Ethnobotany of the Yali

of West Papua

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Contents

ABSTRACT

A general ethnobotanical study of the Yali people was conducted in the Sibi valley in the highlands of West Papua (Jayawijaya, Irian Jaya). The communities were living in a state of relative isolation and relying almost entirely on traditional technology, with substantial use of forest products. Data were collected on the uses and/or properties of 250 wild and cultivated plant species, and over 400 species and cultivar names were recorded in the Yali language. The data are discussed in the context of Yali culture and way of life, and are compared with ethnobotanical records from other New Guinea indigenous peoples. In general it was found that the plant species used by the Yali and the way in which they were employed bore strong similarities to those of most highland peoples of New Guinea.

INTRODUCTION

The Snow Mountains

The Snow Mountains of West Papua constitute the highest part of the central mountain range (Central Cordillera) of New Guinea. The region supports relatively large populations of tribal people, cultivating sweet potatoes in the valleys as their staple crop and speaking languages of the Trans-New Guinea language phylum.

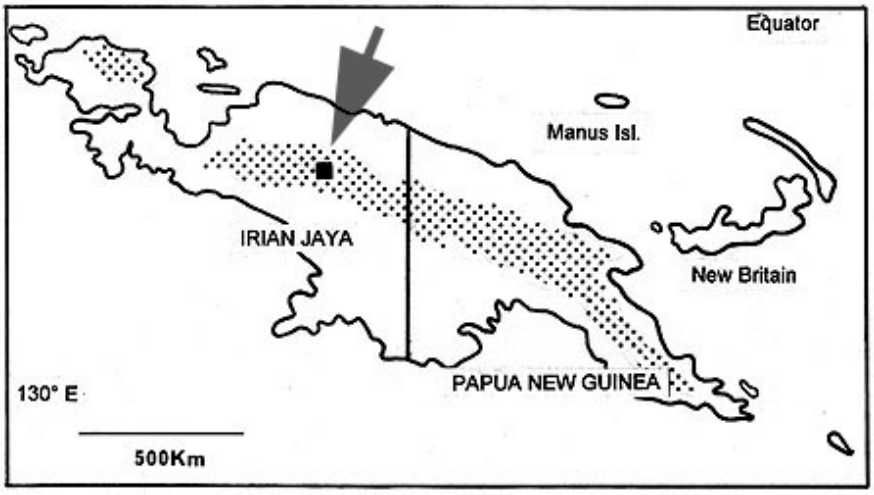

Fig. 1. Location of the study area in New Guinea

Until relatively recently this area was almost entirely unexplored. Early in the 20th century expeditions reached the southern slopes of the Snow Mountains range, and in 1921-22 the Kremer expedition reached the northern slopes, but it was not until 1938 that the Grand Baliem Valley, now the administrative focus of the region, was first sighted by an outsider. The American explorer Richard Archbold, on a reconnaissance flight for his third New Guinea expedition, flew over the valley by chance and was astonished by the evidence of a substantial population and a highly developed system of agriculture. He mounted a major exploratory expedition to the area in 1938-39 (Archbold *et al.*, 1942), which was followed by an influx of explorers and missionaries after the end of the Second World War. In 1955 the Dutch Parliament passed a bill allowing missionary societies unrestricted access to the tribes of the highlands. Protestant proselytisers began to spread through the region with great rapidity, and Catholics followed closely on their heels (Muller, 1991).

In 1963 West Papua passed from Dutch administration and was taken under colonial rule by Indonesia. The transition was not without its difficulties and some controversial acculturation policies were implemented. These included *operasi koteka*, in 1971, which attempted to rid the highland peoples of their penis gourds and impose conformity with Indonesian standards and ideals (Gietzelt, 1989). There followed a period of considerable civil unrest in the region, much of which was put off limits to foreign visitors. In recent years the ruling government has modified its direct reform programmes for more subtle methods of effecting change.

The Yali

Almost forty percent of the indigenous population of New Guinea lives between 1400m and 2700m a.s.l. in the valleys of its Central Cordillera, and the Baliem valley supports one of the densest populations in that range (Powell, 1976a). The Yali inhabit the rugged mountainous terrain which lies east of the valley, living in small villages of round thatched houses perched on the valley sides. The villages consist of one or more of the large (sacred) men's houses and a cluster of smaller family huts built nearby. Their society is strictly male-dominated, and a man's wealth is measured by the number of pigs and wives he possesses. Magic and sorcery traditionally play a very important role in their spiritual culture. The Yali practise shifting cultivation, relying primarily on sweet potato and taro as their staples, and gather supplementary food from the

forest by hunting and gathering. Apart from the clearing and digging of new fields, cultivation and harvesting are the preserve of the women whereas men devote their time to hunting, house construction and at times warfare. Their material culture is based almost entirely upon forest products, and until the 1960s they relied upon stone cutting implements.

The Yali speak a language related to but distinct from that spoken by the Dani. This forms part of the Ngalik-Nduga subfamily (spoken also by the Pesegem south of the Baliem valley), which is part of the Greater Dani language family (Heider, 1970). The name Yali, otherwise written as Jalé, derives from the Dani word *jalé-mó* which means 'lands to the east'. This has been adopted by Koch (1974) to define the population which 'lives east of the Baliem valley; has a cultural tradition which is in many aspects distinct from that of the Dani people; and concentrates its settlements in the Sévé, Jaxólé and Ovaxak Valleys, north of the central divide, and in the Seng Valley, south of it' (see Fig. 1). This area, referred to as Jalémó or Yalimo (Southern Jalemo according to Heider (1970)), was estimated in the late 1960s to support a population of approximately 10,000 (Koch, 1974).

The history of these peoples' early contacts with outsiders is related by Koch (1974). In 1960 an agreement was reached between missionaries of the Protestant Church of Irian Jaya (Geredja Kristen Indjili; GKI) and American missionaries that Yalimo was to be GKI territory, and in March 1961 an exploratory expedition reached Piliam in the Sibi valley, where a mission was established. Later in the same year an airstrip was constructed at Anggruk in the neighbouring Yaholi valley, and another mission was set up. The Piliam mission was moved to the neighbouring village of Pronggoli in November 1963, where in 1964 another airstrip was built. Further missions were soon established in the other valleys of Yalimo, and proselytising and the education of young boys were initiated.

Warring between different groups of the Yali is, traditionally, common. The inhabitants of the Sibi valley, where this study was carried out, have in the past maintained extremely stormy relations with those of the Yaholi valley to the southwest. These took the form of a series of killings and retaliatory attacks between 1940 and 1966, sparked off by the killing of a Dani man in the Sibi valley (Koch, 1974). Subsequent reprisals by the Indonesian police, combined with the influence of the missionaries, have effectively halted most intra-tribal violence in the region.

The study site

The village of Ilamik lies on the northern slope of the Fungfung ridge near the head of the Sibi valley (see Fig. 2) at an altitude of 1700m a.s.l. It was chosen for its relative isolation and its proximity to undisturbed forest. The valley is reached on foot by a trail from Kurima at the southern end of the Baliem valley. This runs over the shoulder of Gunung Elit (3600m), traversing lower montane forest, upper montane elfin moss forest and, at its highest point (Matik, 3300m), a subalpine plateau of bogs, rhododendrons and tree ferns with stands of *Libocedrus*, *Podocarpus* and *Dacrycarpus* on the high ground.

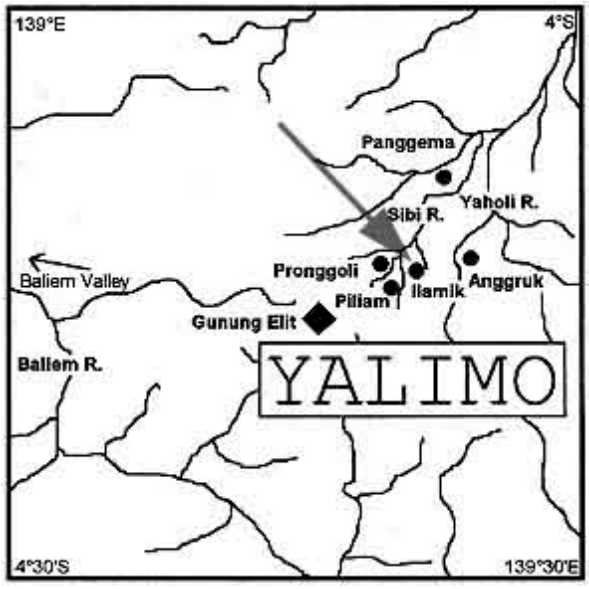

Fig. 2. Sketch map of the study area

The principal village in the valley is Pronggoli, where there is a small airstrip and a GKI mission station. The Indonesian-appointed headman (*Kepala desa*) for the region, Eduard Kabak, was also living at Pronggoli during the study. The village of Ilamik, whose name means 'mosquito' in Yali, was founded in 1972 by Singni Pahabol. At the time of study there were 48 inhabitants (including children), many of whom came from the village of Piliam and all but one of whom bore either of the 'sib' names Pahabol and Kabak. Ilamik is surrounded by forest, which is virtually continuous eastwards towards Anggruk but is broken to the west and north by secondary vegetation and cultivated land.

The head of the Sibi valley is girt by impressive limestone cliffs and the ridges are clothed in forest which descends, generally, as far as the uppermost villages. These cling to remarkably steep valley sides, and in places the ground is dangerously unstable. Rock falls were regularly heard during the study period from a particularly unstable area close to Ilamik, and in 1990 an earthquake precipitated a landslide which wiped out

the village of Piliam with the loss of over 100 people.

Towards the valley bottom the land has largely been cleared of forest for cultivation, some of which is now abandoned and covered with grass and scrub, with an abundance of *Casuarina oligodon* trees (Casuarinaceae). The valley is very broad at its head, with several affluents, but narrows further down before merging with the Pondeno river.

The clearing around Ilamik had grown up to a mixture of scrub and low trees with a height of about 5m. Although largely secondary in nature, the composition of this vegetation appeared to reflect strongly that of the surrounding forest. The forest in the immediate surrounds of the village is significantly disturbed. It stands on damp ground with many small boggy patches, and is strongly dominated by *Nothofagus* cf. *grandis* (Fagaceae), corresponding to the 'beech-forest' described in the region by Brass (1941a). Epiphytes are abundant, including many Ericaceae, ferns, Orchidaceae, Gesneriaceae and *Freycinetia* species (Pandanaceae). The trees and fallen logs (and in places the ground also) are abundantly blanketed with mosses, resulting in substantial intermixing of the terrestrial and epiphytic flora. Further up the valley sides the forest becomes more mixed in composition, and *Pandanus* and tree ferns become more abundant. At the crest of the Fungfung ridge between Ilamik and Anggruk (approx. 2500m a.s.l.) the forest is elfin. Some patches of forest in the gullies below the ridge crest display an apparently secondary nature, dominated by the softwood tree *Parasponia riqida* (Ulmaceae). This is almost certainly as a result of landslides rather than of human disturbance.

It is suspected that the annual rainfall in this area is higher than on the other side of Gunung Elit, although there are no known data to support this. Wamena, in the Baliem valley, receives an average of approximately 2100mm annually (Heider, 1970). It was said that whenever people are climbing the mountain it rains (not disproved during the expedition). The maximum temperature recorded at Ilamik during the visit was 29°C (under the eaves of the men's house), and the minimum (night) temperature was 14°C. The minimum temperature recorded at Matik (3300m) was 2°C.

RESEARCH AND METHODS

The data presented in this paper are the results of a one-month visit by the author (accompanied by Sertu Very Bakaru of POLRES Wamena) to a village of Yali people in September-October 1992. This formed part of the International Scientific Support Trust's 'Expedition to West Papua 1992', which was based in the Baliem Valley. The primary object of the visit was to conduct a systematic ethnobotanical study of the Yali. Given the limited time available in the field, the research was mainly restricted to a general survey among the people of the village of Ilamik, with subsidiary collections of species of higher plants encountered in fruit or in flower. Particular emphasis was placed on the use of forest species, although some information was also gathered on crop plants and agricultural methods.

Almost without exception, ethnobotanical data were supported by voucher specimens. Only when plants were readily identifiable in the field were these specimens not taken (i.e. common cultivated species). The data were further supported, where possible, by slide photographs and artefact collections. Herbarium specimens were collected using standard techniques and preserved in spirit (Schweinfurth method). Fertile voucher specimens are lodged at Bogor (BO), Kew (K), Leiden (L) and Edinburgh (E), and in some cases with the relevant taxonomic specialists at other herbaria. A complete set of vouchers (including sterile material) is maintained at Kew.

On arrival at Ilamik, botanical collection was begun with no attempt to gather ethnobotanical information. This was closely observed by the villagers. Next, vernacular names (if extant) were requested from the group of people who inevitably accompanied collection in the forest and preparation of specimens in the village. These names were written to conform as closely as possible to recognised Indonesian orthography. Subsequently, once the people had a reasonable understanding of the purpose of the research, ethnobotanical data were collected directly in three principal ways:

- Flowering and fruiting specimens were brought back to the village, and any information pertaining to them which was volunteered by the villagers was recorded.
- Specimens were taken of species which were said to be useful by the people who accompanied collecting work in the forest.
- Names of the species used for artefacts etc. seen around the village were recorded, and lists of plants

suitable for certain purposes (e.g. food, medicine etc.), were made. Efforts were then made to collect specimens of the named species.

Transfer of information was primarily conducted in Bahasa Indonesia which, as a consequence of the presence of a mission school at Pronggoli, most young males in Ilamik spoke fluently. This was not true of many of the older men, however, for whom it was necessary to employ a younger person as an interpreter. The author spoke functional Bahasa Indonesia but where necessary Very Bakaru assisted with translation into English. No information was collected from the women of the village, largely as a consequence of their reluctance to make sustained contact. The data gathered were double-checked, generally with the older men of the village and usually while the specimens were being pressed. Information over which an agreement could not satisfactorily be reached was discarded.

It was noted at Ilamik that plant species which did not occur in the vicinity of the village (some of considerable importance) were nonetheless being used, e.g. *Schizostachyum* and *Bambusa* spp. (Gramineae), *Calamus* and *Ptychococcus* spp. (Palmae), etc. In order to collect as many of these as possible, a short visit was made to Panggema (1350m a.s.l.), further down the valley. The lowest altitude at which collections were made was 900m. In addition, collections were made in the subalpine zone near Matik (3300m a.s.l.) during the return journey to Wamena, and these were accompanied by some ethnobotanical data provided by the young men from Ilamik who were employed as porters during the trip.

RESULTS AND DISCUSSION

Yali botanical nomenclature

Over 400 plant species and cultivar names were collected during the study. Without a working knowledge of the language it was not possible to make anything more than a superficial analysis of Yali botanical nomenclature. The names recorded here are pronounced as they would be if written in Bahasa Indonesia, the only significant difference being that the letter 'h', when in the middle of a word, is generally pronounced like a clearing of the throat: [x] in the International Phonetic Alphabet *fide* Koch (1974). Although Yali names have been directly equated with scientific names in this paper, it should be borne in mind that the structure of their nomenclatural system is likely to be substantially different from that of scientific taxonomy. Sillitoe (1983b, 1995), for example, found that the system used by the Wola in Papua New Guinea incorporated considerable (inherent) flexibility, particularly over the nomenclature of less common species, resulting in a 'surprising degree of dissent...calling into question the entire enterprise of matching Wola terms with those of natural science'. However it is very hard to gauge to what extent such discrepancies are the product of a flexible system or of individual ignorance or disinterest.

As is generally the case with folk taxonomy, the degree of nomenclatural differentiation depends on the degree to which a group of plants is used (utilitarianism). For the genus *Rhododendron* (Ericaceae), for example, whose only use appears to be its occasional employment in ritual, only one name (*walahen*) was given for the 20 species collected, in spite of the fact that they are strikingly different in appearance. Conversely, members of the genus *Pandanus* (Pandanaceae), which are largely useful but superficially rather similar in appearance, all possess specific names and could be distinguished with ease (by the Yali though not by the author) in the sterile state. *Pandanus* is a very important genus to the highland peoples of New Guinea, and may consequently be subject to complicated classification systems such as those reported from the Wopkaimin of the Star Mountains by Hyndman (1984).

Crop cultivar names were recorded by asking a group of men to name as many as they could think of (and agree upon), and almost no attempt was made to compare these with plants in the field, with the exception of *Abelmoschus manihot* (Malvaceae) and a few sweet potatoes. Heider (1970), however, noted that among the Dani there was a rather inexact nomenclature for the cultivars of sweet potato, with considerable confusion between them. Sillitoe (1980), who made a rather more detailed (quantitative) study of sweet potato nomenclature among the Wola of Papua New Guinea, found a 'startling lack of agreement' over the identification of cultivars. The group which he studied reached agreement over the construction of a list of existing names (such as that made in this study with the Yali), but not over which name referred to which plant (50% discrepancy). Studies of taro nomenclature gave similar results, which he attributed to an 'over-zealous classification' of plants of extreme importance to the tribe, out-stripping the capacity of the human memory. It is quite possible that a more detailed study of Yali crop nomenclature would prove similar.

When the Yali names refer to more than one species, these are almost invariably found to be members of the same Linnaean genus or family. Exceptions to this are names which are doubled (e.g. *kem-kem*, *mulun-mulun*, *tinggil-tinggil*). The doubling indicates a morphological comparison with the plant referred to by the single name (the latter generally being the more important useful species), but not a confusion of the two. The subalpine shrub *mulun-mulun* (*Symplocos conchinensis* ssp. *leptophylla* var. *orbicularis*, Symplocaceae), for example, does resemble the domesticated edible herb *mulun* (*Rungia klossii*, Acanthaceae), but the two could not possibly be confused. It is notable that several of the names of cultivars of domesticated plants are shared with forest species to which they bear no taxonomic relationship. Again, this is almost certainly the result of morphological similarities and is echoed among a great many other tribal peoples. Doubling of names also occurs in Dani nomenclature. *Lagenaria siceraria* (*Cucurbitaceae*), whose gourds are used for penis sheaths, is called *holim* whereas *Nepenthes* sp.(Nepenthaceae), an utterly different plant whose insect-traps resemble the gourds a little and are sometimes used as such by children, is called *holim-holim* (Purwanto and Walujo, 1992).

A great number of the plant names used by the Yali are completely different from those used by the neighbouring Dani people, including those of species which are equally fundamental to both groups such as *Ipomoea batatas* (Convolvulaceae), known by the Yali as *suburuk* and by the Dani as *hipere*). There are, however, a few species whose names are similar or exactly the same in the two languages (see Table 1).

Table 1

Comparison of selected Yali and Dani names of useful plants

Scientific name	Yali name	Dani name
Araucaria cunninghamii (Araucariaceae)	*sin*	*sin*
Casuarina oligodon (Casuarinaceae)	*wali*	*wille*
Colocasia esculenta (Araceae)	*hom*	*hom*
Dicranopteris linearis (Pteridophyta/Gleicheniaceae)	*tinggil*	*tikil*
Ficus copiosa (Moraceae)	*soluk*	*seluk*
Lagenaria siceraria (Cucurbitaceae)	*humi*	*holim*
Miscanthus floridulus (Gramineae)	*fiyanto*	*hite*
Nicotiana tabacum (Solanaceae)	*pali*	*hanum*
Schoenoplectus mucronatus (Cyperaceae)	*kem-kem*	*kilima*
Zingiber officinale (Zingiberaceae)	*hinde*	*iahe*

(Dani names taken from Purwanto and Walujo, 1992)

Use of plants by the Yali

Food

Although the Yali use many forest plants for food, the bulk of their diet is provided by their fields and kitchen gardens (*yawuk*) (Fig. 3). Their crops and their system of cultivation were not studied in detail, but a broad overview can be made. The staple crop is the sweet potato *Ipomoea batatas* (Convolvulaceae), as it is for most of the other tribes of the New Guinea highlands. This has been shown to constitute 80% of the diet of the people in the Wissel Lakes region of West Papua (Barrau, 1958). At least 49 cultivars of this crop were recognised by the people of Ilamik, and were apparently identified with ease either by their tubers or by their leaves (but see the discussion under 'Yali botanical nomenclature'). Other important crop plants at Ilamik included taro (*Colocasia esculenta*) of which 22 cultivars were recognised, highland pitpit (*Setaria palmifolia*, Gramineae), yam (*Dioscorea alata*, Dioscoreaceae; 10 cultivars), hibiscus spinach (*Abelmoschus manihot*; 3 cultivars), banana (*Musa* spp., Musaceae; 13 cultivars), sugar cane (*Saccharum officinarum*, Gramineae; 10 cultivars), and maize (*Zea mays*, Gramineae; 12 cultivars). Some of the crops currently grown by the Yali have been introduced relatively recently, including maize (*Zea mays*, Gramineae), peanuts (*Arachis hypogaea*, Leguminosae) and cabbages (*Brassica oleracea*, Cruciferae) which were distributed by GKI missionaries in 1964 (Koch, 1974). Several of the introduced crops, such as breadfruit (*Artocarpus altilis*, Moraceae) and cassava (*Manihot esculenta*, Euphorbiaceae), can only be grown at lower altitudes (e.g. at Panggema). A list of cultivated species is given in Table 2.

Table 2

Some food plants cultivated by the Yali

Species	Part eaten	Origins/ Introduction
Abelmoschus manihot (Malvaceae)	L	Ch
Allium sp(p). (Liliaceae)	B	CA-C20
Arachis hypogaea (Leguminosae)	S	N-C20
Artocarpus altilis (Moraceae)	F	Ma
Brassica oleracea (Cruciferae)	L	E-C20
Capsicum frutescens (Solanaceae)	F	N-C20
Carica papaya (Caricaceae)	F	N
Caryota sp. (Palmae)	St	P-D
Citrus aurantiifolia (Rutaceae)	F	Ma-C20
Colocasia esculenta (Araceae)	T	Ma
Dioscorea alata (Dioscoreaceae)	T	Ma
Ficus copiosa (Moraceae)	L	P-D
Ficus dammaropsis (Moraceae)	L	P-D
Ipomoea batatas (Convolvulaceae)	L T	St N
Lablab purpureus (Leguminosae)	F	I
Lagenaria siceraria (Cucurbitaceae)	F L	A
Lycopersicon esculentum (Solanaceae)	F	N-C20
Manihot esculenta (Euphorbiaceae)	T	N
Metroxylon sp. (Palmae)	St	Ma
Musa spp. (Musaceae)	F L	Me
Oenanthe javanica (Umbelliferae)	L St	P-D
Pandanus conoideus (Pandanaceae)	F	P-D
Phaseolus vulgaris (Leguminosae)	F	N-C20
Rungia klossii (Acanthaceae)	L St	P-D
Saccharum officinarum (Gramineae)	St	P-D
Sechium edule (Cucurbitaceae)	F L	N
Setaria palmifolia (Gramineae)	L	P-D
Solanum tuberosum (Solanaceae)	T	N-C20
Zea mays (Gramineae)	F	N-C20
Zingiber officinale (Zingiberaceae)	R	Me

B = bulb; F = fruit; L = leaf; R = rhizome; S = seed; St = stem; T = tuber.

A = Africa; CA = Central Asia; Ch = China; E = Europe; I = India; Ma = Malaysia; Me = Malesia; N = Neotropics; P-D = Papua (domesticated); C20 = 20th century introduction.

Just as there is considerable uncertainty over the origins of the New Guinea peoples (Keleny, 1962; Robbins, 1963), there has also been much speculation about the origins of the crops 'traditionally' cultivated by the highlanders of New Guinea, and the chronology of introduction of those which are not apparently indigenous. The sweet potato, which has been perhaps the most widely discussed (see Yen, 1963; 1964; Powell, 1976a) is now generally accepted as having come from the Americas, probably from northwestern South America, and to have been introduced to New Guinea at an unknown date. Heyerdahl (1950) demonstrated that early voyages from the Americas, which might have effected the introduction to Oceania, are not inconceivable, although the sweet potato probably only reached the New Guinea mainland considerably later. The nearest wild relative of the sweet potato is apparently the American species *Ipomoea trifida* (Kunth) G. Don, but although there has been

Fig. 3. Yali house and kitchen garden at Ilamik. Note the sugar cane and taro among the sweet potatoes surrounding the house, and the two styles of fence construction. The fields on the far ridge demonstrate the typical arrangement of the rectangular beds, and the impressive gradients on which the Yali are able to cultivate by using careful erosion control techniques.

speculation that this was the stock from which the cultigen arose (e.g. Nishiyama, 1963), current opinion holds that this was probably not the case (D. Austin, pers. comm.).

There is archaeological evidence suggesting that man has been in the New Guinea highlands for at least 11,000 years, in marginal areas for 26,000 years and in coastal areas for more than 40-50,000 years (Powell, 1976a; Hope & Golson, 1995). The wild ancestors of sugar cane, hibiscus spinach, highland pitpit and a number of other species were domesticated by the island's early inhabitants. The earliest crops to be introduced were probably taro, yams and bananas, perhaps as long as 8000 years ago (Powell, 1976a). As cultivars developed which could tolerate more extreme conditions (probably yams and bananas before taro), and climatic conditions changed (see Haberle, 1998) man was able to migrate to higher elevations. However, it was not until the sweet potato made its passage across New Guinea (from east to west) was he able to settle in the highest regions in which cultivation is found today (up to 2700m). This was made possible by the sweet potato's notable ability to adapt to a broad range of environments on account of its genetic heterozygosity and its relative freedom from pests and diseases (Kimber, 1972). Furthermore its ability to support pig populations is thought to have had a significant effect upon the role of wealth and prestige in the cultures of the peoples who adopted it as their staple crop (Kimber, 1972).

The system of cultivation employed by the Yali is essentially the same as that found throughout the region: a swidden system with mixed crops and mixed cultivars in raised beds separated from each other by ditches, and supported on steep slopes by wooden fences or stone walls (the latter particularly in the steeper-sided valleys where stones are abundant). The digging is done by the men, and the planting and harvesting largely by the women. The sweet potatoes were said to mature in five months, and the fields to be productive for five to ten years (depending upon local soil conditions), before being abandoned and overrun by weeds and grasses. According to Powell (1976a), sweet potato cultivation cycles in the New Guinea highlands generally incorporate fallow periods of 5-10 months between crops, followed by longer (5-10 year) fallow periods once the yields have dropped off. The relationship between land use and soil in the New Guinea Highlands has been examined in considerable detail by Sillitoe (1996) in the context of the Wola people.

The Yali system is perhaps less sophisticated that that of the neighbouring Dani in the Baliem valley where, according to Barrau (1958), 'drainage methods have been brought to a degree of perfection unequalled in the rest of Melanesia'. This is partly because of the more rugged terrain and partly because in Yalimo there is still forest available for slash-and-burn, whereas the Baliem valley has been devoid of primary forest for a long time and very careful land management is necessary. This includes intercropping with stands of the nitrogen fixing tree *Casuarina oligodon* (see Brass, 1941b).

Of the plant foods taken from the wild, by far the most important are the screw-palm (*Pandanus*) fruits. These abound in the forests (*parema*) of the upper Sibi valley, although on the whole they were sparse at the time of study. Heider (1970) noted that the Dani of the Baliem valley similarly took very little food from the forest apart from pandans and ferns. Sweet potatoes and taro, which make up the bulk of the diet, are poor sources of protein (Norgan *et al.*, 1979), and given the low quantity of animal protein consumed by the Yali it is likely that protein is deficient from their

Fig. 4. Temporary house in a *Pandanus* grove on the Fungfung ridge. The man on the left is the owner of the trees. Norte the large syncarp of *Pandanus antaresensis* on the ground. This was unripe, but was cut down for herbarium collection.

diet when the pandans are out of season. The wild pandans replace the cultivated *Pandanus conoideus* of the lower altitude villages, which is very much at the upper limit of its altitude range at Ilamik and was hardly seen at all. *Pandanus* trees, even when growing a long way from the villages, are each recognised as the property of a specific person and are jealously guarded. During the fruiting season platforms are sometimes built at their bases, which prevent arboreal mammals from climbing them and eating the fruits, and also act as signs of ownership. Similar practices have been recorded amongst the Wola of Papua New Guinea (Sillitoe, 1983a).

Table 3

Some wild food plants and fungi eaten by the Yali

Species	Part eaten
Acrophorus nodosus (Pteridophyta/Aspleniaceae)	young frond
Alpinia athroantha (Zingiberaceae)	stem base
Armillaria fuscipes (Fungi/Tricholomataceae)	fruiting body
Commelina diffusa (Commelinaceae)	leaf
Cyathea magna (Pteridophyta/Cyatheaceae)	young frond
Cyathea microphylloides (Pteridophyta/Cyatheaceae)	young frond
Cyathea spp. (x3) (Pteridophyta/Cyatheaceae)	young frond
Desmodium repandum (Leguminosae)	leaf, fruit
Desmodium uncinatum (Leguminosae)	leaf, fruit
Diplazium spectabilis (Pteridophyta/Aspleniaceae)	young frond
Diplazium sp (Pteridophyta/Aspleniaceae)	young frond
Dryopteris spp. (x2) (Pteridophyta/Aspleniaceae)	young frond
Elaeocarpus millarii (Elaeocarpaceae)	seed
Elaeocarpus womersleyi (Elaeocarpaceae)	seed
Lentinus araucariae (Fungi/Tricholomataceae)	fruiting body
Lentinus fasciatus (Fungi/Tricholomataceae)	fruiting body
Lentinus umbrinus (Fungi/Tricholomataceae)	fruiting body
Oudemansiella canarii (Fungi/Tricholomataceae)	fruiting body
Pandanus antaresensis (Pandanaceae)	fruit
Pandanus iwen (Pandanaceae)	fruit
Pennisetum macrostachyum (Gramineae)	young leaf base
Piper macropiper (Piperaceae)	leaf
Planchonia sp. (Lecythidaceae)	seed
Polyporus arcuarius (Fungi/Polyporaceae)	fruiting body
Pteridium aquilinum (Pteridophyta/Dennsteadtiaceae)	young frond
Rhyticarium elegans (Icacinaceae)	seed
Rubus rosaefolius (Rosaceae)	fruit
Schoenoplectus mucronatus (Cyperaceae)	rhizome
Setaria palmifolia (Gramineae; wild form)	young leaf base
Solanum americanum (Solanaceae)	leaf, stem
Zehneria cissybium (Cucurbitaceae)	fruit
senggenok (unidentified)	fruit

Eight edible pandans (*wiramna*) were named at Ilamik, of which only two were fertile and were collected (*Pandanus antaresensis* and *P. iwen*). The other six names of edible pandans may all represent distinct species or some of them may refer to 'cultivars'; Sillitoe (1983a) recorded 45 names of cultivars of the *P. julianettii/brosimos* complex (Section *Karuka*) among the Wola of Papua New Guinea. There are many records of the cultivation of *Pandanus julianettii* and *P. brosimos* (which are closely related to *P. iwen* and for the purposes of this paper will be regarded as conspecific), and it seems likely that at least some of these trees, which were abundant in the vicinity of Ilamik, had likewise been planted. Their fruits, which taste remarkably similar to coconut (and indeed are known in the Indonesian vernacular as *kelapa hutan* or 'forest coconut'), are eaten raw, roasted or smoked.

Leaves also play an important part in the Yali diet, and many of them are taken from the wild. The most prominent of these are the ferns, of which 13 species were said to be edible, but a number of higher plant species were collected whose leaves were also eaten. The degree to which these plants are used probably

depends to a large extent on the success of the cultivated crops (i.e. some of them may be 'famine foods'). Sillitoe (1996) lists 50 species of famine foods used by the Wola in Papua New Guinea, including a number of the species listed in Table 3 (i.e. *Commelina diffusa*, *Rubus rosaefolius*, *Solanum americanum*, *Desmodium repandum*, *Cyathea* spp. and *Diplazium* spp.

Stopp (1963), working with the Mount Hagen people of Papua New Guinea, pointed out that one could not rely on the people for an assessment of the edibility of fruits because so many of them were avoided for fear of the 'spell-of-death'. Soft fruits are relatively insignificant in the Yali diet; the abundant and moderately pleasant wild raspberry *Rubus rosaefolius* (Rosaceae) is occasionally picked, although with no great ardour, but the equally edible (to the author) *R. moluccanus* was said to be inedible. The only other fruits regarded as edible are collected for their seeds. A list of wild plant species eaten by the Yali is given in Table 3.

Nothofagus cf. *grandis* (Fagaceae), the commonest tall forest tree around Ilamik, and *Casearia* sp. (Flacourtiaceae) are secondary food plants, in that their trunks, when fallen and rotting, become infested with edible beetle larvae (*uluhan*). The Bomagai-Angoiang of Papua New Guinea deliberately girdle certain trees to encourage these grubs (Clarke, 1971), but this practice was not observed amongst the Yali. Thirteen species of edible fungi (*sak*) were named by the people of Ilamik, of which six were collected. One of these, *Lentinus fasciatus* (Tricholomataceae) was fruiting abundantly at the time of study and was eaten in large quantities by the author. At present there is very little published information on the edible fungi of New Guinea, but generally speaking they form only a minor component of the supplementary foodstuffs of New Guinea peoples (Shaw, 1984). However, the Dani of the Baliem Valley are reported to recognise at least 20 species of edible fungi (Wiriadinata, 1992), and Sillitoe (1995) recorded 46 among the Wola of Papua New Guinea, four of which are also eaten by the Yali (*Lentinus araucariae*, *L. umbrinus*, *Oudemansiella canarii* and *Polyporus arcuarius*). Sillitoe (1996) observed that among the Wola, levels of knowledge of edible fungi among the local women varied according to the local abundance of *Castanopsis acuminatissima* - a tree which supports a particularly large number of fungal species.

Salt is a highly desirable and valuable commodity for the Yali as for the other highland tribes of New Guinea. In many areas this is obtained directly from the ashes of certain salt-rich plants (Powell, 1976a). In the Snow Mountains it is extracted from naturally occurring brine pools by soaking the fibres from banana stems in the water and then drying and burning them (see Matthiessen, 1989, for a detailed description of this process among the Dani). The only such pools occurring in Yalimo are beside the Yaholi river near Anggruk (Koch, 1974), which the people of the Sibi valley were prevented from using for many years on account of the animosity between the valleys' inhabitants (see Introduction). They therefore had to make the much longer journey to Jiwika in Dani territory. Sea salt is now available for trade in Pronggoli.

Food gathering and cooking

Vegetables are gathered from the fields by the women, digging sweet potatoes from the ground with straight pointed sticks made from *Ardisia*, *Rapanea* (Myrsinaceae) or *Gardenia* (Rubiaceae) wood. Tubers may be taken from beneath the growing plants using a method similar to 'moiling' in traditional Pembrokeshire (UK) potato farming (G. Argent, pers. comm.), which maintains ground cover and thus presumably minimizes erosion on steep slopes. They are then loaded into string bags, and either taken to simple cooking huts beside the fields or brought back to the village.

The string bags (*sum*) used to carry food (Fig. 5) are an important part of Yali technology, and serve several other purposes. They are made from bark fibre (*hekel*) which is stripped from the twigs of a variety of tree and shrub species (mainly of the family Urticaceae - see Table 4), and rolled into a strong three-ply cord on the thigh. Regular cutting of the same bushes encourages coppice-type growth, producing suitably long and narrow twigs. The string is woven into bags of varying sizes using *Pandanus* leaf spacers to keep the mesh size regular. This is the preserve of the women, who are often seen to be engaged in this activity whilst chatting with other women in the village. Bark string is also used for a number of other purposes.

Fig. 5. String bag of the type often carried by men. Dyed with black (*Melastoma polyanthum*), orange (*Curcuma domestica*) and green (*Spathoglottis parviflora*) vegetable extracts.

String bags are often decorated with dyes. Those most commonly used at Ilamik were *Pittosporum pullifolium* (Pittosporaceae) fruits and *Melastoma polyanthum* (Melastomataceae) fruits for purple/black, *Phaius tankervilleae* (Orchidaceae) leaves for green, and a red clay (see 'Commerce'). Also used are *Gardenia lamingtonii* fruits (orange), *Curcuma domestica* (Zingiberaceae) rhizomes (yellow), and *Calanthe* and *Spathoglottis* (Orchidaceae) leaves (green). For additional decoration, coloured fibres from the stems of *Diplocaulobium regale* (Orchidaceae) and the leaves of *Freycinetia* spp. (Pandanaceae) may be wound around the strings of the bags, although this is much more common amongst the Dani in the Baliem valley.

Table 4

Plants which furnish bark fibres for making string bags etc.

Cypholophus cf. *gjellerupii* (Urticaceae)
Cypholophus cf. *vaccinioides* (Urticaceae)
Cypholophus sp. (Urticaceae)
Ficus arfakensis (Moraceae)
Ficus comitis (Moraceae)
Ficus dammaropsis (Moraceae)
Ficus sp. (Moraceae)
Goniothalamus sp. (Annonaceae)
Maoutia sp. (Urticaceae)
Pipturus cf. *argenteus* (Urticaceae)
Pipturus cf. *verticillatus* (Urticaceae)
Pipturus sp. (Urticaceae)

One of the principal modes of cooking employed by the Yali, as with many other Melanesian peoples, is the ground-oven (Fig. 6). This method is also traditionally used by the Maori of New Zealand, and was probably common in rural Iron Age and Mediaeval Europe (Steensberg, 1980). The food is cooked communally, for the whole village.

Stones are heated on a large pyre, and the shallow cooking pit is lined with leaves. The leaves of *Ischaemum polystachyum* (Gramineae) are commonly used - a species which invades old fields in abundance and is therefore in plentiful supply. Hot stones are then removed from the fire and a layer is placed in the bottom of the pit using tongs of partially split sapling trunks. Another layer of leaves is put down, and then a layer of vegetables, and small quantities of water may be poured in to provide steam. The sequence is repeated, perhaps several times, the sides of the pit being bound up periodically with vines as it rises above the surface of the ground. Cooking of vegetables takes approximately one hour.

Fig. 6. People of the Ilamik community cooking their food in a ground oven. Note the rattan hoops worn by the old man in the foreground, and the large laden string bags carried by the women.

The leaves of many plant species are recognised as suitable for lining ground-ovens, presumably either because they keep the steam in or because their aromatic contents impart a pleasant flavour to the food (or perhaps simply because they are known not to be poisonous or noxious). These include many aromatic Zingiberaceae, some of which may be wrapped around individual sweet potatoes or (when available) pieces of meat, and several Rubiaceae. The leaves of *Spathoglottis plicata* were specifically said to be used for wrapping the fruits of *Pandanus conoideus*, and banana leaves are used to separate the green vegetables (fern fronds, *Setaria* grass etc.) from the other leaf layers, with which they might otherwise become mixed.

Small ovens, used while travelling far from the village, may be constructed above ground level, their sides built up with tree bark. Similar ovens have been described among the Bomagai-Angoiang of the Bismarck Mountains (Clarke, 1971). One such oven seen on the mountain above Ilamik, said to have been made by three men on a cuscus (marsupial)-hunting expedition, had been fashioned from the fibrous bark of *Parasponia rigida* (Ulmaceae). However, if meat is not being cooked on such trips, then sweet potatoes or taro are usually simply placed among the ashes of the fire. One battered aluminium cooking pan was seen at Ilamik, but traditionally the only cooking vessel used by the Yali is a trough for removing the oily pericarp from around

the seeds of cooked *Pandanus conoideus* syncarps. These are usually made from tree barks which can be removed from the trunks in flexible slabs and which presumably do not taint the food with bitter flavours. Trees used for this purpose include *Alphitonia incana* (Rhamnaceae), *Glochidion novoguineense*, *G. perakense*, *Macaranga pleioneura* and *M. inermis* (Euphorbiaceae). One was seen at Panggema which had been made from the sheath of the sago palm *Metroxylon* sp. (Palmae).

Smoking

The Yali are enthusiastic smokers - men, women and even relatively young children. The smoking of tobacco (*Nicotiana tabacum*) is almost universal amongst New Guinea tribes, and has been comprehensively documented (Haddon, 1946). There is considerable controversy over when the plant (which is of South American origin) was introduced to the island, but it seems likely that it was brought by the early Portuguese and Dutch traders in the 16th or 17th centuries.

The Yali cultivate tobacco around their villages, generally beside the walls of the houses, and the leaves are hung inside to dry. They are carried around in small *Pandanus*-leaf pouches or loose inside string bags, together with the 'cigarette paper' leaves with which they are rolled into cigarettes (*sali*). A wide variety of plant species have been recorded as used for this purpose in New Guinea, of which banana and *Pandanus* seem to be the most widespread (Haddon, 1946). At Ilamik the most commonly used was *Acalypha hellwigii* (Euphorbiaceae), a bush which was apparently planted around the village specifically for this purpose. In the forest the leaves of *Glochidion* cf. *wisselense* were generally used. This is a very common shrub/treelet in the lower understorey, and the picking of its leaves seemed for some people to be an almost automatic activity whilst walking along a forest trail. Other species said to be suitable included *Astilbe papuana* (Saxifragaceae) and *Macaranga inermis* (Euphorbiaceae).

To make a cigarette, the dried wrapping leaf is first wetted in the mouth, then rolled (longitudinally) around a small quantity of unshredded tobacco. If no dry tobacco or wrapping leaves are available, the fresh ones are put on a hot stone beside the fire until they are ready. Smoke is drawn in with a sharp inhalation terminated by an audible click of the tongue against the palate. It was said that in the past tobacco was smoked in pipes (*hanum*), which is the Dani word for tobacco), but that these were no longer used. The bowls were made from the hollowed nuts of *Elaeocarpus millarii*, through which a small hole had been drilled and a narrow bamboo tube was attached. Haddon (1946) illustrates nut pipes of this type, with tubes from the stem of a climbing mountain bamboo, collected in 1926 from the slopes of the Snow Mountains. These are somewhat simple in comparison with the elaborately decorated wooden or bamboo pipes used elsewhere in New Guinea.

Records of leaves other than tobacco being smoked in New Guinea include those of sugar cane, ferns and a celery-like plant (possibly *Oenanthe*, Umbelliferae) in the Morobe/Madang region of Papua New Guinea, and *Polygonum* (Polygonaceae) leaves in the middle Sepik (Haddon, 1946). There is also a record of the smoking of the leaves of *Alternanthera sessilis* (L.) DC. (Amaranthaceae) for medicinal purposes in the Baliem valley (Kanis, 1978). At Ilamik it was said that the leaves of *Achyranthes aspera* (Amaranthaceae) were smoked in the past, wrapped in a *yeli* leaf, and likewise *Piper gibbilimbum*, wrapped in its own leaves. These were smoked using an arrangement called a *pop*, whereby the smoke was drawn through a narrow tube pushed into the leaf wrapping. This is probably the same as the system described by Heider (1970) among the Kurelu Dani, where leaves were wrapped into a tight ball, placed on the fire until incandescent, wrapped in a fresh leaf and then smoked through a slender bamboo whose end had been dipped in salty ash. When the leaf ball cooled it was put back into the fire and the process repeated.

Hunting

The main hunting weapon used by the Yali is the bow and arrow, which is also used for tribal war when the occasion demands. Spears (*hit*), which have been used in the past (although probably to a lesser extent than by the neighbouring Dani), were not seen during the visit, but used to be made from *ilibuk* wood (unidentified). Hunting bows are generally made from the outer wood of various palm trees. They would traditionally have been cut with stone axes and shaped with pigs' teeth but nowadays parangs (machetes) and knives are used. Only one large tree palm, *Heterospathe muelleriana*, grows in the forests around Ilamik, and although its wood is sometimes used for bows these were said to be of inferior quality.

The best palm wood comes from species occurring at lower altitudes, including *heliya*, *bi* and *suhunim*. Only *suhunim* (*Ptychococcus* sp.) was collected during the expedition, from trees which had been planted at 900m a.s.l. near Panggema. Since black-palm wood is a valuable commodity in the highlands, these trees are guarded jealously and may furnish up to 30 bows each when mature. Non-palm species used for bows

include *Schuurmansia henningsii* (Ochnaceae), *Pittosporum pullifolium*, *Phyllanthus archboldianus* (Euphorbiaceae), *Syzygium taeniatum* (Myrtaceae) and *ilibuk* (unidentified).

Bow-strings (*sehenenggela* or 'leaf of the bow') are made from a single strip of split rattan palm (*Calamus*) up to one centimetre broad, with the flat (split) surface facing forwards. The species commonly used for this purpose, *mambile*, has to be brought up from villages at lower altitudes where, as at Panggema, it is sometimes planted but also occurs wild in the forest. Another *Calamus* species, *ahal*, is sometimes used as a bowstring but only on a temporary basis. *Smilax* sp. (Smilacaceae), *Flagellaria indica* (Flagellariaceae) and a flexible *Racemobambos* (Gramineae) may also be employed. The knot at each end of the bow is prevented from slipping by a binding of *Freycinetia* (Pandanaceae) fibres, and sometimes another (unidentified) fibre which is attributed with magical properties. The arrows are unfletched and have no nock - the flat end of the cane shaft is simply held against the broad bowstring. The shafts are usually made from swordgrass stems (*Miscanthus floridulus*), and sometimes from *Thysanolaena maxima* (Gramineae).

Fig. 7. Yali arrow heads. From left to right: simple *tok*, made from *Ptychococcus* wood and wound with *Diplocaulobium* fibres; *tok* made from *Casuarina* wood; *suwap* bound with rattan; barbed *tok* from *Casuarina* wood; *minngin* bound with bark-string and rattan and glued with *Garcinia* resin.

Arrow-heads take various forms, according to their function (Fig. 7). For general-purpose killing (including of people), a sharpened wooden foreshaft called a *tok* is used, sometimes carved with small barbs and decorated with grooves filled with coloured clay (in designs very similar to those illustrated by Pospisil (1963) for the Kapauku tribe). The wood of a variety of trees will serve this purpose, including *Casuarina oligodon* (apparently the most frequently used at Ilamik), *Gardenia lamingtonii*, *Planchonella* sp. (Sapotaceae), *Caryota* sp. (Palmae) and all of the bow-woods mentioned above. In addition, it was said that arrow-heads made from the wood of the small palm *Gronophyllum pinangoides* cause death even from a small wound, though it was not clear whether the effect is attributable to magic or to poison. Arrow poison *per se* is not used, but slender strips of the yellow stems of *Diplocaulobium* orchids are sometimes wound around *tok* arrow-heads to make the wounds more unpleasant, as the fibres remain embedded when the arrow is withdrawn. According to the Kurelu Dani these fibres cause unusual pain and inflammation (Matthiessen, 1989).

Pigs are killed with *minggin* arrow-heads made from a sharpened piece of the stem of a large bamboo (*Schizostachyum* cf. *glaucifolium*). These may also be used for war. Birds are taken with special three- or four-pronged arrow-heads called *suwap*, made from the stem of *Bambusa forbesii*. Men generally carry more of these arrows than of the other types when hunting opportunistically, as birds are the game most likely to be encountered during the day. One other type of arrow-head, which was not seen, is the *yenggilirk* made from the sharpened (hollow) slender stem of *Schizostachyum lima* (Gramineae). This may serve the same purpose as the detachable hollow bone arrow-heads used elsewhere in New Guinea for hunting pigs: when the arrow detaches the tubular head remains buried in the flesh and keeps the wound from closing, eventually causing the animal to collapse from blood loss.

Arrow-heads are bound to the shafts with split rattan, bark-fibre string or occasionally the fibres from *Dicranopteris linearis* stems, sometimes in intricate woven patterns. The bindings are sometimes coated with the sticky latex from the trunk of a guttiferous tree (*Garcinia* sp.) as they are by many South American tribes (Milliken *et al.*, 1992). A fore-shaft of one of the woods used for *tok* arrowheads may also be included, lending weight and strength to the arrow. The Yali are very skilled archers, and boys begin with small bows at a very early age and rapidly become highly proficient. The swollen ant-inhabited stems of the epiphytic *Myrmecodia sterrophylla* (Rubiaceae) are often used as targets for practising shooting and spear-throwing, and those around the villages are usually riddled with sticks.

The Yali sometimes keep small hunting dogs, which they appear to treat with considerable affection. In order to improve their performance in the hunt, pieces of the leaves of certain plants may be fed to the dogs beforehand. This is a practice which has been recorded amongst hunting peoples all over the world, and into which little research appears to have been made. The Wola of Papua New Guinea, for example, feed the

leaves of Zebrina sp. to their hunting fogs (Sillitoe, pers. comm.). Plants said by the Yali to be used for this purpose included *Zingiber officinale*, *Phrynium* sp. (Marantaceae) and *Ardisia* cf. *denhamioides*. The *Phrynium* leaves may also be eaten by men before a battle, for the same purpose, whereas it was said that the *Ardisia* leaves, which were brought to Ilamik from elsewhere (carefully wrapped in a case-moth cocoon), bring on a kind of madness in men and are sometimes used to poison people. Stopp (1963) recorded a similar plant among the Mount Hagen people of Papua New Guinea. Its bark was brought from other tribes, and a decoction, if drunk, was said to cause the loss of capacity for clear thought.

Table 5

Some plant species recognized by the Yali as food plants of game animals

Cassowary (*hohubi*)	Arboreal mammals (*bak*) *
Elaeocarpus millarii (Elaeocarpaceae)	*Caldcluvia* cf. *nymanii* (Cunoniaceae)
Elaeocarpus womersleyi (Elaeocarpaceae)	*Cyathea* sp. (Pteridophyta/Cyatheaceae)
Equisetum debile (Equisetaceae)	*Drimys piperita* (Winteraceae)
Pandanus antaresensis (Pandanaceae)	*Elaeocarpus* sp. (Elaeocarpaceae)
Pandanus cf. *limbatus* (Pandanaceae)	*Homalanthus* spp. (Euphorbiaceae)
Planchonia sp. (Lecythidaceae)	*Parasponia rigida* (Ulmaceae)
Rubus spp. (Rosaceae)	*Prunus* sp. (Rosaceae)
Syzygium effusum (Myrtaceae)	*seli* (unidentified)

* 29 species of arboreal mammals (including cuscus etc.) were named, and 16 species of ground mammals.

The Yali, as other hunting peoples, use their knowledge of forest ecology to facilitate their hunting. This was not a subject looked into in great detail, but it was evident that the men were aware of which trees are frequented by which game animals and used this to their advantage (see Table 5). Hides may be set up beside suitable food trees, or at places where birds come to drink. One such hide (*suweheni*), seen in forest high on the ridge above Ilamik (Fig. 8), conformed closely to a description made during the third Archbold Expedition of a Dani hide (Archbold *et al.*, 1942; Heider, 1970), and also to those used by the Wola of Papua New Guinea (Sillitoe, pers. comm.). A perch (*parahen*) had been erected at a small pool where birds were known to drink, with a narrow tube (*hulunggup*) of rolled *Macaranga inermis* bark along part of its length. The tube extended into a small hide of bracken fronds where the hunter waited. When a bird was suitably positioned on the perch, ready to drink from the pool, it was skewered by an arrow fired down the tube.

There are no fish in the valley of the Sibi river, nor are there the large edible crayfish which are found in the Baliem valley and enjoyed by the neighbouring Dani.

Fig. 8. Hide for bird hunting (*suweheni*).

Clothing and adornment

Yali men, like those of the other tribes in the Snow Mountains region, wear penis sheaths (*humi*) made from the dried and hollowed fruits of the bottle gourd *Lagenaria siceraria*. They grow the vines on raised wooden frames in the kitchen gardens; the fruits are long and slender and apparently represent a distinct cultivar. The Dani sometimes elongate these gourds further by hanging weights from them as they grow (Heider, 1970), but this was not observed at Ilamik. The sheath is secured by a bark-fibre string around the waist, and another looped around the scrotum. In addition, numerous split-rattan hoops (*saheyap*) are worn around the hips, but at the time of study these were only used by the old men at Ilamik and the surrounding villages (see Fig. 6). Three species of *Calamus* were said to be particularly suited for the hoops, and stems of *Flagellaria indica* may also be used. Head-nets (made in the same way as the carrying bags) are also sometimes worn, but on the whole only by the older men.

Women wear very small apron-like two-piece skirts (*kem*), the front and rear sections of which are connected with string around the hips (Fig. 9). They are worn improbably low, in order for which the strings must be very tight, apparently causing abrasions which often become infected with *Staphylococcus* bacteria (probably

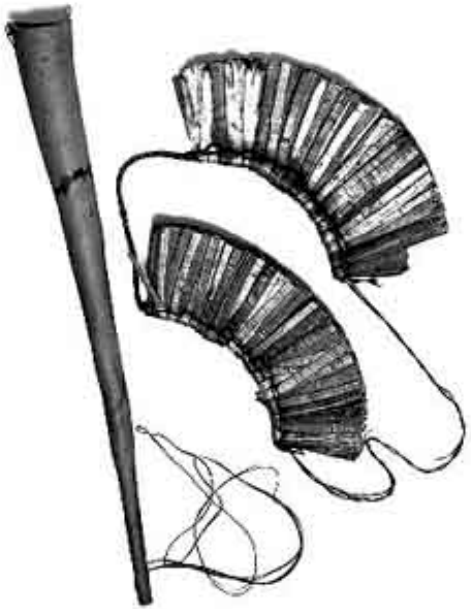

Fig. 9. Penis gourd and sedge skirt

brought in from the Baliem valley along with other contagious diseases in the early days of missionary contact. see Koch, 1974). The skirts are made from the flattened and dried stems of *Elaeocharis dulcis* (Cyperaceae) reeds, which are cultivated in small ponds. Adult women may wear more than one of these skirts, stepped one above another. Women are rarely seen without a large string bag draped over the back (see Food gathering and cooking), and these can perhaps be considered a form of dress in addition to their obvious practical applications.

Rain-capes (*ilit*) are made from *Pandanus* leaves, which are first stripped of their spines and then partially dried. *Pandanus antaresensis* and *P. iwen* were said to be the best species for this. They are sewn together in a double layer with string made from the bast fibres of the *sabe* tree (Malvaceae). These capes are folded up and carried around in the string bags for use when required. The giant leaves of a common forest *Alocasia* species (Araceae) are sometimes used as impromptu umbrellas.

Bracelets and arm bands (*serene*) are woven from the tough vascular fibres from the stems of *Dicranopteris linearis*, a common scrambling fern at the forest edge. These may be black or brown, depending on which part of the plant they are taken from (black from the lower stem). They may be interwoven with finely split (white) strips of rattan for decoration. Armbands are sometimes made purely from rattan strips (thicker than the above), or from the stems of *Geitonoplesium cymosum* (Philesiaceae). The yellowish woody stems of *Dendrobium prostheciglossum* (Orchidaceae) are cut into sections and strung together to make necklaces (*enggelopmangge*). Powell (1976a) listed over 60 species of plants whose flowers and leaves are used to adorn the body by the tribes of New Guinea. Some of these are sometimes worn in the hair or behind the ears by the Yali; when formally photographed at Ilamik many of the men picked the flowers of a striking *Lantana* species (Verbenaceae) for this purpose, which was growing ornamentally beside one of the houses. A cultivar of *Impatiens hawkeri* (Balsaminaceae), with purple/pink variegated leaves, was also seen growing as an ornamental at Ilamik.

There are some forms of body ornament which appear to have been discontinued or will probably shortly be so. It was said that in the past the yellow latex from the bark of certain guttiferous trees (*Calophyllum pauciflorum* and *Garcinia* sp.) were mixed with pig-grease and applied to the men's hair to make 'dreadlocks'. Short lengths of arrow cane (*Miscanthus floridulus*) were attached to the ends of these for dancing and for war, and would fly about in a spectacular fashion. Arrow cane is also sometimes worn by men through the pierced nasal septum or ear lobes (when pig's teeth etc. are not being worn), and one old man at Ilamik wore a piece of the fibrous material from the cocoon of a case-moth through his ear. This material is also used to wrap up objects of value such as magic stones. The Dani use it for the same purpose and believe that if worn around the neck it will attract women (Heider, 1970). Nowadays it is apparently rare for young men to have their ears and noses pierced at Ilamik.

Construction

The Yali in the Sibi valley live in small round wooden houses (*o*), generally thatched with bark. The walls are of double thickness, with a wind-proof lining of bark between the layers. There are few references to this type of wall structure amongst the literature on New Guinea architecture, although Steensberg (1980) describes a similar arrangement from the Mount Hagen area in Papua New Guinea. The houses are built on two levels, the upper floor being used for sleeping and the lower being inhabited during the day. Structural components are lashed together with a variety of flexible vines. The men and older boys inhabit one house (*yowi*), in which the pigs are also kept at night, and the women and young children live in others (*homiya*). According to Koch (1974), the men's houses could traditionally be distinguished from those of the women by linear designs in red ochre and white clay painted on the outside walls beside the entrance, but these were not seen in any of the villages visited and had presumably been discontinued. The houses are generally surrounded by kitchen gardens of varying sizes, with fences to keep the pigs out (Fig. 10). The timbers for these fences were generally laid horizontally, in contrast to the vertical thatched fences typical of Dani villages.

Table 8

Plants used in the construction of the men's house at Ilamik

Species	Use (see Figs 10-13)	
Alphitonia incana (Rhamnaceae)	*ial*	ladder
Calamus sp. (Palmae)	*selebinangge*	thatch binding
	hanti	firewood sling
	helenghele	thatch support
Casuarina oligodon (Casuarinaceae)	*ongga*	thatch (bark)
	kanggok	pig fence (horiz.)
Dodonaea viscosa (Sapindaceae)	*isok/andok*	pig fence (vert.)
Eurya meizophylla (Theaceae)	*oholuk*	circular purlin
Fagraea ceilanica (Loganiaceae)	*inale*	roof spike
	sila	door base (vert.)
	owak	post (inside)
	antuli	floor beam (major)
	kepukano	door post
Musa sp. (Musaceae)	*walukan*	eave packing
Nothofagus starkenborghii (Fagaceae)	*obahat*	wall upright
	fowol	rafter
	kembilik	door base (horiz.)
Pandanus antaresensis (Pandanaceae)	*ilit*	sleeping mat
	salikano	main rafter
Pandanus cf. *limbatus* (Pandanaceae)	*pila*	floor
	pisibukla	floor slat
Parsonia aff. *hebetica* (Apocynaceae)		lashing
Planchonia sp. (Lecythidaceae)	*merabe*	baffle board
	sok	doorpiece
Prunus sp. (Rosaceae)	*liyaliya*	floor beam (minor)
Syzygium effusum (Myrtaceae)	*langwop*	post (outside)
	merkat	floor beam
	ebisengge	main support post
	ulanggentik	baffle board support
Xanthomyrtus sp. (Myrtaceae)	*dik*	wall brace
	sakamoringga	circular purlin
watnam (unidentified)	*hulubit*	wall lining (bark)
	yebet	eave lining (bark)

An inventory was made of the materials used to construct the men's house at Ilamik, the details of which are given in Figs 10-13 and Table 8. For most of the components there is of course considerable latitude in which species may be used, but some pieces demand specific properties, such as resistance to rot for the support posts. *Fagraea ceilanica* (Loganiaceae), for instance, was said to be particularly good for this purpose. Tradition and magic also play a part; it was said that the wood of *Dacrydium* sp. (Podocarpaceae) may not be used for the women's houses, and that 'magic' houses must have one of the four *ebisengge* posts around the fire made from the wood of *Phyllocladus hypophyllus* (Phyllocladaceae).

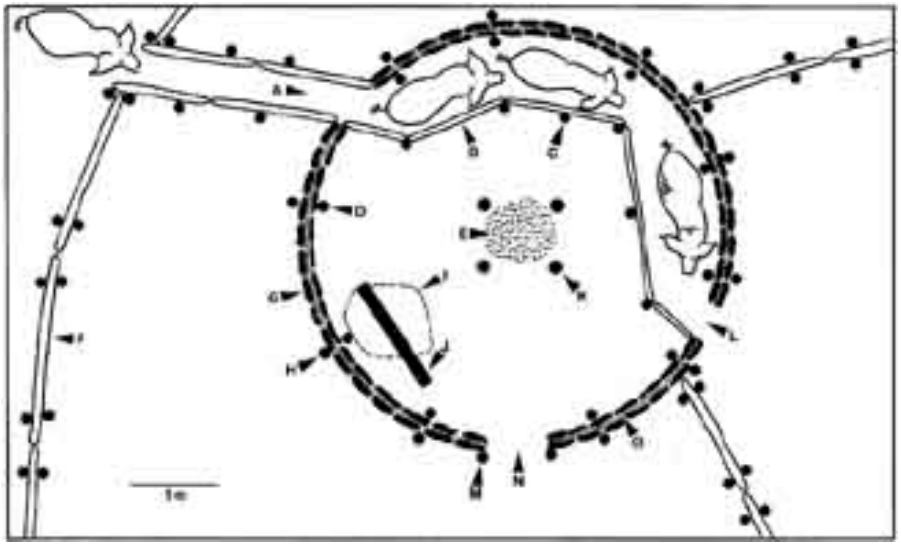

Fig. 10. Approximate layout (aerial view) of the men's house at Ilamik. A) pig run to the forest; B) pig wall (*kanggok*); C) pig wall upright (*isok* or *andok*); D) inner support post (*owak*); E) fireplace (*ulanggen*); F) pig fence; G) wall plank (*obahat*); H) outer support post (*langwop*); I) entrance hole to upper floor (*kekeruk*); J) ladder to upper floor (*jal*); K) central support post (*ebisengge*); L) pig door (*wamkekeruk*); M) door post (*kepukano*); N) main door (*apkekeruk*); O) wall lining (*hulubit*).

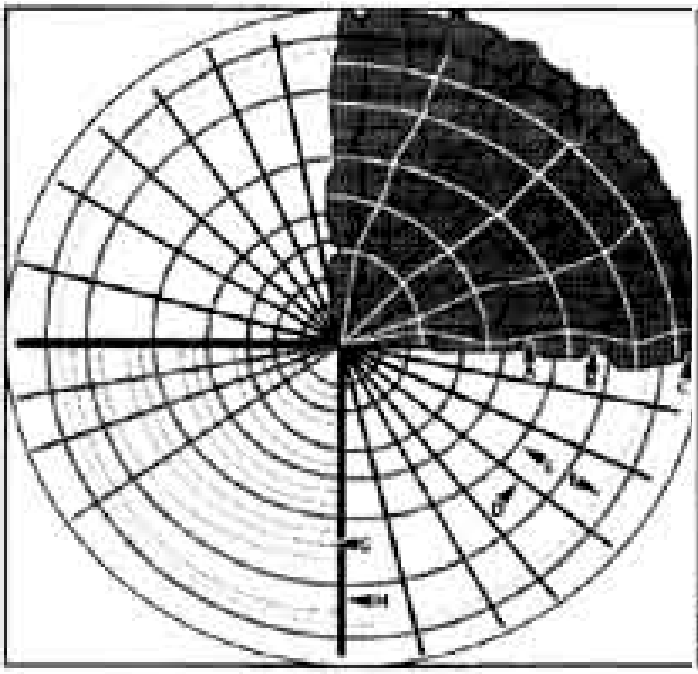

Fig. 11. Detail of construction of the men's house at Ilamik (roof). A) thatch binding (*selebinangge*); B) thatch (*ongga*); C) upper circular purlin (*oholuk*); D) rafter (*fowol*); E) lower circular purlin (*oholuk*); F) line of wall; G) thatch support (*helenghele*); H) main rafter x4 (*salikano*).

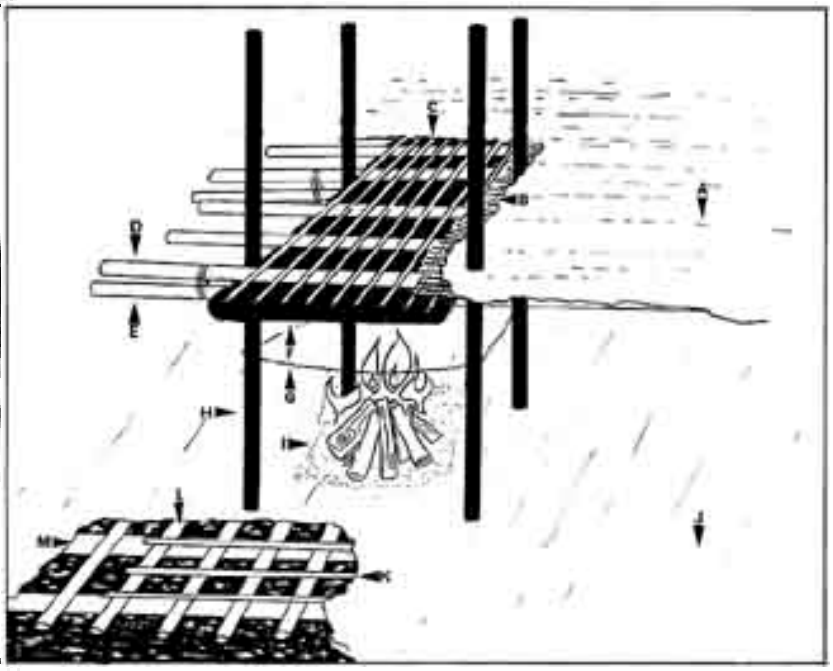

Fig. 12. Detail of construction of the men's house at Ilamik (floor, fireplace and ceiling). A) upper floor matting (*ilit*); B) upper floor slat (*pisibukla*); C) upper floor minor beam (*liyaliya*); D) upper floor major beam (*merkat*); E) baffle board support (*ulanggentik*); F) baffle board (*merabe*); G) cooking sling (*wok*); H) central support post (*ebisengge*); I) fireplace (*ulanggen*); J) lower floor (*pila*); K) lower floor minor beam (*liyaliya*); L) lower floor major beam (*merkat*); M) base (foundation) beam (*antuli*).

Round houses similar to the men's houses are built in strategic locations along trails etc. for use while travelling, collecting *Pandanus* nuts, and hunting (Fig. 4). Some of those seen were less elaborately constructed than the house described at Ilamik, lacking the lined double walls and other such comforts. Archbold *et al.* (1942), in their early account of the region, described such houses as follows: 'In several of these primitive plantations, including the one beside which we camped, were solitary houses built of split timber and tree fern stems roofed with sheets of bark. The natives used these houses when visiting their *Pandanus* trees and travelling in the mountains'. Temporary houses or cooking houses are generally built even more simply, and are often thatched with *Pandanus* leaves.

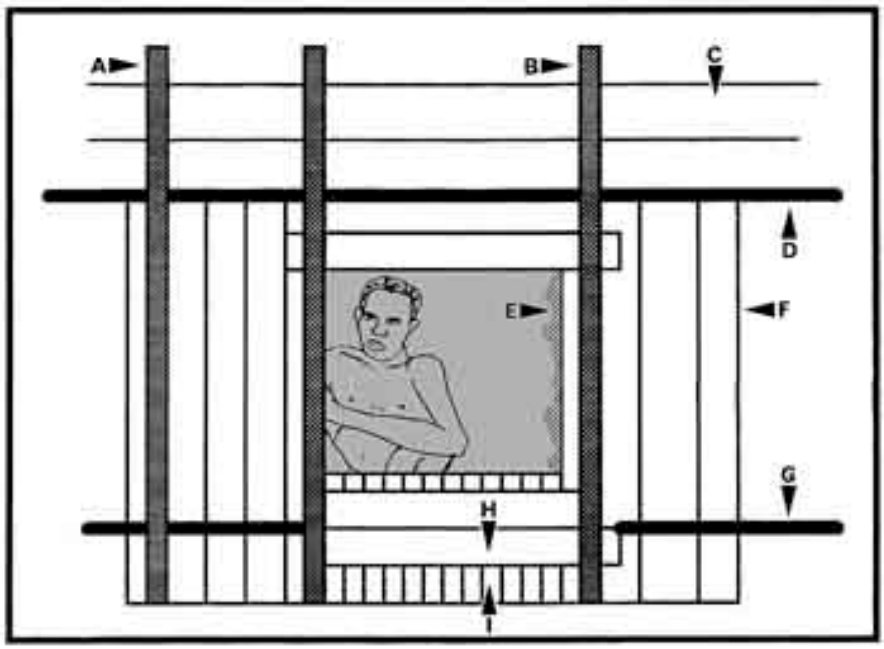

Fig. 13. Detail of construction of the men's house at Ilamik (doorway). A) support post (*langwop*); B) door post (*kepukano*); C) eave lining (yebet); D) upper wall brace (*dik*); E) wall lining (*hulubit*); F) wall upright (*obahat*); G) lower wall brace (*dik*); H) door base crosspiece (*kembilik*); I) door base upright (*sila*).

Several different construction materials were seen in use at Panggema, lower down the valley, the most obvious of which were the leaves used for thatching. Houses were seen roofed with *Metroxylon* and *Phrynium* leaves, but not with the *Imperata cylindrica* grass which is so common in the Baliem valley and is almost invariably used for thatching by the Dani. A list of further construction materials (not employed in the men's house at Ilamik) is given in Table 9.

Table 9

Additional plants used in Yali house construction

FRAME:

Aceratium parvifolium (Elaeocarpaceae)
Dacrydium sp. (Podocarpaceae)
Elaeocarpus womersleyi (Elaeocarpaceae)
Libocedrus papuana (Cupressaceae)
Lithocarpus lauterbachii (Fagaceae)
Miscanthus floridulus (Gramineae)
Olearia cf. *leptocephala* (Compositae)
Phyllocladus hypophyllus (Phyllocladaceae)
Saccharum robustum (Gramineae)
sabe (unidentified Malvaceae)
seli (unidentified)

Wall lining (bark):

Podocarpus neriifolius (Podocarpaceae)
tuhal (unidentified)

THATCH:

Araucaria cunninghamii (Araucariaceae) - bark
Bambusa forbesii (Gramineae) - leaves
Heliconia papuana (Heliconiaceae) -leaves
Libocedrus papuana (Cupressaceae) - bark
Pandanus adinobotrys (Pandanaceae) - leaves
Phrynium sp. (Marantaceae) - leaves

Lashing:

Mucuna novoguineensis (Leguminosae) - stem
Nepenthes maxima (Nepenthaceae) - stem
Parasponia rigida (Ulmaceae) - bark
Rhaphidophora sp. (Araceae) - root
Strongylodon sp. (Leguminosae) - stem
Tecomanthe volubilis (Bignoniaceae) - stem
Tetrastigma pullei (Vitaceae) - stem
Uncaria sp. (Rubiaceae) - stem

N.B. Some of the above lashing materials are used also for making fences, and for making rope bridges. Species used for the latter purpose include *Clematis phanerophlebia* (Ranunculaceae), *Mucuna novoguineensis* and *Uncaria* sp.

Commerce

Traditionally the Yali people have maintained regular trading links with the Dani of the Baliem valley, supplying items which are no longer available there on account of the depleted forests. These included beeswax, moth cocoons, fur, feathers, cassowary femurs, orchid fibres, bamboo, bark fibres, bow and spear wood, and a red clay paint used in initiation ceremonies by the Dani (Heider, 1970; Matthiessen, 1989). Salt, a highly prized commodity, was often traded in return. The Yali of Ilamik did not appear at the time of this visit to be engaged in commerce to any significant extent. Some small-scale trading (of the type described above) took place between villages, particularly for items such as hunting bows whose raw materials are unavailable in the vicinity of Ilamik (on account of altitude), and occasionally somebody would cross Gunung Elit to Wamena to sell some string bags or arrows in the busy market. The money might be used to buy piglets, or practical items such as knives. Bearing in mind the steady march of 'progress' towards the valleys of the Yali, spurred on by the activities of the missionaries and the Indonesians (see below), commerce is very likely to become more of a reality amongst the Yali in the near future, and this will inevitably involve their plant resources.

Other tools, instruments and miscellaneous uses

One of the most important tools traditionally used by the Yali was the stone adze or axe. These have now been superseded by steel axes, which were initially brought in as trade goods by the early expeditions and subsequently by missionaries and colonialists, but stone axes are still made by the Dani in the Baliem valley for sale to tourists in Wamena. The handles (*yahambo*) were made from the naturally forking trunks of certain small trees. The stone was attached to one branch of the fork and the other served as the handle. The stone was held in a split-rattan binding lined with a *Pandanus* leaf (see Steensberg (1980) for a detailed description of the technique). The following species were said to be suitable for axe handles: *Symplocos conchinensis*, *Vaccinium megalophyes* (Ericaceae), *Gardenia lamingtonii*, *seli* and *siyan* (unidentified). Wood of the last species is also used for digging-sticks, as are *Rapanea cacuminum* and *Ardisia* sp. Simple disposable knives for cutting meat etc. are made from sharp slivers of the stem of a large bamboo.

Wooden tools of all kinds, once shaped, are smoothed with the abrasive leaves of *Equisetum debile*. These may also be used to scrub sweet potatoes and to smooth newly made mouth-harps (*pinggong*). These simple harps are made from sections of a wild *Saccharum* stem, and are the principal musical instruments of the Yali. The harp is held to the mouth by the ends of the two outer reeds, and when the string - which is attached to the other end - is tugged rhythmically, the central reed vibrates over the cavity of the mouth and produces a doleful note which is varied by moving the tongue. Recordings were made of the music of these instruments. The only other instruments traditionally used by Yali are drums (*waruk*), although Archbold *et al.* (1942) wrote specifically that they had heard no drums in the neighbouring Baliem valley. These drums were not seen during the visit, but were said to be made from the wood of *Dacrydium* sp., *Toona* sp. and *Xanthomyrtus* sp. Nowadays these species may also be used to make small simple guitars, strung with nylon fishing line.

Steel needles are now used to sew together *Pandanus*-leaf rain-capes (see Clothing and adornment), but in the past wooden needles (*hin*) were employed. These were made from the scandent shrub *Alyxia rostrata* (Apocynaceae), whose stems and branches have a central core of soft pith. The needle is shaped from a piece of the stem where the pith is running across the grain into one of the branches, thus providing a natural eye. Water vessels (*hele*), which are usually left leaning against the walls of the houses in the village, are simply lengths of bamboo (*Schizostachyum*) with their septa pierced or knocked out. Ropes for tying up pigs are made from the bark fibres of certain *Ficus* species (Moraceae), and the rotting (fibrous) leaves of *Pandanus conoideus* are occasionally used as temporary cordage.

Babies are sometimes carried around in string bags, blanketed with the leaves of certain plants including *Strongylodon archboldianus* (Leguminosae) and *Maesa spectabilis* (Myrsinaceae). Other leaves, including *Piper* sp. and *Breynia cernua* (Euphorbiaceae), are used for carrying piglets around. The latter were said to induce weaning. Mothers use the leaves of *Arrhenechthites novoguinensis* (Compositae) to wipe their babies' bottoms and clean up their faeces.

Medicinal plants and magic medicines

In an overview of New Guinea plant use by Staatmans (1967), medicinal plants accounted for 25% of the uses recorded. Although some plants were collected during the present study which could be regarded as medicinal in the 'scientifically' accepted sense of the word, there was little evidence of a developed pharmacopoeia. This may, however, purely be a reflection of the methodology employed (e.g. the lack of information gathered from women) rather than the state of the Yali's traditional knowledge. Likewise for many years the Yanomami of northern Brazil were said not to use medicinal plants to any significant extent but to rely almost entirely on shamanism (e.g. Plotkin, 1993), and it was only when a specific investigation was made that it became clear that their knowledge of medicinal plants was as great as (and in most cases greater than) that of other Amazonian peoples (Milliken e*t* al., 1999).

Medicine and magic are very closely intermeshed among the Yali, and far from easy to separate without a much more detailed knowledge of the culture, but it was clear that in the past, magic (or maybe 'faith healing') played a crucial part in effecting cures. These were performed by specific people respected for their unusual powers or knowledge, usually using magic plants and other powerful objects (e.g. the magic *yanggik uluhan* stones). This association of magic and medicine is by no means uncommon among the peoples of New Guinea, or indeed of elsewhere. Stopp (1963), for example, reported that the people of Mount Hagen (Papua New Guinea) made no distinction between magic and medicinal plants, and regarded (and treated) only skin infections and tooth troubles as physical diseases. Similarly, of the 473 deaths recorded between the years 1900 and 1912 in a Fore parish in Papua New Guinea, over 50% were attributed to magic or sorcery (Lindenbaum, 1979).

Most of the strictly medicinal plants recorded among the Yali were used to treat sores, boils, cuts etc., which are inevitable in the environment in which they live. These included *Dodonaea viscosa*, *Syzygium* sp., *Quintinia ledermannii* (Saxifragaceae), *Emilia prenanthoidea* (Compositae), *Cardamine papuana* (Cruciferae), *Cyrtandra* aff. *wariana* (Gesneriaceae), *Pipturus* cf. *verticillatus* and *Dawsonia superba* (Bryophyta). In addition, *Laportea decumana* (Urticaceae) leaves are used for debility and aching limbs, *Cinnamomum* sp. (Lauraceae) bark for fever, *kilibin* (unidentified Zingiberaceae) for headaches, and the aromatic leaves of *Euodia* spp. and *Piper versteegii* are rubbed on the forehead and body as general cures for aches, fevers etc. *Cinnamomum* bark (*kami*) is apparently traded with the Dani to the west, who chew it as a general cure-all and sometimes carry a piece strung around the neck (Heider, 1970). This is evidently one of the most important plant medicines in the region: Kostermans (1969) collected a new species of *Cinnamomum* (also called *kami* by the Dani) which was attributed contraceptive properties and was also used for fevers, wounds, coughs and stomach ache.

The difficulty in separating medicine from magic among the Yali is illustrated by *Impatiens hawkeri*, a showy herb common around the villages of the Sibi valley but apparently absent from the Baliem. It was said that the cut surface of its fleshy stem should be applied to the umbilicus when it is severed, but that this was done as part of a magic ritual rather than for medicinal reasons. However, the fact the same species is used elsewhere in New Guinea to treat wounds suggests that the performance of this ritual may effectively help to prevent infection of the cut.The use of magic medicines stems partly from the Yali belief, common also amongst other peoples of New Guinea and indeed many other parts of the world, that sickness is caused by supernatural forces and by spells cast by enemies. The cure is thus effected by exorcism of the sickness, which often involves plants but not direct application or ingestion of them. Plants employed in this way

include *Gronophyllum pinangoides* (Palmae), *Drimys piperita*, *Rapanea* spp., *Agathis labillardieri* (Araucariaceae), *Piper* sp., *Phyllanthus archboldianus*, *Scaevola oppositifolia* (Goodeniaceae) and *kim-kim* (unidentified).

In theory the people of Ilamik had access to 'modern' medicines from the nearby village of Pronggoli (one hour's walk away), where there is a small mission station and a locally trained 'nurse'. In reality the supply was too small and disorganised to be significant, and the villagers were making do with what they had. This appeared no longer to include the magic medicines described above, which were formerly so important, as the missionaries had persuaded the Yali to abandon magic of any kind. When speaking about magic plants, often with some reluctance, Yali informants were very careful to point out that these were the plants which they used to use *before* they became Christians.

The missionaries had to some extent succeeded in stripping them of their traditional magic without providing any practical alternative. What remained, apart from their medicinal plants, was a rather bizarre distortion of Christianity which became apparent when an old lady with a very large goitre was brought to the author for a cure. Her husband claimed to have slaughtered a large pig (an extremely valuable commodity), to have sold its meat and given the proceeds to the church. When no cure was apparent, he had repeated the libation twice and finally, in desperation, tried bleeding her from the neck with a sliver of bamboo (equally unsuccessfully). This slaughtering of pigs and offering of money to the missionary church is apparently now commonplace for serious illness. The local missionary was abroad at the time so it was not possible to ascertain how the practice had developed.

Fire

At the time of study the people of Ilamik did not have access to matches, and still employed traditional fire-making techniques. This was achieved by the use of 'fire-saws', which were generally carried about by men in their string bags (Fig. 14). These consist of a partially split stick (*konkon*) held open by a small pebble, and a length of dry split rattan (kept in a twisted coil called a *serene*). The rattan strap is passed around the underside of the stick; fine tinder (*amunanagge*, which may be cut from the rattan coil) is put underneath or into the cleft, and the stick is held firmly to the ground with a foot. The strap is then pulled back and forth vigorously, and within less than twenty seconds the tinder begins to smoke (Fig. 15) and can be kindled into a flame. This process is described in detail by Steensberg (1980).

Fig. 14. Yali fire-making equipment. Split stick (*konkon*) and a coil of split rattan (*serene*).

The stems of four species of *Calamus* were said to be used for the straps, as well as *Racemobambos* aff. *raynalii*, *Smilax* sp. and *Carex* cf. *filicina* (Cyperaceae). The wood of a number of trees is recognized as particularly suitable for the sticks (perhaps because of their lack of sap), including the following species: *Parasponia rigida*, *Ardisia* sp., *Alphitonia incana*, *Saurauia* cf. *occulta* (Actinidiaceae), *Homalanthus* sp., *Eurya meizophylla* (Theaceae), *Rapanea cacuminum*, *Macaranga pleioneura* and *sabe* (unidentified Malvaceae).

Bundles of firewood are kept hanging inside the houses or under the eaves, on rattan loops. Thus a supply of dry fuel is usually available for use. In the Baliem valley *Casuarina oligodon*, according to Archbold *et al.* (1942), 'provided the villages with most of their fuel and practically all of their building and fencing timber'. The Yali at Ilamik, having easy access to primary forest, have a considerably greater choice of fuelwoods. When asked to name tree species which are good for fuel and others which are not, the men named 43 of the former and 59 of the latter. Those which were collected and identified are listed in Table 6. Certain species are recognized for specific burning properties, e.g. *Olearia* sp. (Compositae) which was said to be particularly good for smoke-curing *Pandanus* nuts.

Many of the species which were said not to be used, e.g. *Drimys piperita*, *Euodia* spp., *Alphitonia incana* and *Prunus* sp. (Rosaceae), are avoided because of their high content of aromatic or noxious compounds. Taboos probably also play a role in the decision of whether or not a species is suitable: the wood of *Araucaria*, also shunned by the Yali, is the subject of such a taboo among the Dani (Heider, 1970). The incidence of such taboos may be suggested by the fact that a number of the species said by the Yali not to be suitable as firewood are recorded as being used as such by other peoples of the New Guinea highlands.

Table 6

Species of woody plants used or avoided as firewood by the Yali

Species suitable for firewood:

Acronychia rugosa (Myrsinaceae)
Agathis labillardieri (Araucariaceae)
Calophyllum pauciflorum (Guttiferae)
Casuarina oligodon (Casuarinaceae)
Dacrydium sp. (Podocarpaceae)
Desmodium sequax (Leguminosae)
Dodonaea viscosa (Sapindaceae)
Ficus spp. (Moraceae)
Garcinia spp. (Guttiferae)
Homalanthus spp. (Euphorbiaceae)
Ilex sp. (Aquifoliaceae)
Myristica sp. (Myristicaceae)
Nothofagus cf. *grandis* (Fagaceae)
Olearia cf. *leptocephala* (Compositae)
Rapanea cacuminum (Myrsinaceae)
Solanum dammerianum (Solanaceae)
Styphelia suaveolans (Epacridaceae)
Symplocos conchinensis (Symplocaceae)

Species unsuitable for firewood:

Alphitonia incana (Rhamnaceae)
Ardisia sp. (Myrsinaceae)
Araucaria cunninghamii (Araucariaceae)
Caldcluvia cf. *nymanii* (Cunoniaceae)
Dimorphanthera spp. (Ericaceae)
Drimys piperita (Winteraceae)
Euodia sp. (Rutaceae)
Eurya meizophylla (Theaceae)
Fagraea ceilanica (Loganiaceae)
Gardenia lamingtonii (Rubiaceae)
Glochidion spp. (Euphorbiaceae)
Melastoma polyanthum (Melastomataceae)
Nothofagus starkenborghii (Fagaceae)
Parasponia rigida (Ulmaceae)
Pipturus spp. (Urticaceae)
Planchonella sp. (Sapotaceae)
Podocarpus spp. (Podocarpaceae)
Prunus sp. (Rosaceae)

Fig. 15. Fire making demonstration.

Ritual/magic

Powell (1976a), in her overview of New Guinea ethnobotany, listed over 130 plant taxa as having been attributed magical properties. Medicine aside (see previous discussion), the Yali have a very strong tradition of magic. They were said to be feared for their powers by their neighbouring tribes (including the Dani), some of whom believe that they are capable of flight. Much of this magic, now largely abandoned (see above), involved the use of plants, several of which have highly aromatic leaves. Their applications were diverse, including the banishment of ghosts and sicknesses, the attraction of women, the initiation of young boys, the death or ruination of enemies, the productivity of crops and the postponement of rain. Hulu Pahabol, the old man who provided most of this information, was careful to send the small children away before divulging it, and sometimes found it necessary to whisper or mouth the names of the plants rather than speak them aloud. The plants are listed in Table 7.

Table 7

Some plants with magical or ritual applications

Alphitonia sp. (Rhamnaceae)
Alpinia aff. *flagellaris* (Zingiberaceae)
Alyxia rostrata (Apocynaceae)
Araucaria cunninghamii (Araucariaceae)
Ardisia sp. (Myrsinaceae)
Cordyline sp. (Agavaceae)
Cyathea sp(p). (Pteridophyta)
Dawsonia sp. (Bryophyta)
Dianella ensifolia (Phormiaceae)
Etlingera sp. (Zingiberaceae)
Euodia spp. (Rutaceae)
Ficus scratchleyana (Moraceae)
Libertia pulchellum (Iridaceae)
Myristica aff. *neglecta* (Myristicaceae)
Parsonia sp. aff. *hebetica* (Apocynaceae)
Phyllocladus hypophyllus (Phyllocladaceae)
Pipturus cf. *verticillatus* (Urticaceae)
Prunus sp. (Rosaceae)
Pteridium aquilinum (Pteridophyta)
Rapanea spp. (Myrsinaceae)
Riedelia sp. (Zingiberaceae)
Wendlandia paniculata (Rubiaceae)
Xanthomyrtus spp. (Myrtaceae)
ilibuk (unidentified)

Changes in plant resource use

There are various ways in which changes can affect the use of plant resources by indigenous peoples, including the loss of traditional knowledge resulting from disinterest of the young and death of the elders, introduction of new useful plants, substitution of traditional technology by modern supplies and ideas, altered forest management practices, entry into commerce, loss of land rights and a number of other processes. At the time of the author's visit the Yali of Ilamik were, materially, living in a state relatively unchanged since their

first contacts with the outside world. The only items seen in the village which were not a part of their traditional material culture were steel axe-heads and knives, coloured glass beads, a few items of clothing and two small home-made guitars. A number of crops were being grown which had been introduced only very recently, but it should be remembered that many of the crops which are now regarded by the Yali as 'traditional' were themselves introduced to New Guinea from elsewhere in the more distant past (see Food).

The most significant changes which had taken place at Ilamik were largely the result of missionary presence in the valley, and were visible primarily in their spiritual culture, i.e. the rejection of magic (in which numerous plants were involved), the suppression of warfare, and the acquisition of a form of Christianity. Although a few of the older men still knew of the magic (and therapeutic) properties of plants, it is very likely that within the next couple of generations most of that information and tradition will have been lost irrevocably.

The Yali's comparatively unchanged technological state was largely a result of their isolation, which will not last indefinitely. As this changes the processes described above will accelerate. At the time of study a road was under construction between Wamena (in the Baliem Valley) and Jayapura on the coast, greatly increasing accessibility of the region. Meanwhile the Indonesian transmigration programme was planning to bring large numbers of settlers into the Baliem valley, and it was rumoured that prospecting for precious metals in the mountains at the head of the Sibi Valley had yielded positive results which would probably be exploited in the near future.

The then Indonesian President, Suharto, had exhibited a keen personal interest in the development of Irian Jaya, which, combined with the mineral and biological riches of the colony, would bring great changes for its indigenous peoples. The extent to which these changes will be to the benefit or detriment of those peoples depends largely upon the rate at which they are allowed to take place, and the degree of cultural sensitivity with which they are handled. If the experiences at Tembagabura (Freeport) mine are any guide, the exploitation of minerals in the Sibi valleywould be disastrous for the Yali under the Indonesian regime. If, as is so often the case, the changes and external influences are thrust upon the Yali at a rate at which they cannot be assimilated and accommodated by their culture, and evaluated for their long-term dangers or benefits, it is likely that they will suffer as a consequence. Furthermore, their remarkable forest knowledge will be lost.

CONCLUSION

The results of this study make it clear that the Yali people in the Sibi valley were, at the time of study, living in very close union with the forest around them and depending heavily upon its resources. It is important, however, that the limitations of the study should be borne in mind when considering the results. Firstly, for an ethnobotanical study the time available was relatively short. Although most of the key plant species used at Ilamik appear to have been collected, there will doubtless be a great deal more still to be recorded. This would necessitate spending an extended period in the area, covering the flowering and fruiting seasons of other species and integrating further with the culture and language. Furthermore, the information from Ilamik cannot be extrapolated for the Yali people in general. Their territory is large and spans a broad range of altitudes (down to 425m at Ililim) and consequently of vegetation types, and these differences will certainly be reflected in their ethnobotany. This will probably be compounded by cultural differences between sub-groups of the Yali.

No information was collected from the women of Ilamik, who were generally very retiring. However, studies with other tribes suggest that there may be a considerable body of ethnobotanical information which is known only to them. According to Matthiessen (1989), for example, the Kurelu Dani women in the Baliem valley sometimes practice abortion, but this is disapproved of by their menfolk and therefore kept strictly secret from them. Such information would probably only be made available to a female researcher, if at all.

It is evident from the comparisons made in the text and in the annotated checklist below that the use of plants by the Yali shares a great deal in common not only with the neighbouring Dani tribes but also with the majority of the peoples of the highlands of New Guinea. The level of technology of these peoples is very similar, and essentially they rely upon the same species for food. Local variation in the vegetation, whether as a result of human activity (such as forest clearance in the Baliem Valley) or of natural phenomena (climate, soil, altitude etc.), clearly means that a different range of wild plant species is available for use, but generally speaking the people have ended up using members of the same (taxonomic) plant groups for the same purposes. To what extent this is the result of the spread of technology from people to people or of convergent technological evolution is hard to determine, and would require a greater knowledge of the history of the migrations and origins of New Guinea peoples than we currently possess.

PLANTS OF THE YALI

Names and properties attributed to plants by the Yali and other indigenous peoples of New Guinea

An annotated list of plants collected among the Yali is presented on the following pages. In many cases, references to the uses of the same species in other parts of New Guinea have been included for the sake of interest and comparison. Where possible, the plants discussed have been determined to species level. However, given the current sketchy nature of New Guinea taxonomy and the comparative paucity of collections from the region studied, this has not always been possible.

The uses attributed to these plant species by the Yali have almost all been referred to in the present tense. However, it should be noted that some of these uses, particularly those involving magic and ritual, have been discontinued or may be so in the near future (see text). Four-figure numbers in parentheses refer to the voucher specimen collection numbers (Milliken series WM). If no voucher specimen was collected, this is indicated by (n.c.). References to the literature are cited by reference number (as listed) in parentheses. References to uses taken from herbarium labels (at Kew) are cited as 'Herb.' followed by the collector and collection number.

* = species not found in the vicinity of Ilamik (1700m), but occurring around Panggema (1350-900m)

** = species not found in the vicinity of Ilamik, but occurring around Matik (3200m)

ANGIOSPERMAE

ACANTHACEAE

Rungia klossii S. Moore (1196)
mulun **(acanth spinach)**

Herb cult. in fields, generally growing on banks between the sweet potato beds. Leaves eaten raw or cooked.

Commonly cult. in the PNG highlands; sometimes used for medicinal purposes (Heider, 1970) & as an emetic (Holdsworth, 1977).

ACTINIDIACEAE

Saurauia aff. ***conferta*** Warb. (1240)
samleh
Small forest tree. Unsuitable for fuel.
The Bomagai-Angoiang of PNG use *Saurauia* wood for fuel & fences (Clarke, 1971). Leaves of *S.* spp. eaten in Watut, PNG; also used medicinally (Holdsworth, 1977), & their stems burned for salt (Powell, 1976a).

Saurauia **cf.** *occulta* **A.C. Smith (1302)**
mop
Common tree in secondary vegetation around village. Wood for fire-saws; unsuitable as fuel.

AGAVACEAE

Cordyline fruticosa (L. ex Strickm.) A. Chev. (1202/1313)
huwumo **(palm lily)**
Single-stem shrub cult. in fields. Planted as boundary marker amongst crops etc.
Widely cult. in NG; originates in Malesia (Sillitoe, 1983a). Use as a boundary marker common in the NG highlands (Powell, 1976b). Bomagai-Angoiang men of PNG use the leaves to cover their buttocks (Clarke, 1971). On Manus Island leaves used to treat sores (Holdsworth & Wamoi, 1981); elsewhere in PNG for diarrhoea & cuts (Holdsworth, 1974). The Wola of PNG use them in arrow blade joints (Sillitoe, 1983b) & for lining ground-ovens (Sillitoe, 1983a), & recognize at least 25 cultivars.

Cordyline (?) sp. (1600)
entawiluk
Woody herb on mountain side. Used as a love-charm.

AMARANTHACEAE

Achyranthes aspera L. (1573)
bolak
Herb in secondary vegetation around village. Leaves wrapped in a *yeli* leaf & smoked (in the past).
Used medicinally in N. Bougainville (Holdsworth, 1977); leaves said to be edible (Martin & Ruberte, 1979). Another amaranthaceous weed, *Alternanthera sessilis* (L.) DC., is smoked as a medicine in the Baliem Valley (Kanis, 1978).

ANNONACEAE

Goniothalamus sp. (1288)
henabun
Shrub growing at forest margin. Bark fibres used to make string bags etc.

APOCYNACEAE

Alyxia rostrata (Markgr.) Markgr. (1464)
komunang
Woody vine common in secondary vegetation around village. Sewing needles (*hin*) for making rain-capes carved from wood. Ritual burning of this wood with sweet potato leaves, when fields are being planted, ensures a good crop.
In the E. Highlands of PNG *Alyxia* wood is used for support poles in construction (Hays, 1980).

Parsonia aff. ***hebetica*** Markgraf (1268/1361)
tenu
Twining vine in forest margin. Stem used for lashing in construction. In times of famine, vine wrapped around a string bag & placed in the men's house to boost sweet potato productivity.
Parsonia **stems also used for lashing in PNG (Hays, 1980); fruits eaten in W. New Britain (Powell, 1976a). Elsewhere, *Parsonia* sap used to treat coughs & colds (Powell, 1976a) & stomach-ache (Holdsworth, 1977).**

Note: **The fact that these spp. are both attributed magical properties associated with sweet potato fertility may be related to the fact that they exude white latex (as do the cut stems of sweet potato plants).**

AQUIFOLIACEAE

Ilex sp. (1550)
ginisa
Shrub (epiphytic) at forest margin. Fuel.
The Kapauku of Irian Jaya use *Ilex* wood for arrow-heads (Pospisil, 1963); the Wola use it for fire-lighting (Sillitoe, 1983b).

ARACEAE

Alocasia sp. (n.c.)
filamo
Giant herb common in damper areas in forest. Leaves used as impromptu rain hats.
The Bomagai-Angoiang of PNG use leaves of *A. macrorrhiza* Schott to line ground-ovens (Clarke, 1971). The tubers & leaves are eaten in NG (Powell, 1976a).

Colocasia esculenta (L.) Schott. (n.c.)
hom **(taro)**
Herb cult. in fields & kitchen gardens. Starchy rhizomes eaten. Important food source for the Yali; at least 22 cultivars recognized by the people of Ilamik, some of which differ strikingly in their morphologies.
Probably the staple of most of the highland peoples before the introduction of the sweet potato. Leaves are eaten in the NG highlands; in the Mt Hagen area they are used to treat burns (Powell, 1976a). Elsewhere in PNG they are heated & applied to boils (Holdsworth, 1977).

Note: ***Xanthosoma sagittifolium*** **Schott is also cult. in the highlands; although this was not observed at Ilamik it may be grown by the Yali (& might account for some of the cultivar names). Introduced to NG from S. America in the last century (Sillitoe, 1983a).**

Rhaphidophora sp. (1280)
urunak
Climber common in forest on damp ground. Long trailing aerial roots used for lashing in construction.
Rhaphidophora **stem sap is used to treat cuts & wounds elsewhere in NG (Powell, 1976a).**

ARALIACEAE

Schefflera cf. ***scytinophylla*** Harms (1603) **
puntu
Shrub common in subalpine vegetation. Unsuitable for fuel.
Schefflera **leaves used to treat stomach complaints elsewhere in NG (Powell, 1976a).**

ARAUCARIACEAE

Agathis labillardieri Warb. (1422) *
hendali
Tree in lower montane forest. The resin, burned on a stone, is used for divination (to determine who has cast a spell on a sick person). Split trunk sometimes used to make house walls; wood good for fuel.
Agathis **resin is sometimes used for torches in NG (Powell, 1976a).**

Araucauria cunninghamii D. Don (n.c.)
sin **(hoop pine)**
Tall forest tree. Bark used for thatching; magical properties are also attributed to this tree. Unsuitable for fuel.
In the E. Highlands of PNG timber used for construction, bark used as a lashing material & edible grubs are sought from the trunk (Hays, 1980). Resin sometimes used for torches (Powell, 1976a). The Wola use resin as glue & bark as a pearl shell wrapping (Sillitoe, 1983b).

BALANOPHORACEAE

Balanophora papuana Schltr. (1501/1583)
Parasite on forest floor. Said to be the flower of a *Saurauia* tree, to whose roots it was attached.
In Nokopo (PNG) the plant is used to treat cracked & burned feet (Kocher Schmid, 1991).

BALSAMINACEAE

Impatiens hawkeri Bull *sens. lat.* (1545)
helambuk
Common herb beside streams & in open places. The cut surface of its fleshy stem is applied to the umbilicus when severed. Variegated cultivar of this sp. seen growing as an ornamental at Ilamik.
The Bomagai-Angoiang of PNG use juice from the leaves to treat wounds (Clarke, 1971). Used elsewhere in NG for abdominal pains & labour induction (Holdsworth, 1974; Woodley, 1991). In Watut (PNG) the leaves of *Impatiens* spp. are eaten, & elsewhere burned for salt (Powell, 1976a).

BIGNONIACEAE

Tecomanthe volubilis Gibbs (1347)
amusan
Climbing woody vine in forest. Stem used for lashing in construction.
Tecomanthe **sap is used to treat respiratory problems in PNG (Woodley, 1991).**

CARICACEAE

Carica papaya L. *
(pawpaw)
Tree cult. around villages for its edible fruits.
Used to treat malaria by the Dani (Purwanto & Walujo, 1992). Used in PNG to treat stomach ache, boils & headaches (Holdsworth, 1974), ringworm & diarrhoea (Woodley, 1991).

CASUARINACEAE

Casuarina oligodon L.A. St John ssp. ***abbreviata*** L.A. St John (1227)
wali **(she-oak)**
Common tree in cleared valley bottoms & beside rivers. Bark used for thatching houses. Wood used for arrow-heads & in construction; good for fuel.
In many parts of NG, including the Baliem valley, this (nitrogen fixing) tree is used to replenish the soil for cultivation. The Wola of PNG use wood for steel axe hafts & walking sticks (Sillitoe, 1983b); in the E. Highlands young boys make bows from the branches (Hays, 1980). *Casuarina* wood & bark used in construction elsewhere in NG (Powell, 1976a). The Mt Hagen people are reputed to eat the leaves (Sillitoe, 1983a).

COMMELINACEAE

Commelina diffusa Burm.f. (1390)
obaharengge
Herb growing amongst grasses in cleared land. Cooked & eaten as a vegetable (in small quantities).
Commonly eaten in the highlands of NG. In Nokopo (PNG) it is attributed tonic properties (Kocher Schmid, 1991).

COMPOSITAE

Arrhenechthites novoguinensis (S. Moore) Mattf. ssp. ***novoguinensis*** (1488)
konggop
Woody herb beside stream. Leaves used by women to wipe babies' bottoms & clean up faeces.
The leaves of several Compositae are used in NG to treat skin troubles (Woodley, 1991), which could be the purpose of the Yali application. *Arrhenechthites* leaves eaten in the Chimbu region of PNG (Powell, 1976a). The Dani use an unidentified Compositae to clean their perforated nasal septa (Edwards, 1991).

Emilia prenanthoidea DC. (1568)
wanggilolo
Herb growing amongst grasses close to village. Leaves heated & squeezed over wounds to heal them. The same name & uses attributed to *Cardamine papuana* (Cruciferae).
In the S. Highlands of PNG the leaves are used on sores (Holdsworth, 1977); elsewhere used against toothache (Holdsworth, 1974). In the E. Highlands they are applied to tropical ulcers (Holdsworth, 1977).

Mikania cordata (Burm.f.) B.L. Rob. (1522)
sikele
Twining vine in secondary vegetation. Specifically said *not* to be used for tying up bundles of vegetables on account of bitter flavour.
Leaves reputed to be edible (Martin & Ruberte, 1979). Several *Mikania* spp. used medicinally in PNG (Woodley, 1991).

Olearia cf. ***leptocephala*** Koster (1551)
arak
Small tree at forest margin. Wood sometimes used in construction; good for fuel; used to smoke-cure *Pandanus* fruits.
Olearia **wood used in construction in the Chimbu (Powell, 1976a).**

CONVOLVULACEAE

Ipomoea batatas (L.) Lam. (n.c.)
suburuk **(sweet potato)**
Herb cult. in fields. Tubers, leaves & stems eaten. Main staple of the Yali; people of Ilamik recognize at least 49 cultivars.
Medicinal properties attributed to this sp. in NG include relief of stomach-ache, sores & eye infection (Holdsworth, 1977).

CRUCIFERAE

Brassica oleracea L. var. ***capitata*** (n.c.)
(cabbage)
Herb cult. in kitchen gardens for its edible leaves. A recent introduction to the area.
This sp. originates in the Mediterranean.

Cardamine papuana (Laut.) O.E. Schulz (1480)
wanggilolo
Herb on forest floor. Leaves heated & squeezed over wounds to heal them. Same name & uses attributed to *Emilia prenanthoidea* (Compositae).
Leaves have a pleasant pungent taste (Herb: Brass 23365).

CUCURBITACEAE

Lagenaria siceraria (Molina) Standley (1565)
humi **(bottle gourd)**
Twining vine cult. in gardens on raised frames. Hollowed fruits used as penis sheaths. Leaves & seeds eaten, as are the young fruits.
Originally from tropical Africa, grown in Melanesia since ancient

times (Sillitoe, 1983a). The Bomagai-Angoiang of PNG use the gourds to store salt & *Pandanus* oil (Clarke, 1971).

Sechium edule (Jacq.) Sw. (1310)
kiring (choko)
Vine cult. in fields & kitchen gardens. Fruits & leaves eaten.

Zehneria cissybium (M. Jacobs) ined. (1315)
pimlanggen
Twining vine in secondary vegetation around fields. Fruits & leaves eaten.

CUNONIACEAE

Caldcluvia cf. ***nymanii*** (K. Schum.) R.D. Hoogland (1546)
ibi
Forest treelet. Unsuitable for fuel. Food plant of arboreal mammals.
The Maring of PNG use *Caldcluvia* wood for construction (Rappaport, 1967); the Wola for fire-making (Sillitoe, 1983b).

CUPRESSACEAE

Libocedrus papuana F. Muell. (1606) ** (= *Papuacedrus papuana* (F. Muell.) Li)
lak
Tree in subalpine vegetation. Bark used for thatching houses (better than *Casuarina*). When small, trunk also used in construction.
In the Chimbu the wood is used in construction; elsewhere bark used for lining walls (Powell, 1976a). The green wood, if used for fuel, smokes & gives off little heat (Archbold et al., 1942). *Libocedrus* leaves eaten in Watut & the E. Highlands of PNG (Powell, 1976a).

CYPERACEAE

Carex cf. ***filicina*** Nees (1376/1402)
pal-pal
Herb in clumps beside streams. Stem can be used as fire-saw strap.

Elaeocharis dulcis (Burm.f.) Henschel (1225)
kem (Chinese water chestnut)
Semi-aquatic herb cult. in small ponds. Stems used to make women's skirts.
The Dani cultivate a sp. of *Elaeocharis* for food (Wiriadinata, 1992). Stems also used for skirts by the Huli of PNG (Powell, 1976b).

Schoenoplectus mucronatus (L.) Palla (1576) (= *Scirpus mucronatus* L.)
kem-kem
Common herb in boggy areas around village. Rhizome sometimes cooked & eaten with salt.
The Dani use this sp. as a purgative (Purwanto & Walujo, 1992); the Huli of PNG make skirts from its stems (Powell, 1976b).

DIOSCOREACEAE

Dioscorea alata **L. (1584)**
pim (yam)
Cult. vine. Tubers eaten. At least ten entities recognized, of which only *perekim* collected.
Yams were one of the earliest crop spp. to be introduced to NG (Powell, 1976a).

Note: **Several (at least six) other spp. of *Dioscorea* are cult. in the NG highlands (Barrau, 1958, Powell, 1976a); it is quite likely that more than one are grown by the Yali (& that some of the 10 names may refer to these other spp.).**

ELAEOCARPACEAE

Aceratium parvifolium Schltr (1540)
halik-halik
Small tree at forest margin. Trunk used in construction (posts).

Elaeocarpus millarii Weibel (1374)
manduke
Very large forest tree. Kernels of fruits eaten; the hollow stones used to be used as pipe-bowls for smoking. Fruits said to be eaten by cassowaries.
The Wola of PNG use *Elaeocarpus* bark for screw-pine oil scoops (Sillitoe, 1983b).

Elaeocarpus womersleyi Weibel (1327)
ololom
Small forest tree. Kernels of woody fruits eaten; wood used in construction (posts). Fruits said to be eaten by cassowaries.
The seeds have also been reported in PNG to be edible (Coode, 1981). *Elaeocarpus* wood is used for house posts elsewhere in NG (Powell, 1976a); the Kapauku of Irian Jaya use *Elaeocarpus* wood for axe handles (Pospisil, 1963).

Elaeocarpus sp. (1529)
pohombok
Tree at forest margin. Fruits said to be eaten by birds & arboreal mammals.

Sloanea sp. (1356)
oloho
Large forest tree. Wood used to make fire scoops (for hot coals).
The Wola of PNG use *Sloanea* wood for shields (Sillitoe, 1983b); in the Chimbu it is used in construction (Powell, 1976a).

Sloanea sp. (1442) *
pantuk
Large forest tree. Fruits said to be eaten by small mammals.

EPACRIDACEAE

Staphelia suaveolans (Hook.f.) Warb. (1599) **
linggip-linggip
Bushy shrub in subalpine vegetation. Fuel.

ERICACEAE

Dimorphanthera anchorifera J.J. Smith (1224)
suhumik
Shrubby tree in secondary vegetation near village. Unsuitable for fuel.
Dimorphanthera sap is used as a glue for making drums elsewhere in NG (Powell, 1976a); the stems of some spp. are used for lashing in construction & for arm bands (Powell, 1976a).

Rhododendron spp.
walahen
Twenty spp. of *Rhododendron* (shrubs & epiphytes) were collected in the area; all known by the same common name. Some are attributed magical properties. Unsuitable for fuel.
The overpowering scent of some *Rhododendron* spp. is used as an emetic in the NG highlands; the sticky sap sometimes used as a glue for making drums (Powell, 1976a). *R. macgregoriae* F.v.M., the commonest sp. in the vicinity of Ilamik, is used by the Dani as a remedy for skin fungus (Purwanto & Walujo, 1992).

Vaccinium megalophyes Sleum. (1298)
soho
Small low-branching tree common in secondary vegetation around village. Children sometimes lick nectar from the flowers. Wood may be used for axe-handles, but unsuitable for fuel.
Vaccinium wood is used in construction in the Chimbu (Powell, 1976a); for bird arrow-heads in the E. Highlands (Hays, 1980).

Vaccinium aff. ***quinquefidum*** J.J.Smith (1595) **
sohosa
Used for fuel at high altitudes.

EUPHORBIACEAE

Acalypha hellwigii Warb. var. ***mollis*** (Warb.) Schum. & Lauterb. (1309) (= *A. insulana* M. Arg.)
liringga
Shrub cult. around villages & in old fields. Leaves used as cigarette papers.
Used for cigarettes by a number of other NG tribes, including the Dani (Purwanto & Walujo, 1992). The Huli of PNG burn the apical shoots to make a salt substitute & use the wood in construction (Powell, 1976b). In Morobe (PNG) the leaves are used to treat sores & an infusion used to bathe people possessed by spirits (Woodley, 1991).

Breynia cernua (Poir.) M. Arg. (1574)
nohonil
Treelet in secondary vegetation close to village. Leaves put in a string bag with a piglet in order to stimulate it to wean.
In PNG the fruits are put into the houses to ensure continual return of the pigs (Herb: O.A. Christensen W-210). In Morobe an infusion of the bark is taken for dysentery; in E. New Britain the leaves used for local anaesthesia & treating tropical ulcers (Woodley, 1991). In Tari the wood is used for digging-sticks (Powell, 1976a).

Glochidion novoguineense K. Schum. (1462)
yuwal
Tree in open dry forest on ridge. Bark used to make bowls for pulverizing cooked *Pandanus conoideus* fruits. Fresh wood sometimes burned indoors, as smoke said to be therapeutic for pigs (but unsuitable for everyday use as fuel).
The Wola of PNG use *Glochidion* bark for making screw-pine oil

scoops (Sillitoe, 1983b); the Huli use the timber in construction (Powell, 1976b). *Glochidion* bark is used as a source of red paint by some NG people.

Glochidion perakense Hook.f. var. ***supra-axillare*** (Benth.) Airy Shaw (1463)

faluk

See *G. novoguineense* for description, uses etc.

Glochidion cf. ***wisselense*** Airy Shaw (1209/1511)

werebel

Common understorey shrub/treelet in forest. Leaves used as cigarette papers. This is the sp. most commonly used by people when not in their village.

Homalanthus sp(p). (1178)

song

Small tree common at the forest margin. Wood used for fire-saws; good for fuel. Said to be a food plant of arboreal mammals.

The Wola of PNG use *Homalanthus* bark for screw-pine oil scoops (Sillitoe, 1983b); in the Mt Hagen area of PNG the shoots are used to treat sores (Powell, 1976a).

Macaranga inermis Pax & Hoffm. (1466)

ulup

Tree in open dry forest on ridge. Leaves sometimes used as cigarette papers; bark used to make bowls for pulverizing cooked *Pandanus conoideus* fruits & to make the shooting tubes for bird hides.

The Wola of PNG also exploit the flexible properties of *Macaranga* bark, using it for girdles (Sillitoe, 1983b).

Macaranga pleioneura Airy Shaw (1536)

sindel

Tree at forest margin. Bark used to make bowls for pulverizing cooked *Pandanus conoideus* fruits & wood used for fire-saws.

In the E. Highlands of PNG the timber is used for light construction (Hays, 1980). The Wola of PNG also use this sp. for fire-making (Sillitoe, 1983b); canoes made from the wood in the Wissel Lakes of Irian Jaya (Powell, 1976a).

Macaranga sp. (1571)

wiri

Shrub (juvenile?) in secondary vegetation near village. Leaves used for wrapping miscellaneous items & lining ground-ovens.

Macaranga leaves are also used in ground-ovens in New Britain; on Manus Island they are used to treat sores.

Macaranga sp. (1478)

tuwa

Tree growing beside small river. Leaves used for lining ground-ovens.

Manihot esculenta Crantz (n.c.) *

sanggal (cassava)

Shrub cult. in fields. Leaves & tubers are eaten.

In PNG the leaves are used to treat sore eyes (Holdsworth, 1977).

Phyllanthus archboldianus Airy Shaw & Webster (1459)

hubu

Small tree in open dry forest on ridge. Wood may be used for making hunting bows. Also used 'magical' medicine for stomach wind.

Wood used for construction in the Chimbu; in the Mt Hagen area for digging-sticks (Powell, 1976a). The Wola of PNG use *Phyllanthus* wood for mouth bows (Sillitoe, 1983b).

FAGACEAE

Lithocarpus lauterbachii (von Seem.) Markgr. (1400)

bou

Large forest tree. Wood used in construction (walls).

The Wola of PNG use *Lithocarpus* wood for cleaver clubs & wedges (Sillitoe, 1983b); the Huli use the leaves to pack the eaves of their houses (Powell, 1976b).

Nothofagus cf. ***grandis*** Steen. (1223)

maratna

Dominant forest canopy tree. Large white edible grubs taken from the rotting trunks. Good for fuel. One (uncollected) sp. of edible fungus, *maratnasuk*, associated with this tree.

In Ndumba (PNG) one sp. of *Lithocarpus* likewise known to harbour edible grubs in its trunk & edible fungi at its base (Hays, 1980).

Nothofagus starkenborghii Steenis (1231)

sahe

Large tree common in forest. Wood used in construction (walls & rafters); unsuitable for fuel.

Nothofagus wood used for digging-sticks & spears in the Mt Hagen area; elsewhere for house-posts & planks (Powell, 1976a).

FLACOURTIACEAE

Casearia sp. (1345)

wanwanim

Forest tree. Edible grubs (*'uluhan'*) collected from the rotting trunks. Good for fuel.

FLAGELLARIACEAE

Flagellaria indica L. (1530)

panggil

Climbing vine at forest margin. Tough stem may be used as a substitute for rattan for bowstrings & for waist loops worn by men; also for binding up the sides of ground-ovens.

At Milne Bay (PNG) stem is used for lashing in construction (Herb: Frodin 936); on the Gazelle Peninsula to make fish traps by the Teop (Herb: Waterhouse 872). In Morobe the leaves used to treat ulcers & sore eyes; in the Sepik pieces of the stem taken for stomach ache (Woodley, 1991). It is said that eating the stems causes sterility (Powell, 1976a).

GESNERIACEAE

Cyrtandra aff. ***wariana*** Schl. (1444) *

menanggen

Shrubby epiphyte beside river. Fruits split open & their contents macerated in the palm of the hand with a stick & applied to wounds.

The Yopno people of PNG use *Cyrtandra* fruit juice to treat ear infections (Kocher Schmid, 1991); the Maring eat the leaves of certain spp. (Rappaport, 1967). The Dani use the leaves of one sp. to treat rheumatic pains (Purwanto & Walujo, 1992).

GOODENIACEAE

Scaevola oppositifolia R. Br. (1558)

helerombo

Vine in secondary vegetation around village. Attributed 'magical' medicinal properties for treating wounds.

The Mt Hagen people of PNG use the juice of the shoots to treat ear & eye inflammations (Stopp, 1963). Used in the Chimbu for lashing in construction (Powell, 1976a). Contains alkaloids (Holdsworth, 1977).

GRAMINEAE

Bambusa forbesii (Ridley) Holltum (1436) *

mohu

Small slender-stemmed branching bamboo common at forest margin. Stem used to make multi-pronged bird arrow-heads & leaves sometimes used for thatch.

Cult. as a roofing material by the Maring people of PNG (Rappaport, 1967).

Ischaemum polystachyum Presl. (1572)

tahe

Low grass spreading abundantly over old fields. Leaves commonly used for lining ground-ovens.

Leaves used in ground-ovens in the Chimbu; in Jimi (PNG) they are used for thatching (Powell, 1976a).

Miscanthus floridulus Warb. (1282)

fiyanto (sword-grass)

Tall grass in cleared land. Stem used for arrow shafts & in construction (strips below upper floor matting). Sections of stem sometimes worn through ear & nose; attached to 'dreadlocks' for dancing in past.

Several other NG tribes use this sp. for arrows (Clarke, 1971). In the E. Highlands of PNG it is used for floor mats & torches; children eat a small worm found inside the stem (Hays, 1980). In the Chimbu the stems are used to hold down thatch (Powell, 1976a).

Pennisetum macrostachyum (Brongn.) Trin. (1306)

komulo

Occasional grass in abandoned fields. Young (insubstantial) stem may be eaten.

In Morobe (PNG) this sp. is used to treat centipede bites & earache (Woodley, 1991). Stem said to be used for arrow shafts in the Chimbu (Powell, 1976a), where the leaves are also used in ground-ovens.

Racemobambos aff. ***raynalii*** Holttum (1500)

yeluwa

Slender weeping bamboo common on upper slopes of ridges. Stems

used to make bowstrings & straps for fire-saws.
The Kapauku of Irian Jaya also use a bamboo sp. for fire-saws (Pospisil, 1963).

Saccharum officinarum L. (n.c.)
el (sugar cane)
Tall grass cult. in fields & kitchen gardens. Stems chewed for their sugary juice. At least ten cultivars recognized by the people of Ilamik.
Used in New Britain to treat stomach complaints (Powell, 1976a); chewed in PNG to cure body pains (Holdsworth, 1977).

Saccharum robustum (Brandes & Jesweit) Grassl. vel aff. (1412)
bobindi
Tall grass in secondary vegetation. Sections of the stem used to make mouth-harps. Stems also used in construction (strips below the upper floor matting).
Used in PNG to treat scabies (Holdsworth, 1974). The Wola use the spathe for bone-tipped arrow sleeves (Sillitoe, 1983b); the Huli use stems for fencing (Powell, 1976b). *Saccharum* spp. are used for roofing elsewhere in NG (Powell, 1976a).

Schizostachyum cf. ***glaucifolium*** Munro (1427) *
fili
Large clustering bamboo cult. near village but said to occur wild also. Stems used for water-storage tubes, for cooking (occasionally), & for arrowheads & other cutting implements.

Schizostachyum lima (Blanco) Merrill (1429) *
biliyahnet
Slender bamboo clustered beside stream. Stems used to make *yenggilirk*-type arrowheads.
Bow-strings are made from the stems of this bamboo elsewhere in NG (Holttum, 1967).

Setaria palmifolia (Koen.) Stapf. (1304/1311/1316)
uwan cult.; ***hohumbi*** wild (highland pitpit)
Low fleshy grass cult. in fields & kitchen gardens (sterile); wild (?) in old fields & grassland (fertile). Stems & young leaves cooked & eaten.
Commonly cult. in the highlands; widespread in SE Asia but apparently eaten only in NG (Bourke, 1981). The Wola of PNG use the leaves on arrow blade joints (Sillitoe, 1983b). Stem used medicinally in the highlands for stomach-ache, diarrhoea, fevers, toothache & colds (Holdsworth, 1977).

Thysanolaena maxima O. Kuntze (1452) *
ulubindi
Tall grass beside track on ridge top (forest margin). Stems used as arrow shafts; leaves & inflorescences for wrapping dead birds-of-paradise.

Zea mays L. (n.c.)
wiye (maize)
Recent introduction. Leaves used to line ground-ovens. At least 12 cultivars recognized by the people of Ilamik.
The Wola of PNG use the cob sheath on arrow blade joints (Sillitoe, 1983b).

GUTTIFERAE

Calophyllum pauciflorum A.C. Smith (1260)
tihindik
Forest tree. The yellow latex from the bark, mixed with pig-grease, used to be put in the hair to encourage it to grow into 'dreadlocks' for dancing. Wood good for fuel.
Calophyllum wood is used for spears in New Britain (Powell, 1976a), & for dug-out canoes in the Wissel Lakes region (Powell, 1976a). *C. inophyllum* L. is used for numerous medicinal purposes in PNG (Holdsworth, 1977).

Garcinia sp. (1233)
pik
See *Calophyllum* for description, uses etc.
The leaves, fruits & bark of some *Garcinia* spp. are eaten in the Wissel Lakes region & Watut (Powell, 1976a). The Huli of PNG use the resinous fruits to extract facial hair (Powell, 1976b). Some spp. used medicinally (Holdsworth, 1977).

Garcinia (?) sp. (1375)
seli
Forest tree. Wood used for axe handles & construction; good for fuel. Fruits said to be eaten by arboreal mammals.
The Bomagai-Angoiang of PNG favour the wood of *Garcinia* spp. for axehandles (Clarke, 1971); the Wola use it for tongs & spears (Sillitoe, 1983b). Elsewhere it is used in construction (Powell, 1976a, Powell, 1976b).

Garcinia (?) sp. (1401)
puruaggel
Forest tree. Yellow latex from bark used to coat the bindings of arrow-heads.

HELICONIACEAE

Heliconia papuana Kress (1448) *
kerak-kerak
Giant herbs at margins of abandoned fields. Leaves used for thatch.
In Jimi (PNG), *Heliconia* leaves are used to line ground-ovens (Powell, 1976a).

ICACINACEAE

Rhyticaryum elegans Schellenb. (1379/1510/1526)
sulpuluk
Slender shrub in forest understorey. Seeds edible.
In Watut & the S. Highlands (PNG) *Rhyticaryum* leaves are used to treat stomach complaints (Powell, 1976a).

IRIDACEAE

Libertia pulchellum (R. Br.) Spreng. (1608) **
seri
Small herb in subalpine vegetation. Used as charm to prevent rain on long journeys.

LAURACEAE

Cinnamomum sp. (1230)
kami
Large tree common in forest. Pieces of the (bitter) bark, with strong aromatic scent, chewed & spat out as a cure for fever.
The Dani use the bark of another sp. of *Cinnamomum* (*C. kami* Kostermans - referred to by the same vernacular name) for a number of medicinal purposes, including contraception (Kostermans, 1969). Other *Cinnamomum* spp. are used in PNG to treat fever, headache, diarrhoea & fatigue (Holdsworth, 1977). The Fore people of PNG use *Cinnamomum* bark to flavour food (Powell, 1976a).

LECYTHIDACEAE

Planchonia sp. (1351)
wayo
Large forest tree. The wood (buttress?) is used in construction (door piece & broad baffle-board above fire). The fruits (seeds?) are edible; eaten by cassowaries.

LEGUMINOSAE

Arachis hypogaea L. (n.c.)
(ground nut, peanut)
Herb cult. in fields for edible seeds. Recent introduction.

Desmodium repandum DC. (1335)
yesungga
Common herb in cleared land around villages. Leaves cooked as a vegetable with meat; said to be delicious. Immature fruits may be eaten; taste like beans. Said to be important that this plant is removed from the fields & burned before sweet potatoes are planted.
Leaves & seeds also eaten in the Chimbu region of PNG (Powell, 1976a); the fibres of a *Desmodium* are used for string in the Wissel Lakes (Powell, 1976a).

Desmodium sequax Wall. (1258)
serahan
Shrub in secondary vegetation around village. Used as a cure for pigs' wounds: leaves brushed over the pig's skin or cut twigs poked into wound. Not clear whether this was a 'magical' medicine or a practical one. Good for fuel.
Used to treat toothache in PNG (Holdsworth, 1974); also wounds & cuts (Holdsworth, 1977). Possesses anti-bacterial properties (Rali, 1992).

Desmodium uncinatum DC. (1476)
yesungga
See *D. repandum* for description, uses etc. This sp. did not occur at Ilamik but was abundant around one village further down the valley.

Lablab purpureus (L.) Sweet (1360) (= *Dolichos lablab* L.)
hilanggen (hyacinth bean)
Vine cult. in fields for its edible fruits. Five 'cultivar' names were given, of which only *matik* was collected. These may refer to more than one species.

Note: A number of spp. of beans are grown in the highlands of NG,

several of which are used by the Dani (Wiriadinata, 1992). At Ilamik some were seen which were almost certainly *Phaseolus vulgaris* L.; it is likely that other spp. are also grown there.

Mucuna novoguineensis Scheff. (1437) *

molanggen

Woody vine beside river. Stem used to make vine bridges.

Sap used in the E. Sepik (PNG) to dye string bags & drunk by the men during ceremonies (Herb: LAE 73628).

Strongylodon archboldianus Merr. & Perry (1449)

ahasangga

Woody vine in forest. Stem for lashing; leaves used as a 'blanket' for babies when they are carried in string bags.

LILIACEAE

Allium sp(p). (n.c.) *

(garlic/red onion)

Herbs occasionally cult. in kitchen gardens. Recent introduction.

LOGANIACEAE

Fagraea ceilanica Thunb. (1210/1553)

wan

Forest tree. Trunk used in construction. Said to be particularly good for support posts (resistant to rot?). Unsuitable for fuel.

Wood is used for weapons in the Chimbu (Powell, 1976a). The Wola of PNG use *Fagraea* wood for combs (Sillitoe, 1983b); the Huli for spade handles & fuel (Powell, 1976b).

MALVACEAE

Abelmoschus manihot (L.) Medik. (1312/1359/1585) (= *Hibiscus manihot* L.)

hou (hibiscus spinach)

Low shrub cult. in fields & kitchen gardens. Leaves cooked & eaten. At least three cultivars grown (all collected): ***anggahou***, ***wamilonggo*** & ***towalin***.

Native of China & widely cult. throughout Melanesia (Bourke, 1981). In Morobe (PNG) the sap is used to treat coughs & colds, & a soup of the leaves, together with *Saccharum edule*, taken for asthma (Woodley, 1991). Elsewhere in PNG it is used to treat skin rashes (Holdsworth, 1974).

Gen. indet. (1354)

sabe

Forest tree. Bark fibres used as thread to sew *Pandanus* leaf rain-capes. Wood is used for fire-saws, but unsuitable for fuel.

The Wola of PNG use *Hibiscus* bark for pig tethers & shoulder & hand shields (Sillitoe, 1983b).

MARANTACEAE

Phrynium sp. (1425) *

asin

Herb at forest margin. Leaves sometimes used for thatching. Pieces of leaves fed to hunting dogs to improve their performance; may also be eaten by men before battle.

The Bomagai-Angoiang of PNG eat *Phrynium* leaves raw, & use them to wrap food, to line ground-ovens & as thatch (Clarke, 1971).

MELASTOMATACEAE

Melastoma polyanthum Bl. (1172)

wisuk

Low shrubby tree common at forest margin. Purple-black dye prepared from fruits; used to decorate string bags. Unsuitable for fuel.

The Dani use *Melastoma* fruits for dyeing bags (Purwanto & Walujo, 1992). The leaves of *M. malabathricum* L., a very closely related sp. (perhaps synonymous), are reportedly edible (Martin & Ruberte, 1979).

MELIACEAE

Toona sp. (1378)

kembik

Forest tree. Wood is used to make traditional drums &, nowadays, crude miniature guitars. Unsuitable for fuel.

The Kapauku of Irian Jaya use *Toona* wood to build dug-out canoes (Pospisil, 1963); the Wola make shields from it (Sillitoe, 1983b).

MORACEAE

Artocarpus altilis (Parkinson) Fosberg (n.c.) *

sawe (breadfruit)

Tree cult. around village. Fruits eaten.

Sap used as a wash to prepare bark for painting elsewhere in PNG; sometimes used as a glue for making drums & as bird lime (Powell, 1976a). Taken on Manus Island to treat diarrhoea & dysentery (Holdsworth, 1977). This sp. is used to make bark-cloth in New Britain (Powell, 1976a).

Ficus arfakensis King (1346)

bisolo

Forest tree. Bark fibres used to make string bags etc.

The use of fig bark for fibre (for bags, pig tethers, bark cloth etc.) is common in NG (Powell, 1976a).

Ficus comitis King (1430)

furuk

Forest tree. Bark fibres used to make string bags etc., & ropes for tying up pigs. Wood good for fuel.

Ficus copiosa Steud. (1446/1566)

soluk

Tree cult. around villages but also said to occur wild in the forest. Fruits eaten, as are young leaves (cooked). Good for fuel.

Commonly planted around villages in the NG highlands & used as above (Powell, 1976a). In PNG the leaves are massaged into the stomach to cure stomach-ache (Holdsworth, 1977).

Ficus dammaropsis Diels (1567)

holubi (highland breadfruit)

Tree in secondary vegetation close to village (cult.?). Young leaves cooked & eaten. Bark fibres used to make string bags etc. & ropes for tying up pigs.

Fruits eaten by various peoples in NG (Powell, 1976a). In the E. Highlands the bark is used for tying firewood bundles & for foot straps for tree climbing; edible grubs are collected from the trunk (Hays, 1980). The Wola use the leaves to wrap pig grease & salt, & make bark-cloth fromthe bark (Sillitoe, 1983b).

Ficus scratchleyana King var. ***rhopalosycia*** (Diels) Corner (1259B)

bo

Epiphytic shrub (climber?) in secondary vegetation. Used to evict malicious ghosts from the village.

Ficus sp. (1433)

yuwe

Small forest tree. Bark fibres used to make string bags etc.

MUSACEAE

Musa sp(p). (n.c.)

hali (banana)

Cult. around villages & in fields for edible fruits. Young leaves also cooked & eaten, & the stem bark *in extremis*. Leaves used for lining ground-ovens (on either side of the vegetable layers), for wrapping various objects, for packing the eaves of houses & for a number of other applications.

In Morobe (PNG) the sap from the sucker plants is pressed onto fresh cuts; the stem sap is taken for coughs & colds (Woodley, 1991). Elsewhere in PNG, *Musa* is used as an abortifacient & as a remedy for body pains (Holdsworth, 1974). The Wola use the stem integument on arrow blade joints (Sillitoe, 1983b); the fibres are elsewhere used for string, clothing & pig tethers (Powell, 1976a).

MYRISTICACEAE

Myristica aff. ***neglecta*** Warb. (1269)

bom (wild nutmeg)

Large tree in forest on damp ground. Used to bring about ruination or death of man of whom one is jealous. Good for fuel.

Myristica leaves used as laxatives elsewhere in NG (Powell, 1976a); in the E. Highlands the juice of the fruits is used to attract game (Hays, 1980).

MYRSINACEAE

Ardisia cf. ***denhamioides*** S. Moore (1618)

sunun

A package of the dried leaves of this plant was brought to Ilamik, wrapped in the fibre from a case-moth's nest, from elsewhere. Leaves fed to hunting dogs to improve their performance. May also be used for poisoning people. Victim was said to develop a kind of insanity such that 'he doesn't recognize his own parents'.

The leaves of an *Ardisia* sp. are eaten in the E. Highlands of PNG

as a cure for swollen stomachs (Holdsworth, 1977).

Ardisia sp. (1261)
hendip
Forest shrub (sapling?). Wood used for digging-sticks & fire-saws. When the digging-stick is worn down it is thrown into the fire to ensure a good sweet potato crop.

Ardisia sp. (1381)
bibe
Forest tree. It was said that in Pronggoli the wood of this sp. is used to build houses (not of the traditional type). Unsuitable for fuel.
Ardisia wood is used for construction in the Chimbu (Powell, 1976a).

Maesa spectabilis Sleumer (1199)
hutukele
Woody vine scrambling at forest margin. Stem used for lashing; leaves used as 'blanket' for babies when carried in string bag.
Maesa leaf sap is used to treat itches elsewhere in NG (Powell, 1976a); the wood is used for fencing (Hays, 1980).

Rapanea cacuminum Mez (1263/1367)

Rapanea minutifolia Knoester (1454) *
teken
Low shrubby tree in forest understorey. Wood used for digging-sticks, fire-saws & fuel. Used ritually as 'magical' medicine for stomach wind & for protection of women & children when men collecting *Pandanus* fruits in the mountains.
The Wola of PNG also use *Rapanea* wood for digging-sticks & fire-making (Sillitoe, 1983b); in the Chimbu it is used in construction (Powell, 1976a).

MYRTACEAE

Metrosideros cordata (White & Francis) Dawson (1460)
minmini
Tree in open vegetation on ridge-top. Attracts many birds, which may be shot from its branches.

Syzygium effusum (A. Grey) C. Muell. (1534)
piyanggu
Tree at forest margin. Wood used in construction (posts & tie beams) but unsuitable for fuel. Fruits eaten by cassowaries. The name was also applied to another sp. of *Syzygium*.
The Wola of PNG use *Syzygium* wood for cleaver clubs & wedges (Sillitoe, 1983b). In Tari (PNG) the genus is used for axe handles & digging-sticks (Powell, 1976a); the Huli employ it in construction (Powell, 1976b).

Syyzyium taeniatum Diels vel aff. (1394)
sisoluwa
Small tree in forest understorey. Wood used for hunting bows & arrow-heads.
Syzygium bark used for lashing in construction in some parts of NG (Powell, 1976a).

Syzygium sp. (1569)
tendok
Large tree in semi-cleared land surrounding village. Scrapings of the inner bark applied to cuts, sores & boils.
Masticated *Syzygium* bark used to treat sores in New Britain, & as cure for coughs & colds (Powell, 1976a).

Xanthomyrtus compacta (Ridley) Diels (1610) **
wom
Common shrub among subalpine vegetation. Good for fuel.
Xanthomyrtus leaves are eaten to alleviate body pain in the E. Highlands of PNG (Holdsworth, 1977). The Kapauku of Irian Jaya use *Xanthomyrtus* wood for digging-sticks (Pospisil, 1963); in Tari (PNG) it is used for house posts (Powell, 1976a).

Xanthomyrtus montivaga A.J. Scott (1259A)
wom
Shrub in secondary vegetation around village. Used ritually for protection of women & children when men collecting *Pandanus* fruits in the mountains; good for fuel.

Gen. indet. (1264)
wom
Forest tree. Wood used in construction & good for fuel. Used ritually for protection of the women & children when men collecting *Pandanus* fruits in the mountains.

NEPENTHACEAE

Nepenthes maxima Nees (1179)
buahun ahomi (pitcher plant)
Climbing vine common at forest margin on damp soil. Stem used for lashing.
Dani children sometimes use the insect traps as penis sheaths (J. Camus, pers. comm.).

OCHNACEAE

Schuurmansia henningsii K. Sch. (1369/1475/1538)
sembererk
Slender tree in forest & cleared land. Wood used to make hunting bows.
The Wola of PNG use the wood for bows & digging-sticks (Sillitoe, 1983b). In Morobe (PNG) the seeds are eaten & the leaves fed to hunting dogs to improve performance (Herb: Blackwood 142).

ORCHIDACEAE

Calanthe chrysantha Schltr. (1506)

Calanthe rhodochila Schltr. vel aff. (1508)
sanisani
Epiphytes in forest. A green dye, used to decorate string bags, is prepared from the leaves.
In Jimi (PNG), *Calanthe* leaves are used to line ground-ovens (Powell, 1976a).

Dendrobium prostheciglossum Schltr. (1198)
yuwa-yuwa
Trailing epiphyte at forest margin. Tough yellow stem cut into segments & threaded as beads onto necklaces.
In the E. Highlands of PNG necklaces are also made from the stems of *Dendrobium* spp. (Hays, 1980).

Diplocaulobium regale (Schltr.) A.D. Hawkes (1217/1334)

Diplocaulobium sp. (1413)
wik
Epiphytes in forest. Strips of yellow fibrous stem sometimes wound around the fibres of string bags for decoration, & wound around arrowheads to cause irritation in the wound.
The Dani use orchid fibres for the same purposes (Matthiessen, 1989).

Phaius tankervilleae (Banks) Bl. (1284/1397)
biyanu
Terrestrial herb in forest, also apparently cult. in village. Green dye, used to decorate string bags, prepared from the leaves.
In PNG this sp. is used as a birth regulator (Holdsworth, 1974).

Spathoglottis parviflora Kranzl. (1294)
halhal
Terrestrial herb at forest margin. Green dye, used to decorate string bags, prepared from the leaves.
The Wola of PNG use *Spathoglottis* stems to make armbands (Sillitoe, 1983b).

Spathoglottis plicata Bl. (1428)
halhal
Terrestrial herb in anthropogenic grassland. Leaves used to wrap *Pandanus conoideus* fruits when they are cooked.
The Huli of PNG use large *Spathoalottis* leaves for wrapping traditional salt (Powell, 1976b).

PALMAE

Note: Rattan palms (*Calamus* spp. etc), on account of their tough flexible stems, are widely used for a variety of purposes in NG, as they are throughout their range. The taxonomy of NG rattans is still in its infancy, as a result of which it is impossible to identify the specimens beyond generic level.

Calamus cf. ***hollrungii*** Becc. (1435) *
mambile
Large solitary rattan in forest. Its principle use is as a bow-string (split lengths of the stem), but it may also be used for waist-hoops & fire-saw straps. This sp. is sometimes planted.
An infusion of this sp. is used to treat ear & eye infections in the S. Highlands of PNG (Powell, 1976a).

Calamus sp. (1193)
sebente
Small clustering rattan common in damp areas around village. Stem used for lashing in construction; split lengths woven into armbands & arrow-head bindings.

Calamus sp. (1434) *

ahal

Clustering rattan near forest margin. Stem used for fire-saw straps, temporary bow-strings, lashing in construction, armbands & the waisthoops worn by men.

Calamus sp. (1469) *

punting

Small clustering rattan in open vegetation beside track. Stem used in construction & for fire-saw straps & armbands.

Calamus sp. (1544)

si

Clustering rattan at forest margin. The specimen collected had been planted, although said to grow wild further down the valley. Stem used for fire-saw straps, armbands & construction. Apparently unsuitable for waist-hoops because it turns black.

Caryota sp. (1439) *

suma

Tree in secondary forest at edge of abandoned field. These individuals had been planted. Edible starch extracted from the trunk; wood used for arrowheads.

Caryota starch is also eaten by other NG peoples, & the wood used for hunting bows on the Idenberg River (Powell, 1976a).

Gronophyllum pinangoides (Becc.) Essig & Young vel aff. (1423) *

biyal

Small slender tree in forest understorey. Wood used for arrowheads which are said to be poisonous, although not clear whether this effect is magical or physiological.

The Bomagai-Angoiang of PNG use _Gronophyllum_ wood for arrow fore-shafts, & eat the palm heart (Clarke, 1971).

Heterospathe muelleriana (Becc.) Becc. (1339)

wirale

Understorey tree occasional in forest around Ilamik. Wood used for (second quality) hunting bows & for arrowheads.

The Wola of PNG use the wood for digging-sticks, spears, bows & arrows; armbands are made from the leaf ribs (Sillitoe, 1983b). In Nokopo (PNG) young _Heterospathe_ fronds are eaten & the fruits used as a narcotic (Kocher Schmid, 1991).

Metroxylon sp. (n.c.) *

yasi **(sago palm)**

Stout clustering palm cult. near village. Edible starch extracted from the trunk; spathe used to make bowls for pulverizing cooked _Pandanus conoideus_ fruits. Leaves sometimes used for thatch.

The Wopkaimin of the Star Mountains use sago palm leaves for thatching (Holttum, 1967). On the Fly river the spathe bark is used as a bow bracer; elsewhere the leaf fibres are used for string (Powell, 1976a). In some lowland areas of NG sago is an important source of starch in the diet (Powell, 1976a).

Ptychococcus sp. (1447) *

suhunim **(black palm)**

Slender palm in secondary growth at edge of old fields. These trees deliberately planted & highly valued. Top quality hunting bows made from the wood; one large tree may furnish 30 bows. Wood also used for arrow-heads.

Ptychococcus is also planted in Morobe Province (PNG) for its wood, & used for bows & arrows (Herb: Hoogland 9033).

PANDANACEAE

Freycinetia linearis Merr. & Perry (1384)

Freycinetia sterrophylla Merr. & Perry (1494)

elekasim

Common forest climbers. The fibres are bound around the ends of hunting bows to prevent string from slipping. Powerful magic properties attributed to this plant, associated with warfare & solitary periods in the forest. Traditionally there was a taboo on children speaking its name.

The Bomagai-Angoiang of PNG also use _Freycinetia_ bindings on their hunting bows (Clarke, 1971). The Wola use it for wristbands etc. (Sillitoe, 1983b); in the Jimi it is used for lashing in construction (Powell, 1976a).

Freycinetia cf. ***pseudoinsignis*** Warb. (1180)

likam

Large forest climber with striking inflorescence. Strips of the leaves sometimes wound around the fibres of string bags for decoration, thoug

h said to be more common amongst the Dani.

Freycinetia spp. are used for personal ornamentation & fibre by a number of highland peoples (Powell, 1976b).

Pandanus adinobotrys Merr. & Perry (1503)

hoele

Small understorey tree. Leaves used for thatching temporary shelters. Strips of the leaves sometimes wound around the fibres of string bags for decoration, though more common amongst the Dani.

The Wola of PNG use the wood for bark shields (Sillitoe, 1983b). Fibres from the aerial roots of _Pandanus_ spp. are used for string in PNG (Powell, 1976a).

Pandanus antaresensis St John (1341)

hembiye

Tall stilt-rooted tree on forested ridges above Ilamik. Fruits cooked & eaten; highly prized. Nuts tough; cracked between stones. Split sections of the stilt roots used in construction (spiritual rather than structural significance?). Leaves sewn into rain-capes; fruits eaten by cassowaries.

The Wola of PNG use the leaves for rain-capes & the aerial roots for bark shields (Sillitoe, 1983b). The Wopkaimin of the Star Mountains also eat the fruits, use its leaves to thatch high altitude shelters & employ it in magic medicine for fever, headache, diarrhoea & difficult breathing. They also set snares around its fallen fruits to catch cassowaries (Hyndman, 1984).

Pandanus conoideus Lam. (1421)

sak

Cult. (domesticated) tree, more common at lower altitudes where edible wild _Pandanus_ trees scarce or unavailable. Fruits cooked in ground-ovens & macerated in special bowls & their oily red pulp eaten with vegetables. The rotting leaves (whose fibres remain intact) serve as impromptu cordage.

The oil is used in Nokopo (PNG) to treat skin infections & sore throats (Kocher Schmid, 1991); the Wola use it as a cosmetic (Sillitoe, 1983b). It is sometimes used as a dye (Powell, 1976a).

Pandanus iwen B.C. Stone (1340)

hilak

Understorey forest tree, common in vicinity of villages (where probably planted). Fruits eaten either raw or cooked over a fire; taste very like coconut. Leaves sewn into rain-capes.

The Wola of PNG use the aerial roots on bark shields & the leaves for rain-capes (Sillitoe, 1983b). In the E. Highlands of PNG the leaves are used to thatch temporary shelters & the hollowed trunk for channeling water (Hays, 1980).

Note:**The specimen collected conforms to Stone's description of the sp. but, as he points out in the description (Stone, 1984), this may only be another cultivar of the _P. brosimos_ Merr. & Perry/_P. julianettii_ Martelli complex. These are are hard to distinguish & thus often treated together (as here), & have long been domesticated in NG but also grow wild.**

Pandanus cf. ***limbatus*** Merr. & Perry (1235)

pisi

Tall forest tree on ridges above Ilamik. Bark removed whole & used for flooring houses. Fruits eaten by cassowaries.

Similar use of _Pandanus_ bark for flooring has been recorded amongst the Kapauku of Irian Jaya (Pospisil, 1963). The Wopkaimin of the Star Mountains, who also use _Pandanus_ bark in this manner (other spp.), occasionally eat the fruits of _P. limbatus_ but do not rate it highly (Hyndman, 1984). They also use the leaves for thatching. _Pandanus_ bark is sometimes used for wall lining (Powell, 1976a).

Pandanus sp. (1519)

hul-hul

Low shrub in secondary vegetation close to village. Leaves used to thatch temporary shelters.

Note: **Other wild edible _Pandanus_ (_wiramna_) of the Yali include _penggel_, _olo_, _wesen_, _kawin_, _wendela_ & _punum_. These were not collected.**

PHILESIACEAE

Geitonoplesium cymosum A. Cunn. (1188)

muhulele

Slender vine climbing at forest margin. Stem used for lashing in construction & also for weaving armbands.

The Wola of PNG use the stem to make fishing nets & woven armbands (Sillitoe, 1983b); in Tari & the Chimbu it is used for lashing in construction (Powell, 1976a).

PHORMIACEAE

Dianella ensifolia (L.) DC. (1411)

hek-hek

Herb on forest floor & in marginal vegetation. Attributed magical properties (for laying a curse upon one's enemies).

The Huli of PNG use the leaves to plug bamboo water tubes (Powell, 1976b).

PHYLLOCLADACEA

Phyllocladus hypophyllus Hook.f. (1617) **

inek

Low tree in stunted upper montane forest. When a 'magic' house is built, one of the four posts around the fire must be made from the wood of this sp. It was said to be hard to find but, if pig fat was left in the forest, one would find the tree on returning to the same place.

In the E. Highlands of PNG the wood is used for bridges & traps; the leaves for adornment (Hays, 1980).

PIPERACEAE

Piper gibbilimbum C.DC. (1485)

holuwak

Understorey treelet. The dried leaves are packeted in fresh leaves & smoked through a tube over a fire (the whole arrangement being called a *pop*). This practice appears to have stopped.

In the W. Highlands of PNG the leaves are chewed (Herb: Vink 16419); in the upper Kaugel valley this sp. is planted & its leaves & flowers worn during ceremonies (Herb: Bowers 51). Leaves reputedly used as a narcotic in Nokopo (Kocher Schmid, 1991).

Piper macropiper Pennant *sens. lat.* (1247/1496)

pengga

Common climber in forest on ridges above village. Strongly aromatic leaves & young stems eaten, ideally with salt. They have a sharp but pleasant taste.

The leaves of a *Piper* - probably the same sp. - are also eaten by the Dani (Wiriadinata, 1992). In the Sepik District of PNG the Wasuk people use the stems as torches (Herb: Hoogland & Craven 10409). *Piper* spp. are eaten by the Wola of PNG ; used to treat stomach complaints, itching & stings elsewhere in NG (Powell, 1976a).

Piper versteegii C. DC. (1440) *

gelal

Climber in trees beside river. The pleasantly aromatic leaves are rubbed on the body & attributed therapeutic properties.

Piper sp. (1575)

gelal

Common climber in forest on ridges above village. Used as a 'magical' medicine of uncertain application.

PITTOSPORACEAE

Pittosporum pullifolium Burkill (1243/1577/1602)

maler, maleranggen

Shrub in secondary vegetation around village & in subalpine vegetation. Seeds furnish a black dye used to decorate string bags. Wood used to make hunting bows & arrow-heads.

It is said in Chimbu in the E. Highlands of PNG that handling of the seeds without washing one's hands induces vomiting (Herb: Millar NGF 23119). The Wola of PNG also use the fruits for pigment (Sillitoe, 1983b); in the E. Highlands they are used for face paint (Hays, 1980). Seeds are sometimes eaten (Powell, 1976a).

PODOCARPACEAE

Dacrycarpus compactus (Wassch.) de Laubenf. (1605) **

ibin

Common tree in subalpine vegetation. See *Dacrydium* for uses etc. (from which it appears not to be distinguished).

Dacrydium sp. (1548)

ibin

Large forest tree. Wood used to make ceremonial drums; good for fuel. Also used in construction - only for the men's houses.

Podocarpus neriifolius D. Don vel aff. (1232)

suwerahap

Medium sized forest tree. Bark used for lining walls of houses & sometimes for thatching. Unsuitable for fuel.

The Wola of PNG use the wood for stone axe sockets (Sillitoe, 1983b); in the Sepik (PNG) the leaf sap is used to heal sores (Holdsworth, 1977). The Dani use *Podocarpus* timber for construction (Purwanto & Walujo, 1992). It is used for spears in the Mt Hagen region & for dug-out canoes in the Wissel Lakes (Powell, 1976a).

POLYGONACEAE

Polygonum chinense L. (1372)

huluk-huluk

Scandent herb beside stream in cult. area. Stems used to tie up bundles of sweet potato leaves.

The leaves of this sp. are eaten in the Chimbu region of PNG (Powell, 1976a).

RANUNCULACEAE

Clematis phanerophlebia Merr. & Perry vel aff. (1556)

mahayo

Woody vine at forest margin. Stem used for lashing fences, for bridge construction, & binding up the sides of ground-ovens.

Similar uses are recorded in the E. Highlands of PNG (Hays, 1980). Some spp. are used elsewhere to treat coughs & colds (Powell, 1976a).

RHAMNACEAE

Alphitonia incana (Roxb.) Tejsm. & Binn. ex Kurz (1450)

ili

Common tree in open areas around villages. Bark used to make bowls for pulverizing cooked *Pandanus conoideus* fruits. Wood sometimes used in construction (ladders) & for fire-saws, but unsuitable for fuel.

The Dani rub the leaves on chafed hands (Cooper, 1971). In PNG the wood has been recorded as used for house posts (Herb: A.N. Millar NGF 18898) & as a medicine (Rappaport, 1967). The Mt Hagen people use the bark to treat swellings (Stopp, 1963); many collectors refer to a smell of wintergreen. An important firewood sp. for the Bomagai-Angoiang of PNG (Clarke, 1971) - a curious discrepancy with the Yali information.

Alphitonia sp. (1272)

ili

Shrub (sapling?) in abandoned field. Leaves used in the ritual initiation of young boys (to make them forget their parents when they are taken off into the forest).

ROSACEAE

Prunus sp. (1262)

sana

Forest understorey treelet (sapling?). Used ritually for protection of women & children when men collecting *Pandanus* fruits in the mountains. Unsuitable for fuel. Eaten by arboreal mammals.

Prunus bark is used to make belts in PNG (Powell, 1976a); in the Sepik the wood is used in construction (Herb: Hoogland & Craven 10397).

Rubus rosaefolius J.E. Sm. (1317)

molip (wild raspberry)

Low bramble common in old fields. Fruits occasionally eaten, although not regarded as a serious food. This sp. said to be eaten by cassowaries.

The Mt Hagen people of PNG use the chewed leaves to treat itches (Stopp, 1963). In the E. Highlands they are chewed & spat onto sores (Holdsworth, 1977). The leaves are also said to be edible (Martin & Ruberte, 1979).

RUBIACEAE

Gardenia lamingtonii F.M. Bailey (1344)

wembuwak

Small forest tree. Orange dye prepared for the fruits & used to decorate string bags. Wood used for arrow-heads, digging-sticks & axe handles; unsuitable for fuel.

Use of the fruits for dyeing has been recorded in Morobe & the E. Highlands of PNG (Herb: D. Frodin 26419; K.J. White 9635); also by the Dani (Purwanto & Walujo, 1992). Wood extremely hard (Kanis, 1978). *Gardenia* is also used for axe hafts & digging-sticks by the Wola of PNG (Sillitoe, 1983b) & the Huli (Powell, 1976b).

Myrmecodia sterrophylla Merr. & Perry (1513)

sehendep

Epiphyte in forest around village. The swollen (ant-filled) stems are used by the children as targets for practising archery & spear-throwing.

Psychotria sp. (1580)

iksabilik

Shrub in secondary vegetation around villages. Leaves are used to line ground-ovens.

Psychotria leaves are chewed to alleviate toothache & used to heal pig bites in PNG (Holdsworth, 1977).

Timonius avensis Val. (1458)

heli

Small forest tree. Wood particularly good for fuel.

The wood of this sp. is used in construction in the Chimbu (Powell, 1976a). The Wola of PNG use *Timonius* wood for bows (Sillitoe, 1983b).

Uncaria sp. (1218)
uluk
Woody vine at forest margin. Stem used for lashing in construction & rope bridges. Leaves are used to line ground-ovens.
Uncaria stems are also used for lashing in the Chimbu region of PNG, & the leaves are eaten (Powell, 1976a).

Wendlandia paniculata (Roxb.) DC. (1256/1456)
suhun
Small common forest tree. The trunk is used in construction (for posts). This plant is also used to ward off disease from the village.
The Dani also use the wood in construction (Purwanto & Walujo, 1992), as do several other NG peoples (Powell, 1976a). In PNG this sp. is used to treat muscle pains (Holdsworth, 1974).

RUTACEAE

Acronychia rugosa Hartley (1391/1405)
iliwukel
Small tree in forest understorey. Wood good for fuel.
Acronychia wood is used for digging-sticks in the Mt Hagen area (Powell, 1976a).

Citrus aurantiifolia (Christm.) Swingle (n.c.) *
(lime)
Small tree occasionally planted around villages for its fruits. Recent introduction.
In Milne Bay (PNG) the leaves are used to treat 'cutaneous eruptions' (16).

Euodia sp. (1190)
ambenehen
Common understorey treelet. The strongly aromatic leaves are rubbed on the forehead for headaches, fevers etc. This sp. may also be used to lay a curse upon one's enemy.
The leaves of certain *Euodia* spp. are used to treat fevers elsewhere in NG; some are considered edible (Holdsworth, 1977, Powell, 1976a). References to the medicinal & magic uses of *Euodia* spp. (many of which contain alkaloids) are found throughout the literature on NG ethnobotany - including that on the Dani (Purwanto & Walujo, 1992). *Euodia* wood is used for digging-sticks in the Mt Hagen region (Powell, 1976a).

Euodia (?) sp. (1357)
biyoho
Small forest tree. Employed in ritual ceremonies. Unsuitable for fuel.

Melicope cf. ***reticulata*** Laut. (1499)
yak
Small forest tree. Unsuitable for fuel.

SAPINDACEAE

Dodonaea viscosa (L.) Jacq. (1353)
pabi
Tree at forest margin. Wood used in construction; good for fuel. Leaves heated over a fire & wrapped around wounds as plasters.
Wood also used in construction (rafters & purlins) elsewhere in NG & for making fish-traps (Powell, 1976a). The Huli of PNG use saplings as tongs for hot cooking-stones (Powell, 1976b). The Dani rub the leaves on sore shoulders when on the march, & on dead bodies. They also use them as incense in cremation fires (Cooper, 1971). In Morobe (PNG) the leaves are used to stimulate lactation in women; elsewhere for boils, ulcers & cuts (Woodley, 1991) & dysentery (Holdsworth, 1974). Dani children eat 'stink-bugs' which are found on the leaves of *pabi* trees (Heider, 1970). The Wola of PNG use the wood for digging-sticks, stone axe sockets & fire-lighting (Sillitoe, 1983b).

SAPOTACEAE

Planchonella sp. (1578)
bumbabi
Treelet (sapling?) in forest understorey. Wood used for arrow-heads; unsuitable for fuel.
Planchonella wood is used in construction in the Chimbu (Powell, 1976a). The Bomagai-Angoiang of PNG use the seeds to make necklaces (Clarke, 1971).

SAXIFRAGACEAE

Astilbe papuana Schltr. (1276)
ikpilik
Herb in secondary vegetation & at forest margin. Leaves used as cigarette papers.
Astilbe leaves are eaten in the Chimbu region of PNG (Powell, 1976a).

Quintinia ledermannii Schltr. (1208/1570
solahe
Forest tree. Scrapings of the inner bark are applied to cuts, sores & boils. Said to be a food plant of arboreal mammals.
Quintinia wood is used for digging-sticks & construction in the Tari region of PNG (Powell, 1976a).

SMILACACEAE

Smilax australis R. Br. (1531)
sohon
Vine in secondary vegetation. Stem used for bowstrings & firesaw straps.
Smilax sap is used to treat ear infections in PNG (Powell, 1976a). Leaves used as bait for hunting cuscus (a marsupial) (Herb: Blackwood 78) & stem used in Morobe to make fishing nets (Herb: NGF 23347).

SOLANACEAE

Capsicum frutescens L. (n.c.) *
(chilli pepper)
Bush occasionally cult. around villages. Fruits may be eaten (although rarely). Recent introduction.
In Manus Island (PNG) the fruit juice is used as an analgaesic (Holdsworth & Wamoi, 1981).

Lycopersicon esculentum Miller (n.c.)
(tomato)
Bush occasionally cult. around villages. Fruits are eaten.

Nicotiana tabacum L. (n.c.)
pali (tobacco)
Herb cult. around houses. Leaves dried & smoked.
In PNG tobacco is used to treat stomach ache & sores, & to kill hair lice (Holdsworth, 1974). In the Sepik the young leaves are chewed & swallowed to treat stomach complaints (Powell, 1976a).

Solanum americanum Mill. (*sens. lat.*)
yendual (black nightshade)
Herb growing amongst sweet potato fields & at forest margin (cult.?). The leaves are eaten, either raw or cooked; taste rather like spinach.
This sp. is cult. elsewhere in the NG highlands (Pospisil, 1963) & is used to treat diarrhoea & cuts (Holdsworth, 1977). The Dani use it to cure stomach ache (Purwanto & Walujo, 1992).

Solanum dammerianum Lauterb. & K. Schum. (1305)
hohom
Small tree in secondary vegetation. Good for fuel.

Solanum tuberosum L. (n.c.)
(Irish potato)
Herb occasionally cult. in kitchen gardens. A recent introduction to the area. The tubers are eaten.
This sp. originates in the Americas.

SYMPLOCACEAE

Symplocos conchinensis (Lour.) S. Moore ssp. ***leptophylla*** (Brand) Noot. (1457/1579)
imim
Shrub in secondary vegetation. The wood is used for axe handles; the fruits are said to be eaten by birds.
The Kapauku of Irian Jaya use *Symplocos* wood for fire-saws (Pospisil, 1963); it is used for weapons & construction in the Chimbu (Powell, 1976a).

Symplocos conchinensis ssp. ***leptophylla*** var. ***orbicularis*** (Hemsley) Noot. (1597) **
mulunmulun
Shrub in subalpine vegetation. The wood is good for fuel.

THEACEAE

Eurya meizophylla (Diels) Kob. (1355/1451)
sali
Small tree in secondary & marginal vegetation. The wood is used in construction (flexible sticks bent around the roof to secure the thatch), & for fire-saws. It is unsuitable for fuel.
The Wola of PNG use *Eurya* bark for girdles & armbands (Sillitoe,

1983b); the wood of this genus is also used for construction (& fuel) by the Huli of PNG (Powell, 1976b).

ULMACEAE

Parasponia rigida Merr. & Perry (1487)

buwe

Tree common on old landslides on ridge slopes. Strips of the bark are wrapped around the small raised ground-ovens used on hunting trips. The bark fibres are also used for lashing in construction. The wood is unsuitable for fuel. This was said to be a food plant of arboreal mammals.

In Morobe Province (PNG) the bark is used for rope (Herb: van Royen & Millar 17546).

UMBELLIFERAE

Oenanthe javanica DC. (1308)

musan (Javanese dropwort)

Common herb in damper areas of old fields. Apparently cult.. The young leaves & stems are eaten.

This sp. is grown & eaten throughout the NG highlands (Bourke, 1981). At Modeni (PNG) it is used as a medicine for sore throats (Herb: Cruttwell 453). Elsewhere in NG it is used for coughs, headaches & as a poison antidote (Woodley, 1991), & for sores (Holdsworth, 1974). The Wola of PNG use the leaves on claw-tipped arrows (Sillitoe, 1983b).

URTICACEAE

Note: Most woody Urticaceae possess fibrous bark; a large number of spp. are used for making string bags etc. throughout the highlands of NG.

Cypholophus cf. *gjellerupii* Winkl. (1319)

hesendip

Low shrub in abandoned field. The bark fibres are used to make string bags.

Cypholophus leaves are eaten by the Watut in PNG ; their bark fibres are used in the Chimbu (Powell, 1976a).

Cypholophus aff. *vaccinioides* Winkl. (1482)

kiririahe

Shrub common beside river. The bark fibres are used to make string bags.

Cypholophus sp. (1484)

sakal

Treelet among rocks beside river. The bark fibres are used to make string bags.

Laportea decumana (Roxb.) Wedd. (1271)

sabi (giant nettle)

Shrub in secondary vegetation. The stinging leaves are pressed over the body as a remedy for general debility & tiredness (e.g. during a strenuous journey). It was said to thin the blood, allowing it to return to the limbs.

There are numerous records of similar medicinal uses of this plant in NG (Hays, 1980, Holdsworth, 1974, Holdsworth, 1977, Kocher Schmid, 1991, Sillitoe, 1983b, Woodley, 1991). In the Southern Highlands of PNG it is used as an abortifacient (Powell, 1976a).

Maoutia sp. (1244)

merabe

Shrub growing at the base of a cliff. The bark fibres are used to make string bags.

Maoutia fibres are used for string in the Jimi region (Powell, 1976a).

Nothocnide melastomatifolia (K. Sch.) Chew (1554)

moholal

Shrub at forest margin. The bark fibres are used to make string bags.

In Nokopo (PNG) this sp. is used to treat colds, wounds & serious sicknesses (Kocher Schmid, 1991).

Pipturus cf. *argenteus* (Forst.f.) Wedd. (1483)

yuhum

Treelet amongst rocks beside river. The bark fibres are used to make string bags. The wood is unsuitable for fuel.

The Mt Hagen people of PNG apply the juice to fresh wounds & aching teeth (Stopp, 1963). Elsewhere in NG this sp. is used for asthma, headaches & fevers, coughs, centipede bites & stomach ache (Kocher Schmid, 1991, Woodley, 1991). Its leaves & bark are eaten in Watut & the E. Highlands of PNG (Powell, 1976a).

Pipturus cf. *verticillatus* Winkl. (1283)

ilihi

Small tree growing in village beside house (possibly domesticated). The bark fibres are used to make string bags. The leaves are collected from the ground & burned, & the ash rubbed on boils. The plant may also be used to inflict such boils on one's enemy (by sorcery). The wood is unsuitable for fuel.

The Huli of PNG have domesticated *Pipturus* bushes for their fibre supply (Powell, 1976b). The mucilaginous exudate of *Pipturus* sp. is used as a laxative in PNG (Powell, 1976a).

Pipturus sp. (1314)

moholop

Shrub in abandoned field. The bark fibres are used to make string bags.

VERBENACEAE

Callicarpa pentandra Roxb. (1461)

mik

Small tree in secondary vegetation near village. The leaves are used to wrap bananas for cooking.

The wood is used for house beams elsewhere in NG (Powell, 1976a). *Callicarpa* spp. are used to treat body pain in the Northern District of PNG, & elsewhere as contraceptives (Powell, 1976a).

VITACEAE

Tetrastigma pullei Lauterb. (1517)

wolhele

Scrambling vine in shrubby vegetation at forest margin. The stem is used for lashing in house & fence construction, & for making rope bridges.

WINTERACEAE

Drimys piperita Hook.f. (1192/1398)

taluk

Shrub in secondary vegetation around village. This sp. is used as a 'magical' medicine for stomach wind, & is a food plant of arboreal mammals. The wood was said to be particularly unsuitable for fuel.

According to Cooper (Cooper, 1971), *Drimys* wood burns 'tolerably well when green'. The exocarp is used to treat toothache in PNG (Powell, 1976a).

ZINGIBERACEAE

Alpinia athroantha Val. (1241)

kukalem

Large herb in damp patches in the forest. The pithy base of the stem is peeled & eaten, & has a rather sharp aromatic flavour.

The leaves & rhizomes of *Alpinia* spp. are eaten widely in NG; some are cult. for this purpose (Powell, 1976a). In the Mt Hagen region the rhizomes are used to treat toothache (Powell, 1976a).

Alpinia aff. *flagellaris* (Ridl.) Loesen. (1186/1270)

fetferik

Herb on forest floor. This plant is used in a hunting ritual involving young children.

The Dani also attribute magic powers to *Alpinia* spp. (Purwanto & Walujo, 1992).

Alpinia odontonema K. Schum. (1216)

sinandul-ambiyang

Large herb on forest floor. The leaves are used to wrap sweet potatoes for cooking.

Alpinia leaves are sometimes used for thatching in NG; many are used for cooking (as above) (Powell, 1976a).

Curcuma domestica Val. (1299)

buhulik (turmeric)

Herb cult. in kitchen gardens. A yellow dye is prepared from the rhizome, which is used to decorate string bags.

This sp. is widely used as a condiment in NG (Powell, 1976a).

Etlingera sp. (1275)

kilibin

Giant herb in forest. The aromatic leaves are used to wrap sweet potato leaves for cooking. The leaves are wrapped around the forehead to treat headache.

Etlingera is used for food in the E. Highlands of PNG (Herb: Sands 1781). *Alpinia* leaves are used to treat headache elsewhere in NG (Powell, 1976a).

Etlingera sp. (1471)

yebik

Herb on open ground beside a track. The (aromatic) leaves are smoked over a fire & put in the fields to keep rats from eating the taro crop. This was said to be a magical use.

Hornstedtia cf. ***scottiana*** (F. Muell.) K. Schum. (1426)
suhulik
Giant forest herb. The leaves are used to wrap sweet potatoes for cooking.
Hornstedtia seeds are eaten elsewhere in NG (Powell, 1976a); the leaves are also used to wrap bananas for cooking (Hays, 1980).

Riedelia sp. (1185)
lulubi
Herb on forest floor. This plant is used in a ritual performed before going on a journey, in order to protect the children.
The Huli of PNG use *Riedelia* leaves for clothing & personal ornamentation (Powell, 1976b).

Zingiber officinale Roxb. (1328)
hinde (ginger)
Herb cult. in kitchen gardens. The rhizomes & the leaves are eaten raw or cooked. They are also fed to hunting dogs to improve their performance.
This sp. is used medicinally by the Dani (Purwanto & Walujo, 1992). It is attributed numerous other applications in NG including treatment of stomach ache, diarrhoea, headache, spear wounds, malarial fever, parasites, sterility, coughs, rheumatism & tropical ulcers (Holdsworth, 1977, Woodley, 1991). In Manus Island (PNG) it is used as a contraceptive (Holdsworth & Wamoi, 1981). The Wola of PNG use the leaves on arrow blade joints (Sillitoe, 1983b).

FAMILY INDET.

watnam (1234)
Large forest tree. The bark is used to line the walls of houses. The wood is unsuitable for fuel.

ilibuk (1267)
Forest tree. The wood is used to make spears & hunting bows. This plant is also used as a protective charm by travellers.

senggenok (1373)
Forest shrub. The fruits are eaten.

tuhal **(1380)**
Forest tree. The bark is used to line the walls of houses.

kimkim (1383)
Forest shrub. The leaves possess magical properties (application uncertain) & may be carried around in people's string bags.

siyan (1393)
Forest tree (shrub?). The wood is used for axe handles, but is unsuitable for fuel.

linggelingge (1533)
Small tree at forest margin. The wood is good for fuel.

kabangahom (1539)
Shrub at forest margin. The wood is used for fire-saws, but is unsuitable for fuel.

EQUISETOPSIDA

EQUISETACEAE

Equisetum debile Roxb. (1477)
uki (horse tail)
Herb common amongst rocks beside river. The leaves, which are abrasive, are used to smooth hunting bows, axe handles, mouth harps etc. & to clean sweet potatoes. This plant was said to be eaten by cassowaries.
The use of this sp. as an abrasive is common in the highlands of NG (Powell, 1976b).

PTERIDOPHYTA

Note: The young fronds of a broad range of ferns are widely reported as being eaten by indigenous peoples of NG. These include the genera *Asplenium*, *Athyrium*, *Ctenitis*, *Cyathea*, *Cyclosorus*, *Dennstaedtia*, *Diplazium*, & *Dryopteris* (Powell, 1976a).

ASPLENIACEAE

Acrophorus nodosus C. Presl. (1326)
kundikumak
Terrestrial fern on damp ground beside stream. The young fronds are eaten.

Diplazium spectabilis (Mett.) Ching (1320)
toho
Terrestrial fern at forest margin. The fronds are eaten.
Diplazium leaves are used to treat yaws & sores in NG (Holdsworth, 1977).

Diplazium sp. (1321)
wanggol
Tree fern at forest margin. The young fronds are eaten.

Dryopteris spp. (1242/1325)
wesenamun, ***yehelekanggolop***
Terrestrial ferns on damp ground. The young fronds are eaten, either raw or cooked.

CYATHEACEAE

Cyathea agna Copel. (1342)
ambin
Tree fern on ridge slope above village. The fronds are eaten.
The Dani use the trunks of tree ferns to make causeways over bogs (Edwards, 1991). *Cyathea* shoots are used to treat colds & induce labour in PNG (Holdsworth, 1977).

Cyathea microphylloides Ros. (1343)
ilhik
Tree fern on ridge slope above village. The young fronds are eaten.

Cyathea sp. (1228)
mui
Tree fern on ridge above village. The young fronds are eaten.

Cyathea sp. (1265)
neme
Terrestrial fern in forest. This plant is used ritually for protection of the women & children when men are collecting *Pandanus* fruits in the mountains. This was said to be a food plant of arboreal mammals.

Cyathea sp. (1266)
huphup
See (1265) for description, uses etc. This plant appears (according to accepted taxonomy) to be the same sp. as *neme* (1265), but was said by the Yali to be definitely distinct.

Cyathea spp. (1322/1323/1324)
pinde, ***sambom***, ***waklia***
Tree ferns at forest margin. The young fronds are eaten.

DENNSTEADTIACEAE

Pteridium aquilinum (L.) Kuhn var. ***wightianum*** (Agardh) R.M. Tryon (1273/1453)
helarik (bracken)
Terrestrial fern at forest edge. The fronds are put on the fences around fields to deter people from trampling the crops. The terminal (soft) parts of the fronds are eaten.
The Mt Hagen people of PNG use the juice as a stimulant, & apply pieces of the petiole to poor teeth (R50). The Bomagai-Angoiang of PNG hang fern fronds on boundary markers to prevent the passage of sickness (R6).

GLEICHENIACEAE

Dicranopteris linearis (Burm.f.) Underw. var. ***montana*** Holttum (1296)
tinggil
The core fibres from the stem are woven into bracelets & armbands; sometimes used to bind arrow-heads.
The Dani (& many other highland tribes) also use this sp. for bracelets (R39). The Wola of PNG use the fibres to make fishing nets (R46); in Jimi they are used for lashing in construction (R37).

BRYOPHYTA

DAWSONIACEAE

Dawsonia superba Grev. (1205)
kehorok
Giant moss growing in boggy patches in forest. The green capsules are opened at the tip, & the spores squeezed into wounds to heal them.

FUNGI

The following fungi are all eaten:

TRICHOLOMATACEAE

Armillaria fuscipes **Petch (1337)**	***lulupik***
Lentinus araucariae **Pat. & Har. (1338)**	***polohobwok***
Lentinus fasciatus **Berk. (1292)**	***wun***
Lentinus umbrinus **H.W. Reinhardt (1543)**	***sawal***
Oudemansiella canarii **(Jungh.) Hohnel (1336/1419)**	***amuksuk***

POLYPORACEAE

Polyporus arcuarius **(Fr. Fr.) Fr. (1418)** ***ngapukpuk***

Note: **Other edible fungi (*suk*) include *sirep*, *wilin*, *maratnasuk*, *obel*, *lelare*, *bunduk* & *undel*.**

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