after. It is also used to make fishing lines and hammocks. Pineapple is used in medicine "to treat fatigue and indigestion. The pharmaceutical industry extracts a chemical, bromelianine, from the stems and the hearts of the fruit for use as a cardiac accelerator.

Genus
Arachis

Family
Fabaceae

The genus comprises 4–80 species according to different authors, the majority not being well described. They are all originally from South America. A single species is present in Vanuatu.

Species present
***Arachis hypogea* L.**
Peanut, groundnut

Commercial cultivation of peanut started soon after European contact, but it did not really expand until the 1960s. The main producers, located in Santo and Efate, supply the markets abundantly. In parallel, the local population eats ever-increasing quantities of peanuts.

References
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Complementary food plant, introduced

Arachis hypogea

Peanut, groundnut

History

Vanuatu received the peanut from Europeans, who themselves brought it from South America. The species was domesticated in prehistoric times in the Gran Chaco region (and more widely in southern Bolivia and northwest Argentina), from a wild ancestor (*A. monticola*). From there it spread through the southern part of the American continent, and nowadays six centres of secondary or tertiary diversity are recognised in that region. In the 16th century the Portuguese brought it from Brazil to West Africa, where it underwent huge development, and then to India; the Spanish spread it from Mexico into the Pacific as far as the Philippines. The plant then reached the countries of Asia. Very soon after European contact the species was grown in some villages in Vanuatu, for export to Australia

up to 1914 and then to New Caledonia. But the production, which is not great, is mainly for the local market. Since the 1960s the main producer has been the village of Fanafo which – curiously – considers it to be an indigenous crop of Vanuatu, in contrast to copra, coffee and cacao which in the villagers' eyes are European crops. In 1974 a Port Vila businessman decided to start peanut as a commercial crop and stimulate production in Fanafo and surrounding areas. Some years later producers who had appeared in Efate were supplying the Port Vila market. In 1978 and 1979 high-yielding seeds were imported from South Africa, multiplied at the Saraoutou experimental station and then distributed to farmers in Efate and Santo. Santo became the most important area of production, and improved varieties were distributed to the producers of Fanafo by the IRHO agronomic research station at the beginning of the 1980s. They came from the CIRAD seed laboratory at Montpellier.

Description

Annual, erect or sprawling herbaceous plant (50 cm tall). Composite leaves with two pairs of opposite leaflets, 4–8 cm long, with elongate stipules at the base of the petiole. Flowers **sessile**, spaced out on the plant, yellow; narrow tubular calyx, 5 cm long, one lobe of which is curved downwards; long style. After flowering, the peduncle curves downwards and buries itself in the ground to a depth of 2–7 cm. It is in this position that the fruit develops to maturity. The light brown, lignified outer casing, furnished with conspicuous wrinkles, contains 2–4 elongate seeds that are covered with a red epidermis.

Morphological variability

The numerous cultivars present around the world may be divided into two main groups: Virginia–Peruvian (ssp. *hypogea*) and Spanish–Valencia (ssp. *fastigiata*), both of which are present in Vanuatu. Apart from varied introductions on specific occasions, we note the arrival of seeds of Virginia in 1961 from Australia for planting in Tanna, and then the introduction of seeds of Valencia to the Tagabe experimental station in 1968. The Virginia–Peruvian varieties produce sprawling forms, with long lateral branches and dark green leaves. The fruits contain two seeds which germinate after a period ranging from one month to one year. The Valencia varieties produce erect forms, with short lateral branches and light green leaves. The fruits contain three to four seeds which germinate immediately.

Cultivation and production

The plant prefers well-drained, fertile soils, and rainfall of 500–1,000 mm followed by a dry period. Propagation is by planting the seeds in their pods, at a shallow depth and 40 cm

apart. The rows are hoed and slightly mounded up, especially after fruiting which takes place in the soil. They reach maturity in 4–5 months, which allows several harvests per year. Harvesting is by pulling up the entire plant, with the leaves and stalks then being left on the soil surface.

Alimentary uses

In Vanuatu peanut is eaten raw, or roasted in its shell which makes it more digestible. Grown mainly as a commercial crop, it is not used much by villagers in their everyday consumption. Quite early on the health services tried to make them part of the local diet because of their high protein content. In actual fact peanut has discovered a new life thanks to the multiplication of kava bars – the kava drinkers like to nibble peanuts to take away the taste of the kava brew. Worldwide, peanut is the second most important source of oil after soybean. By crushing the seeds it is also made into the famous peanut butter, which was first made a long time ago by the Incas.

Other uses

Like all legumes, peanut fixes atmospheric nitrogen in the soil, and its introduction into the subsistence cropping cycle, which has been encouraged in Vanuatu, contributes to soil fertility.

Genus
Brassica

Family
Brassicaceae

The genus comprises around 40 species, originating for the most part from northern Europe. Vanuatu has received various varieties of *Brassica oleracea* as well as various Asian green brassicas.

Species present

Western green brassicas:

Brassica oleracea L. var. *capitata* L.
Cabbage, head cabbage, Savoy cabbage, red cabbage

Brassica oleracea L. var. *botrytis* L.
Cauliflower

Brassica oleracea L. var. *gongylodes* L.
Kohl-rabi

Brassica oleracea L. var. *italica* Plenck
Broccoli

Asian green brassicas:

Brassica juncea (L.) Czernjaew & Coss
Indian mustard, Chinese mustard

Brassica rapa L. ssp. *chinensis* (L.) Hanelt[20]
Bok choi (or choy), pak choi

Brassica rapa L. ssp. *parachinensis* (Bailey) Tsen & Lee
Choi (or choy) sum

We also note two plants found in supermarkets in Vanuatu, imported and hardly grown at all in the country:

Brassica oleracea L. var. *gemmifera* L.
Brussels sprouts

Brassica rapa L. ssp. *pekinensis* (Lour) Olsson
Chinese cabbage

All the green brassicas of Vanuatu have been introduced from Europe or Asia. The European ones belong to the species *B. oleracea* while the Asian ones are combined under the species name *B. rapa*. The various different sorts are nowadays established

[20] The taxonomy of Chinese cabbages is still very complex and less well elucidated than that of the Western green brassicas. The name *B. rapa* is an ancient name that taxonomists have proposed to use as a replacement for *B. campestris* which was for a long time accepted. It includes four subspecies, among them *bok choi* and Chinese cabbage. One may still find it in the literature as *B. chinensis* (or *B. pekinensis* in the case of Chinese cabbage).

in the country and grown to varying degrees, either for family consumption or for sale in the urban markets. The most popular and frequently grown are the various Chinese cabbages, of which the bok choi has become a common food among the ni-Vanuatu.

References

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Occasional food plant, introduced

Brassica juncea

Indian mustard, Chinese mustard

History

The centre of origin of this species is uncertain, but it is generally accepted to have come from the only region in which the two supposed parents – *Brassica rapa* and *Brassica nigra* – both grow: the Himalayan region of central Asia. *B. juncea* probably appeared at two different times. First of all, a mutation of *B. rapa* gave rise to a new plant which then hybridised with *B. nigra* to give the species that we know today. This ancient plant spread quite early on to India, China and the Caucasus, where it was cultivated either for its oily seeds or its leaves according to region. Chinese peasants selected forms with large leaves which fed them over the centuries. These are the forms that are found nowadays in the markets of Vanuatu. Many research centres, especially in Canada and India, have bred improved forms of this species.

Description

Main stem robust, notched, dark green, branched in its upper part. Leaves broad and oval; midrib extending well along the petiole, leaf crimped between the leaf veins, dark green; margins dentate; petiole thick, winged, white, 10 cm long. Flowers arranged in a terminal raceme, yellow, small in size (less than 1 cm). Fruits narrow, with a slight beak-like structure, yellow-green. Numerous small seeds.

Morphological variability

Forms are recognised that are more or less robust, and with leaves more or less developed. China possesses numerous varieties with edible leaves. These are distinguished by the morphology of their leaves.

Cultivation and production

The plant is grown from seed, sown in rich, well-drained soil. It grows best in the cool, dry season. After one month the leaves can start being harvested, and picking can be done a number of times. The plants are grown as intercrops between legumes and produce modest yields, of the order of 200–500 g per cut. The whole plant is regularly sold in the markets.

Alimentary uses

The leaves, well washed and with part of their petiole removed, are chopped up if they are large or left whole if they are small. They are then boiled in a little salted water, which is changed once if there is any concern about bitterness. They are served as accompaniments to dishes of rice or root crops, or they are added to soups. The species is high in iron and potassium, and also in vitamin C.

Plants occasionally eaten, introduced

Brassica oleracea var. *capitata*

Cabbage, head cabbage, Savoy cabbage, red cabbage

var. *botrytis*

Cauliflower

var. *gongyloides*

Kohl-rabi

var. *italica*

Broccoli

History

Brassica oleracea L. is a very ancient European species, though no archaeological traces of it have been found. It is estimated as having been cultivated for 4,500 years. Very polymorphic, over time it has produced a wide variety of forms in different regions, used as human food or as forage for animals. All these forms derive from a wild ancestor that was originally from coastal Great Britain and the Atlantic coasts of Europe from Denmark to the Charente region in the mid-Atlantic coast of France (even to Spain). It has been cultivated and progressively diversified in each location, people preferring the forms with leaves tightly packed against each other. Some among these then spread to the Mediterranean where other species of *Brassica* grew (for example *B. cretica* in Greece), and the Atlantic forms exchanged genes with the Mediterranean ones. The Greeks then developed and differentiated all the forms by selecting them for leaf morphology (head cabbage, red cabbage, Savoy cabbage), for the inflorescences (cauliflower and broccoli) or for the stem (kohl-rabi). Two hundred and fifty years ago the Europeans introduced all these varieties to their colonies, from India to Australia from where they also reached the islands of the Pacific. Edible brassicas were introduced to Vanuatu by the first missionaries, and by ni-Vanuatu returning from plantations in Australia or New Caledonia. Later on the Department of Agriculture attempted to promote its culti-

vation. Nowadays these vegetables can be found on the shelves of certain groceries, imported from overseas for the most part. The ni-Vanuatu, particularly those close to towns, also grow some varieties of cabbage from Japanese or Taiwanese hybrid seeds purchased in groceries. They grow these for their own use or for sale in the markets.

Description

- var *capitata*: plant with a stalk so short that the leaves overlap tightly to form a ball-like head of cabbage. Leaves green or red, smooth, crinkled and with wavy margins. The inflorescence continues to grow during flowering, so that new flower buds sit above the flowers that have opened out, with pale yellow petals. The cylindrical fruits measure about 10 cm and contain small beige or brown seeds.
- var. *botrytis*: the inflorescences of cauliflower bear flowers that are atrophied and fused to their peduncle and to the young leaves, forming a compact, white mass of densely aggregated flowers packed together.
- var. *gongylodes*: the short stalk is swollen at the base just above the soil surface, to form a compact globe with a fleshy interior and a fibrous skin, colour greenish or purple, 5–10 cm in diameter. Leaves with a long petiole, arising in a spiral around the swollen stem.
- var. *italica*: broccoli has a mass of true flowers that are greenish or purple, arranged in loose aggregates that are slightly spaced out on the stems.

Morphological variability

- head cabbage was developed in the Middle Ages by the peoples of southwest Europe, from numerous forms spread by the Romans. It quickly became an important vegetable in the diet. Its leaves are smooth and green, then white, red or curly. Numerous cultivars of head cabbage exist around the world, and therefore also numerous different types of seed offered for sale. Distinctions are made between the head cabbage with green or white leaves (f. *alba*), the red cabbage with purplish leaves (f. *rubra*) and the Savoy cabbage with crinkly leaves. The head cabbages of Vanuatu are small in size. They have slightly wavy leaves, less tightly packed than in the country of origin and slightly more elongate.
- cauliflower probably originated in Italy, from ancient Brassica greens spread by the Romans. It could equally have reached Italy in the 15th century from the Levant or Cyprus. Later it spread to Northern and Central Europe, which regions are major producers of the species. It does not grow well in Vanuatu,

which regularly imports small quantities for sale in supermarkets. Numerous cultivars are known.

- kohl-rabi appeared in the Middle Ages in Central and Southern Europe. It has been spread in Asia for 200 years, and has become an important vegetable in China. Introduced to Vanuatu, doubtless with other brassicas, it has never been appreciated for its true worth. A number of cultivars exist.
- broccoli is an ancient plant of Northern Europe, but the form that we use nowadays – green broccoli with a main head – appeared in Italy at the beginning of the 20th century, then reached the United States with Italian migrants. From there the improved species reached Northern Europe and then many parts of the world.

Cultivation and production

- the head cabbage and even more so the Savoy cabbage survive frosts well and prefer high altitude areas. They are propagated from seed, bought commercially or collected from plants that have flowered. Some hybrid varieties do not produce seeds, but robust side shoots that emerge from the main stem can be used. In kitchen gardens cabbages are planted in rows, spaced about 50 cm apart. The plants are pricked out when 30–40 days old and are intercropped with other species. The soil needs to be well weeded and well dug. Cabbages reach maturity after three to five months. Cabbage crops respond to applications of manure, and the cabbage heads keep well at low temperatures. Yields of 20 kg per $10m^2$ can be expected in Vanuatu, the most favourable conditions being found in the centre of the island of Tanna where temperatures are cool.
- cauliflower and broccoli are very hard to grow in Vanuatu, where temperatures are too high and the variations in photoperiod are not sufficiently marked.
- kohl-rabi is grown from imported seed. It is much more tolerant of heat than cabbage or cauliflower. It is harvested quite quickly, between 50 and 60 days after planting because it can become very tough if it is left too long in the soil. Yields of 10–15 kg per $10m^2$ can be expected in Vanuatu.

Alimentary uses

- cabbage, boiled or steamed, is a European vegetable that is very important in its region of origin. It may be preserved in the form of sauerkraut. In Vanuatu the white-heart cabbage is eaten raw or boiled. In rural areas it is not used much, and village farmers grow it mainly to sell. In

season it is abundant in the markets, and is found in various sizes though all fairly small. In the urban area, head cabbages and Savoy cabbages are cut in thin strips or pieces that are boiled as an accompaniment to a dish of root crops or mixed into a meat stew.

- cauliflower is eaten raw as a salad or boiled as a vegetable. Broccoli is boiled or fried. Both are most often imported to Vanuatu, and therefore fairly expensive and not eaten much. Asian cuisine uses them as an ingredient in many dishes.
- kohl-rabi is not eaten much in rural areas and is grown for sale in the markets. It is, however, a delicious vegetable that can be eaten as a salad, grated or thinly sliced, or as a vegetable, boiled or fried, to accompany a dish of meat.

Complementary food plant, introduced

Brassica rapa ssp. chinensis

Bok choi (or choy), pak choi

ssp. parachinensis

Choi (or choy) sum

History

The species *Brassica rapa* L. originated from two main centres: the Mediterranean, and the region comprising eastern Afghanistan and Pakistan, with Asia Minor, the Caucasus and Iran possibly as a secondary centre. The wild form, which no doubt still exists as a relic, has been cultivated since ancient times somewhere in southwest Asia. No archaeological trace has been found, so one must determine the origin of its cultivation by studying linguistic criteria. It would not have been produced for its leaves but rather for its oily seeds. Over time it gave rise to several subspecies that were cultivated for their oily seeds, their bulbous bases or their leaves. In Europe selections were made particularly for the root, giving rise in particular to the turnip (*Brassica napus* L.), while in Asia the selections were for the leaves: bok choi, choi sum and pe-tsai. Bok choi, regarded as a delicacy by the Chinese, was mentioned for the first time in a Chinese text dating back to 500 AD. The Chinese took it to Malacca in the 15th century, to North America during the gold rush, and then to many places in the Pacific including Papua New Guinea and Vanuatu. Nowadays this vegetable has spread to many countries and is extremely popular in Vanuatu. Choi sum, often classified as a variety of bok choi, was probably introduced to Vanuatu at the same time as bok choi. Choi sum is less common than bok choi, but still appears regularly on the market stalls.

Description

- ssp. *chinensis*: plant reaching to 70 cm in height. Leaves in a loose rosette, erect, oblong

Allium sativum, garlic.

Shallot (leaves and bulbs of *Allium cepa*, var. *ascalonicum*) is very popular among the ni-Vanuatu.

HERBACEOUS PLANTS

Allium tuberosum, garlic chive or Chinese chive.

Ananas comosus, pineapple, is very popular in Vanuatu.

Grown everywhere and very popular, pineapple is sometimes used as the main ingredient of a meal.

Raw or roasted in their shells, peanuts (*Arachis hypogaea*) are sold in bunches tied by their stalks, or in little bags.

Brassica oleracea, cabbage

Cabbages came from Europe and are grown mainly for sale.

Brassica juncea, Chinese mustard.

The brassicas from Asia are the more popular.

Three varieties of Chinese cabbage, *Brassica rapa*, the best known of which is bok choi.

Capsicums or green peppers (*Capsicum annuum*).

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Two varieties of chilli (*Capsicum frutescens*) grown in Vanuatu. The green one is the milder.

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Rhizome of *Curcuma longa*.

Turmeric is grown in Vanuatu for its deep yellow colouring agent.

Heads of lettuce (*Lactuca sativa*). Although hard to grow, lettuce is present in many gardens.

Tomatoes grown for sale (*Lycopersicon esculentum*).

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Mentha piperita (peppermint).

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Carrots (*Daucus carota*) produced in Vanuatu are small in size and are not grown much.

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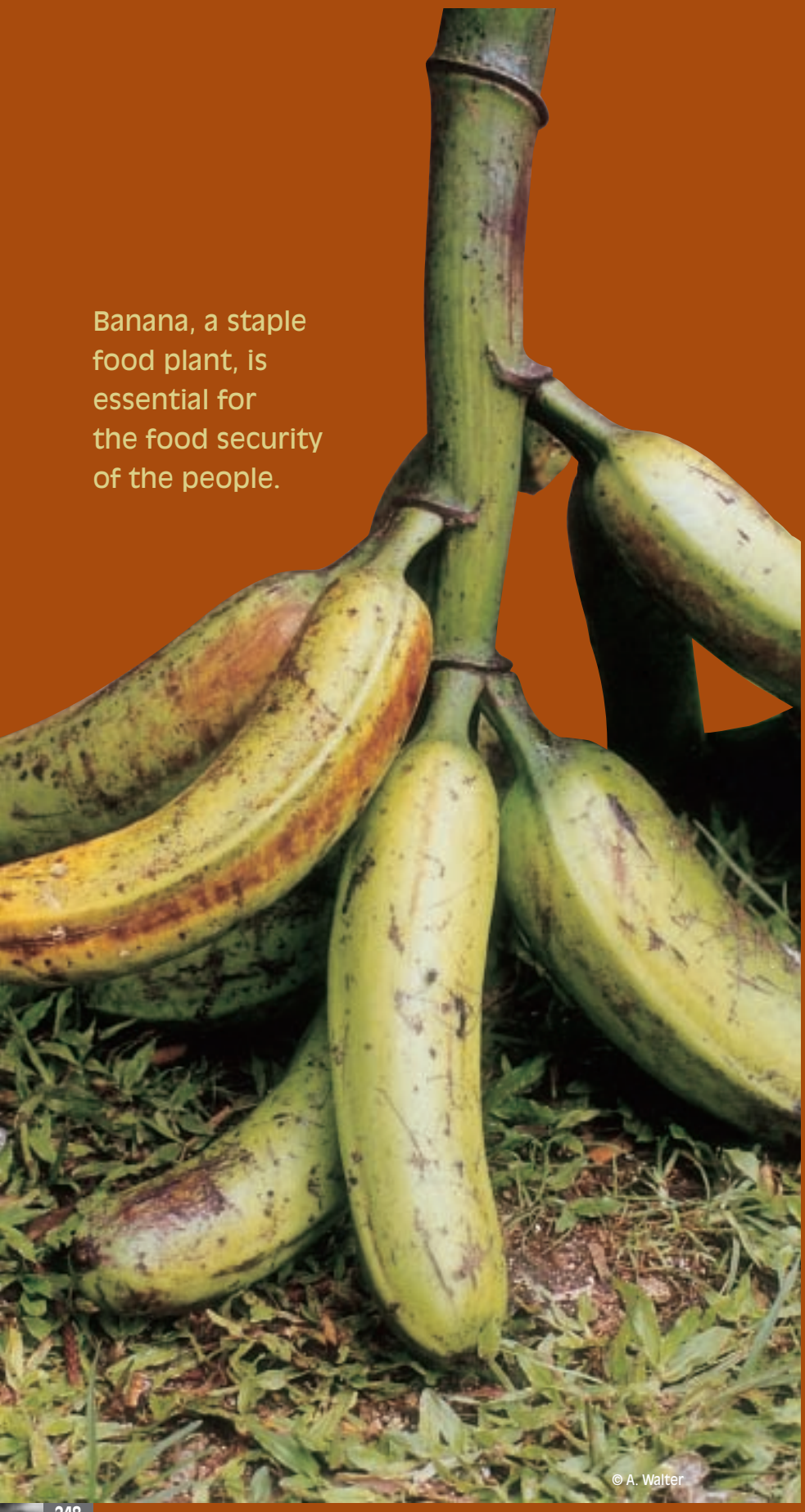

Banana, a staple food plant, is essential for the food security of the people.

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Silk banana.

Several varieties of banana (*Musa* spp.) grown in Vanuatu. On the left: the variety Popo'ulu. Below: the variety Cuban red.

Plantain banana, originally from Africa.

Preparation of a dish of bananas with fish.

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Ocimum basilicum, basil.

Petroselinum crispum, parsley.

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The large white radish is cooked, and is the one most eaten.

Above and right: White radish and pink radish (*Raphanus sativus*).

Bunches of watercress (*Rorripa nasturtium*).

Solanum melongena, eggplant or aubergine.

Sugar cane and naviso are two important local herbaceous plants.

Saccharum officinarum, sugar cane.

Sticks of sugar cane. Cut into pieces, they are chewed at any time.

Saccharum edule, naviso or pitpit, is a popular vegetable.

Zea mays, maize.

Zingiber officinale, common ginger.

© V. Lebot

Two species of ginger: zerumbet or wild ginger, an ancient plant, and common ginger, a plant that reached Vanuatu quite late.

Rhizome of wild ginger (*Zingiber zerumbet*).

© D. Greindl

or rounded, ending abruptly at the petiole, yellowish green, large in size (20–50 cm long), petiole robust, winged, convex and crenate at the back, ivory white. Raceme of bright yellow flowers. Fruits with a long beak, containing about 20 round seeds, dark brown or reddish.

- ssp. *parachinensis*: distinguished by the stalks, regular, slightly crenate, greenish and tender. The leaves are prolongations of a petiole that is only slightly winged. Flowers yellow or cream, in a panicle at the end of the stalk.

Morphological variability

- ssp. *chinensis*: two main forms exist, one with rounded leaves, dark green and with a milk white petiole, the other with pale green leaves and a cream or greenish petiole (Shanghai bok choi). However, there are numerous commercial, cultivated varieties which differ according to the height of the plant, the degree of erectness of the leaves, their shape and their size, and the colour and size of the petioles. Several of these are seen in the urban markets, the most popular among them being the *Waet bon*, which is a form with a white petiole.
- ssp. *parachinensis*: several cultivars exist, varying from year to year according to which commercial seeds have been purchased.

Cultivation and production

Bok choi is often found in the mixed gardens of the villages, after the first harvest of yams, on the holding walls of the irrigated taro pits or in urban kitchen gardens. It is grown from seed supplied by commercial seed companies in Taiwan. Young seedlings are transplanted into beds 30–50 cm apart. This green vegetable reaches maturity after three months, or sometimes two and a half. The majority of varieties bear flowers, and in Vanuatu produce attractive yellow flowering stalks and fertile seeds. The farmers do not have any problem in getting supplies, and sow seeds all the year round. The yields, however, are better in the cool season. Apart from the giant African snail, which eats the young plants, no serious natural enemies or diseases are known. Choi sum is often grown as an intercrop with other species, using pricked out seedlings. The seedbeds are sown with seeds either collected from plants that have flowered or bought from stores. They are harvested three to four months after planting, and yields of 10–15 kg per 10 m^2 are usual. The young plants require early weeding to avoid

them being quickly smothered by weeds. No serious diseases are known, but the rose beetle (*Adoretus versutus*) eats the soft leaves.

Alimentary uses

Chinese cabbage is used in Vanuatu like island cabbage (aibika; *Abelmoschus manihot*). It is cut into thin strips and boiled, mixed with meat stews, fried dishes and soups. However, its tough leaves do not lend themselves to the making of *lap-lap*. After the toughest leaves have been removed it is carefully washed, the ends of the green leaves are pulled off and the petioles are cut into small pieces. These are then boiled for some minutes, or even fried. According to individual taste the green parts of the leaves may be added towards the end of the cooking, since they cook very quickly. Bok choi is available abundantly throughout the year in the urban markets. In the case of choi sum, which has a more delicate flavour, everything is eaten. The bases of the stalks and the leaves are washed carefully, then all cut into pieces, flowers included, and boiled in a little salted water or fried on the stove. This vegetable is also used as an ingredient of soups and Asian dishes.

Genus
Capsicum

Family
Solanaceae

The genus comprises 25–30 species, five of which have been domesticated in Central and South America. Two species have reached Vanuatu, though they are sometimes considered to be one single species.

Species present
Capsicum annuum L.
Capsicum, green pepper, red pepper, sweet pepper

Capsicum frutescens L.
Chilli

Capsicum is grown in urban areas for the markets, where they are sold in large quantities. Chilli, more or less naturalised for a long time, was first grown as an ornamental bush before being exploited commercially. The former is increasingly eaten, the latter not very much.

References
Andrews (1984), Eshbaugh *et al.* (1983), **Govindarajan** (**1985**, 1986), Messiaen (1998), Neal (1929), Ochse & Bakhuizen van den Brink (1980), **Pickersgill** (1969, **1988**), Pickersgill *et al.* (1979), Piperno & Pearsall (1998), PROSEA (1994), Purseglove (1988, 1991), Rubatzky & Yamagushi (1997), Smartt & Simmonds, eds (1995), Viard (1995), Weightman (1989), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Capsicum annuum[21]

Capsicum, green pepper, red pepper, sweet pepper

History

This species was one of the very first grown in Latin America. Distributed from the southern United States to the north of South America, it was domesticated in the northern part of its area of distribution, probably around eastern Mexico. Its evolution then becomes complicated. Dispersed at the same time as humans and birds, this plant has been subjected to diverse selections. When Christopher Columbus discovered America it was already widespread, and the great navigator brought back some of the fruits to Spain

[21] Although some consider *C. annuum* (capsicum) and *C. frutescens* (chilli) to be a single species, we treat them as separate here.

from his first voyage. Following this the species was spread by sailors travelling to the tropics. Capsicum first reached the Pacific in the 16th century with the Portuguese, and it came to Vanuatu with the first missionaries.

Description

Branching herbaceous plant or shrub, 0.5–1.5 m in height; leaves simple, lanceolate or oval, variable in size. Flowers terminal; calyx persistent as a cup-shape; one corolla with five or six lobes, colour whitish. Fruits upright or pendant, solitary, hollow, variable in shape (conical, globular, sometimes twisted), very variable in size (1–30 cm long) and colour. Numerous seeds set on white partitions inside the fruit; small, smooth and flat, beige in colour.

Morphological variability

This variability is very important. The cultivars are distinguished according to the sweet or sharp taste of the fruits and according to their shape, size and colour. All these varieties can intercross and give rise to numerous distinct morphotypes and to intermediate forms. Varieties exist that are green, yellow, red, orange, violet or brown when mature. Numerous seed firms offer an enormous choice of varieties whose characteristics suit Vanuatu to a greater or lesser extent, and these are tried out by farmers each year. For example we note varieties with squarish fruits (from America or Italy), with large, globular red fruits (from Spain or Argentina), with elongate fruits (from central France) and with sharp-tasting fruits.

Cultivation and production

Capsicum grows in all sorts of soils, but does not tolerate frost or heavy rain that leads to rots. It is largely grown in the peri-urban zone to supply the markets of Port Vila and Luganville. It is grown from seed (which the farmers save from one crop to the next), sown into a seedbed and later transplanted. The harvest of green capsicums begins after three weeks, and continues at intervals of one to two weeks for three months. Its production is very irregular, and the yields are better during the cool, dry season.

Alimentary uses

Capsicum, particularly the red one, is a good source of vitamin A, vitamin C and potassium, but the contents of these vary with variety and degree of maturity. Western cuisine uses them raw in salads, or cooked in all sorts of dishes. They are also used in numerous Asian dishes, fried or sauté, after the thin skin has been removed. Vanuatu cuisine uses it less often. After the seeds and the white internal partitions have been removed, it is cut into thin strips and added in small quantities to beef stews.

Plant occasionally eaten, introduced

Capsicum frutescens

Chilli

History

The history of chilli is the same as that of capsicum, but its natural area of distribution is situated further south, extending from the Amazon basin to the West Indies. It was domesticated in lowland areas of northern South America. Capsicum and chilli were spread together around the world. Asia and India in particular gave rise to hot (peppery) forms, selected for the heat and dryness of some of the regions. Asia is nowadays a secondary centre of diversity of the species. In the Pacific and in Vanuatu chilli was adopted very early on, but more as an ornamental than as a food plant. It is found growing spontaneously in traditional gardens.

Description

Very branched shrub which resembles capsicum (*C. annuum*), from which it is distinguished by its greenish flowers and the narrow, elongate fruits that arise in pairs or in clusters. Only the variety *baccatum* has rounded fruits[22].

Morphological variability

A great variety of chillis exist according to the size and shape of the fruit, as well as the taste which can be more or less hot. Without doubt the hottest is *habanero*, quite small, round and vermilion coloured, followed by Cayenne pepper, wrinkled, curved and bright red. The bird's eye chilli (*piment oiseau* or *piment enragé*) small, elongate and bright red, is very hot; the banana chilli, red and as large as a small capsicum, and conical in shape, is mild like most African chillis. In Vanuatu the main forms growing are a small pointed chilli that grows wild, the variety *baccatum* and a large green chilli that is quite mild. Increasingly all sorts of forms can now be found that come from commercial seed supplies.

Cultivation and production

Chilli grows in the wild state in all the islands of Vanuatu, close to gardens and in the villages. Originally garden escapes, these are nowadays an integral component of the local flora. They prefer very sunny positions and dry weather. They are prone to root rots, nematodes and bacterial wilt, so rotation with other market garden crops is therefore avoided. Yields are high, and it is common to see bushes heavily laden with fruits. Some private enterprises harvest the chillis for use in the dried state, as a powder or a paste. This crop, although it has potentially good financial rewards particularly for export to the Indian community of Fiji, has not been exploited much.

[22] Some botanists consider this to be a separate species, *Capsicum baccatum*, which was domesticated in Bolivia.

Capsicum frutescens

Alimentary uses

Harissa, Tabasco and pili-pili are manufactured spices made from chilli. Not found much in the rural populations of Vanuatu, it is used more and more in meat stews, and sometimes raw as an accompaniment to a dish of root crops. It is sold regularly in urban markets, in small sachets or – more attractively – in plaited garlands. They are also sold in bottles or dried.

Other uses

In Vanuatu it is used first and foremost as an ornamental shrub, and for marking the boundaries of plots of land.

Genus
Coriandrum

Family
Apiaceae

The genus contains two species, one of which is cultivated. It has been introduced to Vanuatu.

Species present
***Coriandrum sativum* L.**
Coriander, cilantro,
Chinese parsley

In Vanuatu coriander is grown for its leaves that are used to flavour many dishes, but the ni-Vanuatu only eat it in moderate quantities. Its seeds are not used as a food.

References
Boisvert & Hubert (1977), *Encyclopédie des aliments* (1997), French (1986), Norman (1991), Ochse & Bakhuizen van den Brink (1980), **PROSEA (1999)**, Purseglove (1991), Purseglove *et al.* (1981), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Coriandrum sativum

Coriander, cilantro, Chinese parsley

History

Coriander, a weed of cereal crops in the Middle East, became one of the oldest spices of the Mediterranean region. It was grown as a medicinal and food plant by the Egyptians, Greeks and Romans. Its name comes from the Greek *koris*, which indicates bed bugs, from the characteristic odour of the young plant. It later spread throughout Europe, in Asian countries and then America, for both its seeds and its leaves. This European plant reached Vanuatu with the arrival of Asian people.

Description

Erect and branched, annual herbaceous plant, 30–70 cm tall. Coriander is **heterophyllous**. Leaves flat with dissected margins (upper leaves) or lobate margins (lower leaves). Inflorescence an umbel bearing white or pink flowers, small in size in the middle and broad at the periphery. Fruits rounded, small, yellowish and grooved, containing two seeds.

Morphological variability

Several varieties exist, distinguishable by the height of the plant, the morphology of the leaves and the fruits, and above all by the chemical composition. We note among others Moroccan coriander with spherical, grooved seeds, and Indian coriander with more elongate and smooth seeds. A distinction is also made between *C. sativum* var. *sativum* (weight of 1,000 fruits over 10 g and average diameter of fruits over 3 mm) and *C. sativum* var. *microcarpum* (weight of 1,000 fruits less than 10 g and average diameter of fruits less than 3 mm).

Cultivation and production

In Vanuatu coriander is grown for its leaves which are supplied to the markets. It is also planted in kitchen gardens. The plant does not tolerate very strong sun and its cultivation is tricky. It is grown from seed, mostly bought commercially. The plant reaches maturity in three months, but leaves can be harvested after 60 days. In Vanuatu nematodes weaken the plant roots, and a bacterial wilt impairs their good development when they are grown in the hot and wet season, namely November to April.

Alimentary uses

In Vanuatu coriander leaves, which are very rich in vitamin A, are sold fresh in bunches in the markets. They are used in Asian cuisine and for seasoning salads, soups, fish and various other dishes. Coriander seeds are imported and are sold in groceries. They are purchased by the expatriate population which uses them in their cuisine.

Genus
Curcuma

Family
Zingiberaceae

The genus comprises about 70 species, mainly originating from the Indo-Malayan Region, with some species from Madagascar and Southeast Asia. Vanuatu possesses at least one species.

Species present
Curcuma longa L.
Turmeric

Present in Vanuatu from olden times, turmeric is naturalised there. It is grown for the colouring agent extracted from its roots, and to a lesser extent as a spice.

References
Barrau (1962), Boisvert & Hubert (1977), de Candolle (1883), French (1986), Norman (1991), Ochse & Bakhuizen van den Brink (1980), Peekel (1984), Pétard (1986), PROSEA (1999), Purseglove (1988), Purseglove *et al.* (1981), **Sastri, ed. (1950)**, Smartt & Simmonds, eds (1995), Sopher (1964), Zeven & de Wet (1982).

Plant occasionally eaten, local

Curcuma longa
Turmeric

History

Unknown in the wild state, turmeric has been cultivated for a long time in India from where it probably originates. It has been domesticated in Southeast Asia, and early on reached China where it was already seen by Marco Polo, and then the countries of Oceania. The Arabs introduced it to Europe in the Middle Ages. It reached Vanuatu with the first human migrations, and became naturalised there. This autochthonous (or indigenous) plant, which is used as a food colorant and a pharmaceutical (food additive E-100 in the EU list), is certainly worth developing into a commercial crop.

Description

Perennial herbaceous plant with a straight and tough stem, reaching up to 1 m in height. Central rhizome surrounded at a right angle by numerous, smaller, lateral rhizomes, smooth but furnished with flexible scales, straight or slightly curved, orange or yellow. Leaves sheathing the stem with their slightly winged

petioles, lanceolate, longitudinally striated, pale green, 30 x 7 cm. Long terminal inflorescence bearing white or yellow, tubular flowers separated by large bracts. Fruits absent.

Morphological variability

Several cultivars of turmeric exist in India, but the diversity of the plant in Vanuatu has not been studied.

Cultivation and production

The plant likes hot and wet climates, and aerated and well-drained soils. It is propagated from pieces of rhizome. In Vanuatu this plant grows spontaneously, and is not really cultivated but is simply propagated. It is, however, the object of occasional small trade. It is found hither and thither, and as an intercrop in gardens, particularly in Fanafo and on the island of Santo.

Alimentary uses

Used in India and Asian countries as a fragrant flavouring for food, turmeric is used as an ingredient in curries and in Worcestershire sauce. It is one of the rare spices that was used in Melanesian cuisine before the arrival of Europeans and Asians. With a mild flavour, it gives meat dishes a subtle fragrance, slightly tangy, and an attractive yellow colour. In earlier times in the centre of Santo a ritual existed in which men cooked large roots of turmeric in an oven of hot stones and then ate them[23].

Other uses

A dark yellow colouring agent (curcumine) is extracted from the root, which can be used to dye vegetable fibres, wool and silk. Nowadays in Vanuatu the plant is used for dyeing the pandanus fringes of certain ceremonial mats, and wooden objects used in dances, and for making coloured designs on the faces and bodies of the dancers. It is also used as a medicine and a cosmetic.

[23] Though this could have been *Curcuma angustifolia* Roxburgh.

Genus
Daucus

Family
Apiaceae

The genus comprises 22 species, mainly European and Mediterranean. *Daucus carota* is itself a complex of 13 species. Vanuatu has only the cultivated carrot with the orange root.

Species present
Daucus carota L. subsp. *sativus* (Hoffm.) Thell
Carrot

In Vanuatu carrot is not grown much because of its poor agronomic performance. The carrots are small and thin. Always popular as a food, however, the great majority are imported.

References
De Candolle (1883), **Cullen (1972)**, **Heywood (1983)**, Ochse & Bakhuizen van den Brink (1980), PROSEA (1994), Purseglove (1991), Smartt & Simmonds, eds (1995), Viard (1995), Villeneuve & Leteinturier (1992), Weightman (1989), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Daucus carota

Carrot

History

It was in Afghanistan that the carrot, originally violet or straw-coloured, was first cultivated over 2,000 years ago. It reached successively Iran, China and Turkey, and then the Arabs spread it to the Mediterranean basin. In the 16th century this vegetable appeared on the tables of Europe, and it was then introduced to America. The violet carrot was gradually replaced in Europe by a pale yellow carrot, the greater part of which grew above the soil, and finally by the orange carrot that we know today which appeared in the Netherlands after much selection. All the varieties of orange carrot cultivated today throughout the world derive from this last selection. It was this form that was introduced to Vanuatu by missionaries in the middle of the 19th century.

Description

Plant reaching to 1 m in height. Leaves composed of leaflets that are themselves made up of smaller segments that in turn are made up of lanceolate segments;

petiole long. Umbel reaching 37 cm in diameter bearing flowers with five white or pink petals, with a toothed calyx. Small, oblong fruits a few millimetres long. Root swollen, variable in size, squat and dumpy or elongate, yellow or orange.

Morphological variability

D. carota is a complex comprising very variable species, wild or cultivated. There are two major groups of cultivated carrots. The first, which is Asian, encompasses the forms with a yellow or purple root, divided; the second, which is western, contains the forms with orange roots, sometimes yellow or white, not divided. In Turkey the two forms coexist and hybrids between the two groups occur. The cultivated forms cross easily with the wild forms, and numerous cultivars have been selected around the world. The Vanuatu carrot is always cultivated, and varies according to which seeds have been available to purchase.

Cultivation and production

In Vanuatu the carrot is a plant of market gardens, grown in the centre of Tanna and in peri-urban zones. It is grown from seed bought commercially, sown into well-dug and well-drained ground. The young seedlings are thinned, and the plants are later harvested before they have reached full maturity, while the roots are still tender. The cultivation of carrot is made difficult by the fact that it is prone to nematode attack, and its roots are never very large. Carrots are sold in the markets during the cool season, generally in small quantities. The supermarkets import larger and more tender varieties from Australia, and these are generally preferred by consumers.

Alimentary uses

This vegetable is not eaten much by rural people or by those who do not have the means to buy the imported varieties. Carrots are eaten raw, in salads, or cooked. They are boiled after being cut into pieces or into strips. They are added to meat stews or are mixed with other vegetables and boiled or sautéed.

Other uses

The leaves may be fed to animals.

Genus
Lactuca

Family
Asteraceae

The genus comprises about 100 species, many of which originated from northern Europe or western Asia. A single species is present in Vanuatu.

Species present
Lactuca sativa L.
Lettuce

Lettuce is a popular vegetable, present in all the villages. However, its sensitivity to low temperatures and to nematodes makes its cultivation in open soil difficult. It is, however, sold regularly in the markets.

References
De Candolle (1883), **Ferakova (1976)**, Harlan (1987), Lindqvist (1960), Ochse & Bakhuizen van den Brink (1980), Purseglove (1991), Robinson *et al.* (1983), Smartt & Simmonds, eds (1995), Viard (1995), Weightman (1989), Wien (1997), Zeven & de Wet (1982), Zohary (1991), Zohary & Hopf (1994).

Complementary food plant, introduced

Lactuca sativa

Lettuce

History

Lettuce is depicted on Egyptian monuments and mentioned in Greek and Roman literature. A plant of western Asia and the Mediterranean, it was first produced for the oil extracted from its seeds. The exact path of hybridisations that led to the lettuce that we know today is no longer clear. The Persians, the Romans and then the Arabs selected a number of forms, with dense foliage and short stems. The Roman legions introduced them to Europe, then the first navigators took them to America where they became very popular. They reached China in the 7th century AD. The human selections were for characteristics of the seeds, and then the shape of the leaves (flat or curly, ability to form a heart, colour), finishing up with a great diversity of forms that are often grouped within a complex, *L. seriola-sativa*.

Description

This herbaceous plant initially forms a dense rosette of leaves arranged in a spiral around a short, squat stalk. Their shape, size, colour and texture are very variable. The leaf blade is whole, segmented or slightly undulating. The long flower stalk (1 m in height) appears later. It is made up of numerous flowering heads bearing small yellow flowers. Fruit an achene[24], oval, surmounted with a plume of hairs.

Morphological variability

This kitchen garden plant has a multitude of varieties. The forms that are closest to the ancient species, with leaves that are erect, thick, narrow, stiff and crisp (for example cos lettuce which is common in northern Europe) are grouped together under the variety *longifolia* Lam. The Americans prefer forms with dense hearts and tightly packed leaves, pale green and crisp (var. *capitata* L.), or heading lettuces. Europeans particularly like butter lettuce (likewise var. *capitata* L.), with broad, flexible leaves, slightly open, in various shades of green. The forms with a curly head (var. *crispa* L.), which never form a heart and have broad, wavy leaves, have quite recently become popular in the countries of northern Europe. Lettuce is grown from seeds purchased commercially, and one may therefore find numerous different morphotypes in Vanuatu according to which particular seeds have been imported that season.

Cultivation and production

Lettuce is a plant of temperate countries, and no variety is really adapted to the tropics. In Vanuatu the leaves have difficulty forming hearts and the plants have a tendency to produce long stalks. Principally grown in the centre of Tanna, and by market gardeners around Port Vila, lettuce is also grown by women in peri-urban villages for sale at markets during the cool season from May to October. It is grown from seed, sown in seedbeds and then transplanted into growing beds after six weeks. It is harvested three months after sowing. Since the 1970s it has been produced by hydroponic[25] culture and sold in plastic bags in the supermarkets. Despite its proneness to nematodes, many growers sow it in their gardens for their own home consumption.

Alimentary uses

Lettuce is eaten raw, seasoned with a little salt and lemon juice or vinaigrette. The leaves are also cooked as a vegetable, alone or mixed with other vegetables. Without being very common, consumption of cooked lettuce is regular in rural regions. In urban areas it is most often served as a salad.

[24] A dry, indehiscent fruit with a single cavity and a single seed, the pericarp of which is not fused with the seed (the hard seeds that are found on a strawberry are achenes).

[25] Culture without soil, where the roots develop in nutrient solutions.

Genus
Lycopersicon

Family
Solanaceae

The genus comprises the cultivated tomato, and seven wild species which grow in a coastal belt of land stretching from the Equator to northern Chile. The cultivated tomato is present in Vanuatu.

Species present
Lycopersicon esculentum Miller
Tomato

Formerly known as the love apple, the tomato, which is introduced, is nowadays grown in all the gardens. It is mostly eaten cooked, in meat or vegetable dishes.

References
Anaïs (1997), Atherton & Rudish, eds (1986), Hawkes *et al.*, eds (1979), Jenkins (1948), Mathon (1981), PROSEA (1994), Purseglove (1991), Ochse & Bakhuizen van den Brink (1980), Smartt & Simmonds, eds (1995), **Taylor (1986)**, Viard (1995), Weightman (1989), Zeven & de Wet (1982).

Complementary food plant, introduced

Lycopersicon esculentum

Tomato

History

The tomato as we know it is the cultivated form of a wild species with small, acid fruits (*L. esculentum* var. *cerasiforme*), originally from the equatorial and Peruvian Andes. This weed plant spread throughout tropical America, and was then domesticated and improved in Mexico. It was from there that the Spanish took it to Europe. For a long time this plant, which was reputed to be poisonous, was not eaten outside Italy but was instead used as a medicine or an ornamental plant. At the end of the 18th century the Europeans introduced it to the United States where its improvement really began, giving the round, fleshy, sweet tomatoes that we know today. The Spanish introduced it to the Pacific and the Philippines after 1650. It spreads easily in the subsistence gardens and often becomes naturalised. Finally, the improved varieties of tomatoes were introduced to the islands

of Oceania. Nowadays in Vanuatu one may find spontaneously growing forms with small fruits and cultivated forms with large fruits in the indigenous gardens, mainly in the peri-urban zone. In season, tomatoes (cherry tomatoes or round ribbed) appear in large quantities in the markets.

Description

Plant shrubby, reaching up to 2 m in height, or scrambling, with a robust, hairy stalk and a strong smell. Leaves made up of 6–9 leaflets, lobed or entire, oval, with short hairs; margins with small teeth. Flowers hermaphrodite, in flower spikes separated by three leaves (indeterminate pattern) or two leaves and then one (determinate pattern); calyx persistent, made up of six pointed lobes; five to six recurved petals, yellow. Fruits variable in shape, rounded (smooth or ribbed), elongate or pear-shaped, yellow or red in colour, size likewise variable (1–10 cm in diameter), containing numerous small brown seeds.

Morphological variability

Two to five varieties of tomatoes are known, according to the mode of growth of the plant and the morphology of the fruit. The following three varieties are present in Vanuatu:

- var. *cerasiforme* (Dun.) Alef.: cherry tomato. Originally from Peru and Ecuador, this wild form (subsequently improved and cultivated) is spread throughout the tropical world and nowadays is often naturalised. The flowers have five petals and the yellow or red fruits are small in size (2 cm in diameter). In Vanuatu it is found in all the gardens, along footpaths and around houses;
- var. *pyriforme* Alef.: pear tomato. The flowers have five petals and the yellow or red fruits are pear-shaped. It is not grown much in Vanuatu;
- var. *commune* Bailey: common tomato. The flowers usually have six petals and the fruits are variable in shape and size. It is grown in all the islands of Vanuatu. The ribbed form is very much predominant.

Besides these, very many other cultivars have been produced in temperate regions since the end of the 19th century, varying according to the shape, colour and size of the fruit, the taste and the vitamin content, the degree of precocity (early maturity), whether the growth form is erect or scrambling, and the disease resistance.

Cultivation and production

Tomato is adapted to many environments, but in hot and humid tropical regions such as Vanuatu it produces fewer fruits and more leaves. In the islands it is grown in the mixed gardens that are planted after the first harvest of yams. It is grown from

seed, most often bought commercially or collected from the fruits and dried, or by grafting on to eggplants (aubergines) which are more resistant to bacterial diseases. The seeds germinate 7–10 days after being sown into seedbeds. The young seedlings are transplanted after five weeks into prepared beds of soil. Although under some conditions the plant can give three harvests per year, in Vanuatu the fruits generally appear only once a year in the markets, from June to November. In the 1980s the Department of Agriculture began trials to produce high quality tomatoes throughout the year, resistant to bacterial diseases and nematodes. Numerous resistant varieties from Taiwan were distributed to growers. The hardiest of these have fruits of medium size (5–8 cm in diameter), and were popular with the producers who continue to grow them using the seeds collected from the fruits.

Alimentary uses

The small cherry tomatoes which grow spontaneously in garden areas are eaten raw between meals. It is often children who pick them and eat them as snacks. They are also cooked before they are fully ripe, as an accompaniment to a dish of root crops. The improved forms with larger fruits, grown in the gardens, are sprinkled with salt and eaten raw, or cooked in meat stews.

Genus
Mentha

Family
Lamiaceae

Twenty-five species of mint exist, plus very many cultivars. Two species are particularly important in Vanuatu.

Species present
***Mentha piperita* L.**
Peppermint

***Mentha spicata* L.**
Spearmint, garden mint

Mentha spicata is the commonest mint in Vanuatu, but other cultivars and other related species are also found, spontaneous or cultivated.

References
Encyclopédie des aliments (1997), French (1986), **Harley (1972)**, Hill (1952), Purseglove (1991), Ruttle (1938), Tucker & Fairbrother (1990), Tucker *et al.* (1980).

Plants occasionally eaten, introduced

Mentha piperita
Mentha spicata

Peppermint
Spearmint, garden mint

History

Known since biblical times and originating from temperate Europe and Asia, the different species of mints have been progressively spread around the world. They have undergone numerous interspecific hybridisations with parental and/or secondary (derived) species, yielding new species and cultivars. Accordingly, *M. piperata* is a sterile hybrid resulting from the crossing of three species of mint, one of which is *M. spicata*. Mint is generally grown in kitchen gardens or in pots close to houses. Introduced to the United States in the 19th century, it was improved and is widely grown there. In Vanuatu it is naturalised but also cultivated in the gardens.

Description

- *Mentha piperita* L.: herbaceous plant with a square stem 50 cm long, green-mauve, branched and erect; stolons leafy. Leaves with

a strong smell, lanceolate, dentate, hairy, bright green, quite large (5 cm). Violet flowers in terminal heads.

- *Mentha spicata* L.: leaves with a less strong smell, rounded, slightly dentate, grey-green, smaller. More or less violet flowers in heads.

Morphological variability

Very important and occurring almost continuously, but not studied in Vanuatu.

Cultivation and production

Naturalised in Vanuatu, mint is found in all garden areas and in damp places. It is cultivated both from seed and from planting of stolons in the vegetable gardens. The species that is commonest in rural areas and that is most often seen in the wild state is *M. spicata*.

Alimentary uses

Mint leaves are used to flavour soups, salads, food dishes, sauces and some ices. Rural people use it in moderation.

Genus
Musa

Family
Musaceae

Bananas are hybrids between different species. In Vanuatu both cooking bananas and dessert bananas are found, as well as the celebrated *Fe'i*.

Species present
Musa spp.
Interspecific hybrids

Musa fehi Bert. ex. Vieill.

In some of the islands of Vanuatu bananas are the staple food plants, essential for the food security of the local people. The plantains are often made into *lap-lap*, and the dessert varieties are eaten throughout the day. The various species of banana are treated together here.

References
Bakry *et al.* (1997), INIBAP/IPGRI (2001), Lebot *et al.* (1994), Sharrock (1995), **Stover & Simmonds (1987)**.

Staple food plant, local (and introduced)

Musa spp.

Banana, plantain

The genus *Musa* is divided into four sections which include forms with seeds and seedless forms. Two sections have a base chromosome number of 10 (*Callimusa* and *Australimusa*) and the other two sections (*Musa* and *Rhodochlamys*) have a base number of 11 chromosomes. The section *Australimusa* is endemic to Oceania and does not exist in Asia, and includes the famous *Fe'i* banana with its erect bunches that is so popular in Tahiti and the Marquesas. This section in fact originated in Melanesia where wild and cultivated individuals coexist. The great majority of banana cultivars belong to the section *Musa*, which is also the most important in the genus and the most widely distributed. It is found from India to Southeast Asia and certainly in the Pacific. The most ancient cultivated bananas originated from Papua New Guinea and Melanesia, but domestication has occurred for tens of thousands of years across to India and southern China. The Austronesians introduced it to Madagascar, and from there to Africa where the population

adopted it as a staple food plant, particularly in East Africa and the equatorial region. Marco Polo, Arab traders, the Portuguese and then other Europeans spread them endlessly around the world. Nowadays 80% of the world production is of the variety Cavendish, which is a cultivar originally from southern Yunnan in China.

Description

Giant herbaceous plant, with a trunk-like pseudostem formed from many **leaf sheaths** tightly rolled around each other. Leaves are produced by the terminal meristem of the underground stem (or corm) that is reduced in size. The root system is shallow and the number of shoots varies according to variety. The vertical inflorescence forms a cluster or bunch, made up of imbricate (partially overlapping) spathes arranged in a spiral, in the axils of which arise rows of flowers. The female flowers are made up of a basal ovary, and staminodes or reduced, functionless stamens. Female sterility is absolute in many clones. In the commercial cultivars, the ovaries fill with flesh to make the fruit, without pollination and without seeds being formed. The growth of the inflorescence continues and it produces a male flower, which is generally purple and hangs beneath the bunch of fruits.

Morphological variability

The cultivars derive from two species: *Musa acuminata* (genome A), fragrant and rich in sugar, and *M. balbisiana* (genome B), which is relatively tasteless and is rich in starch. The seeds of bananas are numerous, the size of a lentil, not very nice on the palate and very hard between the teeth. The first selections were therefore towards sterile forms that did not have these seeds, and were diploids of *M. acuminata* (AA). It is, above all, this parthenocarpy (fruit development without the need for pollination) that makes banana appealing and edible. At some moment or other in their history, the diploid and triploid cultivars of *M. acuminata* exchanged pollen with *M. balbisiana* to give rise to interspecific hybrid cultivars that were diploid (AB), triploid (AAB, ABB) and even tetraploid (AAAB, AABB, ABBB). The banana varieties most grown in Vanuatu belong to the group called "Pacific plantains" in international nomenclature. They comprise three triploid AAB varieties, the fruiting stalks of which carry bunches of large cooking bananas, and they are staple food plants. These varieties are known by experts under their Hawaiian names of *Maia Maoli*, *Popo'ulu* and *Iholena*. *Maoli* (= Maori banana) is the variety with the largest fruits, and corresponds to *Mao'i* of the Marquesas, *Ma'ohi* of Tahiti and the *Chef* banana of New Caledonia. *Popo'ulu* are short, fat, squat bananas, sometimes as broad as they are long, known under the name *Po'u* in Tahiti, *Po'upo'u* in the Marquesas and *Poingo* in New Caledonia. Finally the *Iholena* of Hawaii, or *Ore'a* of Tahiti, are remarkable for their deep orange flesh which, like the *Fe'i* bananas, gives a fluorescent yellow colour to the urine, which

surprises even regular eaters. Within each of these varieties, *Maoli*, *Popo'ulu* and *Iholena*, the farmers distinguish numerous forms according to the colour of the plant, the epidermis and the flesh of the fruit. Because of the linguistic diversity of Vanuatu, these forms are known under dozens of different names in the vernacular languages. The missionaries introduced numerous cultivars of dessert bananas that are also now very popular. One may find Ney Pouvan (Lady Finger), the very small fruits of which are quite fragrant; also the Brazilian, which has a more acid taste, and the Cavendish which has a rather bland taste but yields exceptionally well. The number of varieties has not been tallied exactly but easily exceeds 50 or so, and distinct morphotypes can be counted in the hundreds.

Cultivation and production

Banana is one of the most important food plants of Vanuatu. It is regularly planted in the borders of gardens, either as a windbreak or simply to mark the border. The species is planted using large suckers cut from the base of a mother plant. The suckers are usually placed at the bottom of holes 30 cm deep made with a crowbar. The first bunch appears after 8–10 months. At each harvest the pseudostem is chopped down, but the daughter shoots are left and they then fruit in their turn. The plant becomes a perennial and remains in the soil for three to five years, the time that it takes for a cyclone to come and knock it down. Black Sigatoka disease (*Mycosphaerella fijiensis*) is the most serious problem, and banana weevil (*Cosmopolites sordidus*) bores into the bases of the stalks and can lead to them falling over.

Alimentary uses

Omnipresent in the markets, the Pacific plantains, which have yellow flesh, are sold as cooking bananas and for preparation of *lap-lap*, and are very popular with consumers. These bananas may be boiled and then mashed for children, or cut into slices and fried. They are very rich in complex carbohydrates and therefore nutritious. Dessert bananas, which are eaten when fully ripe, are eaten by the ni-Vanuatu at any time of day as snacks.

Other uses

Banana leaves are used mainly as table mats, plates or dishes. They are sometimes used instead of *Heliconia* leaves for wrapping foods before or after cooking, but they are not as strong. The sap of certain varieties, particularly the *Fe'i* bananas, is a popular dye for colouring mats to an attractive purple. Finally, the trunk-like stalks may be crushed in order to obtain long fibres, used as string or rope or for weaving skirts.

Genus
Ocimum

Family
Lamiaceae

The genus comprises 30 species spread around tropical and subtropical regions. Three species are present in Vanuatu.

Species present

***Ocimum basilicum* L.**
Basil

***Ocimum tenuiflorum* L.**
Basil (very close to *O. basilicum* and difficult to distinguish from it)

***Ocimum gratissimum* L.**
Wild basil (foraged species; see CD-ROM)

Basil is found in all urban gardens, but also frequently in rural areas. It is regularly used, in small quantities like all aromatic herbs.

References
Darrah (1974), Germosen-Robineau, ed. (1999), Grayer *et al.* (1996), Messiaen (1998), OMS (1998), **Paton (1992)**, Paton & Putievsky (1996), Pétard (1986), PROSEA (1999), Purseglove (1991), Pushpangadan & Bradu (1995).

Plant occasionally eaten, introduced

Ocimum basilicum

Basil

History

Originally from west Asia, basil was cultivated by the Egyptians, then by the Greeks and Romans. From there it reached the rest of Europe and then the continent of America. Grown for a long time as a medicinal plant and an aromatic herb, the species comprises numerous cultivars. It is nowadays present throughout the world. It was introduced to Vanuatu where it grows abundantly, often spontaneously.

Description

Aromatic herb with a robust stalk, erect and quadrangular. Leaves simple, **decussate**, oval or elliptical, dentate or entire, reaching 8 cm in length. Inflorescence terminal, reaching up to 30 cm, with three spikes of purple, white or cream flowers;

calyx fringed; pedicels very short. Fruits consisting of four small, dark maroon nuts, 1 mm in diameter.

Morphological variability

The species, whose taxonomy is not well known, may be confused with other closely similar species (*O. tenuiflorum* in particular). Moreover, it is extremely variable, with the cultivars being differentiated mainly by the content of aromatic compounds. Thus many forms of basil exist in Vanuatu, and they have not been studied in any detail. One may distinguish, however, a form with broad leaves, and a form with small, oval leaves which is more shrubby.

Cultivation and production

Basil grows in all the villages and gardens, but above all in pots or in kitchen gardens in urban areas. It is grown from seeds bought commercially or collected from mature plants. The seeds germinate in about five days, the plant grows quickly, and picking of the leaves stimulates further growth. It flowers after three months.

Alimentary uses

The leaves have been used for a long time to flavour soups, sauces and various different dishes. They are the basic ingredient in the famous pesto sauce of Italy and southeast France. In Vanuatu they are used in small quantities to flavour soups and certain stews. However, it is mostly the Asian and European expatriate populations in the urban areas who use it to flavour their dishes.

Other uses

Oil extracted from the leaves is used in the cosmetic industry, in particular to scent soaps. It is also a medicinal plant.

Genus
Petroselinum

Family
Apiaceae

A single species occurs in Vanuatu.

Species present
Petroselinum crispum (Mill.) Nyman ex. A.W. Hill
Parsley

Parsley is a European introduction to Vanuatu.

References
PROSEA (1999), Purseglove (1991), Smartt & Simmonds, eds (1995), Zeven & de Wet (1982).

Plant occasionally eaten, introduced

Petroselinum crispum

Parsley

History

Parsley, originally from the western Mediterranean, was already known to the Greeks and the Romans. It is nowadays spread throughout the world, and is naturalised in most of the temperate zones.

Description

Biennial or perennial herb with a hollow stem, 70 cm high on average. Leaves arranged in rosettes, made up of three leaflets with deeper and shallower indentations (particularly on the lower leaves), flat or curly, bright green, 1–2 cm long. Flowers borne on flattened umbels 2–5 cm in diameter, small, yellow. Fruits ovoid and laterally compressed, 1–2 cm long, containing the seed.

Morphological variability

Parsley is a very ancient cultivated plant, which varies according to its habitat and to the size and shape of the leaves. Three main groups of cultivars may be distinguished:

- flat-leaved parsley (var. *neapolitanum* Danert), preferred by continental Europeans, with flattened and well spaced out leaves, strongly flavoured;
- curly-leaved parsley (var. *crispum*), preferred by Anglo-Saxons, with compact, curly leaves, mildly flavoured;
- parsley with a tuberous root, not found in Vanuatu.

Within each group a number of cultivars exist, many of which have been developed in agricultural research stations.

Cultivation and production

Parsley is grown by sowing seeds, which germinate with difficulty. When the plantlets have six leaves they are transplanted into a bed, or at least thinned out. Leaves are then picked as needed, with flowering heads being removed whenever they form. In the gardens the growers allow some inflorescences to develop, however, to produce seeds that will germinate spontaneously and maintain the crop.

Alimentary uses

Parsley, so common as a decoration on a plate or a seasoning for sauces, has still not been incorporated into the cuisine of Vanuatu. Only people of Asian or European origin use it with any regularity. It is therefore mainly grown in urban vegetable gardens or by peri-urban market gardeners who sell it in the markets. In the rural areas it may be found in the gardens, mainly in well-drained, moist hollows, but it is not used much.

Genus
Raphanus

Family
Brassicaceae

The genus contains six species originally from the shores of the Caspian Sea. The only cultivated species has been introduced to Vanuatu.

Species present
***Raphanus sativus* L.**
Radish

Only the varieties of radish with large roots are eaten by the ni-Vanuatu, though various sorts may be grown within a garden for sale in markets or for experimenting with new plants.

References
Messiaen (1998), **Pistrick (1987)**, PROSEA (1994), Purseglove (1968), Rubatsky & Yamagushi (1997), Smartt & Simmonds, eds (1995).

Plant occasionally eaten, introduced

Raphanus sativus

Radish

History

Radish originated between the Mediterranean and the Caspian Sea. A weed among cultivated crops and harvested for its oily seeds, it was finally recognised as a vegetable by the Egyptians and then the Greeks and Romans. It was at that time a black radish. Parallel to that development another centre of domestication appeared in China, with the two groups of plants later exchanging genes after the Silk Road had opened up. Progressive selection split the cultivated radish into two forms – one with a small root, predominant in temperate regions of Europe, and the other with a large root and predominant in Asia. The small red radish that appeared in the 16th century belongs to the first group. Radish is nowadays grown throughout the world, and both forms have been introduced to Vanuatu.

Description

Pilose herbaceous plant, 20–100 cm in height. Base of the stem and **hypocotyl** swollen, cylindrical or round, white, black or red in colour, variable in size. Leaves in a rosette, oblong,

downy; margins **crenate**. Long **raceme** bearing small, scented, white or violet flowers. Fruits flattened, long (10–30 cm), containing 6–12 yellowish seeds.

Morphological variability

The group of small radishes comprises several types according to shape (long or round) and colour of the epidermis (white or red). The group of radishes with large roots (*Raphanus sativus* var. *longipinnatus*) is even more polymorphic, comprising types that are elongate in shape, with the epidermis yellow, green, black or violet and the flesh white, red, purple or green. Forms also exist in which the root is not swollen, and these are grown for their leaves. In Vanuatu one finds the forms that are round and red (Cherry belle type), ovoid and white with a red collar (Pernot type), and elongate and white (Daikon or Japanese radish type).

Cultivation and production

Cultivation of radish is only successful in the cool season. Commercially bought seeds are sown in beds whose soil has been well worked. After germination the seedlings are thinned, and the most vigorous ones are replanted with 20 cm spacing. Radishes need to be hoed a couple of times to remove weeds, and are harvested ten weeks later before they become too fibrous. No serious pest or disease problems are known.

Alimentary uses

The small red radishes are eaten raw, but are not used much by rural populations. The large radishes are more common and are eaten cooked. Peeled and cut into pieces or small rings, they are added to dishes with sauces and are an ingredient of many Asian dishes.

Other uses

The leafy cultivars are grown for use as a green manure.

Genus
Rorripa

Family
Brassicaceae

A single species exists in Vanuatu.

Species present
Rorripa nasturtium (L.) Mensfeld
Watercress

Watercress, regularly sold in buckets in the markets, is eaten cooked as a vegetable or raw in salads. It is grown mainly in irrigated taro pits for home consumption or in peri-urban villages for supply to the markets. It is grown commercially in Efate and Santo.

References
Bailey (1992), Guillaumin (1946), **Jonsel (1988)**, Messiaen (1998), Ochse & Bakhuizen van den Brink (1980), **PROSEA (1994)**, Purseglove (1991), Rubatzky & Yamaguchi (1997), Zeven & de Wet (1982).

Complementary food plant, introduced

Rorripa nasturtium

Watercress

History

Originally from west Asia and the eastern Mediterranean, this aquatic plant is nowadays present throughout the world, naturalised or cultivated. It is sometimes – e.g. in New Zealand – a weed of riverbanks. It was introduced to Vanuatu at the beginning of the 19th century.

Description

Aquatic herbaceous plant with a hollow stem 10–60 cm long, producing roots at each node. Leaves composite with 3–9 leaflets, round or oval, wavy, light green, 3 x 3 cm. Inflorescence terminal, bearing numerous small white flowers 5 mm in diameter. Fruits minute, less than 2 mm long and longer than broad.

Morphological variability

Poorly known in Vanuatu. At most one may distinguish forms that vary in the size of the leaves.

Cultivation and production

The plant likes clear water with no stagnation and not very deep, such as that in irrigated taro pits, but it grows equally well in water-saturated soils and flooded banks of watercourses. It is very common in Vanuatu. Cultivation may be from seed (often commercially bought), but is most often from stem cuttings. It does not flower much in the tropics. Harvesting may begin after a month, and the more the stem tips are cut the more the plant branches and grows. It is sold throughout the year in the markets, in large bundles.

Alimentary uses

The young leaves, the stem tips and often the whole plant are eaten raw in salads or cooked as a vegetable. In Vanuatu, where local people do not eat many salads, the plant is usually boiled, alone or mixed with taro leaves to accompany a dish of root crops. In some regions, such as the west coast of Santo where it is grown in irrigated taro pits, it is served several times a week. Its fresh and slightly tangy taste goes well with dishes of taro. It is necessary to wash the watercress well in clean water in case the water in which it was growing was muddy. In urban areas, expatriate and Asian people mostly eat it raw in salads or sometimes in a soup.

Genus
Saccharum

Family
Poaceae

The genus comprises six species. Two of these are found in the wild state – the rest are only known in cultivation. Two species are present in Vanuatu.

Species present
Saccharum edule Hasskarl
Naviso, pitpit

Saccharum officinarum L.
Sugar cane

These two species have been present for a long time in Vanuatu, and are an integral part of traditional crop systems. Naviso is a popular vegetable, and sugar cane is chewed throughout the year.

References
Barrau (1962), Brandes (1958), **Daniels & Roach (1987)**, Fauconnier & Bassereau (1970), French (1986), Galloway (1989), Hill (1952), Ochse & Bakhuizen van den Brink (1980), Purseglove (1988), Roach (1995), Sauer (1993), Weightman (1989).

Complementary food plant, local

Saccharum edule

Naviso, pitpit

History

The species originated in New Guinea. It is probably from a sterile form of *S. robustum*, a wild species of cane found only in New Guinea and the adjacent islands, or even the product of introgression between *S. officinarum* and other genera. It entered Vanuatu with the movement of aboriginal people into the land, and it is nowadays found in all the gardens. This ancient plant did not spread beyond Vanuatu, or according to some authors Fiji.

Description

Large herbaceous plant with a tall stalk (2–3 m), slender, growing in clusters of three or four stalks together. The pale green leaves are slightly hairy and rough. The stalks are often streaked with different colours according to the variety. The terminal inflorescences abort

before reaching maturity, and the numerous flower buds are pressed tightly together inside a white or cream sheath.

Morphological variability

Several distinct forms of naviso exist but they are poorly known at this time. They are distinguished by the colour of the stalk.

Cultivation and production

This species never produces seeds and is propagated vegetatively. The slender and dry stalks do not lend themselves to the production of cuttings, so instead suckers are used and are transplanted into gardens or close to homes. The suckers are planted directly into the soil in pairs, often tilted, after the soil has been somewhat broken up. The inflorescences are harvested after six months, and then regularly over two to three years after which the planting is replaced. No serious diseases or pests are known.

Alimentary uses

The sterile inflorescence, delicate and fragile, is extracted from its sheath and then braised in small bamboo containers or boiled in a *marmite*. It is then sprinkled with coconut milk and served as an accompaniment to a dish of root crops. It may also be grilled on hot stones, still enclosed in its sheath. Naviso is sold in urban markets, in large bundles.

Saccharum edule

Complementary food plant, local

Saccharum officinarum

Sugar cane

History

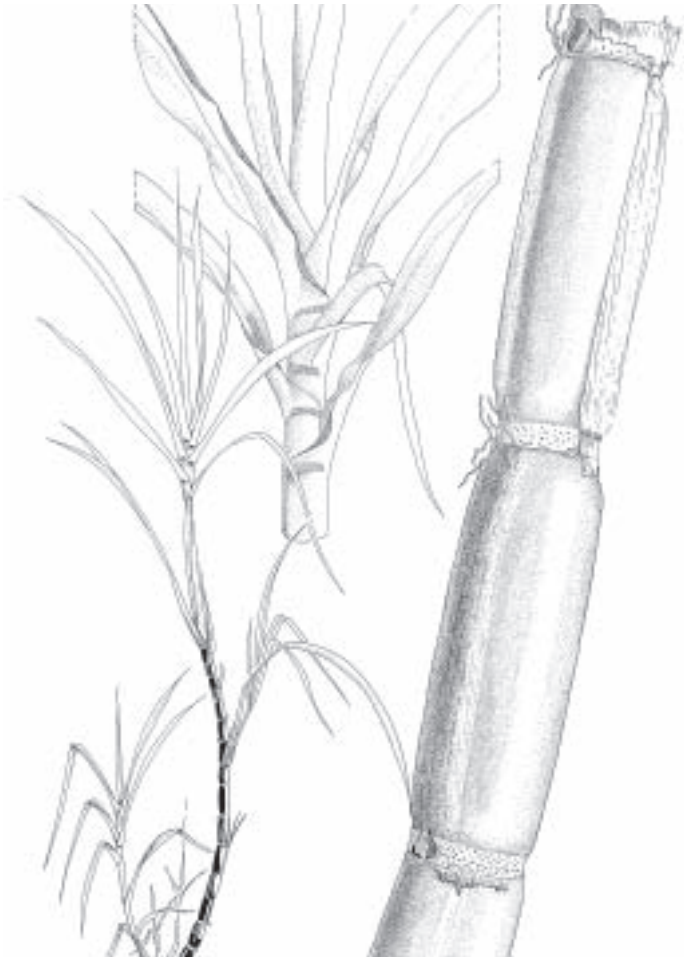
Saccharum officinarum exists only in the cultivated state, and its centres of diversification and domestication are incontrovertibly New Guinea; its ancestor was *S. robustum*. This species probably corresponds with a complex of species that includes spontaneous populations derived from spontaneous hybridisations between *S. spontaneum* and other genera (*Erianthus* and *Miscanthus*) present in a region stretching from the Sunda islands to New Guinea. Repeated selections for high sugar content by regular chewers of the cane maintained, through cloning, the forms of *S. officinarum* that were low in fibre content. Sugar cane was part of the freight carried by the first canoes of the peoples who progressively colonised the entire Pacific. It is thus found in Vanuatu and in all the islands to Hawaii. It also moved northeastwards. Papuan farmers grew a tall variety of sugar cane, and likewise those of Vanuatu. It is worth noting that the manufacture of sugar in India must have been from cane introduced from New Guinea, but the Melanesians never attempted such a process. The large colonial plantations of sugar such as those of Fiji were not developed in Vanuatu.

Description

Herbaceous plant with clumps of 3–5 strong, thick stalks about 5–8 cm in diameter, fibrous; epidermis with a base colour of yellow-green, green, purple and violet. Internodes 10–30 cm long. Pale green leaves long and narrow, with the mid-vein white or yellow. Inflorescences feathery and decorative, producing seeds only under exceptional circumstances. The clumps are perennial, and re-shoot regularly after the mature stalks have been cut.

Morphological variability

Numerous varieties exist, recognised according to the size and colour of the stalk, the length of the internodes, the colour of the pith and the sugar content of the juice. All have been selected since ancient times for high sugar content and relative flexibility of the stalk. Cuttings of a number of these varieties have been taken by overseas scientific missions in order to establish collections. Australia in particular has used Melanesian varieties in its programs of sugar cane improvement. The varieties do not fruit in the gardens, and probably result from mutations selected by the farmers in the gardens.



Saccharum officinarum

Cultivation and production

Sugar cane is propagated from cuttings of young, immature stalks. Its cultivation was more abundant in earlier days, when it was the sole source of sugar – nowadays sugar is bought from groceries. It is planted each year in all new gardens and harvested a year later, and it continues to be cut for a number of years in gardens that are in fallow.

Alimentary uses

Sugar cane, sold in long sticks over 1 m in length, is cut into chunks and then crushed to extract the sugary juice. The bark is torn away with the teeth, the juicy fibre is crunched and chewed, and then spat out when it is dry. Sticks of sugar cane are carried on all journeys, are chewed in the gardens or along footpaths, are sold in urban markets and are munched in the evenings while drinking kava.

Genus
Solanum

Family
Solanaceae

The genus comprises close to 1000 species and its classification is not stable. Two species have been introduced to Vanuatu.

Species present

Solanum americanum Miller
American black nightshade (minor species; see CD-ROM)

Solanum melongena L.
Eggplant, aubergine

Solanum torvum Swartz
Devil's fig, turkeyberry, prickly solanum (foraged species; see CD-ROM)

Solanum tuberosum L.
Potato (minor species; see CD-ROM)

Eggplant and potato are not used much in Vanuatu cuisine. They are mainly grown in commercial ventures by some farmers for supply to urban centres and their expatriate populations.

References

D'Arcy (1979), D'Arcy, ed. (1986), Daunay (1997), Fernandez-Munoz (1978), **Hawkes (1990), Hawkes *et al.*, eds (1979)**, Lebot (1988), Messiaen (1998), Pearce & Lester (1979), PROSEA (1994), Purseglove (1991), Rubatzky & Yamagushi (1997), Sauer (1993), Siemonsma & Piluek (1993), Smartt & Simmonds, eds (1995), **Symon** (1979, **1981**), Weightman (1989).

Plant occasionally eaten, introduced

Solanum melongena

Eggplant, aubergine

History

The ancestral forms of eggplant (nowadays grouped under the name *S. incanum*) appeared in East Africa. They moved very early, in a natural progression following the movement of humans, towards the region of Indochina. They were progressively domesticated in the Indo-Burmese region, then Arabia, Japan and China. The cultivated forms migrated westwards following the Silk Route, and then the Moors introduced them

in the 9th century to the whole Mediterranean basin and Spain. Eggplant, introduced to Vanuatu in the 19th century by missionaries, is nowadays grown in all tropical and temperate regions.

Description

Herbaceous plant about 1 m in height; stem hairy, rugose, green or violet. Leaves simple, oval, hairy, cordate at the base; petiole 2–10 cm; margins broadly toothed. Flowers solitary, with five lobes, mauve or violet, broad (5 cm in diameter); calyx tubular, woody and persistent, with 5–7 lobes. Fruits pendant, very variable in shape (ovoid, oblong, globular, very elongate), smooth, shiny, white, yellow, mauve, purple or black, sometimes bicoloured, up to 40 cm long; flesh white or green. Numerous light brown seeds.

Morphological variability

The phenotypic variability is extensive and covers the weight, colour and shape of the fruit. In reality eggplant belongs to a species complex whose limits are not well determined. In Vanuatu imported commercial seeds include all sorts of varieties distinguished mainly by the shape and colour of the fruits varying from black to dirty white. Thus over different years one may see eggplants that are round, ovoid, oblong or elongate, small or large in size, white, mauve, purple or bicoloured, marbled or striped. Among the main varieties are: Violette longue (early maturing, South of France), Zebrina (striped violet-white or brown-green, Spain), Black Beauty (late maturing, black with green flesh, American) and Porcelaine (white and round, West Indies).

Cultivation and production

Eggplant in Vanuatu is a perennial plant that is propagated from seeds or by transplantation of lateral shoots. The seeds germinate in two weeks, the seedlings are transplanted after three weeks, and harvesting begins three months later. Picking continues for three to four months as the fruits become large enough. Attention is needed to pick the fruits while they are still immature, or the skin becomes too thick and the seeds too hard. Eggplants are hardy, and more tolerant than tomatoes to bacterial wilt and nematodes.

Alimentary uses

Occasionally eaten by the local people, eggplant is cut into pieces or slices, then fried or boiled in a sauce. They can be used to make excellent curries. They can also be added to many sorts of meat stew.

Genus
Zea

Family
Poaceae

The genus comprises four species originally from Central and Latin America. One species has been introduced to Vanuatu.

Species present
Zea mays L. subsp. *mays*
Maize

Introduced to Vanuatu in the 17th century, maize has been adopted by the ni-Vanuatu who nowadays grow it in all the gardens. It is mostly eaten as a vegetable or simply nibbled while still on the cob.

References
Beadle (1977), Buckler & Holtsford (1996), **Doebley (1990)**, Freeling & Walbot, eds (1994), Galinat (1992, 1995), Goodman (1995), **Iltis & Doebley (1980)**, Mangelsdorf (1974, 1986), Mangelsdorf *et al.* (1964), Marchand *et al.* (1997), Ochse & Bakhuizen van den Brink (1980), Piperno & Pearsall (1998), Purseglove (1988), Weightman (1989).

Complementary food plant, introduced

Zea mays
Maize

History

Maize derives from teosinte, a wild species of maize, or (nowadays thought less likely) from an extinct species. It is possible that this ancient teosinte was first collected for its fruits and its sweet stem, or maybe just for its seeds. But much later, at the start of the Holocene, a form with a number of rows of seeds was selected and apparently multiplied, resulting in a first population of maize with bare seeds and a soft glume. This initial population, born in the valley of Balsas in central Mexico, then became dispersed, giving rise to a number of secondary, local populations, adapted to the ecological conditions and progressively improved by farmers. Initially a complementary food plant in the diet, it later became a staple food in certain regions. Since the discovery of the Americas these many varieties of maize have been spread around the world, and have been hybridised and greatly improved. Maize reached Vanuatu in 1606 when Queiros established a small

plantation of it near Matantas, and then came in much later but on a much greater scale in the second half of the 19th century. It was adopted – as a complementary food plant – by the ni-Vanuatu who planted it in all their gardens, but the plant was not subjected to any particular selection. The first colonists made maize a favoured commercial crop, exported to New Caledonia and Australia.

Description

Erect annual herb, reaching up to 3 m in height. Stalk rigid, with internodes. Leaves arising at each internode, long, narrow strips in shape, with their bases sheathing the stalk, variable in size (30–150 cm x 3–15 cm). Inflorescence in male and female spikes on the same plant; males grouped in a terminal panicle at the end of the stalk and furnished with lateral branches; females axillary and solitary, enveloped by about ten thick bracts, **rachis** white, yellow or violet; styles filiform (threadlike) and close to 45 cm long, all emerging at the top of the spike, green, yellow, red, brown or violet. Fruits with seeds arising in multiple rows, rounded and compressed, yellow, white or violet.

Morphological variability

Maize is an **allogamous** plant, and cross-pollination followed by repeated selection has produced forms that adapt quickly to local conditions. Repeated introduction of different forms of maize and natural hybridisation within gardens has produced some local variability of the species. The forms vary in the size of the spikes, the colour of the seeds, the time taken to reach maturity, and the taste. The two most widespread varieties are Tuxpeno from Hawaii and Philadelphie, introduced and distributed by the Department of Agriculture during the 1960s. Since then they have been the objects of numerous spontaneous hybridisations, and as farmers mix the varieties and replant their own seeds, the result is quite heterogeneous populations but with selection tending to be for fresh usage. In fact maize in Vanuatu is hardly grown for dry seed. A very common variety is *Dent de cheval* (Horse Tooth maize), which produces long cobs and whose plants are very tall (over 2 m). The dried stalks of this robust variety are used as stakes for yam vines.

Cultivation and production

Maize is planted in new gardens at the beginning of October, from seeds stored in small baskets. It is often intercropped with other plants, and its dried stalks make good stakes for yams. The seeds are hand-sown directly into the soil, three per hole, about 5 cm deep. The plants are not thinned and generally grow in clumps. Yields per plant are reasonable and no serious diseases are known. The local varieties

have cycles ranging from 100 to 130 days, and better yields are obtained in winter. Heavy rain causes the stalks to lodge.

Alimentary uses

In Vanuatu maize is picked at maturity for home consumption. It is grilled on hot stones or embers, or boiled in a *marmite*. It is a complementary food that is very popular in season. It is eaten during a meal, accompanying or replacing root crops, or it is nibbled between meals especially by children. Many also grow it for sale in markets.

Genus
Zingiber

Family
Zingiberaceae

The genus comprises 85 species spread through Asia and tropical Australia. Two edible and cultivated species occur in Vanuatu.

Species present
Zingiber officinale Roscoe
Common ginger

Zingiber zerumbet (L.) J.E. Smith
Wild ginger, Shampoo ginger, pinecone ginger, zerumbet ginger

The wild or zerumbet ginger is an ancient Melanesian plant, while the common ginger was introduced in the 19th century. The latter is nowadays grown commercially, and appears in abundance in the markets, together with a few rhizomes of zerumbet which itself is always grown in the villages.

References
Bois (1934), Clair (1963), Germosen-Robineau, ed. (1999), Lagriffe (1968), PROSEA (1999), Purseglove *et al.* (1981), Smartt & Simmonds, eds (1995), **Theilade (1996)**, Weightman (1989).

Plant occasionally eaten, introduced

Zingiber officinale

Common ginger

History

Ginger has not been found in the wild state but it probably originated in India. It was cultivated early on in China and then introduced to the Mediterranean. From there the Arabs took it to Europe. The Greeks and Romans used it for its medicinal properties as well as for flavouring their dishes. Fresh, dried or processed, it was one of the main commercial spices of the Middle Ages. In the 17th century Francisco de Mendoza introduced it to America and it then spread to all tropical regions. Its arrival in Vanuatu, which already had other species of ginger, was quite late.

Description

Erect herbaceous plant reaching up to 1.5 m, grown as an annual. Tuberous rhizome, irregular in

shape and aromatic, growing horizontally, very pale yellow. Lanceolate leaves, 30 x 2 cm, with parallel veins. Cylindrical and fleshy flower spike, 20-30 cm high, bearing pale yellow flowers, arising under yellow-green bracts, slightly convex. Fruits red with small seeds.

Morphological variability

Two groups of cultivars exist, one with very pale yellow rhizomes (cv. *officinale*) and the other with smaller, reddish rhizomes (cv. *rubrum*). Only the former occurs in Vanuatu. Ginger varies in its aroma amongst other features.

Cultivation and production

Ginger is propagated vegetatively through pieces of rhizome planted in soil and then mounded up. The mounding up is important because it allows the buds to initiate more stems which makes the plant more vigorous, and it protects the rhizome from light which would increase the chlorophyll content and alter the taste. If the mounding up is not done, in Vanuatu as elsewhere the result is rhizomes that are small in size. The main constraint on the crop is nematodes that attack and spoil the plant roots. After ten months the rhizomes are carefully harvested. It is then either sold fresh after being washed, or commercially as a powder after being chopped into pieces and dried.

Alimentary uses

Ginger is used throughout the world as a spice, and is used in the preparation of beverages, cakes and pastries. In Vanuatu it is mainly used in Asian cuisine. It is grown in one commercial enterprise in Fanafo, but the outlets are at present limited.

Other uses

The plant is also medicinal, and the rhizome tenderises meat with which it is cooked.

Plant occasionally eaten, introduced

Zingiber zerumbet

Wild ginger, shampoo ginger, pinecone ginger, zerumbet ginger

History

Originally from India, this ginger is grown throughout Asia. It was probably introduced by the ancestors of the ni-Vanuatu, and is found in all the islands in a spontaneous or cultivated state.

Description

Perennial plant with a tuberous rhizome, yellow and then whitish. Erect leafy stem reaching to 1.5 m. Leaves lanceolate, 20–40 cm long, veins parallel. Flowering head cylindrical and fleshy, 12 cm high, bearing white or pale yellow flowers arising under green or reddish bracts, slightly convex. Fruit red with small seeds.

Morphological variability

The species is extremely variable. At least four varieties are recognised:

- var. *americanus*: ellipsoidal flower head;
- var. *aromaticum*: ovoid flower head;
- var. *zerumbet*: globular flower head;
- var. *littorale*: oblong flower head.

Cultivation and production

The species grows in damp, rich forest soils. It is propagated with pieces of rhizome, and its cultivation is identical to that of common ginger.

Alimentary uses

The rhizome is used in certain meat dishes, after having been washed and sliced up.

Other uses

The plant is often used in traditional medicine.

Index of generic names

Index of common names[26]

Name	Language	Scientific name	See page or CD-ROM
Acalypha	French	*Acalypha grandis*	CD-ROM, minor species
Aelan kabij	Bislama	*Abelmoschus manihot*	p. 111
Aerial yam	English	*Dioscorea bulbifera*	p. 71
African cucumber	English	*Momordica charantia*	p. 207
African yam	English	*Dioscorea rotundata-cayenensis*	p. 71
African yam	Bislama	*Dioscorea trifida*	p. 71
Aian wud	Bislama	*Casuarina equisetifolia*	CD-ROM, foraged species
Aibika	English	*Abelmoschus manihot*	p. 111
Ail	French	*Allium sativum*	p. 223
Alocase	French	*Alocasia macrorrhiza*	p. 59
Amaranth	English	*Amaranthus viridis*	CD-ROM, minor species
Amaranthe	French	*Amaranthus viridis*	CD-ROM, minor species
Ambrevade	French	*Cajanus cajan*	p. 123
Anacardier	French	*Anacardium occidentale*	CD-ROM, minor species
Ananas	French	*Ananas comosus*	p. 229
Angled loofah	English	*Luffa acutangula*	CD-ROM, minor species
Anion	Bislama	*Allium cepa* L. var. *cepa*	p. 223
Arachide	French	*Arachis hypogea*	p. 232
Aranis	Bislama	*Citrus aurantium*	CD-ROM, minor species
Aranis	Bislama	*Citrus sinensis*	p. 129
Arbre à pain	French	*Artocarpus altilis*	p. 118
Arrowroot	English	*Maranta arundinacea*	CD-ROM, minor species
Arrowroot de Tahiti (de Fidji)	French	*Tacca leontopetaloides*	CD-ROM, minor species

[26] Common names in French, English and Bislama (the *lingua franca* or common langauge of Vanuatu).

Name	Language	Scientific name	See page or CD-ROM
Ash pumpkin	English	*Benincasa hispida*	p. 181
Asparagus pea	English	*Psophocarpus tetragonolobus*	p. 213
Attier	French	*Annona squamosa*	p. 114
Aubergine	French	*Solanum melongena*	p. 291
Avocado	English	*Persea americana*	p. 166
Avocatier	French	*Persea americana*	p. 166
Avokado	Bislama	*Persea americana*	p. 166
Badamier	French	*Terminalia catappa*	CD-ROM, fruits
Balsam pear	English	*Momordica charantia*	p. 207
Bamboo	English	*Dendrocalamus giganteus*	CD-ROM, foraged species
Bambou	French	*Dendrocalamus giganteus*	CD-ROM, foraged species
Bambu	Bislama	*Dendrocalamus giganteus*	CD-ROM, foraged species
Banana	English	*Musa* spp.	p. 276
Banane fehi	French	*Musa troglodytarum*	p. 276
Bancoulier	French	*Aleurites moluccana*	CD-ROM, foraged species
Basel	Bislama	*Ocimum basilicum*	p. 279
Basil	English	*Ocimum basilicum*	p. 279
Basilic	French	*Ocimum basilicum*	p. 279
Basilic sauvage	French	*Ocimum gratissimum* *Ocimum tenuiflorum*	CD-ROM, foraged species
Beach hibiscus	English	*Hibiscus tiliaceus*	CD-ROM, minor species
Beefwood	English	*Casuarina equisetifolia*	CD-ROM, foraged species
Belembe	English	*Xanthosoma sagittifolium*	p. 106
Benincasa	French	*Benincasa hispida*	p. 181
Bermuda arrowroot	English	*Maranta arundinacea*	CD-ROM, minor species
Bidao	French	*Benincasa hispida*	p. 181
Bigaradier	French	*Citrus aurantium*	CD-ROM, minor species
Bin	Bislama	*Phaseolus vulgaris*	p. 211
Bird's nest fern	English	*Asplenium nidus*	CD-ROM, foraged species
Bisa	Bislama	*Adenanthera pavonina*	CD-ROM, foraged species
Bitter gourd	English	*Momordica charantia*	p. 207
Bitter melon	English	*Momordica charantia*	p. 207
Bitter orange	English	*Citrus aurantium*	CD-ROM, minor species
Black palm	Bislama	*Caryota ophiopelis*	p. 128

Name	Language	Scientific name	See page or CD-ROM
Black Pepper	English	*Piper nigrum*	CD-ROM, minor species
Bladdercherry	English	*Physalis angulata*	CD-ROM, foraged species
Bois de fer	French	*Casuarina equisetifolia*	CD-ROM, foraged species
Bok choi	English	*Brassica rapa* L., ssp *chinensis*	p. 235
Bonavist bean	English	*Lablab purpureus*	p. 202
Bottle gourd	English	*Lagenaria siceraria*	p. 204
Bourao	French	*Hibiscus tiliaceus*	CD-ROM, minor species
Bourao blong soltwata	Bislama	*Cordia subcordata*	CD-ROM, foraged species
Breadfruit	English	*Artocarpus altilis*	p. 118
Bredfrut	Bislama	*Artocarpus altilis*	p. 118
Brocoli	French	*Brassica oleracea*	p. 235
Bulb onion	English	*Allium cepa* L. var. *cepa*	p. 223
Bullock's heart	English	*Annona reticulata*	p. 114
Burao	Bislama	*Hibiscus tiliaceus*	CD-ROM, minor species
Burckella	English	*Burckella obovota*	CD-ROM, fruits
Butternut pumpkin	English	*Cucurbita moschata*	p. 195
Cabbage	English	*Brassica oleracea*	p. 235
Cacao	English	*Theobroma cacao*	CD-ROM, minor species
Cacaoyer	French	*Theobroma cacao*	CD-ROM, minor species
Cachimentier	French	*Annona reticulata*	p. 114
Caféier Arabica	French	*Coffea arabica*	CD-ROM, minor species
Caféier Robusta	French	*Coffea canephora*	CD-ROM, minor species
Cajan	French	*Cajanus cajan*	p. 123
Calabash gourd	English	*Lagenaria siceraria*	p. 204
Calebasse	French	*Lagenaria siceraria*	p. 204
Canarium nut	English	*Canarium harveyi*	CD-ROM, fruits
Canarium nut	English	*Canarium indicum*	CD-ROM, fruits
Candlenut	English	*Aleurites moluccana*	CD-ROM, foraged species
Canne à sucre	French	*Saccharum officinarum*	p. 287
Capsicum	English	*Capsicum annuum*	p. 259
Capulin	English	*Muntingia calabura*	CD-ROM, minor species
Carambola	English	*Averrhoa carambola*	p. 121
Carambolier	French	*Averrhoa carambola*	p. 121

Name	Language	Scientific name	See page or CD-ROM
Cardinalier	French	*Adenanthera pavonina*	CD-ROM, foraged species
Carotte	French	*Daucus carota*	p. 267
Carrot	English	*Daucus carota*	p. 267
Caryota	French	*Caryota ophiopelis*	p. 128
Cashew	English	*Anacardium occidentale*	CD-ROM, minor species
Cassava	English	*Manihot esculenta*	p. 100
Cassave amère	French	*Manihot esculenta*	p. 100
Cauliflower	English	*Brassica oleracea* L., var *botrytis*	p. 235
Cédratier	French	*Citrus medica*	CD-ROM, minor species
Celery cabbage	English	*Brassica rapa* L. ssp. *chinensis* *Brassica rapa* L. ssp. *pekinensis*	p. 235
Cerisier de Chine	French	*Litchi sinensis*	p. 159
Châtaignier de Tahiti	French	*Inocarpus fagifer*	CD-ROM, fruits
Chayote	English	*Sechium edule*	p. 215
Chili	English	*Capsicum frutescens*	p. 259
Chinese cabbage	English	*Brassica rapa* L. ssp. *chinensis*	p. 235
Chinese chive	English	*Allium tuberosum*	p. 223
Chinese flowering cabbage	English	*Brassica rapa* L. ssp. *parachinensis*	p. 235
Chinese parsley	English	*Coriandrum sativum*	p. 263
Chinese taro	English	*Xanthosoma sagittifolium*	p. 106
Chinese white cabbage	English	*Brassica rapa* L. ssp. *parachinensis*	p. 235
Chinese yam	English	*Dioscorea esculenta*	p. 71
Choi san	French	*Brassica rapa* L. ssp. *parachinensis*	p. 235
Choko	English	*Sechium edule*	p. 215
Chou	French	*Brassica oleracea*	p. 235
Chou chinois	French	*Brassica rapa* L. ssp. *chinensis*	p. 235
Chou-fleur	French	*Brassica oleracea*	p. 235
Chou de Pekin	French	*Brassica rapa* L. ssp. *pekinensis*	p. 235
Chou-rave	French	*Brassica oleracea*	p. 235
Chou de Shangton	French	*Brassica rapa* L. ssp. *pekinensis*	p. 235
Chou des îles	French	*Abelmoschus manihot*	p. 111
Chouchoute	French	*Sechium edule*	p. 215

Name	Language	Scientific name	See page or CD-ROM
Christophine	French	*Sechium edule*	p. 215
Chrysocarpier	French	*Finschia chloroxantha*	CD-ROM, foraged species
Cibol	English	*Allium fistulosum*	p. 223
Ciboule	French	*Allium fistulosum*	p. 223
Ciboulette chinoise	French	*Allium tuberosum*	p. 223
Citron	English	*Citrus medica*	CD-ROM, minor species
Citronnier	French	*Citrus limon*	p. 129
Citrouille	French	*Cucurbita pepo*	p. 195
Cive	French	*Allium fistulosum*	p. 223
Coconut	English	*Cocos nucifera*	p. 137
Cocotier	French	*Cocos nucifera*	p. 137
Cocoyam	English	*Xanthosoma sagittifolium*	p. 106
Cœur de bœuf	French	*Annona reticulata*	p. 114
Coffee	English	*Coffea arabica* *Coffea canephora*	CD-ROM, minor species
Comb tree	English	*Planchonella grayana*	CD-ROM, foraged species
Combava	French	*Citrus hystrix*	CD-ROM, minor species
Common bean	English	*Phaseolus vulgaris*	p. 211
Common ginger	English	*Zingiber officinale*	p. 296
Concombre	French	*Cucumis sativus*	p. 185
Congo pea	English	*Cajanus cajan*	p. 123
Coral pea	English	*Adenanthera pavonina*	CD-ROM, foraged species
Cordyline	French	*Cordyline terminalis*	p. 67
Coriander	English	*Coriandrum sativum*	p. 263
Coriandre	French	*Coriandrum sativum*	p. 263
Corossolier	French	*Annona muricata*	p. 114
Cottonwood	English	*Hibiscus tiliaceus*	CD-ROM, minor species
Coucouzelle	French	*Cucurbita pepo*	p. 195
Cougourde	French	*Lagenaria siceraria*	p. 204
Courge à la moelle	French	*Cucurbita pepo*	p. 195
Courge cireuse	French	*Benincasa hispida*	p. 181
Courge musquée	French	*Cucurbita moschata*	p. 195
Courge serpent	French	*Trichosanthes cucumerina*	p. 217
Courgette	French	*Cucurbita pepo*	p. 195
Cousse couche	French	*Dioscorea trifida*	p. 71
Cresson	French	*Rorripa nasturtium*	p. 285
Cucumber	English	*Cucumis sativus*	p. 185

Name	Language	Scientific name	See page or CD-ROM
Curcuma	French	*Curcuma longa*	p. 265
Cush-cush yam	English	*Dioscorea trifida*	p. 71
Custard apple (in India)	English	*Annona squamosa*	p. 114
Custard apple (in West Indies)	English	*Annona reticulata*	p. 114
Cut nut	English	*Barringtonia edulis* *Barringtonia novae-hiberniae* *Barringtonia procera*	CD-ROM, fruits
Cycas	French/ English	*Cycas rumphii*	p. 157
Doliko	Bislama	*Lablab purpureus*	p. 202
Dolique asperge	French	*Vigna unguiculata* subs. *unguiculata*	p. 219
Dolique d'Égypte	French	*Lablab purpureus*	p. 202
Dolique lab-lab	French	*Lablab purpureus*	p. 202
Dolique tubéreuse	French	*Pachyrrhizus erosus*	CD-ROM, minor species
Doll	English	*Cajanus cajan*	p. 123
Doulier	French	*Burckella obovota*	CD-ROM, fruits
Dragon plum	English	*Dracontomelon vitiense*	CD-ROM, fruits
Dye fig	English	*Ficus tinctoria*	CD-ROM, foraged species
Échalote	French	*Allium cepa* L. var. *ascalonicum*	p. 223
Eggplant	English	*Solanum melongena*	p. 291
Egplan	Bislama	*Solanum melongena*	p. 291
Egyptian bean	English	*Lablab purpureus*	p. 202
Elephant bread	English	*Amorphophallus campanulatus*	p. 62
Elephant ear	English	*Alocasia macrorrhiza*	p. 59
Elephant foot yam	English	*Amorphophallus campanulatus*	p. 62
Elephant yam	English	*Amorphophallus campanulatus*	p. 62
False sandalwood	English	*Ximenia americana*	CD-ROM, foraged species
Feuille à *laplap*	French	*Heliconia indica*	CD-ROM, minor species
Figue du diable	French	*Solanum torvum*	CD-ROM, foraged species
Figuetier	French	*Ficus aspera*	CD-ROM, fruits
Figuetier d'Océanie	French	*Ficus scabra*	CD-ROM, fruits
Figuetier de Mélanésie	French	*Ficus wassa*	CD-ROM, foraged species
Figuetier vanuatais	French	*Ficus granatum*	CD-ROM, fruits

Name	Language	Scientific name	See page or CD-ROM
Fiji taro	Bislama	*Xanthosoma sagittifolium*	p. 106
Finschia	English	*Finschia chloroxantha*	CD-ROM, foraged species
Fish tail palm	English	*Caryota ophiopelis*	p. 128
Five fingered yam	English	*Dioscorea pentaphylla*	p. 71
Five leaflet yam	English	*Dioscorea pentaphylla*	p. 71
Fougère	French	*Dennstaedtia samoense*	CD-ROM, foraged species
Fougère	French	*Dicksonia brakenridgei*	CD-ROM, foraged species
Fougère	French	*Diplazium harpoides*	CD-ROM, foraged species
Four-angles bean	English	*Psophocarpus tetragonolobus*	p. 213
Fruits de la passion	French	*Passiflora edulis*	p. 209
Fuzzy melon	English	*Benincasa hispida*	p. 181
Galic	Bislama	*Allium sativum*	p. 223
Garlic	English	*Allium sativum*	p. 223
Garlic chive	English	*Allium tuberosum*	p. 223
Ghost-lime	English	*Citrus macroptera*	CD-ROM, foraged species
Giant squash	English	*Cucurbita maxima*	p. 195
Giant swamp taro	English	*Cyrtosperma chamissonis*	p. 69
Giant taro	English	*Alocasia macrorrhiza*	p. 59
Ginga	Bislama	*Zingiber officinale*	p. 296
Gingembre blanc	French	*Zingiber zerumbet*	p. 296
Gingembre commun	French	*Zingiber officinale*	p. 296
Glossy nightshade	English	*Solanum americanum*	CD-ROM, minor species
Goa bean	English	*Psophocarpus tetragonolobus*	p. 213
Golden apple	English	*Spondias cytherea*	CD-ROM, fruits
Gommier	French	*Cordia subcordata*	CD-ROM, foraged species
Gourde	French	*Lagenaria siceraria*	p. 204
Goyavier	French	*Psidium guajava*	p. 177
Goyavier de Chine	French	*Psidium cattleianum*	CD-ROM, foraged species
Grande igname	French	*Dioscorea alata*	p. 71
Grapefruit	English	*Citrus paradisi*	p. 129
Greater yam	English	*Dioscorea alata*	p. 71
Grenadier	French	*Punica granatum*	CD-ROM, minor species
Grepfrut	Bislama	*Citrus paradisi*	p. 129

Name	Language	Scientific name	See page or CD-ROM
Guanabana	English	*Annona muricata*	p. 114
Guava	English	*Psidium guajava*	p. 177
Guinea yam	English	*Dioscorea rotundata-cayenensis*	p. 71
Hairy melon	English	*Benincasa hispida*	p. 181
Hard yam	English	*Dioscorea nummularia*	p. 71
Haricot (haricot vert)	French	*Phaseolus vulgaris*	p. 211
Haricot ailé	French	*Psophocarpus tetragonolobus*	p. 213
Haricot kilomètre	French	*Vigna unguiculata* subs. *unguiculata*	p. 219
Heliconia	French	*Heliconia indica*	CD-ROM, minor species
Herbe à calalou	French	*Solanum americanum*	CD-ROM, minor species
Horsetail	English	*Casuarina equisetifolia*	CD-ROM, foraged species
Houailou	French	*Dioscorea rotundata-cayenensis*	p. 71
Hyacinth bean	English	*Lablab purpureus*	p. 202
Iambin	Bislama	*Pachyrrhizus erosus*	CD-ROM, minor species
Igname à cinq doigts	French	*Dioscorea pentaphylla*	p. 71
Igname africaine	French	*Dioscorea rotundata-cayenensis*	p. 71
Igname bulbifère	French	*Dioscorea bulbifera*	p. 71
Igname chinoise	French	*Dioscorea esculenta*	p. 71
Igname sauvage	French	*Dioscorea nummularia*	p. 71
Indian sorrel	English	*Hibiscus sabdariffa*	CD-ROM, minor species
Indian bean	English	*Lablab purpureus*	p. 202
Indian mulberry	English	*Morinda citrifolia*	CD-ROM, fruits
Indian mustard	English	*Brassica juncea*	p. 235
Indian plum	English	*Flacourtia rukam*	CD-ROM, foraged species
Iron wood	English	*Casuarina equisetifolia*	CD-ROM, foraged species
Island cabbage	English	*Abelmoschus manihot*	p. 111
Jackfruit, jack	Bislama	*Artocarpus heterophyllus*	CD-ROM, minor species
Jacquier	French	*Artocarpus heterophyllus*	CD-ROM, minor species
Jakfrut	Bislama	*Artocarpus heterophyllus*	CD-ROM, minor species
Jamaica cherry	English	*Muntingia calabura*	CD-ROM, minor species

Name	Language	Scientific name	See page or CD-ROM
Jamaican sorrel	English	*Hibiscus sabdariffa*	CD-ROM, minor species
Jamalac	French	*Syzygium malaccense*	CD-ROM, fruits
Japanese bunching onion	English	*Allium fistulosum*	p. 223
Jicama	English	*Pachyrrhizus erosus*	CD-ROM, minor species
Kabij	Bislama	*Brassica oleracea*	p. 235
Kabij	Bislama	*Brassica rapa* L. ssp. *chinensis*	p. 235
Kabij	Bislama	*Brassica rapa* L. ssp. *pekinensis*	p. 235
Kaffir lime	English	*Citrus hystrix*	p. 129
Kakao	Bislama	*Theobroma cacao*	CD-ROM, minor species
Kambak	Bislama	*Calamus vanuatensis* (= C. sp. aff. *vitiensis)*	CD-ROM, foraged species
Kandltri	Bislama	*Aleurites moluccana*	CD-ROM, foraged species
Kangkong	French/ English	*Ipomoea aquatica*	p. 200
Karot	Bislama	*Daucus carota*	p. 267
Kasta apel	Bislama	*Annona squamosa*	p. 114
Kauri	French/ English/ Bislama	*Agathis macrophylla*	CD-ROM, foraged species
Kava	French/ English/ Bislama	*Piper methysticum*	p. 169
Knob-fruited screwpine	English	*Pandanus dubius*	CD-ROM, fruits
Kofi	Bislama	*Coffea arabica*	CD-ROM, minor species
Kofi	Bislama	*Coffea canephora*	CD-ROM, minor species
Kohl-rabi	English	*Brassica oleracea* L., var *gongylodes*	p. 235
Kokonas	Bislama	*Cocos nucifera*	p. 137
Kong kong	English	*Xanthosoma sagittifolium*	p. 106
Konjac	French	*Amorphophallus campanulatus*	p. 62
Koudzou	French	*Pueraria lobata*	p. 104
Kudzu	English	*Pueraria lobata*	p. 104
Kukumba	Bislama	*Cucumis sativus*	p. 185
Kumala	Bislama	*Ipomoea batatas*	p. 97
Kumquat	French/ English	*Fortunella japonica*	CD-ROM, minor species

Name	Language	Scientific name	See page or CD-ROM
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Laem	Bislama	*Citrus aurantiifolia*	p. 129
Laitue	French	*Lactuca sativa*	p. 269
Laplap lif	Bislama	*Heliconia indica*	CD-ROM, minor species
Leechee	English	*Litchi sinensis*	p. 159
Leek	English	*Allium ampeloprasum* L. var. *porrum*	CD-ROM, minor species
Lemon	English	*Citrus limon*	p. 129
Lesser yam	English	*Dioscorea esculenta*	p. 71
Lettuce	English	*Lactuca sativa*	p. 269
Leucaena	English	*Leucaena leucocephala*	CD-ROM, foraged species
Lik	Bislama	*Allium ampeloprasum* L. var. *porrum*	CD-ROM, minor species
Lik	Bislama	*Allium cepa* L. var. *ascalonicum*	p. 223
Lik	Bislama	*Allium fistulosum*	p. 223
Lik blong china	Bislama	*Allium tuberosum*	p. 223
Lime	English	*Citrus aurantiifolia*	p. 129
Limetier	French	*Citrus aurantiifolia*	p. 129
Liseron d'eau	French	*Ipomoea aquatica*	p. 200
Litchi	French/ English	*Litchi sinensis*	p. 159
Long bean	English	*Vigna unguiculata* subs. *unguiculata*	p. 219
Long pitpit	English	*Saccharum edule*	p. 287
Lychee	English	*Litchi sinensis*	p. 159
Macabo	French English	*Xanthosoma sagittifolium*	p. 106
Macadamia nut	English	*Macadamia ternifolia*	CD-ROM, minor species
Macadamier	French	*Macadamia ternifolia*	CD-ROM, minor species
Madras Thorn	English	*Pithecellobium dulce*	CD-ROM, foraged species
Mahoe	English	*Hibiscus tiliaceus*	CD-ROM, minor species
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Annex 1: Plants that are foraged

Species	Family	Notes
Acacia simplex (Sparrman) Pedley	Mimosaceae	On the west coast of Santo, children nibble the seeds.
Aceratium oppositifolium D.C.	Elaeocarpaceae	The fruits, which are slightly bitter, must be cooked before being eaten. They are hardly eaten except in times of great food scarcity.
Adenanthera pavonina L.	Fabaceae	The seeds are eaten as snacks only in certain villages of Santo. Originally from the Indo-Malayan Region, this plant was introduced in ancient times to Fiji, and then after European contact to eastern Polynesia.
Agathis macrophylla (Lindley) Masters	Araucariaceae	The Pacific kauri nut (or *noix de Bancoul*) is slightly toxic and causes nausea and vomiting when more than two to three kernels are eaten. It is not really eaten (apart from very rare varieties that are hardly toxic), despite its delicious taste. Just a few nuts may be eaten as snacks after being roasted, for their good taste or when food is scarce.
Aleurites moluccana (L.) Willdenow	Euphorbiaceae	The seeds were eaten in earlier times.
Angiopteris evecta (G. Forst.) Hoffman	Marattiaceae	The swollen stem was used in eastern Polynesia and in New Caledonia as a food in times of famine. Nowadays, including in Santo, the local people prefer to eat the young fronds separated out after the crozier has been cut.
Asplenium nidus L.	Aspleniaceae	In Ambrym and Pentecost, and probably elsewhere, the very young shoots and young fronds are eaten mixed with meat and cooked in an oven of hot stones. The leaves are also used to wrap and preserve foods that are taken on long treks into the forest.

Begonia vitiensis A.C. Smith	Begoniaceae	In the centre of Santo, stem tips and young leaves of begonia are added to foods while they are being cooked to give them a salty taste. The same use is recorded from Papua New Guinea.
Burckella sp. (*Cassidispermum megahilum* Hemsley)	Sapotaceae	The fruits are baked before they reach maturity or are eaten raw under the tree when they are ripe. On the west coast of Malekula, the only place where they have been preserved, they are eaten in abundance when in season.
Calamus vanuatensis (= *C.* sp. aff. *vitiensis*)	Arecaceae	In Pentecost, Epi and no doubt elsewhere, the water contained in the stem provides a pleasant drink during excursions in the forest.
Canarium vitiense A. Gray	Burseraceae	The tiny seeds are nibbled by children.
Carpoxylon macrospermum Wendl. & Drude	Arecaceae	Wherever the tree is present, the endosperm of the young fruits is sucked.
Castanospermum australe Cunn. & Fraser ex. Hook.	Papilionaceae	In the north of Efate the seeds (which are toxic) are eaten after being roasted for a long time.
Casuarina equisetifolia L. 	Casuarinaceae	Children eat the tiny seeds as snacks, and they are sometimes also eaten in times of food scarcity.
Citrus macroptera Montrouzier 	Rutaceae	The juice is used like lemon juice, to make drinks, or the pulp is sucked as it is.
Cordia subcordata Lamarck	Boraginaceae	Children nibble the seeds, and adults eat them likewise when food is scarce.
Costus sp.	Zingiberaceae	The small fruits, which are edible, are eaten as snacks by children.
Cryptocara wilsonii Guillaumin	Lauraceae	The seeds are eaten as snacks by children, and less commonly by adults.

Cyathea lunulata (Forst.) Copel.	Cyatheaceae	In earlier times this plant was eaten by several communities in Vanuatu. Nowadays it is eaten less, but it remains a resource plant for times of food scarcity. In Tanna the tip of the stem is cut while still young, which causes the trunk diameter to increase. When this structure has reached the desired size, it is cut and cooked in an oven of hot stones, and the centre of the trunk is then eaten. A little further south in Anatom, the core of the trunk is likewise eaten after being cooked in an oven, but without being made to swell first. In Pentecost the very young leaves are cooked in small bamboo containers or in an oven of hot stones, mixed with pieces of meat.
Cyrtandra obovata and *Cyrtandra schizocalyx*	Gesneriaceae	The fruits are eaten in the centre of Santo.
Dendrocalamus giganteus Munro	Poaceae	The water contained in the stalk is a drink that is commonly used during trips away from the village.
Dennstaedtia samoensis	Dennstaedtiaceae	The young shoots are eaten as vegetables, cooked at the same time as meat.
Dicksonia brackenridgei Mett.	Pteridaceae	The very young leaves are cooked with coconut milk in a *marmite*. They are sometimes mixed in with a meat dish. When the frond is a little older it is no longer edible. The stalk is also picked, and cut into pieces that are boiled or baked in a hot stone oven. This vegetable is delicious with a dish of taro or yam.
Diplazium harpeodes Moore	Polypodiaceae	The very young fronds are eaten cooked in Pentecost and Epi. It is mainly a food held in reserve and used when other vegetables are scarce.
Diplazium proliferum (Lam.) Thouars	Polypodiaceae	The young fronds are eaten in Pentecost and Santo, boiled in a bamboo container or cooked with meat.

Diplocyclos palmatus (L.) C. Jeffrey	Cucurbitaceae	The young leaves are cooked in sections of bamboo or are boiled and then served as vegetables.
Donax canniformis (Forster f.) Schum.	Marantaceae	The fruits are eaten raw as snacks in Maewo.
Elaeocarpus chelonimorphus Gillespie 	Elaeocarpaceae	In the interior of Santo the kernels from this tree are eaten infrequently.
Elatostema macrophylla Brongn.	Urticaceae	In earlier times in central and west Santo a vegetable salt was prepared from this plant. The plant was completely burnt in a hole dug in the ground, by itself or together with the stem tips of *Ficus adenosperma*. The ash recovered was moistened with water and then filtered. Root crops or *lap-lap* were then sprinkled with this salty liquid before being cooked.
Entada phaseoloides (L.) Merrill 	Fabaceae	The toxic seeds must undergo long preparation before they can be eaten, so this dish is only prepared in times of great food shortage. The pods are first soaked for a week in seawater and then for another week in fresh water. They are next baked on hot stones. Then different methods of preparation may be used. The seeds may be wrapped in leaves of *Heliconia* and buried for several days (Erromango) or they may be placed in a small coconut palm basket and retted (steeped in water) again for several days. After this the seeds are washed in running water, and the paste obtained is wrapped in leaves of *Inocarpus* and baked. Some people simply place the pods in water for several weeks until the seeds swell and their hard integument breaks. The paste obtained is then treated as before. We also note that the vine contains good drinking water that is regularly used.
Epipremnum pinnatum (L.) Engler	Araceae	The young sprouts are put together in small bundles, wrapped in a leaf and then baked on a fire before being eaten.

Ficus adenosperma Miquel	Moraceae	The leaves are very occasionally eaten more or less everywhere in Vanuatu. In Santo they are generally cooked on hot stones as an accompaniment to fish during trips into the forest. The figs, green or yellow, are eaten in times of food shortage by certain communities.
Ficus smithii Horne ex. Baker	Moraceae	This species is not often eaten in Vanuatu outside Santo, where the leaves and fruits are eaten raw to accompany a piece of taro, often cold. It is mostly a food collected during trips away from the village, but it does happen that leaves are picked within the village, cooked and served together with a dish of taro.
Ficus storckii Seeman	Moraceae	It is mainly the young leaves of this tree that are eaten by villagers. They are munched as a snack, raw and with coconut milk, yam or taro. They are often served at midday in a meal taken in the gardens. Sometimes they are cooked in bamboo and served in an evening meal around a dish of root crops. The figs are not really eaten, though when they are green and very young they can be eaten raw like the leaves.
Ficus tinctoria Forster f.	Moraceae	The figs are sometimes eaten and the leaves are used as vegetables, though only rarely, in the centre of Santo.
Ficus virgata Reinw.	Moraceae	This species is not usually eaten, but some people maintain that the leaves can be used in times of food scarcity.
Ficus wassa Roxburgh	Moraceae	Both the fruits and the leaves of this common tree are eaten. The immature fruits are boiled and sprinkled with coconut milk, while the mature fruits less commonly are munched beneath the tree. The leaves are a more popular vegetable than those of *F. storckii*, preferably cooked in bamboo or cut into thin strips that are sprinkled on a *lap-lap* before it is cooked.

Finschia chloroxantha Diels	Proteaceae	A not very common species but present in all the islands. It grows spontaneously and may occasionally be transplanted near to the gardens. The round seed is eaten as it is, after the fruit has been knocked down and the very hard nut broken.
Flacourtia rukam Zollinger & Morritzi	Flacourtiaceae	This species has been introduced to Vanuatu and grows there spontaneously, though its fruits are acid and of poor quality. It is collected a few times a year, and children and adults nibble on them in time of food shortage.
Freycinetia impavida (Hombron & Jacquinot) Stone	Pandanaceae	The fruits and the flowers are eaten raw.
Garcinia pseudoguttifera Seemann 	Clusiaceae	The fruits are eaten by men out on hunting trips in Tanna and in Santo.
Haplolobus floribundus (Sch.) H. Lam.	Burseraceae	The small seeds are eaten by children as snacks.
Hedycarya dorstenioides A. Gray	Monimiaceae	In Erromango the young branches are chewed like sugar cane.
Hornstaedia scottiana (F. Muel.) K. Schumann	Zingiberaceae	In Santo the sweet seeds are munched, and fish is wrapped in its leaves before being baked.
Kleinhovia hospita L.	Sterculiaceae	In Pentecost the stem tips and the young leaves are cooked as vegetables.
Leucaena leucocephala (Lam.) de Wit	Fabaceae	In Vanuatu this plant is not used much, although children like to nibble the seeds while they are still green. The young leaves may be cooked as vegetables.

Leucosyke australe Hunru.	Urticaceae	In Pentecost the young leaves are eaten as vegetables.
Maesa ambrymensis Guillaumin	Myrsinaceae	The small fruits are eaten as snacks.
Maesa nemoralis D.C.	Myrsinaceae	In Epi the fruits are eaten raw.
Malaysia scandens (Lour.) Planch.	Moraceae	In Malekula the small fruits are eaten as snacks.
Marattia smithii Mett. ex. Kuhn	Marattiaceae	In Maewo the sap that runs from the cut rachis is drunk.
Neisosperma oppositifolium (Lam.) Fosberg & Sachet	Apocynaceae	The fruit is cut by children to release a flat and soft seed that they nibble. In times of food scarcity, adults eat these seeds too.
Ocimum gratissimum L.	Lamiaceae	This spontaneously growing basil is introduced, and is sometimes used as a seasoning.
Passiflora foetida L.	Passifloraceae	The fruits are collected by children who nibble them. In Santo adults eat them raw or cooked to accompany a dish of taro.
Passiflora maliformis L.	Passifloraceae	The small fruits of this passionfruit introduced from America are eaten as a snack food in Malekula.
Pemphis acidula Forster	Lythraceae	In Torres the young leaves are prepared as vegetables.
Physalis angulata L.	Solanaceae	The fruits are eaten as snacks.
Pipturus argenteus (Forster f.) Weddell	Urticaceae	The bunches of small, sweet fruits are collected by children who suck them like sweets. In times of food scarcity adults eat them as well, because although small they are abundant and provide a sweet food.
Pisonia grandis R. Brown	Nyctaginaceae	The leaves, cooked as vegetables, go well with meat and fish.

Pithecellobium dulce (Roxb.) Benth.	Mimosaceae	The fruits are eaten as snacks in Pentecost.
Planchonella grayana St John	Sapotaceae	The fruits, which are astringent, are washed, peeled and then eaten raw or baked in their skins. The wood contains grubs that are much sought after, and are eaten fried.
Psidium cattleianum Sabine	Myrtaceae	This small tree is rare in Vanuatu. The red fruits, at most the size of a ping-pong ball, are eaten with their skins on and are tasty and juicy. They are also used to make good jams and jellies.
Pteris comans Forst. f.	Pteridaceae	In Pentecost the young leaves are eaten cooked, together with meat.
Pteris pacifica Hieron.	Pteridaceae	In Santo the young leaves are cooked in an oven of hot stones, together with pork.
Pteris tripartita Swartz	Pteridaceae	The young leaves are cooked in the oven with meat.
Rubus rosifolius Sm.	Rosaceae	The fruits, gathered in abundance at the end of the dry season, are eaten fresh and are sold in the market.
Salvia splendens Sellow ex. Roem. & Schult.	Lamiaceae	The sweet flower is sucked by children.
Senna occidentalis L.	Caesalpiniaceae	In Pentecost the young leaves are gathered to make an infusion, drunk in the morning instead of tea.
Sida rhombifolia L.	Malvaceae	The immature small fruits are eaten by children as snacks.
Solanum torvum Swartz	Solanaceae	The small, immature fruits may be eaten cooked.
Streblus pendulinus (Mueller) Corner	Moraceae	In Tanna the fruits are cooked in a *marmite* or in bamboo.
Syzygium sp. *nutans*	Myrtaceae	The fruits are occasionally eaten.

Syzygium clusiifolium (A. Gray) Muller	Myrtaceae	The fruits are eaten by children.
Syzygium richii (A. Gray) Merrill & Perry	Myrtaceae	The fruits are sometimes eaten as snacks in the centre of Santo.
Tectaria latifolia (Forst. f.) Copel.	Aspidiaceae	The leaves are lactogenic, and are eaten as vegetables.
Terminalia samoensis Rechinger	Combretaceae	In Aniwa children munch the small seeds.
Terminalia sepicana Diels	Combretaceae	Children munch the minute seeds as a game.
Trichosanthes dieniensis Merr. & Perry	Cucurbitaceae	An ancient plant with round, red fruits. The fruits are eaten baked or cooked in a *marmite*.
Trichosanthes ovigera Blume	Cucurbitaceae	An ancient plant with ovoid fruits, eaten boiled.
Vaccinium macgillivreyi Seem.	Ericaceae	The fruits are sometimes eaten as snacks.
Veitchia spp.	Arecaceae	After the tough pericarp has been broken, the endocarp adhering to the seed is sucked. The heart of *V. montgomeryana* is eaten in salads.
Wollastonia biflora (L.) D.C.	Asteraceae	In the south of the archipelago the young leaves are eaten raw with coconut, or cooked as vegetables which are sometimes sprinkled with coconut milk. The leaves give a flavour to fish that is wrapped in them. They used to be used in Pentecost to flavour the seawater in which yams were cooked.
Ximenia americana L.	Olacaceae	The fruits are edible.
Zehneria baueriana Endl.	Cucurbitaceae	In Santo the young leaves and the fruits are eaten, raw or cooked, with taro.
Zehneria mucronata (Bl.) Miquel	Cucurbitaceae	In the north of the archipelago the fruits are eaten cooked.

Annex 2: Synopsis of species covered in book and CD-ROM

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Abelmoschus manihot	(L.) Medik.	Malvaceae	Island cabbage, aibika	Chou des îles	Aelan kabij	Indo-Malayan	Cultivated	Year-round	Leaf	Important
Acacia simplex	(Sparrman) Pedley	Mimosaceae	Wattle		Namariu blong soltwata	Pacific	Spontaneous		Seed	Occasional
Acalypha grandis	Benth.	Euphorbiaceae		Acalypha		Central Pacific, Vanuatu	Cultivated	Year-round	Stem end, leaf	Moderate
Aceratium oppositifolium	D.C.	Elaeocarpaceae				Maluku	Spontaneous	September-February	Fruit	In times of famine
Adenanthera pavonina	Linnaeus	Fabaceae	Coral pea	Cardinalier	Bisa	Indo-Pacific	Spontaneous	June-August	Seed	Rare
Agathis macrophylla	(Lindley) Masters	Araucariaceae	Kauri	Kauri	Kauri	Vanuatu	Spontaneous		Seed	Rare (not eaten any longer)
Aleurites moluccana	(L.) Willdenow	Euphorbiaceae	Candlenut	Bancoulier	Kandltri	India	Spontaneous		Seed	Rare; toxic
Allium ampeloprasum L. var. *porrum*	(L.) J. Gay	Liliaceae	Leek	Poireau	Lik	Caucasus, North Africa	Cultivated	August-October	Base of stalk	Rare
Allium cepa L. var. *ascalonicum*	Backer	Liliaceae	Shallot	Échalote	Grin anion	Asia (species); France (cv)	Cultivated	August-October	Bulb	Occasional
Allium cepa L. var. *cepa*	Linnaeus	Liliaceae	Bulb onion	Oignon	Anion	Central Asia	Cultivated	August-October	Bulb	Important

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Allium fistulosum	Linnaeus	Liliaceae	Spring onion	Cive, ciboule	Lik	Siberia, China	Cultivated	Year-round	Leaf	Occasional
Allium sativum	Linnaeus	Liliaceae	Garlic	Ail	Galik	Central Asia	Cultivated		Bulb	Occasional
Allium tuberosum	Rottl. ex. Spreng.	Liliaceae	Garlic chive, Chinese chive	Ciboulette chinoise	Lik blong china	Indeter-minate	Cultivated	Year-round	Leaf	Occasional
Alocasia macrorrhiza	(L.) Schott.	Araceae	Alocasia, elephant's ear, giant taro	Alocase, oreille d'éléphant	Navia	India, Southeast Asia	Spontaneous/ cultivated	Year-round	Corm	In times of famine
Amaranthus viridis	Linnaeus	Amaranthaceae	Amaranth	Amaranthe		India, South-east Asia	Cultivated/ spontaneous	Year-round	Leaf	Moderate
Amorphophallus campanulatus	(Roxb.) Blume ex. Decne	Araceae	Elephant foot yam	Konjac		Southeast Asia	Cultivated/ spontaneous	Year-round	Corm	Rare
Anacardium occidentale	Linnaeus	Anacardiaceae	Cashew	Anacardier		Brazil	Cultivated		Seed	Rare
Ananas comosus	(L.) Merr.	Bromeliaceae	Pineapple	Ananas	Paenap	Venezuela, Guyana	Cultivated	December-March	Fruit	Important
Angiopteris evecta	(G. Forster) Hoffman	Marattiaceae				Pacific	Spontaneous	Year-round	Frond	Occasional or during famine
Annona muricata	Linnaeus	Annonaceae	Soursop	Corossolier	Saosop	West Indies	Cultivated	Year-round	Fruit	Frequent
Annona reticulata	Linnaeus	Annonaceae	Bullock's heart, custard apple	Coeur de boeuf, cachimentier		West Indies	Cultivated	Year-round	Fruit	Occasional

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Annona squamosa	Linnaeus	Annonaceae	Sweetsop, sugar apple, custard apple	Attier, pomme cannelle	Kasta apel	West Indies	Cultivated	November-March	Fruit	Rare
Arachis hypogea	Linnaeus	Fabaceae	Peanut	Arachide	Pistas	Bolivia/ Argentina	Cultivated	Several times per year	Seed	Moderate, increasing
Artocarpus altilis	(Parkinson) Fosberg	Moraceae	Breadfruit	Arbre à pain	Bredfrut	New Guinea	Cultivated	December-February (+ June-August)	Pulp, seed	Very important
Artocarpus heterophyllus	Lamarck	Moraceae	Jackfruit	Jacquier	Jakfrut	India (north)	Cultivated		Fruit	Exceptional
Asplenium nidus	Linnaeus	Aspleniaceae	Bird's nest fern	Nid d'oiseau		Asia, Pacific, East Africa	Spontaneous	Year-round	Young leaf	Rare
Averrhoa carambola	Linnaeus	Oxalidaceae	Carambola, star fruit	Carambolier, pommier de Goa	Sta frut	Indonesia	Cultivated	June-August	Fruit	Rare
Barringtonia edulis	(Miers) Seemann	Lecythidaceae	Cut nut	Vellier	Navele	Melanesia	Cultivated/ spontaneous	Year-round	Seed	Important
Barringtonia novae-hiberniae	Lauterbach	Lecythidaceae	Cut nut	Vellier	Navele	Melanesia	Cultivated/ spontaneous	Year-round	Seed	Important
Barringtonia procera	(Miers) Knuth	Lecythidaceae	Cut nut	Vellier	Navele	Melanesia	Cultivated	March-June + all-year	Seed	Important
Begonia vitiensis	A.C. Smith	Begoniaceae				Pacific	Spontaneous	Year-round	Stem end, leaf	Rare condiment

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Benincasa hispida	(Thunb.) Cogn.	Cucurbitaceae	Hairy melon, Chinese winter melon, wax gourd	Courge cireuse, bidao, benincasa		Java (?)	Cultivated	Twice per year	Fruit	Moderate
Brassica juncea	(L.) Czernjaew & Coss.	Brassicaceae	Indian mustard, Chinese mustard	Moutarde chinoise, moutarde indienne		Central Asia	Cultivated	Year-round	Leaf, flower	Moderate
Brassica oleracea	Linnaeus	Brassicaceae	Cabbage	Chou	Kabij	Europe	Cultivated	June-October	Leaf	Moderate
Brassica rapa ssp. *parachinensis*	(Bailey) Tsen & Lee	Brassicaceae	Choi sum, Chinese white cabbage	Choi san	Kabij	Southwest Asia	Cultivated	Year-round	Leaf	Moderate
Brassica rapa ssp. *pekinensis*	(Lour) Hanelt	Brassicaceae	Chinese cabbage	Chou de Pekin, chou de Shangton, petsai	Kabij	Southwest Asia	Cultivated	Year-round	Leaf	Exceptional
Brassica rapa ssp. *chinensis*	(L.) Hanelt	Brassicaceae	Bok choi, pak choi	Pak-choi, chou chinois	Kabij, Waet bon	Southwest Asia	Cultivated	Year-round	Leaf	Important
Burckella fijiensis	(Hemsley) A.C. Smith & S. Darwin	Sapotaceae		Poirier-tortue		Central Pacific	Cultivated	October-December	Fruit	Daily in season (Futuna)
Burckella sp. (*Cassidispermum megahilum* Hemsley)		Sapotaceae				Pacific	Spontaneous/ cultivated	October-December	Fruit	Locally frequent (Malekula)

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Burckella obovata	(G. Forster) Pierre	Sapotaceae	Burckella	Doulier	Naduledule	Pacific	Spontaneous/ cultivated	February-May	Fruit	Frequent but not very important
Cajanus cajan	(L.) Millsp.	Fabaceae	Pigeonpea	Ambrevade, cajan, pois d'Angol	Piginpi	India	Cultivated	Once or twice per year	Seed	Occasional
Calamus vanuatensis (= *C.* sp. aff. *vitiensis*)		Arecaceae	Rattan	Rottin	Kambak	Pacific	Spontaneous	Year-round	Sap	Occasional
Canarium harveyi	Seemann	Burseraceae	Canarium nut	Nangailler	Nangai	Melanesia	Cultivated/ spontaneous	October-March	Seed	Important
Canarium indicum	Linnaeus	Burseraceae	Canarium nut	Nangailler	Nangai	Maluku, New Guinea	Cultivated	October-March	Seed	Important
Canarium vitiense	A. Gray	Burseraceae				Melanesia	Spontaneous		Seed	Snack (children)
Capsicum annuum	Linnaeus	Solanaceae	Capsicum, green pepper	Poivron		Central America	Cultivated	Year-round	Fruit	Occasional
Capsicum frutescens	Linnaeus	Solanaceae	Chilli	Piment	Pili pili	Northern South America	Spontaneous/ cultivated	Year-round	Fruit	Occasional
Carica papaya	Linnaeus	Caricaceae	Papaya, pawpaw	Papayer, melon des tropiques	Popo	Central America	Cultivated/ spontaneous	Year-round	Flesh	Frequent
Carpoxylon macrospermum	Wendl. & Drude	Arecaceae				Vanuatu	Spontaneous		Seed	Rare
Caryota ophiopelis	Dowe	Arecaceae	Fishtail palm	Caryota	Black palm	Asia	Spontaneous/ cultivated	Year-round	Trunk	In times of famine

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Cassia occidentalis	Linnaeus	Fabaceae	Negro coffee			Central America	Spontaneous	Year-round	Leaf	Rare (as an infusion)
Castanospermum australe	Cunn. & Frazer ex. Hook.	Papilionaceae	Moreton Bay chestnut			Australia	Spontaneous		Seed	Exceptional
Casuarina equisetifolia	Linnaeus	Casuarinaceae	Sheoak, iron wood, horsetail beefwood	Bois de fer, Filao	Aian wud	Malaysia and Melanesia	Spontaneous		Seed	Snack (children) or in times of famine
Citrullus lanatus	(Thunb.) Matsum. & Nakai	Cucurbitaceae	Watermelon	Pastèque	Wota melan	Africa	Cultivated		Fruit	Frequent
Citrus aurantiifolia	(Christmann & Panzer) Swingle	Rutaceae	Lime	Limetier	Laem	India and Myanmar	Cultivated	Year-round	Fruit	Frequent
Citrus aurantium	Linnaeus	Rutaceae	Bitter orange, Seville orange	Bigaradier, orange amère	Aranis	China	Spontaneous/ cultivated	Year round	Fruit juice	Moderate
Citrus grandis	(L.) Osbeck	Rutaceae	Pomelo, pummelo, shaddock	Pample-moussier	Pomelo	Thailand/ Malaysia	Cultivated	February-May and year-round	Fruit	Very important
Citrus hystrix	D.C.	Rutaceae	Kaffir lime	Combava		Asia	Cultivated		Zest of fruit	Exceptional
Citrus limon	(L.) Burm. f.	Rutaceae	Lemon	Citronnier		Myanmar/ China	Cultivated	Year-round	Fruit	Variable

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Citrus macroptera	Montrouzier	Rutaceae	Local orange, ghost-lime			Southeast Asia to New Guinea	Spontaneous	Year-round	Fruit juice	Occasional
Citrus medica	Linnaeus	Rutaceae	Citron	Cédratier		Southwest Asia	Cultivated		Fruit juice	Exceptional
Citrus paradisi	Macf.	Rutaceae	Grapefruit	Pomelo	Grepfrut	West Indies	Cultivated	July-December	Fruit	Occasional
Citrus reticulata	Blanco	Rutaceae	Mandarin	Mandarinier		Southeast Asia	Cultivated	July-December	Fruit	Important
Citrus sinensis	(L.) Osbeck	Rutaceae	Sweet orange	Oranger	Aranis	Southeast Asia/South China	Cultivated	July-December	Fruit	Important
Cocos nucifera	Linnaeus	Arecaceae	Coconut	Cocotier	Kokonas	Indo-Malayan/ Pacific	Cultivated	Year-round	Flesh, water, milk	Daily
Coffea arabica	Linnaeus	Rubiaceae	Coffee	Caféier	Kofi	Ethiopia/ Sudan/ Kenya	Cultivated	August-October	Seed (roasted)	Exceptional
Coffea canephora	Pierre ex. Froehner	Rubiaceae	Coffee	Caféier Robusta	Kofi	West Africa	Cultivated	August-October	Seed (roasted)	Exceptional
Colocasia esculenta	(L.) Schott.	Araceae	Taro	Taro	Taro	Indo-Malayan	Cultivated	Year-round	Corm	Very important
Cordia subcordata	Lamarck	Boraginaceae	Sea trumpet	Gommier	Bourao blong soltwata	Pan-Pacific	Spontaneous	Year-round	Seed	Snack (children) or in times of famine

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Cordyline terminalis	(L.) Knuth	Liliaceae	Cordyline	Cordyline	Ti, nagria	Southeast Asia, Melanesia	Cultivated	Year-round	Tuber	In times of famine
Coriandrum sativum	Linnaeus	Apiaceae	Coriander, cilantro, Chinese parsley	Coriandre, persil chinois, persil arabe		Middle East	Cultivated	Year-round	Leaf	Occasional
Costus sp.		Zingiberaceae					Spontaneous			Snack for children
Corynocarpus similis	Hemsley	Corynocarpaceae				Vanuatu	Spontaneous/ cultivated	September-February	Fruit	Rare, in times of famine
Cryptocaria wilsonii	Guillaumin	Lauraceae				Melanesia	Spontaneous		Seed	Snack for children
Cucumis sativus	Linnaeus	Cucurbitaceae	Cucumber	Concombre, concombre jaune	Kukumba	Himalayan foothills	Cultivated	Year-round	Fruit	Important
Cucurbita maxima	Duchesne ex. Lam.	Cucurbitaceae	Giant squash, Hubbard squash	Potiron	Pamkin	Andean coasts	Cultivated	July-December	Fruit	Moderate
Cucurbita moschata	(Duchesne ex. Lam.) Duch. ex. Poiret	Cucurbitaceae	Winter squash, butternut pumpkin	Courge musquée	Pamkin	Central America	Cultivated	July-December	Fruit	Frequent

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Cucurbita pepo	Linnaeus	Cucurbitaceae	Zucchini, courgette, vegetable marrow	Citrouille, courgette, patisson, courge à la moelle, coucouzelle	Pamkin	Mexico	Cultivated	July-December	Fruit	Occasional
Curcuma longa	Linnaeus	Zingiberaceae	Turmeric	Curcuma, safran d'Océanie, souchet		India	Spontaneous/ cultivated	Year-round	Rhizome	Occasional
Cyathea lunulata	(Forst.) Copel.	Cyatheaceae					Spontaneous	Year-round	Trunk	In times of famine
Cycas rumphii	Miquel	Cycadaceae	Cycas	Cycas	Namwele	Asia	Cultivated	Year-round	Trunk, seed	In times of famine
Cyrtandra obovata and *Cyrtandra schizocalyx*		Gesneriaceae				Pacific	Spontaneous		Fruit	Rare
Cyrtosperma chamissonis	(Schott.) Merrill	Araceae	Giant swamp taro	Taro géant, taro de marais	Wael taro	Southeast Asia	Cultivated	Year-round	Corm	Rare
Daucus carota	L. subsp. *sativus* (Hoffm.) Thell.	Apiaceae	Carrot	Carotte	Karot	Afghanistan	Cultivated	July-November	Root	Occasional
Dendrocalamus giganteus	Munro	Poaceae	Bamboo	Bambou	Bambu	Myanmar	Spontaneous	Year-round	Sap (to drink)	Occasional
Dennstaedtia samoense		Dennstaedtiaceae		Fougère		Pacific	Spontaneous	Year-round	Young leaf	Moderate
Dicksonia brackenridgei	Mett.	Pteridaceae		Fougère		Pacific	Spontaneous	Year-round	Leaf and stalk	Occasional

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Dioscorea alata	Linnaeus	Dioscoreaceae	Winged yam, greater yam, water yam	Grande igname	Sopsop yam	Southeast Asia	Cultivated	April-June	Tuber	Very important
Dioscorea bulbifera	Linnaeus	Dioscoreaceae	Air potato, aerial yam, potato yam	Igname bulbifère	Wael yam	Asia and Africa	Spontaneous/ cultivated	Year-round	Tuber	Occasional
Dioscorea esculenta	(Lour.) Burkill.	Dioscoreaceae	Chinese yam, lesser yam, sweet yam	Igname chinoise, wovilé	Wovilé	Southeast Asia	Cultivated	March-April	Tuber	Important
Dioscorea nummularia	Lamarck	Dioscoreaceae	Pacific yam, hard yam	Igname sauvage	Strong yam	Melanesia	Spontaneous/ cultivated	October-December, year-round	Tuber	Moderate
Dioscorea pentaphylla	Linnaeus	Dioscoreaceae	Five-fingered yam	Igname à cinq doigts		Southeast Asia, Melanesia	Spontaneous/ cultivated	Year-round	Tuber	Moderate
Dioscorea rotundata-cayenensis	Poiret	Dioscoreaceae	African yam, white yam	Igname africaine, houailou	Six manis	West Africa	Cultivated	April-July	Tuber	Important
Dioscorea trifida	Linnaeus	Dioscoreaceae	Cushcush, Indian yam	Cousse couche	Wailu	Brazil/ Guyana	Cultivated	August-September	Tuber	Rare
Diplazium harpoides	Moore	Polypodiaceae		Fougère			Spontaneous	Year-round	Leaf	Moderate
Diplazium proliferum	(Lam.) Thouars	Polypodiaceae		Fougère			Spontaneous	Year-round	Leaf	Moderate
Diplocyclos palmatus	(L.) C. Jeffrey	Cucurbitaceae				Southeast Asia	Spontaneous	Year-round	Leaf	Moderate

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Donax caniformis	(Forster f.) Schum.	Marantaceae					Spontaneous		Fruit	Snack for children
Dracontomelon vitiense	Engler	Anacardiaceae	Dragon plum	Tambolier	Nakatambol	Santa Cruz to Samoa	Spontaneous/ cultivated	May-July	Fruit	Daily in season
Elaeocarpus chelonimorphus	Gillespie	Elaeocarpaceae				Vanuatu, Fiji	Spontaneous		Seed	Rare
Elatostema macrophylla	Brongn.	Urticaceae					Spontaneous	Year-round	Whole	Exceptional (vegetable salt)
Entada phaseoloides	(L.) Merr.	Fabaceae	St Thomas bean			Asia-Pacific	Spontaneous		Seed	In times of famine (rare)
Epipremnum pinnatum	(L.) Engler	Araceae				Asia-Pacific	Spontaneous		Bud	Rare
Ficus adenosperma	Miquel	Moraceae				Solomon Is, Vanuatu	Spontaneous		Leaf, fig	Rare
Ficus aspera	Forster f.	Moraceae	Wild fig, rough-leaved fig	Figuetier		Vanuatu	Spontaneous/ cultivated	Year-round (leaves)	Leaf, fig	Regular in small amounts
Ficus granatum	Forster f.	Moraceae	Wild fig	Figuetier vanuatais		Vanuatu	Spontaneous/ cultivated	July-November	Fig	Seasonal
Ficus scabra	Forster f.	Moraceae	Wild fig	Figuetier d'Océanie		New Caledonia to Tonga	Spontaneous/ cultivated	Several times per year	Leaf, fruit	Regular in small quantities
Ficus smithii	Horne ex. Baker	Moraceae	Wild fig, sandpaper cabbage			Solomon Is to Fiji	Spontaneous		Leaf, fruit	Rare
Ficus storckii	Seemann	Moraceae				Vanuatu, Fiji	Spontaneous		Leaf	Occasional

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Ficus tinctoria	Forster f.	Moraceae	Dye fig			Indo-Pacific	Spontaneous		Leaf, fig	Rare
Ficus virgata	Reinw.	Moraceae				Philippines to Vanuatu	Spontaneous		Leaf	Exceptional
Ficus wassa	Roxburgh	Moraceae		Figuetier de Mélanésie		From Flores and Timor to Vanuatu	Spontaneous	Several times per year	Fruit	Frequent
Finschia chloroxantha	Diels	Proteaceae	Finschia	Chryso-carpier		New Guinea/ Vanuatu	Spontaneous/ cultivated	September-November	Seed	Occasional
Flacourtia rukam	Zollinger & Morritzi	Flacourtiaceae	Indian plum	Prunier café		Malaysia to Solomon Is	Spontaneous	Several times per year	Fruit	Snack (children)
Fortunella japonica	(Thunb.) Swingle	Rutaceae	Cumquat	Kumquat		China	Cultivated	Several times per year	Fruit	Rare
Freycinetia impavida	(Hombron & Jacquinot) Stone	Pandanaceae				Sri Lanka to Polynesia	Spontaneous		Inflorescence	Occasional
Garcinia pseudoguttifera	Seemann	Clusiaceae				Solomon Is to Tonga	Spontaneous	April-June	Fruit	Rare
Gnetum gnemon	Linnaeus	Gnetaceae	Two leaf			From Assam to Fiji	Spontaneous/ cultivated		Seed	Rare
Graptophyllum pictum	(L.) Griffith	Acanthaceae				Indo-Malayan	Cultivated	Year-round	Leaf	Occasional
Haplolobus floribundus	(Sch.) H. Lam.	Burseraceae				New Guinea	Spontaneous		Seed	Snack (children)
Hedycarya dorstenioides	A. Gray	Monimiaceae					Spontaneous	Year-round	Stem	Rare

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Heliconia indica	Lam.	Musaceae	Lap-lap leaf	Feuille à lap-lap, heliconia	Laplap lif	Sulawesi to Samoa	Cultivated	Year-round	Leaf	Daily
Hibiscus sabdariffa	Linnaeus	Malvaceae	Rosella	Roselle		Africa	Cultivated/ spontaneous	May-August	Flower	Rare
Hibiscus tiliaceus	Linnaeus	Malvaceae	Sea hibiscus, beach hibiscus, cottonwood	Bourao	Burao	Pantropical	Spontaneous	Year-round	Stalk	In times of famine (rare)
Hornstedtia scottiana	(F. Muel.) K. Schumann	Zingiberaceae				Indonesia (east)	Spontaneous		Seed	Rare
Inocarpus fagifer	(Parkinson ex. Zollinger) Fosberg	Fabaceae	Tahitian chestnut	Châtaignier de Tahiti	Namambe	Indo-Pacific	Cultivated	January-April	Seed	Important
Ipomoea aquatica	Forskal	Convolvulaceae	Water spinach, kangkong	Liseron d'eau, patate aquatique, kangkong		Tropical Asia	Cultivated	Year-round	Young leaf	Occasional
Ipomoea batatas	(L.) Lam.	Convolvulaceae	Sweet potato	Patate douce	Kumala	South America	Cultivated	Year-round	Tuber	Important
Kleinhovia hospita	Linnaeus	Sterculiaceae	Guest tree			Tropical Asia to Polynesia	Spontaneous		Stem end, leaf	Rare

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Lablab purpureus	(L.) Sweet	Fabaceae	Hyacinth bean, lablab, bonavist	Dolique lab-lab, dolique d'Égypte, pois boucoussou	Doliko	India, Southeast Asia; East Africa	Cultivated		Pod, seed	Occasional
Lactuca sativa	Linnaeus	Asteraceae	Lettuce	Laitue	Salad	West Asia	Cultivated	Year-round	Leaf	Moderate
Lagenaria siceraria	(Molina) Standley	Cucurbitaceae	Bottle gourd, calabash, spaghetti squash	Gourde, cougourde, calebasse		South America and Papua New Guinea	Cultivated/ spontaneous	Several times per year	Fruit	Occasional
Leucaena leucocephala	(Lam.) De Wit.	Fabaceae	Leucaena	Leucaene, faux mimosa	Kasis	Central America	Spontaneous	July-October	Fruit, leaf	Snack
Leucosyke australe	Hunru	Urticaceae					Spontaneous	Year-round	Leaf	Rare
Litchi sinensis	Sonnerat	Sapindaceae	Lychee, litchi	Litchi, cerisier de Chine	Litsi	Southeast Asia	Cultivated	November-December	Aril	Occasional
Luffa acutangula	(L.) Roxburgh	Cucurbitaceae	Angled luffa, ridged gourd, sponge gourd	Papengaye		India or Southeast Asia	Cultivated		Fruit	Rare
Lycopersicon esculentum	Miller	Solanaceae	Tomato	Tomate	Tomat	South America	Cultivated/ spontaneous	June-November	Fruit	Important
Macadamia ternifolia	F. Muell.	Proteaceae	Macadamia nut	Macadamier		Australia	Cultivated		Seed	Exceptional

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Maesa ambrymensis	Guillaumin	Myrsinaceae					Spontaneous		Fruit	Snack
Maesa nemoralis	D.C.	Myrsinaceae					Spontaneous		Fruit	Snack (rare)
Malaysia scandens	(Lour.) Planch.	Moraceae					Spontaneous		Fruit	Rare
Mangifera indica	Linnaeus	Anacardiaceae	Mango	Manguier	Mango	India/ Southeast Asia	Cultivated	December-March	Fruit	Important
Manihot esculenta	Crantz	Euphorbiaceae	Cassava, tapioca, manioc	Manioc, cassave amère	Maniok	South America	Cultivated	Year-round	Root	Important
Maranta arundinacea	Linnaeus	Marantaceae	Arrowroot			South America	Cultivated	Year-round	Root	Rare
Marattia smithii	Mettenius ex. Kuhn	Marattiaceae				Vanuatu to Samoa	Spontaneous	Year-round	Sap	Rare
Mentha piperita and *Mentha spicata*	Linnaeus Linnaeus	Lamiaceae Lamiaceae	Peppermint, spearmint, garden mint	Menthe poivrée Menthe verte		Europe, Asia, North Africa	Cultivated/ spontaneous	Year-round	Leaf	Variable
Metroxylon warburgii	Heim. Beccari	Arecaceae	Sago	Sagoutier	Natangora	Vanuatu to Samoa	Spontaneous/ cultivated	Year-round	Trunk	In times of famine
Momordica charantia	Linnaeus	Cucurbitaceae	Bitter melon, balsam pear	Paroka, momordique à feuilles de vigne		India, Himalayas	Cultivated		Fruit	Occasional
Morinda citrifolia	Linnaeus	Rubiaceae	Indian mulberry	Morindier	Noni	Malaysia, Australia, Polynesia	Spontaneous/ cultivated	Year-round	Fruit	Rare

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Muntingia calabura	Linnaeus	Elaeocarpaceae	Capulin, Panama berry, Jamaica cherry			America	Cultivated	Year-round + October-January	Fruit	Regular in times of need
Musa troglodytarum	Linnaeus	Musaceae	Fehi banana	Banane fehi		New Guinea	Cultivated	Year-round	Fruit	Important
Neisosperma oppositifolium	(Lam.) Fosberg & Sachet	Apocynaceae	Twin apple	Ochrosia		Pantropical	Spontaneous	Year-round	Kernel	Snack
Ocimum basilicum	Linnaeus	Lamiaceae	Basil	Basilic	Basel	West Asia	Cultivated	Year-round	Leaf	Slight but regular
Ocimum gratissimum	Linnaeus	Lamiaceae		Basilic sauvage			Spontaneous	Year-round	Leaf	Moderate
Ocimum tenuiflorum	Linnaeus	Lamiaceae		Basilic		West Asia	Cultivated/ spontaneous	Year-round	Leaf	Moderate
Pachyrrhizus erosus	(L.) Urban.	Fabaceae	Jicama, yam bean	Dolique tubéreuse	Iambin	Mexico and northern Central America	Cultivated	Year-round	Tuber	Occasional
Pandanus dubius	Sprengler	Pandanaceae	Knob-fruited screwpine	Pandanus		Indo-Malayan	Spontaneous/ cultivated	Year-round	Seed	Snack
Pandanus tectorius	Parkinson	Pandanaceae	Pandanus	Pandanus, vacouet, vaquois		Pacific	Spontaneous/ cultivated	Year-round	Seed	Rare
Pangium edule	Reinwardt	Flacourtiaceae	Pangi	Pangi		Malaysia/ Indonesia	Spontaneous/ cultivated	July-August	Seed	In times of famine

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Passiflora edulis	Sims.	Passifloraceae	Passionfruit	Fruit de la passion, maracuja	Pasonfrut	South America	Cultivated/ spontaneous	Several times per year	Fruit	Frequent
Passiflora foetida	Linnaeus	Passifloraceae	Passion flower	Passiflore sauvage, passiflore fétide		South America	Spontaneous	Year-round	Fruit	Snack (children)
Passiflora maliformis	Linnaeus	Passifloraceae				South America	Spontaneous	Year-round	Fruit	Rare
Pemphis acidula	Forster	Lythraceae				Pantropical	Spontaneous	Year-round	Leaf	Rare
Persea americana	Miller	Lauraceae	Avocado	Avocatier	Avokado	Central America	Cultivated	December-February	Fruit	Important
Petroselinum crispum	(Mill.) Nyman ex. A.W. Hill	Apiaceae	Parsley	Persil		Southern Europe	Cultivated	Year-round	Leaf	Occasional
Phaseolus vulgaris	Linnaeus	Fabaceae	Green bean, French bean	Haricot, haricot vert	Bin	Central America	Cultivated	Several times per year	Pod	Moderate
Physalis angulata	Linnaeus	Solanaceae	Cape gooseberry, bladder cherry			Pantropical	Spontaneous		Fruit	Snack
Piper methysticum	Forster f.	Piperaceae	Kava	Kava	Kava	Vanuatu	Cultivated	Year-round	Root	Frequent (beverage)
Piper nigrum	Linnaeus	Piperaceae	Black pepper	Poivre	Pepa	India (Ghats)	Cultivated		Seed	Rare
Pipturus argenteus	(Forster f.) Weddell	Urticaceae	Pipturus	Pipturus		Indo-Malayan	Spontaneous	Year-round	Fruit	Snack and in times of famine

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Pisonia grandis	R. Brown	Nyctaginaceae					Spontaneous	Year-round	Leaf	Moderate
Pithecellobium dulce	(Roxb.) Benth.	Fabaceae	Madras thorn, Manila tamarind			Indo-Malayan	Spontaneous		Fruit	Snack
Planchonella grayana	St John	Sapotaceae	Comb tree			Vanuatu to Tuamotu	Spontaneous	October-December	Fruit	Rare
Polyscias cissodendron	(C. Moore & F. Mueller) Harms	Araliaceae				Malayan Region/ Pacific	Cultivated	Year-round	Leaf	Moderate
Polyscias cumingiana	(K. Presl.) Fernandez-Villar	Araliaceae				Malayan Region/ Pacific	Cultivated	Year-round	Leaf	Rare
Polyscias fruticosa	(L.) Harms	Araliaceae	Panax			Malayan Region/ Pacific	Cultivated	Year-round	Leaf	Moderate
Polyscias guilfoylei	(Bull.) Bailey	Araliaceae				Malayan Region/ Pacific	Cultivated	Year-round	Leaf	Moderate
Polyscias multijuga	(A. Gray) Harms	Araliaceae				Fiji/Tonga	Cultivated	Year-round	Leaf	Rare
Polyscias samoensis	(A. Gray) Harms	Araliaceae				Samoa	Cultivated	Year-round	Leaf	Moderate
Polyscias schmidii	Lowry	Araliaceae				New Caledonia	Cultivated	Year-round	Leaf	Rare

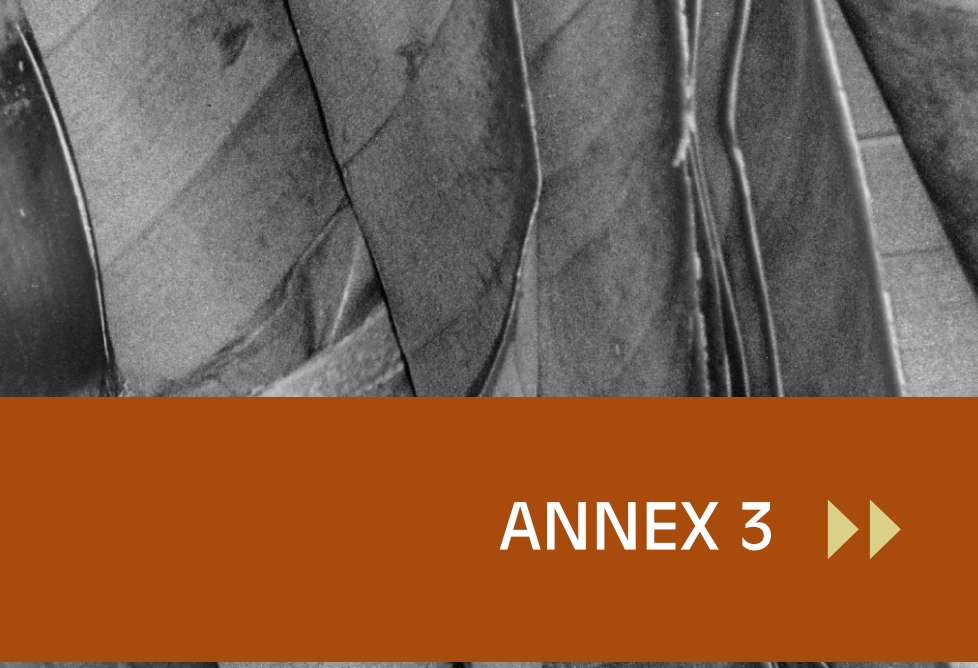
Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Polyscias scutellaria	(Burman f.) Fosberg	Araliaceae				Solomon Is/ Vanuatu	Cultivated	Year-round	Leaf	Moderate
Pometia pinnata	J.R. & G. Forster	Sapindaceae	Taun tree	Pometier		Papua New Guinea/ Vanuatu	Spontaneous/ cultivated	April-July	Fruit	Frequent
Pseuderanthemum carruthersii	(Seem.) Guillaumin	Acanthaceae					Cultivated	Year-round	Leaf	Moderate
Pseuderanthemum longifolium	(Forst. f.) Guillaumin	Acanthaceae					Cultivated	Year-round	Leaf	Moderate
Pseuderanthemum pelagicum	Seem.	Acanthaceae					Cultivated	Year-round	Leaf	Moderate
Pseuderanthemum whartonianum	Hemsley	Acanthaceae					Cultivated	Year-round	Leaf	Moderate
Psidium cattleianum	Sabine	Myrtaceae	Strawberry guava	Goyavier-fraise, goyavier de Chine		Brazil	Spontaneous	April-September	Fruit	Rare
Psidium guajava	Linnaeus	Myrtaceae	Guava	Goyavier	Guava	Tropical America (Brazil)	Spontaneous/ cultivated	April-September	Fruit	Frequent
Psophocarpus tetragonolobus	(L.) D.C.	Fabaceae	Winged bean	Pois carré, haricot ailé	Skwa bin	Asia/Papua New Guinea	Cultivated	Several times per year	Seed	Occasional
Pteris comans	Forster f.	Pteridaceae					Spontaneous	Year-round	Leaf	Rare
Pteris pacifica	Hieron.	Pteridaceae					Spontaneous	Year-round	Leaf	Rare
Pteris tripartita	Swartz	Pteridaceae					Spontaneous	Year-round	Leaf	Rare

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Pueraria lobata	(Willd.) Ohwi	Fabaceae	Kudzu, pueraria	Pueraria, koudzou		Asia and Japan	Cultivated		Tuber	In times of famine
Punica granatum	Linnaeus	Punicaceae	Pome-granate	Grenadier		Iran, Afghanistan, Himalayas	Cultivated		Fruit	Exceptional
Raphanus sativus	Linnaeus	Brassicaceae	Radish	Radis		Eastern Mediterr-anean	Cultivated		Base of stalk	Occasional
Rorripa nasturtium	(L.) Mensfeld	Brassicaceae	Watercress	Cresson		Europe, Western Asia	Cultivated	Year-round	Leaf	Frequent
Rubus rosifolius	Smith	Rosaceae	Red raspberry			Indo-Malayan	Spontaneous	September-October	Fruit	Frequent
Saccharum edule	Hasskarl	Poaceae	Pitpit, naviso	Naviso	Naviso	New Guinea	Cultivated	April-May	Inflorescence	Frequent
Saccharum officinarum	Linnaeus	Poaceae	Sugarcane	Canne à sucre	Sugaken	New Guinea	Cultivated	Year-round	Stalk	Important
Salvia splendens	Sellow ex. Roem. & Schult.	Lamiaceae					Spontaneous		Flower	Snack
Sechium edule	(Jacq.) Swartz	Cucurbitaceae	Choko, chayote	Chouchoute, christophine	Susut	Mexico, Guatemala	Cultivated	Year-round	Fruit, leaf	Important
Senna occidentalis	Linnaeus	Fabaceae				America			Leaf	Infusion
Sida rhombifolia	Linnaeus	Malvaceae	Paddy's lucerne			Pantropical	Spontaneous		Fruit	Snack

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Solanum americanum	Miller	Solanaceae	Glossy nightshade	Herbe à calalou, la morelle noire		Central America	Spontaneous	Year-round	Young leaf, fruit	Regular
Solanum melongena	Linnaeus	Solanaceae	Eggplant, aubergine	Aubergine	Egplan	East Africa	Cultivated	Several times per year	Fruit	Moderate
Solanum torvum	Swartz	Solanaceae	Prickly solanum	Figue du diable		West Indies	Spontaneous		Fruit	Rare
Solanum tuberosum	Linnaeus	Solanaceae	Potato	Pomme de terre	Potato	Andes (Peru/ Bolivia)	Cultivated	July-November	Tuber	Occasional
Spondias cytherea	Sonnerat	Anacardiaceae	Golden apple	Pommier de Cythère		Indeter-minate	Cultivated	April-June	Fruit	Important
Sterculia vitiensis	Seemann	Sterculiaceae	Sterculia	Sterculia		Fiji/Vanuatu	Cultivated/ spontaneous		Seed	Moderate
Streblus pedulinus	(Mueller) Corner.	Moraceae					Spontaneous		Fruit	Rare
Syzygium sp. *nutans*		Myrtaceae					Cultivated/ spontaneous		Fruit	Rare
Syzygium clusiifolium	(A. Gray) Mueller	Myrtaceae				Papua New Guinea/ Solomon Is	Spontaneous		Fruit	Rare
Syzygium malaccense	(L.) Merrill & Perry	Myrtaceae	Malay apple	Jamalac	Nakavika	Western Melanesia	Cultivated	September-January	Fruit	Frequent
Syzygium richii	(A. Gray) Merrill & Perry	Myrtaceae				Central Pacific	Spontaneous		Fruit	Rare

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Tacca leontopetaloides	(L.) O. Kuntze	Taccaceae	Polynesian arrowroot	Arrow-root de Tahiti, de Fidji, fécule de pia		Southeast Asia	Cultivated	March-May	Corm	In times of famine
Tamarindus indica	Linnaeus	Fabaceae	Tamarind	Tamarinier	Tamarin	Africa	Cultivated		Pulp	Occasional
Tectaria latifolia	(Forst. f.) Copel	Aspidiaceae					Spontaneous		Leaf	Moderate
Terminalia catappa	Linnaeus	Combretaceae	Sea almond, Indian almond, tropical almond	Badamier	Natapoa	Asia/Pacific	Spontaneous/ cultivated	More or less continuous throughout year	Seed	Frequent
Terminalia samoensis	Rechinger	Combretaceae				Pacific	Spontaneous		Seed	Snack (children)
Terminalia sepicana	Diels	Combretaceae				Pacific	Spontaneous		Seed	Snack (children)
Theobroma cacao	Linnaeus	Sterculiaceae	Cocoa, cacao	Cacaoyer	Kakao	Central America	Cultivated	August-October	Seed (mucilage)	Snack (children)
Trichosanthes cucumerina var. *anguina*	(L.) Haines	Cucurbitaceae	Snake gourd	Courge serpent		India	Cultivated	Year-round	Fruit	Frequent
Trichosanthes dieniensis	Merr. & Perry	Cucurbitaceae				Asia	Cultivated	Year-round	Fruit	Frequent
Trichosanthes ovigera	Blume	Cucurbitaceae				Asia/Pacific	Spontaneous/ cultivated		Fruit	Occasional
Vaccinium macgillivreyi	Seem.	Ericaceae					Spontaneous		Fruit	Snack
Vanilla fragrans	(Salisb.) Ames	Orchidaceae	Vanilla	Vanille	Vanila	Central America	Cultivated	June-August	Pod	Rare
Vanilla tahitensis	J.W. Moore	Orchidaceae	Tahitian vanilla	Vanille de Tahiti	Vanila	Tahiti	Cultivated		Pod	Rare

Name	Author(s)	Family	English	French	Bislama	Origin	Status	Harvested	Part eaten	Consumption
Veitchia macdanielsii	H.E. Moore	Arecaceae				Vanuatu	Spontaneous	Year-round	Seed	Moderate
Veitchia montgomeryana	H.E. Moore	Arecaceae				Vanuatu	Spontaneous	Year-round	Trunk	Moderate
Veitchia winin	H.E. Moore	Arecaceae					Spontaneous	Year-round	Seed	Moderate
Vigna unguiculata subsp. *unguiculata*	(L.) (Walpe) Verde group *sesquipedalis*	Fabaceae	Yard-long bean, snake bean, asparagus bean	Haricot kilomètre, dolique asperge	Snek bin	Africa (+ Southeast Asia)	Cultivated	Year-round	Pod	Important
Wollastonia biflora	(L.) D.C.	Asteraceae				Pantropical	Spontaneous	Year-round	Leaf	Rare
Xanthosoma sagittifolium	(L.) Schott.	Araceae	Tannia, macabo, cocoyam, yautia	Macabo	Taro fidji	Central America	Cultivated	Year-round	Corm	Important
Ximenia americana	Linnaeus	Olacaceae	Yellow plum, tallow wood, false sandalwood, wild olive	Prunier de mer		Pantropical	Spontaneous	Year-round	Fruit	Occasional
Zea mays	L. subsp. *mays*	Poaceae	Maize	Maïs	Mais	Mexico	Cultivated	May-December	Seed	Important
Zehneria bauheriana	Hendl.	Cucurbitaceae					Spontaneous		Leaf, fruit	Rare
Zehneria mucronata	(Bl.) Miquel	Cucurbitaceae					Spontaneous		Fruit	Rare
Zingiber officinale	Roscoe	Zingiberaceae	Common ginger	Gingembre commun	Ginga	India	Cultivated	Year-round	Rhizome	Rare
Zingiber zerumbet	(L.) J.E. Smith	Zingiberaceae	Wild ginger, shampoo ginger, pine-cone ginger, zerumbet ginger	Zerumbet, gingembre blanc		India	Spontaneous/ cultivated	Year-round	Rhizome	Rare



ANNEX 3

Species names and main synonyms

***Abelmoschus manihot* (L.) Medik.**
Hibiscus manihot L.

***Acacia simplex* (Sparrman) Pedley**
Acacia laurifolia A. Gray
Acacia simplicifolia (L. f.)

***Acalypha grandis* Benth.**
Acalypha consimilis Muell. Arg.
Acalypha grandis var. *genuina* Muell. Arg.
Ricinocarpus consimilis O. Kuntze
Ricinocarpus grandis O. Kuntze

***Aceratium oppositifolium* D. C.**
Aceratium angustifolium A. C. Smith
Aceratium branderhorstii Schltr.
Aceratium insulare A. C. Smith
Aceratium versteegii Schltr.
Elaeocarpus edulis Teysm & Binn
Elaeocarpus oppositifolius D. C. Miquel

***Agathis macrophylla* (Lindley) Masters**
Agathis obtusa

***Aleurites moluccana* (L.) Willd.**
Aleurites lobata Blanco
Aleurites triloba Forst.
Jatropha moluccana L.

***Allium ampeloprasum* L. var. *porrum* (L.) J. Gay**
Allium porrum L.

***Allium cepa* L. var. *ascalonicum* Backer**
Allium ascalonicum auct. non Strand

***Allium fistulosum* L.**
Allium bouddhae O. Debeaux
Allium bakeri Hoop.

***Allium sativum* L.**
Allium ophioscorodon Don.
Porrum sativum Reichb.

***Allium tuberosum* Rottl. ex. Spreng.**
Allium odoratum auct. non L.
Allium senescens Miquel
Allium uliginosum G. Don.

***Alocasia macrorrhiza* (L.) Schott.**
Alocasia indica L. (Roxb.) Schott.
Alocasia macrorrhiza Schott.
Arum costatum (Solander ex.) Parkinson
Arum macrorrhizon Forst.
Arum macrorrhizum L.
Colocasia macrorrhiza Schott.

***Amaranthus viridis* L.**
Amaranthus lividus L.

***Amorphophallus campanulatus* (Roxb.) Blume ex. Decne**
Amorphophallus paeoniifolius
Dracontium polyphyllum (Solander ex.) Parkinson
(Dennst.) Nicolson

***Ananas comosus* (L.) Merr.**
Ananas sativus Schutt. f.
Ananassa sativa Lindley
Bromelia ananas L.
Bromelia comosa L.

***Angiopteris evecta* Hoffman**
Angiopteris beecheyama de Vries
Angiopteris durvilleana de Vries
Angiopteris palmiformis C. Chr.
Polypodium evectum Forst.

***Artocarpus altilis* (Parkinson) Fosberg**
Artocarpus camansi Blanco
Artocarpus communis J. R. & G. Forst.

***Artocarpus heterophyllus* Lam.**
Artocarpus integra (Thunb.) Merr.
Artocarpus integrifolia L.

***Asplenium nidus* L.**
Neottopteris nidus J. Smith

***Barringtonia edulis* (Miers) Seemann**
Barringtonia excelsa sensu Seemann
Barringtonia seaturae sensu Payens
Butonica edulis (Seemann) Miers
Butonica samoensis Miers
Huttum edule (Miers) Brittons

***Barringtonia novae-hiberniae* Lauterbach**
Barringtonia brosimos Merrill & Perry
Barringtonia oblongifolia Knuth

***Barringtonia procera* (Miers) Knuth**
Barringtonia edulis (non Seemann) Bailey
Barringtonia excelsa (non Bl.) Benth
Barringtonia guppyana Knuth
Barringtonia magnifica Laut.
Barringtonia schuchardtiana K. Schum.
Barringtonia speciosa K. Schum.
Butonica procera Miers

***Benincasa hispida* (Thunb.) Cogn.**
Benincassa cerifera Savi

***Brassica juncea* (L.) Czernjaew & Coss.**
Brassica integrifolia (West) Rupr.
Sinapis juncea L.
Sinapis timoriana D. C.

***Brassica rapa* L. ssp. *parachinensis* (Bailey) Tsen & Lee**
Brassica chinensis L. var. *parachinensis* (Bailey) Tsen & Lee
Brassica parachinensis Bailey

***Brassica rapa* L. ssp. *pekinensis* (Lour.) Hanelt**
Brassica campestris L. ssp. *pekinensis* (Lour.) Olson
Brassica pekinensis (Lour.) Rupr.

***Brassica rapa* L. ssp. *chinensis* (L.) Hanelt**
Brassica campestris L. ssp. *chinensis* (L.) Makino
Brassica chinensis L.

***Burckella fijiensis* (Hemsley) A. C. Smith & S. Darwin**
Burckella macrantha Lam.
Burckella macropoda var. *macrantha* Lam. & van Royen
Burckella multinervis Lam.
Burckella thurstonii sensu Gillespie
Chelonespermum fijiense Hemsley

***Burckella* sp. (*Cassidispermum megahilum* Hemsley)**
Cassidispermum megahilum Hemsley

***Burckella obovata* (G. Forster) Pierre**
Bassia obovata Forster
Burckella hollrungii Pierre
Burckella kajiewskii (Guillaumin) Lam.
and probably *Burckella coco* (Scheffer) Pierre

***Cajanus cajan* (L.) Millsp.**
Cajanus indicus Spreng.
Cytisus cajan L.

***Canarium harveyi* Seemann**
For *C. harveyi* var. *harveyi:*
C. harveyi sensu Seemann

***Canarium indicum* L.**
Canarium commune L.
Canarium nungi Guillaumin

***Capsicum annuum* L.**
Capsicum frutescens L.

***Capsicum frutescens* L.**
Capsicum minimum Roxb.

***Carica papaya* L.**
Papaya vulgaris C. D. C.

***Citrullus lanatus* (Thunb.) Matsum. & Nakai**
Citrullus vulgaris Schrader ex. Ecklon & Zeyher
Colocynthis citrullus (L.) O. Kuntze
Momordica lanata Thunb.

***Citrus aurantiifolia* (Christmann & Panzer) Swingle**
Citrus javanica Blume
Citrus notissima Blanco
Limonia aurantifolia Christm. & Panzer

***Citrus aurantium* L.**
Citrus aurantium var. *bigaradia* Brandis & Hooker
Citrus vulgaris L.

***Citrus grandis* (L.) Osbeck**
Citrus decumana Willd.
Citrus decumanus L.

***Citrus limon* (L.) Burm. f.**
Citrus limonia Osbeck

***Citrus macroptera* Montrouzier**
Citrus aurantium subsp. *saponacea* Safford
Citrus hystrix sensu Christophersen
Citrus vulgaris sensu Seemann

***Citrus reticulata* Blanco**
Citrus nobilis Andrews (non Lour.)

***Citrus sinensis* (L.) Osbeck**
Citrus aurantium L. var. *sinensis* L.

***Colocasia esculenta* (L.) Schott.**
Arum colocasia L.
Arum esculentum L.
Arum peltatum Lam.
Caladium esculentum Vent.
Colocasia esculenta Schott.
Eucolocasia esculenta Schott.

***Cordia subcordata* Lam.**
Cordia campanulata Roxburgh
Cordia hexandra Roem & Schult.
Cordia orientalis R. Br.

***Cordyline terminalis* (L.) Knuth**
Cordyline terminalis Kunth
Dracaena terminalis L.
Taetsia fructicosa Merrill

***Coriandrum sativum* L.**
Coriandrum diversifolium Gilib.
Coriandrum globosum Salisb.

Coriandrum majus Gouan
Coriandrum testiculatum Lour.

***Cucurbita moschata* Duchesne ex. Poiret**
Cucurbita pepo L. var. *moschata* Lam.

***Cucurbita pepo* L.**
Cucurbita esculenta Gray
Cucurbita fastuosa Salisb.
Cucurbita subverrucosa Willd.

***Curcuma longa* L.**
Amomum curcuma Jacq.
Curcuma domestica Lour.
Curcuma domestica Valeton

***Cycas rumphii* Miquel**
Cycas circinalis Blanco

***Cyrtosperma chamissonis* (Schott.) Merrill**
Cyrtosperma edule Schott.
Apeveoa esculenta Moerenhout
Arisacontis chamissonis Schott.
Cyrtosperma lasioides Griffith
Cyrtosperma merkusii (Hassk.) Schott.

D

***Daucus carota* L.**
Daucus gingidium L.

***Dioscorea bulbifera* L.**
Dioscorea aercidea Langley
Dioscorea sativa (non L. sp. Pl.) Thunb.

***Dioscorea esculenta* (Lour.) Burkill.**
Dioscorea aculeata L.
Dioscorea fasciculata Roxb.
Dioscorea papuana Warb
Dioscorea sativa L.
Dioscorea spinosa (Roxb. ex.) Hooker

***Dioscorea nummularia* Lam.**
Dioscorea glabra (non Roxb.) Koorders
Dioscorea hebridensis Knuth
Dioscorea palauensis Knuth
Dioscorea pirita Nadeaud
Dioscorea seemanii Prain & Burkill.

***Diplocyclus palmatus* (L.) C. Jeffrey**
Bryonopsis affinis (Endl.) Cogn.
Bryonopsis laciniosa auct., non L. and non (L.) Naudin

***Dracontomelon vitiense* Engler**
Dracontomelon sylvestre Seemann
Dracontomelum vitiense Engl. ex. Guillaumin

E

***Entada phaseoloides* (L.) Merr.**
Entada scandens Benth
Lens phaseoloides L.

F

***Finschia chloroxantha* Diels**
Finschia densiflora White ex. Walker
Finshia micronesica Kanehira
Finshia waterhousiana Burtt
Grevillea elaeocarpifolia Guillaumin
Grevillea micronesica Kanehira

***Flacourtia rukam* Zollinger & Morritzi**
Flakourtia euphlebia Merr.

***Fortunella japonica* (Thunb.) Swingle**
Citrus inermis Roxb.
Citrus japonica (Thunb.)

***Garcinia pseudoguttifera* Seemann**
Garcinia echinocarpa Seemann
Garcinia pancheri Guillaumin

***Gnetum gnemon* L.**
Gnetum acutatum Miquel
Gnetum ovalifolium Poir.
Gnetum sylvestris Brongn.
Gnetum vinosum Elmer

***Hibiscus sabdariffa* L.**
Hibiscus digitatus Cav.

***Hornstedtia scottiana* (F. Muel.) K. Schumann**
Elletaria scottiana F. Muell
Hornstedtia lycostoma (Laut. & K. Shum) Shum

***Inocarpus fagifer* (Parkinson ex. Zollinger) Fosberg**
Inocarpus edulis J. R. & J. G. Forst.
Inocarpus fagiferus Parkinson

***Ipomoea aquatica* Forskal**
Ipomoea reptans Poir.
Ipomoea repens Roth.

***Ipomoea batatas* (L.) Lam.**
Batatas edulis Choisy
Convolvulus batatas L.
Convolvulus chryzorrhizus (Soland. ex.) Parkinson

***Lablab purpureus* (L.) Sweet**
Dolichos albus Lour.
Dolichos cultratus Thunb.
Dolichos lablab L.
Dolichos purpureus L.
Lablab niger Medikus
Lablab vulgaris Savi

***Lactuca sativa* L.**
Lactuca scariola L. var. *hortensis* Bisch.
Lactuca scariola L. var. *sativa* Boiss.
Lactuca serriola L. var. *sativa* Moris

***Lagenaria siceraria* (Molina) Standley**
Cucurbita lagenaria L.
Cucurbita siceraria Mol.
Lagenaria idolatrica Seringe
Lagenaria leucantha (Duch.) Rusby
Lagenaria vulgaris Seringe

***Leucaena leucocephala* (Lam.) De Wit**
Leucaena glauca (Willd.) Benth.
Leucaena latisiliqua (L.) Gillis

***Litchi sinensis* Sonnerat**
Dimocarpus litchi Lour.
Litchi philippinensis Radlk.

Litchi sinense J. Gmelin
Nephelium litchi Cambess

***Luffa acutangula* (L.) Roxburgh**
Cucumis acutangulus L.

***Lycopersicon esculentum* Miller**
Lycopersicon lycopersicum (L.) Karsten
Solanum lycopersicum L.

M

***Macadamia ternifolia* F. Muell.**
Macadamia integrifolia Maid. & Betch

***Manihot esculenta* Crantz**
Jatropha manihot L.
Manihot aipi Pohl
Manihot dulcis Pax
Manihot palmata Muell.-Arg.
Manihot utilissima Pohl

***Mentha spicata* L.**
Mentha viridis L.

***Metroxylon warburghii* Heim. Beccari**
Coelococcus warburgii Heim.

***Momordica charantia* L.**
Momordica balsamica Blanco non L.
Momordica chinensis Sprengel
Momordica cylindrica Blanco non L.
Momordica elegans Salisb.
Momordica indica L.

***Morinda citrifolia* L.**
Morinda bracteata Roxburgh
Morinda citrifolia var. *bracteata* (Roxb.) Hook f.
Morinda indica L.
Morinda litoralis Blanco

N

***Neisosperma oppositifolium* (Lam.) Fosberg & Sachet**
Cerbera oppositifolia Lam.
Cerbera parviflora Forst.
Ochrosia oppositifolia K. Schum.
Ochrosia parviflora Hensl.

O

***Ocimum basilicum* L.**
Ocimum americanum L.

***Ocimum gratissimum* L.**
Ocimum sanctum L.

P

***Pachyrrhizus erosus* (L.) Urban.**
Dolichus erosus L.
Pachyrrhizus angulatus Rich. ex. D. C.
Pachyrrhizus bulbosus (L.) Kurz.

***Pandanus dubius* Sprengler**
Pandanus hombronii F. Muell.

***Pandanus tectorius* Parkinson**
Pandanus odoratissimus L. f.

***Persea americana* Miller**
Laurus persea L.
Persea drymifolia Schlecht. & Cham.
Persea gratissima Gaertn. f.
Persea nubigena

***Petroselinum crispum* (Mill.) Nyman ex. A. W. Hill**
Carum petroselinum Benth.
Petroselinum hortense Hoffman
Petroselinum vulgare J. Hill
Petroselinum sativum Hoffman

***Phaseolus vulgaris* L.**
Phaseolus esculentus Salisb.

***Piper methysticum* Forst. f.**
Macropiper methysticum Miquel

***Piper nigrum* L.**
Piper aromaticum Lam.

***Pipturus argenteus* (Forst. f.) Weddell**
Pipturus propinquus Seemann
Pipturus velutinus Seemann
Urtica argenteus (Forst. f.) Weddell

***Planchonella grayana* St John**
Lucuma vitiensis Gillespie
Planchonella costata (Endlicher) Pierre var. *vitiensis* Lam.
Pouteria costata var. *vitiensis* Baehni
Sapota vitiensis A. Gray
Sideroxylon vitiense Benth. & Hook.

***Polyscias cissodendron* (C. Moore & F. Mueller) Harms**
Molyscias monticola Harms
Panax cissodendron C. Moore & F. Muell.
Panax myriophyllus Baillon
Tieghemopanax microcarpus Viguier
Tieghemopanax neo-ebudarum (Guillaumin) Stone

***Polyscias cumingiana* (K. Presl.) Fernandez-Villar**
Anomopanax cumingianus (K. Presl.) Merr.
Nothopanax crispatum (ex. Bull.) Merr.
Nothopanax ornatum (ex. Bull.) Merr.
Nothopanax pinnatum (Lam.) Miquel
Polyscias filicifolia (C. Moore ex. E. Fourn) Bailey
Polyscias sorongensis Gibbs

***Polyscias fruticosa* (L.) Harms**
Nothopanax fructicosa (L.) Miquel
Nothopanax obtusum (Blume) Miquel
Polyscias obtusa (Blume) Harms
Tieghemopanax fructicosus (L.) Viguier

***Polyscias guilfoylei* (Bull.) Bailey**
Nothopanax guilfoylei (Bull.) Merr.
Nothopanax fructicosum (L.) Miquel var. *victoriae*

***Polyscias multijuga* (A. Gray) Harms**
Noothopanax multijugum (A. Gray) Seemann
Paratropia multijuga A. Gray
Polyscias excelsa (Guillaumin) B. C. Stone
Polyscias nusedhul (Guillaumin) B. C. Stone
Tieghemopanax excelsa Guillaumin
Tieghemopanax nusedhul Guillaumin

***Polyscias samoensis* (A. Gray) Harms**
Arthrophyllum kaltenbachii Riedl-Dorn & Riedl
Nothopanax samoense (A. Gray) Seem.

***Polyscias scutellaria* (Burman f.) Fosberg**
Aralia cochleata Lam.
Nothopanax cochleatum (Lam.) Miquel

Nothopanax scutellarium (Burm. f.) Merrill
Nothopanax tricochleatum Miquel
Panax pinnatum J. R. & G. Foster
Polyscias umbellata Sprengel

***Pometia pinnata* J. R. & G. Forst.**
Aphania neo-ebudica Guillaumin
Nephelium pinnatum Camb
Pometia alnifolia (Blume) Radlk.
Pometia coriacea Radlk.
Pometia tomentosa Teysm. & Binnend

***Psidium cattleianum* Sabine**
Psidium littorale Raddi

***Psidium guajava* L.**
Psidium aromaticum Blanco

***Psophocarpus tetragonolobus* (L.) D. C.**
Botor tetragonolobus (L.) O. Kuntze
Dolichos ovatus Grah.
Dolichos tetragonolobus L.

***Pueraria lobata* (Willd.) Ohwi**
Dolichos lobatus Willd.
Pachyrrhizus trilobus D. C.
Pueraria hirsuta Schneider
Pueraria novoguiniensis Warb.
Pueraria thunbergiana (Sieb.& Zuc) Benth
Pueraria triloba Backer

***Rorripa nasturtium* (L.) Mensfeld**
Nasturtium officinale L.
Nasturtium officinale R. Brown
Rorippa officinalis (R. Br.) P. Royen
Sisymbrium nasturtium-aquaticum L.

***Sechium edule* (Jacq.) Swartz**
Chayota edulis Jacq.
Sechium americanum Poiret

***Sida rhombifolia* L.**
Sida microphylla Cav.
Sida retusa L.

***Solanum americanum* Miller**
Solanum nigrum auct. non L.
Solanum nodiflorum Jacq.

***Solanum melongena* L.**
Solanum coagulans Forsskal
Solanum cumingii Dunal
Solanum pressum
Solanum undatum Poiret sensu Ochse

***Spondias cytherea* Sonnerat**
Evia dulcis (Parkinson) Kostermans
Spondias dulcis Solander ex. Forst. f.

***Sterculia vitiensis* Seemann**
Sterculia tannaensis Guillaumin

***Streblus pedulinus* (Endl.) Muell., F.**
Morus brunoniana Endl.
Morus pendulina Endl.
Pseudomorus brunoniana (Endl.) Bur.

***Syzygium clusiifolium* (A. Gray) Mueller**
Eugenia clusiaefolia A. Gray

***Syzygium malaccense* (L.) Merrill & Perry**
Eugenia malaccensis L.
Eugenia richii sensu Guillaumin, non A. Gray
Jambosa domestica Rumph.
Jambosa malaccensis (L.) D. C.

***Syzygium richii* (A. Gray) Merrill & Perry**
Eugenia richii A. Gray
Eugenia ritchei A. Gray ex. Seem.)
Jambosa richii Mueller

***Tacca leontopetaloides* (L.) O. Kuntze**
Chaitea tacca (Solander ex.) Parkinson
Leontice leontopetaloides (Amann) L.
Tacca littorea Rumphius
Tacca pinnatifida J. R. Forst.

***Trichosanthes ovigera* Blume**
Trichosanthes cucumeroides (Seringe) Maxim.
Trichosanthes himalensis C. B. Clarke

***Vanilla fragrans* (Salisb.) Ames**
Vanilla mexicana P. Miller
Vanilla planifolia Andrews
Vanilla viridiflora Blume

Vigna unguiculata* subsp. *unguiculata* (L.) (Walpe.) Verde. groupe *sesquipedalis
Dolichos sesquipedalis L.
Vigna sesquipedalis (L.) Fruhw.
Vigna sinensis (L.) Hassk. ssp. *sesquipedalis* (L.) van Eseltine
Vigna unguiculata (L.) Walp. ssp. *sesquipedalis* (L.) Verdc.
Vigna unguiculata var. *sesquipedalis* (L.) Ohashi

***Wollastonia biflora* (L.) D. C.**
Melanthera biflora (L.) Willd.
Wedelia biflora D. C.

***Xanthosoma sagittifolium* (L.) Schott.**
Arum sagittaefolium L.
Xanthosoma edule (Mey.) Schott.
Xanthosoma xanthorrhizon (Jacq.) C. Koch

***Ximenia americana* L.**
Ximenia elliptica Forst. f.
Ximenia spinosa Salisb.

ANNEX 4

Herbarium specimens

Abelmoschus manihot
P. Curry: PaCu1354
J. Josiah: JJ102, JJ42
L. Kalomor: LKa102, LKa74
P. Kamasteia: PK24

Acacia simplex
H. S. McKee: RS24310
H. S. McKee: RS24249
P. Cabalion: PC3106
C. Wee Lek: RS273
S. Gowers: SLG191

Acalypha grandis
G. Bourdy: GB585, GB240, GB992
P. Cabalion: PCV1691, PCV306, PCV2042, PCV1503, PCV1608, PCV1171, PCV567, CV1648, PCV2041, PCV1198, PSG1012, PSG1010
P. Curry: PaCuP1527, PaCu869, PaCu559, PaCu561, PaCu562, PaCu780, PaCu1317, PaCu562, PaCu561, PaCu869, PaCu780, PaCu559, PaCu1317, PaCu1527
Chew Wee-Lek: CWL160, CWL192, CWL308
S. Gowers: SLGNH70
N. Hallé: NH6306
J. Josiah: JJ10
L. Kalomor: LKa103
J. Raynal: JR16303
S. Seoule: SS20
B. Suprin: BS343
C. Sam: CSV2099, CSV355
D. S. Walsh: DSW68
A. Walter: AW434, AW45
J. I. Wheatley: JWV584, JWV212, JWV661, JWV856, JWV869, JWV247

Aceratium oppositifolium
P. Cabalion: PC1200, PC1542, PC967, PC2181, PC3051, PC2689, PC1657
G. Bourdy: GB1038, GB651
C. Wee Lek: RS116
C. Sam: CS175
P. S. Green: RS1279
M. Schmid: SC3177S

Adenanthera pavonina
P. Curry: PaCu838, PaCu683
P. Cabalion: PCV1049, 2222
S. Gowers: SLGNH86, 175
J. Josiah: JJ4, JJ115
L. Kalomor: LKa5, LKa101
J. Tavoa: JT6
D. S. Walsh: DSW158
J. I. Wheatley: JWV682, 876

Agathis macrophylla
S. Gowers: SLGNH1

Aleurites moluccana
P. Cabalion: PCV2894
Chew Wee-Lek: CWL307
P. Curry: PaCu339, PaCu1221
S. Gowers: SLGNH129
J. Josiah: JJ90
C. Sam: CSV320, 884, 1012
J. I. Wheatley: JWV310

Amaranthus viridis
P. Cabalion: PCV3086, PCV1623, PCV1622, PCV2245
A. N. Gillison: ANG16433
H. S. McKee: HSMK24334, HSMK24126
C. Sam: CSV360

Amorphophallus campanulatus
N. Hallé: NH6453
P. Curry: PaCu1481, PaCu1578

Ananas comosus
A. Walter: AW318

Angiopteris evecta
A. F. Braithwaite: RS2591, RS2163, RS2497

G. Bourdy: GB818, GB939, GB1084, GB18
P. Cabalion: PC2686, PC1927
C. Sam: CS338

Annona muricata
G. Bourdy: GB299
H. S. McKee: HSMK24259
L. Kalomor: LKa67

Artocarpus altilis
J. Josiah: JJ95, JJ46
L. Kalomor: LKa62
P. Kamasteia: PK17

Asplenium nidus
C. Sam: CSV2014
P. Curry: PaCu406, PaCu1364

B

Barringtonia edulis
A. Walter: AW311, AW312, AW442
Chew Wee-Lek: CWL115
G. Mescam: GM36
I. de Garine: IG45
J. I. Wheatley: JWV519, JWV520
N. Hallé: NH6288
P. Curry: PaCu391, PaCu392, PaCu319, PaCu319, PaCu391
P. Cabalion: PCV286
P. S. Green: PSG1031
S. Gowers: SLGNH150, SLGNH178, SLGNH30
C. Sam: CSV1036, 424, 425, 439, 440, 451, 496, 519, 552, 592, 596, 600, 605, 606, 612, 613, 615, 618, 619, 628, 630, 633, 635, 643, 688, 692, 693, 758, 761, 764, 770, 771, 772, 775, 776, 777, 778, 782, 784, 804, 806, 864

Barringtonia novae-hiberniae
C. Sam: CSV 424, 425, 439, 440, 451, 496, 519, 552, 592, 592, 596, 600, 605, 606, 612, 613, 615, 618, 619, 628, 630, 633, 635, 643, 688, 692, 693, 758, 761, 764, 770, 771, 772, 775, 776, 777, 778, 782, 784, 804, 806, 864, 1036.

Barringtonia procera
L. Kalomor: LKa73
C. Sam: CSV420, 422, 447, 474, 476, 477, 478, 482, 492, 517, 522, 528, 553, 560, 570, 571, 584, 585, 611, 616, 617, 621, 622, 672, 673, 674, 676, 690, 781, 799, 814, 815, 816, 823, 824, 835, 838, 859, 860, 890, 891, 893, 895, 896, 941, 964, 997, 1038, 1039, 1040, 1042, 1043

Begonia vitiensis
C. Sam: CSV324
H. S. McKee: HSMK24163
I. de Garine: IG29
J. Raynal: JR16283
P. Cabalion: PCV2603, PCV2697, PCV1263, PCV2846
Files Kamasteia: PK62
P. Kamasteia: PK62

Brassica juncea
H. S. McKee: HSMK24235
P. S. Green: PSG24235
S. Seoule: SS75, SS75

Burckella fijiensis
C. Sam: CSV960

Burckella obovata
J. Josiah: JJ66
L. Kalomor: LKa68
P. Curry: PaCu1331, PaCu989, PaCu989, PaCu1455, PaCu1111, PaCu1144, PaCu1291, PaCu1297
C. Sam: CSV473 485, 538, 541, 572, 573, 624, 625, 696, 699, 769, 774, 906, 973, 989, 1006

***Burckella* sp. (syn.: *Cassidispermum*)**
C. Sam: CSV1026

C

Cajanus cajan
P. Cabalion: PC1189, PC2251, PC2043, PC1576
H. S. McKee: RS24277
G. Bourdy: GB806
A. Walter: AW191

***Calamus vanuatuensis* (= *C.* sp. aff. *vitiensis*)**
C. Sam: CSV2012
P. Curry: PaCu520, PaCu609, PaCu0

Canarium indicum
C. Sam: CSV430, 434, 442, 452, 457, 467, 468, 469, 479, 481, 490, 495, 543, 551, 561, 574, 579, 580, 595, 603, 626, 631, 632, 644, 647, 655, 656, 685, 687, 697, 765, 792, 797, 825, 831, 832, 833, 834, 865, 869, 872, 883, 899, 901, 902, 907, 907, 943, 974, 983, 998, 1003, 1019, 1021, 1022, 1023, 1024, 1027, 1028, 1030, 1031, 1033, 1034, 1035, 1037, 1044, 1045, 1046, 1047, 1048

Canarium harveyi
J. I. Wheatley: JWV377
P. Curry: PaCu481
C. Sam: CSV1018, 456, 491, 525, 549, 558, 559, 575, 578, 586, 657, 682, 683, 684, 691, 807, 877, 878, 879, 880, 882, 897, 898, 936, 937, 961, 980;
RMV1, 2, 3, 4, 6, 7

Canarium indicum
A. Walter: AW300, AW214, AW253
C. Sam: CSV2067
Chew Wee-Lek: CWL392
D. S. Walsh: DSW43, DSW37
G. Mescam: GM23
H. S. McKee: HSMK24184
J. W. Parham: JWP11357
J. I. Wheatley: JWV378, JWV167
P. Curry: PaCu829, PaCu385, PaCu482, PaCu430, PaCu430, PaCu482, PaCu606
P. Cabalion: PCV2656, PCV2416, PCV2416, PCV1570
S. Gowers: SLGNH131
P. Curry: PaCu606

Canarium* cf. *salomonense
C. Sam: CSV870

Canarium vanikoroense
C. Sam: CSV945

Canarium vitiense
C. Sam: CSV453;
JWV479, 482, 559

Canarium vulgare
RMV5;
C. Sam: CSV686

Capsicum frutescens
P. Curry: PaCu849, PaCu1010
P. Kamasteia: PK26

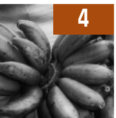
Carpoxylon macrospermum

Caryota ophiophellis
Scott Zona: SZo728

Carica papaya
H. S. McKee: HSMK24276
J. Josiah: JJ35

Castanospermum australe
PCV685; SLGNH38; CSV908; DSW188; JWV296

Casuarina equisetifolia
C. Sam: CSV2116
H. S. McKee: HSMK 24301
J. Josiah: JJ92
J. M. Veillon: JMV4525
J. Raynal: JR16284
L. Kalomor: LKa88,
P. Curry: PaCu866, PaCu403, PaCu0, PaCu866
P. Cabalion: PCV1961, PCV2470
P. S. Green: PSG1092
S. Gowers: SLGNH190



Cassia occidentalis
A. Walter: AW394, AW81
C. Sam: CSV5
G. Bourdy: GB226
P. Curry: PaCu329, PaCu316, PaCu316, PaCu329
P. Cabalion: PCV1845, PCV1617

Citrullus lanatus
A. Walter: AW362
H. S. McKee: HSMK24278
P. Curry: PaCu1089, PaCu1089

Citrus macroptera
PCV752, 1467;
C. Sam: CSV414; DSW30
P. Curry: PaCu1365, PaCu576

Cocos nucifera
J. Josiah: JJ20

Coffea arabica
A. Walter: AW211

Corynocarpus similis
CSV413, 913, 950bis

Cordyline terminalis
A. Walter: AW210
C. Sam: CSV2017, CSV2042
Chew Wee-Lek: CWL380
J. I. Wheatley: JWV142
N. Hallé: NH6338
P. Curry: PaCu263, PaCu970, PaCu1606, PaCu1349, PaCu1140, PaCu1012, PaCu1012, PaCu568, PaCu807, PaCu818, PaCu1255, PaCu1012, PaCu1349, PaCu1255, PaCu568, PaCu807, PaCu1140, PaCu818, PaCu970, PaCu1606, PaCu263
P. Cabalion: PCV569, PCV1592
P. Kamasteia: PK69
R. Navian: RNa22

Corynocarpus similis
A. E. Beveridge: AEB3002
A. Walter: AW151
B. Suprin: BS360
C. Sam: CSV2072
D. S. Walsh: DSW104
F. Tzerikiantz: FT7
G. Bourdy: GB620, GB995, GB734
I. de Garine: IG30
J. I. Wheatley: JWV747, JWV233
N. Hallé: NH6279
P. Curry: PaCu1501, PaCu1357, PaCu1271, PaCu1304, PaCu1304
P. Cabalion: PCV2275, PCV2802, PCV2008, PCV1862, PCV1713, PCV1127
Ph. Morat: PhM7425
S. Gowers: SLGNH138

Cordia subcordata
B. Suprin: BS389
C. Sam: CSV61
Chew Wee-Lek: CWL. 38
G. Bourdy: GB1176
J. M. Veillon: JMV5573
J. I. Wheatley: JWV578, JWV887, JWV326
L. Kalomor: LKa86
Lord Medway: LdM
M. Kilman: MK1
P. Curry: PaCu669, PaCu856, PaCu0, PaCu744, PaCu856, PaCu669, PaCu744
P. Cabalion: PCV2464, PCV1084
P. S. Green: PSG16265
S. Gowers: SLGNH99

Cordyline terminalis: **n. d.**
C. Sam: CSV358
G. Bourdy: GB501, GB584, GB1118
G. Mescam: GM30
P. Cabalion: PCV2050, PCV906, PCV1492, PCV1730

Cryptocara wilsonii
Schmid 3769

Cucurbita moschata
A. Walter: AW358
G. Bourdy: GB280
G. Mescam: GM9
H. S. McKee: HSMK24251
J. Josiah: JJ118
P. Curry: PaCu414, PaCu414

***Curcuma longa:* n. d.**
P. Kamasteia: PK58

***Cyathea lunulata:* n. d.**
J. Josiah: JJ8
P. Curry: PaCu287, PaCu1674

Cyrtandra obovata
P. Cabalion 2116, 1989,
P. S. Green RSNH 1158,
G. Bourdy 1050

***Cycas rumphii:* n. d.**

Cyrtandra neoebudica
P. Cabalion: PCV2551
P. S. Green: PSG1296

Cyrtandra obovata
P. Cabalion: PCV2116, PCV1989
P. Kamasteia: PK59
P. S. Green: PSG1158

Cyrtandra schizocalyx
A. Berry: AB9
J. Raynal: JR16377
P. Cribb: PCr38
P. Cabalion: PCV725

***Cyrtandra schizocalyx:* n. d.**

D

Dennstaedtia samoensis
G. Mescam: GM3
A. Walter: AW418
G. Bourdy: GB1089

Dicksonia brackenridgei
P. Cabalion: PC2854
A. F. Braithwaite: RS2398, RS2121
I. De Garine: IG26
J. Raynal: RS16188

Dioscorea alata
P. Curry: PaCu515, PaCu515
P. Cabalion: PCV1810

Dioscorea bulbifera
A. Walter: AW113
G. Bourdy: GB1189, GB679
I. de Garine: IG44
P. Curry: PaCu236, PaCu995,
PaCu995, PaCu995, PaCu236
P. Cabalion: PCV2418, PCV2749
R. Clark: RC10
S. Seoule: SS66

***Dioscorea esculenta:* n. d.**
CSV 2341

Dioscorea nummularia
A. Walter: AW315
H. S. McKee: HSMK24257
P. Cabalion: PCV2389

Dioscorea pentaphylla
G. Bourdy: GB345
I. de Garine: IG5
P. Cabalion: PCV2438
R. Clark: RC14

***Dioscorea rotundata-cayenensis:* n. d.**
CSV 2342

***Dioscorea trifida:* n. d.**
CSV 2340

Diplazium harpoides
P. Curry: PaCu969, PaCu969,
PaCu1019, PaCu1019, PaCu465

Diplazium proliferum
C. Sam: CSV37,
H. S. McKee: HSMK24052
P. Curry: PaCu1659
P. Cabalion: PCV2244, PCV2703,
PCV2242, PCV2703

Diplocyclos palmatus
H. S. McKee: RS24222
P. Cabalion: PC1715, PC2876

Donax caniformis
A. Walter: AW485, AW120, AW413
B. Suprin: BS283
Cribb&Wheatley: C/W6
C. Sam: CSV2016, CSV2058, CSV335
D. S. Walsh: DSW42

G. Bourdy: GB911, GB295, GB1141, GB481, GB630
H. S. McKee: HSMK24098
J. Raynal: JR16293
L. Kalomor: LKa91
N. Hallé: NH6452
P. Curry: PaCu900, PaCu421, PaCu988, PaCu1472, PaCu1351, PaCu1225, PaCu516, PaCu435, PaCu773, PaCu1351, PaCu1472, PaCu1225, PaCu988, PaCu516, PaCu773, PaCu900, PaCu435, PaCu421
P. Cabalion: PCV3043, PCV2620, PCV564, PCV2177, PCV997
Ph. Morat: PhM7418, PhM7410

Dracontomelon vitiense
A. N. Gillison: ANG3510
A. Walter: AW421, AW474
C. Sam: CSV2037, CSV2068, 437, 449, 463, 497, 498, 521, 554, 598, 604, 620, 639, 641, 740, 773, 785, 790, 791, 831, 871, 977, 986, 1000, 1001
Chew Wee-Lek: CWL393
I. de Garine: IG50
J. I. Wheatley: JWV588
P. Curry: PaCu676, PaCu1490, PaCu496, PaCu676, PaCu496
P. Kamasteia: PK18
P. S. Green: PSG1098
T. C. Whitmore: TCW3025, TCW3035

Elaeocarpus chelonimorphus
A. Walter: AW168
J. I. Wheatley: JWV675, JWV404
M. Schmid: MS3858
P. Cabalion: PCV2548, PCV881, PCV2548;
RSNH3858;
C. Sam: CSV927

Elatostema macrophylla
P. Curry: PaCu1587

Entada phaseoloides
C. Sam: CSV2040
P. Curry: PaCu910, PaCu582, PaCu775, PaCu694
R. Navian: RNa27

Epipremnum pinnatum
A. Walter: AW3, AW270
C. Sam: CSV2015
G. Bourdy: GB244, GB77, GB635
H. S. McKee: HSMK24062
J. Josiah: JJ44
J. Raynal: JR16222
N. Hallé: NH6426
P. Curry: PaCu939, PaCu940, PaCu433, PaCu448, PaCu448, PaCu433, PaCu939
P. Cabalion: PCV1285, PCV1351, PCV2684, PCV3053, PCV2370
Ph. Morat: PhM7439

Ficus adenosperma
A. Berry: AB20
L. Kalomor: LKa129
P. Curry: PaCu1005, PaCu1016, PaCu1016, PaCu1667, PaCu1342, PaCu601
P. Kamasteia: PK43
G. Bourdy: GB230, 703, 878; PCV1148, 1172, 1347, 2029, 2406; PhM7468;
SLGNH52, 148;
RSNH31, 364, 1067, 1141, 1201, 16252, 16288, 24133, 24242;
C. Sam: CSV224, 392;
DSW026;
AW258;
JWV187

Ficus aspera
A. Walter: AW546
F. Tzerikiantz: FT6
P. Curry: PaCu1497, PaCu1102, PaCu571
G. Bourdy: GB1265;
PCV1792, 2216, 2305, 2460;
RSNH15, 55, 268, 385, 16029, 24243;
C. Sam: CSV403, 408;
DSW106

Ficus granatum
P. Curry: PaCu1456
P. Kamasteia: PK49
G. Bourdy: GB441, 912;
PCV1487, 3060, 3061;
IG15;
SLGNH108;
C. Sam: CSV137, 962;
RSNH136, 1286, 3862

Ficus scabra
C. Sam: CSV2100
L. Kalomor: LKa117
P. Curry: PaCu971, PaCu996, PaCu999, PaCu1438, PaCu1542, PaCu808, PaCu1400, PaCu1281
GB76, 488, 637, 782, 1127, 1312;
PCV2403, 2532, 3031;
PaCu808, 917, 1281, 1400, 1438, 1542;
RSNH196, 1311, 16215, 16253, 16369;
C. Sam: CSV470, 623, 721, 963, 972, 1015

Ficus smithii
A. Berry: AB8
R. Navian: RNa43

Ficus storckii
C. Sam: CSV2048, CSV2080
P. Curry: PaCu468, PaCu1509, PaCu1571, PaCu1607, PaCu612

Ficus tinctoria
J. Josiah: JJ71, JJ58
P. Curry: PaCu945, PaCu973, PaCu973, PaCu1360, PaCu1097, PaCu1136, PaCu915, PaCu785, PaCu812
P. Kamasteia: PK44, PK45, PK31
G. Bourdy: GB855;
PCV1195, 1762, 2685;
RSNH1118, 1205, 1209, 24154, 24271;
DSW105;
JWV284

Ficus virgata
L. Kalomor: LKa24
P. Curry: PaCu976, PaCu976
G. Bourdy: GB719, 1269;
PCV2071, 2427;
PaCu530, 976;
RSNH105, 167;
C. Sam: CSV905;
AW188

Ficus wassa
C. Sam: CSV2086
J. Josiah: JJ112
L. Kalomor: LKa61
P. Curry: PaCu963, PaCu1000, PaCu733, PaCu1343, PaCu1059, PaCu517, PaCu457, PaCu878, PaCu567, PaCu1262
G. Bourdy: GB1145;
CSV725, 967, 1011bis

Finschia chloroxantha
PB3;
G. Bourdy: GB154, 156, 344, 666;
PCV1605, 3083;
CSV451bis, 745, 950;
AW278;
JWV546

Flacourtia rukam
C. Sam: CSV77
Chew Wee-Lek: CWL132
P. Curry: PaCu1096, PaCu1150, PaCu522, PaCu1308, PaCu1312, PaCu522, PaCu1308, PaCu1312, PaCu1150, PaCu1096
P. Cabalion: PCV1038, PCV1265, PCV1738
RSNH132

Freycinetia impavida
P. Curry: PaCu271, PaCu975

Garcinia pseudoguttifera
J. Josiah: JJ1
L. Kalomor: LKa138
P. Curry: PaCu964, PaCu356, PaCu1163, PaCu1259, PaCu1303
P. Kamasteia: PK46
C. Sam: CSV731

Gnetum costatum
PB2

Gnetum gnemon
A. Walter: AW121
D. S. Walsh: DSW41, DSW171
J. Josiah: JJ64, JJ69
P. Curry: PaCu0, PaCu1289, PaCu1265, PaCu1298, PaCu1265, PaCu1289, PaCu1298
P. Kamasteia: PK41
PB1;
C. Sam: CSV917, 1007 ; DSW41, 171

Graptophyllum pictum
H. S. McKee: RS24202
P. Morat: PM5221
N. Hallé: RS6449

Haplolobus floribundus

Hedycarya dorstenioides
G. Bourdy: GB624, GB368, GB1029
C. Sam: CS58, CS387, CS85, CS174
P. Cabalion: PC1352, PC2776, PC1201, PC1493, PC883, PC992, PC2095, PC869, PC700
A. Walter: AW51, AW272

Heliconia indica
P. Cabalion: PC2441
G. Mescam: GM13, GM7, GM31
G. Bourdy: GS265
J. Raynal : RS16285

Hibiscus sabdariffa: **n. d.**

Hibiscus tiliaceus
J. Josiah: JJ36
L. Kalomor: LKa2
L. Kalomor: LKa96
P. Curry: PaCu824, PaCu415, PaCu495
P. Kamasteia: PK16

Hornstaedia scottiana
P. Curry: PaCu1167

Inocarpus fagiper
J. Josiah: JJ24
P. Curry: PaCu833, PaCu389, PaCu726, PaCu497
P. Kamasteia: PK20
C. Sam: CSV427, 448, 450, 458bis, 462, 465, 526, 545, 548, 555, 562, 563, 581, 583, 593, 594, 599, 629, 636, 638, 706, 711, 712, 713, 714, 715, 716, 733, 741, 759, 763, 766, 768, 786, 787, 789, 793, 794, 808, 975, 976, 987, 990, 1016

Ipomoea aquatica
H. S. McKee: HSMK24296

Ipomoea batatas
H. S. McKee: HSMK24260, HSMK24226

K

Kleinhovia hospita
P. Curry : PaCu844, PaCu1510, PaCu500, PaCu688

L

Lablab purpureus
F. Tzerikiantz: FT8

Lagenaria siceraria
CSV 2339

Leucaena leucocephala
J. Josiah: JJ87
L. Kalomor: LKa4

Leucosyke australe
PH. Morat: PM7452, PM5185, PM7475
P. Cabalion: PC1930, PC1405, PC3021
G. Bourdy: GB354, GB709
D. S. Walsh: DS023
A. Walter: AW266
C. Sam: CS79
M. Schmid: RS3857
B. Suprin: BS309
P. Cabalion: PC2801
C. Wee Lek: RS221

Litchi sinensis
S. Gowers: SG. 67

M

Maesa ambrymensis
G. Bourdy: GB105;
P. Cabalion: PCV734, 1671bis, 2120;
PhM 7467;
RSNH1020, 16062, 24070;
C. Sam: CSV203;
SS18;
DSW126;
JWV665

Maesa nemoralis
A. Berry: AB15
L. Kalomor: LKa46
P. Curry: PaCu1027

Malaysia scandens: **n. d.**
CSV 2073, CSV 301
G. Bourdy 1195
P. Curry 1486, 1441
P. Cabalion 2314
Igor de Garine 14

Manihot esculenta
A. Walter: AW314, AW313
G. Mescam: GM34
J. Josiah: JJ22
P. Curry: PaCu429, PaCu429
P. Cabalion: PCV1609
P. Kamasteia: PK23

Mangifera indica
A. Walter: AW198, AW205, AW204
H. S. McKee: HSMK24207
P. Kamasteia: PK10

Marattia smithii
P. Curry: PaCu275, PaCu382, PaCu445

Melanthera biflora
A. Walter: AW246, AW111
C. Sam: CSV242
H. S. McKee: HSMK24120

J. Raynal: JR16068
J. I. Wheatley: JWV423, JWV158
N. Hallé: NH6382
P. Curry: PaCu1404, PaCu598
P. Cabalion: PCV2654, PCV739, PCV2044
P. S. Green: PSG1330
S. Seoule: SS25

***Mentha spicata:* n. d.**

***Mentha piperita:* n. d.**

Metroxylon warburgii
J. Josiah: JJ80, JJ27
P. Curry: PaCu696
Scott Zona: SZo734

Momordica charantia
A. Walter: AW13
B. Suprin: BS380
C. Sam: CSV132
D. Koroiveibau: DKo10794
G. Bourdy: GB779
H. S. McKee: HSMK24318
L. Kalomor: LKa9
P. Cabalion: PCV2512, PCV2240, PCV1807

Morinda citrifolia
J. Josiah: JJ106, JJ38
J. Tavoa: JT21
L. Kalomor: LKa72
P. Curry: PaCu755, PaCu839, PaCu324, PaCu1208
G. Bourdy: GB541, 500, 788, 1136, 1227;
PaCu324, 755, 839;
SLGNH143;
RSNH1101, 16024;
C. Sam: CSV540, 916; SS7;
A. Walter: AW46, 497;
JWV165, 551

***Musa* sp.**
P. Kamasteia PK29

N

Neisosperma oppositifolium
A. Thomas: AT2494
G. Bourdy: GB444, GB347
J. Josiah: JJ29, JJ75, JJ53
L. Kalomor: LKa82
P. Curry: PaCu731, PaCu731
S. Seoule: SS5
T. Sevenet: TS1217
J. I. Wheatley: JWV515, JWV681
P. Cabalion: PCV1480
S. Gowers: SLGNH16

O

Ocimum basilicum
A. Walter: AW236
P. Cabalion: PCV1228

Ocimum gratissimum
C. Sam: CSV315
G. Bourdy: GB1137
P. Curry: PaCu1191, PaCu1191
P. Cabalion: PCV1227

Ocimum sanctum
C. Sam: CSV96, CSV25, CSV95
D. S. Walsh: DSW66, DSW226
G. Bourdy: GB309
H. S. McKee: HSMK24313
P. Cabalion: PCV2673

Pandanus dubius
C. Sam: CSV547

Pandanus tectorius
RSNH1219, 16209, 1072

Pangium edule
G. Bourdy: GB1013;
P. Cabalion: PCV257, 1781;
Pat Curry: PaCu1098;
SLGNH134;
RSNH384, 4535;
C. Sam: CSV310, 944;
DSW209;
A. Walter: AW116;
JWV317;

Pangium edule
A. Walter: AW116
C. Sam: CSV310
Chew Wee-Lek: CWL384
D. S. Walsh: DSW209
G. Bourdy: GB1013
J. Josiah: JJ50
J. M. Veillon: JMV4535
J. I. Wheatley: JWV317
P. Curry: PaCu1098, PaCu1098
P. Cabalion: PCV257, PCV1781
S. Gowers: SLGNH134

Passiflora edulis
P. Kamasteia: PK98

Passiflora foetida
P. Curry: PaCu836, PaCu718

Passiflora maliformis
C. Sam: CSV2044
P. Curry: PaCu1533

Pemphis acidula
C. Sam: CSV2108
J. Josiah: JJ91, JJ55
L. Kalomor: LKa87
P. Curry: PaCu670, PaCu1413, PaCu714, PaCu1286

Persea americana
P. Cabalion: PC2486
D. S. Walsh: W72
G. Mescam: GM52

Physalis angulata
P. Curry: PaCu1595

Piper methysticum
C. Wee Lek: RS50
C. Sam: CS128
D. S. Walsh: DSW213, DSW220, DSW219, DSW221, DSW223

Pipturus argenteus
PB38;
C. Sam: CSV730

Pisonia grandis
P. Curry: PaCu846, PaCu932, PaCu1011, PaCu454, PaCu1293

Pithecellobium dulce: **n. d.**

Planchonella grayana
G. Bourdy: GB129;
P. Cabalion: PCV1015, 1789, 1883, 2319;
Pat Curry: PaCu732, 923, 1550, 1565;
SLGNH82, 139;
RSNH1203, 24100;
C. Sam: CSV405, 970;
DSW121;
JWV709

Polyscias cissodendron
Chew Wee-Lek: CWL78
G. Bourdy: GB423, GB200, GB1104
Gil.& Bev: 3522
J. M. Veillon: JMV4559
J. Raynal: JR16346
J. I. Wheatley: JWV648
P. Curry: PaCu984, PaCu984, PaCu984
P. Cabalion: PCV1991, PCV2188, PCV2818, PCV2348, PCV1650, PCV1057, PCV895
Ph. Morat: PhM7445, PhM7474

Polyscias fructicosa
A. Walter: AW540, AW541, AW97, AW226, AW496
I. de Garine: IG35
P. Cabalion: PCV2033, PCV1670
R. Navian: RNa18
S. Gowers: SLGNH66

Polyscias samoensis
P. Curry: PaCu931, PaCu1392, PaCu1392

Polyscias scutellaria
A. Walter: AW382
C. Sam: CSV297
F. Tzerikiantz: FT3
G. Bourdy: GB245, GB263, GB796, GB150
J. Josiah: JJ100, JJ26
L. Kalomor: LKa116
P. Curry: PaCu724, PaCu588, PaCu588
P. Cabalion: PCV2670, PCV2513, PCV2032, PCV711, PCV2514
S. Gowers: SLGNH69

Pometia pinnata
P. Curry: PaCu840, PaCu1346, PaCu483
P. Kamasteia: PK13
PB15;
C. Sam: CSV534, 660, 734, 735

Pouteria costata
A. Walter: AW551
P. Curry: PaCu732, PaCu1550, PaCu1565, PaCu923

Pseuderanthemum carruthersii
A. Walter: AW542, AW115
G. Bourdy: GB490
G. Mescam: GM27
H. S. McKee: HSMK6361
L. Kalomor: LKa108
P. Curry: PaCu728, PaCu611, PaCu611, PaCu728
P. Cabalion: PCV743, PCV2284, PCV2289, PCV2535, PCV1672
P. S. Green: PSG1206

Pseuderanthemum longifolium
A. Walter: AW549
P. Curry: PaCu717, PaCu717

Pseuderanthemum pelagicum
F. Tzerikiantz: FT2
J. M. Veillon: JMV4564
N. Hallé: NH6303
P. Curry: PaCu1518
P. Cabalion: PCV1942, PCV1429, PCV565
P. S. Green: PSG1280

Psidium cattleianum
D. S. Walsh: DSW100
P. Cabalion: PC1956

Psidium guajava
A. Walter: AW5
C. Sam: CS52
I. de Garine: IG46

Psophocarpus tetragonolobus

Pteris comans
P. Curry: PaCu348

Pteris pacifica
A. Walter: AW482
C. Sam: CS323
G. Bourdy: GB487
J. E. Braggins: JB21, JB8760
A. F. Braithwaite: RS2006, RS2526
G. Bourdy: GB636
R. Willan: RW6

Pteris tripartita
A. F. Braithwaite: RS2557, RS2493
J. Raynal: RS16423
G. Bourdy: GB271, GB693
A. Walter: AW27
R. Willan: RW8
P. Cabalion: PC2613

Pueraria lobata
J. Josiah: JJ110, JJ40
P. Curry: PaCu772, PaCu1502, PaCu1362

Rorripa nasturtium
I. de Garine: IG20
N. Hallé: RS6398
J. Raynal: RS16309
H. S. McKee: RS24197
P. Cabalion: PC1851, PC2643

Rubus rosifolius
P. S. Green: RS1075
J. Raynal: RS16060
P. Cabalion: PC1839
N. Hallé: RS6280

Salvia splendens
A. Walter: AW268
P. Cabalion: PC2511, PC2516

Senna occidentalis
A. Walter: AW394, AW81
P. Watt: PW38
P. Cabalion: PC2243, PC2434, PC3012, PC1846, PC2279, PC1617
J. M. Veillon: RS4510
C. Sam: CS5, CS293
G. Bourdy: GB499, GB226

Scleropyrum aurantiacum
PB6, 41

Sida rhombifolia
R. Clark: RC3
I. de Garine: IG32
A. Walter: AW15, AW18, AW331, AW3, AW457, AW201, AW218, AW457, AW234
P. Cabalion: PC2616, PC1548, PC2021, PC1717, PC1173
G. Bourdy: GB482, GB883, GB516, GB883
H. S. McKee: RS24085, RS24209
P. Watt: PW26
C. Sam: CS8, CS369

Solanum melongena
P. Curry: PaCu651

Solanum americanum.
A. Walter: AW543

Solanum torvum
Ph. Morat: 5530

Spondias eriadulcis
D. S. Walsh: DSW82
C. Sam: CSV459, 460, 461, 471, 472, 484, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 537, 556, 567, 577, 650, 651, 652, 661, 662, 665, 666, 667, 668, 669, 670, 679, 680, 681, 779, 822, 829, 830, 873, 978, 663, 664, 1002
Chew Wee-Lek: CWL394
J. I. Wheatley: JWV484
L. Kalomor: LKa89
P. Curry: PaCu499, PaCu499
P. Cabalion: PCV2611, PCV572

Streblus pedulinus
J. Tavoa: JT13
P. Curry: PaCu1564

Sterculia schumanniana
PB25, 71

Sterculia vitiensis
G. Bourdy: GB157;
PCV1635;
PaCu1454;
SLGNH115;
C. Sam: CSV994;
JWV782

Streblus pendulinus
C. Sam: CS302
P. Cabalion: PC2430
A. N. Gillison: RS3542

Syzygium clusiifolium
J. Josiah: JJ52
L. Kalomor: LKa81
P. Curry: PaCu1459, PaCu1396,

PaCu1290, PaCu1275
P. Kamasteia: PK33
PCV1128;
AG3543;
CSV969;
DSW114;
JWV608

Syzygium malaccense
C. Sam: CSV428, 431, 432, 436, 444, 464, 480, 520, 523, 590, 591, 597, 703, 707, 819, 820, 909, 966, 982

Syzygium nutans
CSV438, 1029

Syzygium richii
PCV2277, 2599;
PaCu1461;
SLGNH156;
RSNH1216;
CSV87, 881;
SS42;
JWV611

Syzygium samarangense
JWV620;
PG & JWV114

***Syzygium* spp.**
C. Sam: CSV494, 566

Tacca leontopetaloides
S. Séoulé: SS30
G. Bourdy: GB319
P. Cabalion: PC1997, PC2489, PC1331
C. Sam: CS130
A. Walter: AW42

Tectaria latifolia
C. Sam: CSV2001, CSV2057
P. Curry: PaCu987, PaCu987, PaCu1539, PaCu1603

Terminalia catappa
A. Walter: AW426, AW174
D. S. Walsh: DSW2
G. Bourdy: GB1183, GB388
I. de Garine: IG49
J. Josiah: JJ98, JJ72
J. I. Wheatley: JWV657
P. Curry: PaCu395, PaCu511, PaCu511, PaCu395
P. Cabalion: PCV2209, PCV2471
S. Gowers: SLGNH37, SLGNH109
AM003;
CSV423, 445, 446, 466, 486, 487, 489, 493, 499, 518, 532, 533, 535, 536, 569, 576, 607, 608, 609, 610, 627, 637, 642, 659, 677, 678, 694, 695, 698, 757, 780, 783, 795, 796, 811, 868, 968, 979, 999, 1013, 1017

Terminalia samoensis
C. Sam: CSV2113
P. Curry: PaCu1420, PaCu1420
P. Cabalion: PCV3114; PCV2209;
PaCu1420;
CSV488, 531, 539, 836

Terminalia sepicana
C. Sam: CSV248
D. S. Walsh: DSW216
G. Bourdy: GB843, GB421
J. I. Wheatley: JWV489, JWV405, JWV791
L. Kalomor: LKa139
P. Curry: PaCu1120, PaCu1120
GB421, 843;
PCV1785;
CSV248, 911, 932, 946, 1014;
DSW216;
JWV405, 489, 791

Theobroma cacao
P. Curry: PaCu828

Trichosanthes ovigera
D. S. Walsh: DSW140
P. Curry: PaCu1361, PaCu1361
P. S. Green: PSG1112

Vaccinium macgillivreyi
P. Curry: PaCu241

Veitchia arecina
P. Curry: PaCu979

Veitchia macdanielsii
P. Curry: PaCu702
S. C for S. Zona: S. C for SZo733, SZo735, SZo737, SZo736

Veitchia sp.
J. Josiah: JJ81
P. Curry: PaCu1476, PaCu1353, PaCu1356, PaCu513, PaCu607
Scott Zona: SZo724, SZo723, SZo731, SZo721, SZo732, SZo718, SZo719, SZo720

Wollastonia biflora
A. Walter: AW285
G. Bourdy: GB103, GB752,GB223
P. Cabalion: PCV2453, PCV2713, PCV1295
D. S. Walsh: DSW16
L. Kalomor: LKa47
P. Curry: PaCu1418, PaCu1419, PaCu1421, PaCu598, PaCu1404, PaCu1421
P. Kamasteia: PK6

Xanthosoma sagittifolium
P. Cabalion: PCV2344
P. Kamasteia: PK28

Ximenia americana
P. Curry: PaCu1448

Zea mays
H. S. McKee: HSMK24258

Zehneria bauheriana
A. Walter: AW228
B. Suprin: BS363
C. Sam: CSV2041
Chew Wee-Lek: CWL152, CWL193
G. Bourdy: GB91
I. de Garine: IG6
J. Raynal: JR16308, JR16307
P. Curry: PaCu1032, PaCu1224
P. Cabalion: PCV898
P. S. Green: PSG1281

Zehneria mucronata
P. Curry: PaCu1032, PaCu1224

Zingiber zerumbet
P. Curry: PaCu1580
P. Kamasteia: PK57
R. Navian: RNa30

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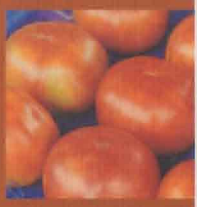
RMV: Roger Malapa
PhM: Philippe Morat
RSNH: Royal Society Expedition
CSV: Chanel Sam
SS: Siri Seoule
DSW: D. S. Walsh
AW: Annie Walter
JWV: Joss Wheatley



Annie Walter, a researcher at the Institut de Recherche pour le Développement (IRD), is a specialist on ni-Vanuatu knowledge of medicinal and food plants. She is also the author of a work on the fruiting trees of Oceania.

Vincent Lebot, a researcher at the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), works on the agrobiodiversity of subsistence agriculture. He is the author of numerous publications on plants of Melanesia.

In Oceania, particularly in Vanuatu, gardens are the evidence of an ancestral rural tradition in which food plants are at one and the same time an indispensable resource, the symbols of a community and the objects of barter or trade. The ni-Vanuatu devote themselves with true passion to their gardens, within which they collect, select and diversify a rich botanical heritage.

Perusing this abundantly illustrated work, the reader will discover the full diversity of Oceanian food plants as well as the many exotic species introduced by the great explorers of the 16th century. Each species is the subject of a detailed dossier that describes amongst other things the variability, morphology, mode of cultivation and production of the plant as well as its different uses. The CD-ROM that accompanies the book provides information in greater detail for the specialist: bibliographic references, details and descriptors of yams and taros, photos illustrating the morphological variability, and much more. With the aim of preserving this exceptional plant heritage to the greatest possible extent, this work will draw the attention of a wide public to the gardens of Vanuatu, and to this Oceanian agriculture that combines a variety of multicultural contributions with great originality.

Key words
Agrobiodiversity – Food Plants – Oceania

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