

4. The botanical and ethnobotanical background

This chapter highlights botanical and ethnobotanical information of relevance to the present study. Reference is made to some of the most relevant botanical earlier work carried out in both East and West Timor. The botanical descriptions by Joachim Metzner (1977) are described in a separate section, as they form the only systematic work done in the area under analysis. Finally, other ethnobotanical accounts resulting from relevant anthropological work in Timor are also listed.

4.1 Three hundred years of botanical work in East Timor

Forbes (1989, original publication from 1885) and Cinatti (1950b) give comprehensive lists of all early botanical investigations carried out in both East and West Timor, and a table (4.1) listing those works by year, collector and region is given in appendix 18. Forbes, who described and collected plant specimens in the eastern part of Timor between 1882-83, published his account in 1885. Forbes' work was later updated by Cinatti, who was a professional forester. Cinatti, whose passion for botany was triggered by Forbes' and by Castro's (1943) works, also did his own plant collections in Timor.

Dampier was the first of the amateur and professional botanists who during the 18th and 19th centuries arrived in Timor and collected plants (Dampier 1927, originally published in 1697). Like many others in that early period, Dampier worked only in the western part of the island around Kupang. In the nineteenth century, the famous naturalists Alfred Russel Wallace (1962, original work from 1869) and Henry O. Forbes spent time in East and West Timor. They both collected plants and their important ethnobotanical remarks are referred to below. In 1887, Gomes da Silva would become the first Portuguese amateur botanist to collect plants in East Timor. Others followed, such as Osório de Castro, whose work in the Dili area is of particular interest (Castro 1943).

In 1946-47, Cinatti collected plant specimens from several locations in eastern Timor. Wood samples were also collected and sent to CSIRO, in Melbourne, where identifications were confirmed. Work on some of these wood samples was carried out by Freitas (1955 and 1958), which for the first time involved anatomical description and section analysis based on

microscopic images (10 x 60 magnification). Cinatti would also publish a major description of forest types in East Timor (Cinatti 1950), as well as other significant works including a list of indigenous names of plants (Cinatti 1954) and an historical account of *Santalum album*, sandalwood (Cinatti 1950c). The most significant ethnobotanical observations by Cinatti are also discussed below. Other relevant works involving plant collections and descriptions in East Timor were carried out by Meijer Drees, van Steenis and Metzner. Metzner did not recover plant specimens but instead systematically described the vegetation along a north-to-south transect from Baucau to the southern coast (Metzner 1977). As this work is of extreme importance for the present study, it will be described in more detail in the following section.

Botanical work in Timor in the last three centuries included several plant collections and descriptions of plant coverage. Although earlier works deal mostly with the western (formerly Dutch) part of the island, some have also been carried out in what today is East Timor. A comprehensive botanical description of the entire island however, is still missing. Nearly a quarter of a century of Indonesian occupation had a significant impact on the vegetation cover of East Timor. These more recent patterns of change are suggested by several oral testimonies, recovered during fieldwork around the studied area and elsewhere (O'Connor pers. comm.), as well as by data obtained through satellite imagery (Bouma and Kobryn 2004). Over exploitation due to forced population movements is but one of several possible causes, often related to complex patterns of land tenure and ownership (McWilliam 2003). Apart from effects on vegetation cover caused by climate change, the long history of human usage of forest resources, confirmed through historical data and the archaeological record, has surely also been responsible for dramatic changes. These changes are only slowly coming to light and still require a more precise chronometric frame of reference.

4.1.1 Metzner's botanical description of the area under study

The following section concentrates on the work done by Metzner as part of his doctoral research (Metzner 1977). This is the most comprehensive ethnobotanical description undertaken in East Timor and it directly covered the area under analysis in this thesis. Metzner described a transect of approximately 30 kilometres wide by 60 kilometres long, from the northern coast around Baucau, across the central mountain chain around Venilale, Ossu and Viqueque, and to the southern coast. That area is shown in figure 4.1.

presumably covered in the past by deciduous and semi-deciduous monsoon forests. However, apart from the localised information provided by the phytolith analysis presented in this study, there is as yet no precise palaeoenvironmental record from Timor to confirm this.

The main physiographic units of interest described by Metzner (1977:24-27) are:

I – The **northern coastal zone**, corresponding to the small alluvial coastal strip that affords sheltered sites for mangroves (although no mangrove grows in the study area today), as well as the floodplains of the Manoléden and Seiçal streams;

II – The **marine terrace zone**; although part of the Baucau Plateau, this zone consists of a “series of up to twelve upheaved Pleistocene marine terraces which rise abruptly from the sea in a step-like fashion.” [...]“At the base of these cliffs water seepages can be found which enable denser vegetation to grow” (Metzner 1977:25); in this area there are also a few major springs, close to which terraces down to the sea are cultivated;

III – The **Baucau Plateau**, consisting of an uplifted coral reef and limestone outcrops which are an obstacle to agriculture; subsurface drainage is common here, and water availability is reduced;

IV – The **western and eastern escarpments of the Baucau Plateau**; this is a zone of great agricultural significance, close to the alluvial plains of the Manoléden and Seiçal streams, with water seepages, slumps, and frequent landslides.

Major Physiographic Units shown in figure 4.2 (following page):

I – Northern Coastal Zone;

II – Marine Terrace Zone

III – Baucau Plateau

IV – Western and Eastern Escarpment
of the Baucau Plateau

V – Central Upland Zone

VI – Quelicai-Uato Lari Foothill Zone

VII – Southern Foothill Zone

VIII – Southern Littoral Plains Zone

Syzygium nervosum and *Olea paniculata*. Ground flora often includes *Vaccinium varingiifolium*, *Euonymus japonicus* and *Viburnum cylindricum*.

2 – Medium altitude moist evergreen forest: located at altitudes between 1000 and 1500 metres above sea level, in steep slopes or broken limestone cliffs. Its extent has been largely affected by fires and cultivation, and it has been replaced today by *Eucalyptus urophylla* woodland, forest/savannah mosaic, and low grassland. Besides Podocarpaceae being usually absent, it is generally comprised of two conspicuous tree layers. The upper (canopy) layer includes *Elaeocarpus petiolatus*, *Ehretia acuminata*, *Putranjiva roxburghii* and *Pouteria lucuma*. The lower layer includes *Acer laurinum*, *Pararchidendron pruinatum*, *Olea paniculata*, *Mischocarpus australis*, *Neolitsea cassiaefolia*, *Mallotus philippensis*, various Myrtaceae and Araliaceae, various species of *Ficus*, climbing bamboo and tree ferns.

3 – Semi-deciduous [monsoonal] forest: although there is no sharp distinction between this and the evergreen forest, most of it has been destroyed by fire and no longer exists. On the northern coast, the remaining semi-deciduous forest is located from 400 to 1000 metres above sea level. Palms, if present, are mainly *Corypha utan* and *Arenga pinnata*. The canopy on its upper layer is formed by one third of deciduous species, including *Acacia leucophloea*, *Sterculia foetida*, *Garuga floribunda*, *Tetrameles nudiflora*, *Carallia brachiata*, *Maranthes corymbosa* and *Pouteria psammophila*. The lower layer is mostly composed of evergreen species, including *Santalum album*, *Timonius timon*, *Millettia xylocarpa*, *Albizia saponaria*, *Mischocarpus australis* and *Glochidion zeylanicum*.

4 – Largely deciduous forest: typical of low rainfall areas, up to 300 to 400 metres above sea level (e.g. both sides of the Baucau Plateau, along the Manoléden and Seiçal streams). It presents a similar structure to the semi-deciduous forest but with a lower canopy. The upper layer is mostly formed by deciduous species: *Dracontomelon dao*, *Homalium tomentosum*, *Garuga floribunda*, *Celtis philippensis*, *Albizia lebbek*, *Schleichera oleosa* and *Melia azedarach*. Other non-deciduous species include *Tamarindus indica* (evergreen) and *Albizia procera* (irregular). The lower layer, “densely interwoven by lianas, some *Usnea* sp., lichen and a few orchids” (Metzner 1977:103), also includes *Antiaris toxicaria*, *Zanthoxylum rhetsa*, *Protium javanicum*, *Pterocarpus indicus*, *Cassia fistula*, and *Schoutenia ovata*.

5 – Forest/savannah mosaic at medium altitudes: partially destroyed from 400 to 1500 metres above sea level due to fire and cultivation, it survives in the escarpment zones of the Baucau plateau and higher up. At lower levels, it merges into *Casuarina junghuhniana*, *Acacia*

leucophloea and *Corypha utan* savannah. At its upper limit, it grades into moist evergreen forest and into *Eucalyptus urophylla* woodland.

6 – *Eucalyptus urophylla* woodland: gregarious, fire resistant, evergreen *E. urophylla* stands, confined to altitudes between 1000 and 1200 metres above sea level.

7 – Savannah: the most widespread kind of vegetation in the area (and throughout the Lesser Sunda Islands). It can be seen in coastal plains, foothills and hills up to 1000 metres high. In Timor, savannahs are recognised as the result of human influence, mostly through fire and cultivation. They represent a secondary vegetation type with a much reduced number of species. Four different types of savannah can be recognised:

7a – *Eucalyptus alba* savannah: existing in red calcareous soils of the Baucau Plateau, it consists of almost pure stands of *E. alba* and grasses. The latter include *Panicum* sp., *Sporobolus* sp., *Setaria verticillata*, *Cynodon dactylon*, *Desmodium laxiflorum* and *Rhynchosia minima*.

7b – *Acacia leucophloea* savannah: located on heavy clay soils below 300 metres altitudes, on both sides of the Baucau Plateau. It is composed of *A. leucophloea* and other deciduous species, including *Schleichera oleosa*, *Ziziphus timorensis*, *Ziziphus mauritiana*, *Cassia fistula*, *Pterocarpus indicus*, *Aegle marmelos*, *Vitex pubescens* and *Bauhinia acuminata*. Grasses include *Andropogon* sp., *Dichanthium caricosum*, *Bothriochloa bladhii* subsp. *glabra*, *Setaria parviflora* and *Heteropogon contortus*.

7c – *Casuarina junghuhniana* savannah: located on heavy and often degraded clay soils, above 300 metres high. It covers the largest area of all vegetation types and is mostly composed of fire-resistant open areas of *C. junghuhniana*, intermediated with other deciduous species. It also presents a lower layer of grasses composed of *Eleusine indica*, *Cynodon dactylon*, *Dichanthium caricosum*, *Digitaria violascens* and *Mnesithea rottboellioides*.

7d – Palm savannah and palm woodlands: are usually located on high water tables, along the water seepages on both sides of the Baucau Plateau. They are mostly composed of the two chief palm species existing in Timor: *Corypha utan* (in wetter soils) and *Borassus flabellifer* (in drier soils), both fire-resistant species.

8 – Scrub: located on the Baucau Plateau, it is mostly composed of deciduous shrubs, due to water stress. These areas are dominated by *Tecoma stans* scrub and *Schleichera oleosa* and *Sterculia* sp. trees. Grasses existing on the reddish calcareous soils include *Heteropogon*

contortus, *Chloris elata*, *Eragrostis elongata*, *Panicum delicatulum*, *Dichanthium caricosum*, *Apluda mutica* and *Mnesithea rottboellioides*.

9 – Grasslands: these are abundant in the study area (both at the time of Metzner's work and today) and represent a gradual transition from savannahs. Although it is generally believed that most grassland has been created by regular human-induced fire, Metzner notes that "it is not known to what extent natural grasslands existed in Timor before the advent of man" (Metzner 1977:109).

10 – Beach vegetation: this vegetation is less complex and varied on the northern coast, due to orographic effects and human influence. It is mostly composed by herbs, such as *Ipomoea pes-caprae*, and grasses, including *Spinifex littoreus*, *Perotis hordeiformis*, and *Scleria lithosperma*. Behind this and forming a wall up to 6 metres high, shrubs and low trees include *Scaevola taccada*, *Barringtonia* sp., *Terminalia catappa*, *Hibiscus tiliaceus*, *Thespesia populnea*, *Clerodendrum* sp., *Grewia* sp., *Premna* sp., *Hernandia* sp., *Heritiera* sp., and *Calophyllum inophyllum*. This type of vegetation is often interrupted by a "conspicuous line of *Casuarina equisetifolia* and *Pandanus tectorius*" (Metzner 1977:110).

11 – Mangrove: in the area studied by Metzner, it occurs only on the southern coast.

12 – Swamp forest: it is usually located behind mangroves, although in the area studied it only exists today in small patches along the southern coast. It is characterised by some important tree species, such as *Canarium asperum*, *Metroxylon sagu*, *Pongamia pinnata*, *Barringtonia* sp, *Sterculia foetida* and *Ficus* spp.

13 – Riparian forest: described as too small to be mapped, due to the absence of large rivers. Along river beds up to 1000 metres above sea level, it is comprised of *Pandanus tectorius* and *Casuarina junghuhniana*. According to altitude above sea level, other species may include:

- Lowland and lower hills up to 300 metres high: *Buchanania arborescens*, *Milium horsfieldii*, *Terminalia microcarpa*, *Xylocarpus amarus*, *Erythrina variegata*, *Toona sureni*, *Ficus ampelas*, *Syzygium jambos*, *Maranthes corymbosa*, *Neonauclea calycina* and *Psychotria* sp.;

- Medium altitude up to 1000 metres high: *Polyscias cumingiana*, *Bischofia javanica*, *Dysoxylum acutangulum*, *Dysoxylum speciosum*, *Arenga pinnata*, *Pittosporum moluccanum*, *Timonius timon*, *Wendlandia burkillii* and *Pouteria obovata*.

- Above 1000 metres high: *Olea paniculata* and *Eleocarpus petiolatus*.

4.2 The early ethnobotany of East Timor

General accounts on early ethnobotanical descriptions given in this section follow, for the most part, publications by Cinatti (1964) and Loureiro (1995). The suggested scientific names of genus and species published by Cinatti are given in square brackets. The later publication by Loureiro, dedicated to the history of sandalwood, also contains an anthology of early written documents in which other useful plants from Timor are referred to.

Ethnobotanical accounts of Timor started with the arrival of the first European explorers, in the 16th century. Tomé Pires, in his *Suma Oriental* (described by Cortesão 1978), is the first Portuguese to describe Timor, in 1514-1515, referring to sandalwood as the most valuable trade good in the island. The same is confirmed by Duarte Barbosa around 1516, when his *Livro do que viu e ouviu no Oriente* was published (Dames 1918, originally published in 1518). Pigafetta, chronicler of Magellan's early voyage around the world, arrived on the northern coast of Timor in 1522. Amongst the food plants used in Timor at the time, Pigafetta described the presence of *Oryza sativa*, *Musa* spp., *Zingiber officinale*, *Saccharum officinarum*, *Citrus grandis* and other *Citrus* spp., *Canarium vulgare* and *Terminalia catappa*, and beans *Dolichos trilobus* and *Psophocarpus tetragonobulus* (Pigafetta 1969, originally published in 1525).

Several 16th and 17th century documents detail accounts from local priests, government officials and merchants in Asia which were sent to the Portuguese crown, in Lisbon. Only a few of these make any references to Timor, often describing the most significant commodity obtained through trade in the island: sandalwood. In one of the more detailed accounts, Godinho de Erédia mentions sandalwood, as well as wax, honey, white and red cotton, fruits, rice and several other grain crops and medicinal plants (Loureiro 1995:120). In a report from the islands of Solor and Timor from 1624, rice is referred to as the main food staple, said to be grown mostly on mountain slopes. *Dioscorea* spp., *Ipomoea batatas*, *Saccharum officinarum*, *Zea mays*, *Sorghum bicolor* and *Pennisetum glaucum* are also mentioned (Cinatti 1964:10-11). Another report from 1634 by Father Miguel Rangel (who was in Timor in 1592) repeats the information from the 1624 report, adding legumes and fruits, including *Vitis vinifera*, *Citrus* spp., *Cucurbitaceae* (muskmelon), *Musa* spp., *Ananas comosus*, *Mangifera* spp., *Artocarpus heterophyllus* and *Anacardium occidentale* (Cinatti 1964:11).

As pointed out by Cinatti, "it is obvious by now that several plants of American origin had been introduced in the Archipelago and were being cultivated in Timor, as well as others from Europe, Africa and India" (Cinatti 1964:11). One of these, *Zea mays*, was described by Dampier

(1939, originally published in 1729) as the main food staple in Timor. In Dampier's 1699 *Voyage to New Holland* (published in 1939 by Williamson) the following species from Timor that had not been previously mentioned are described: *Psidium guajava*, *Cocos nucifera*, *Punica granatum*, *Citrullus lanatus*, *Cucurbita* sp. (pumpkin), *Tamarindus indica*, *Borassus flabellifer*, and various vegetables and roots. Besides the common *Zea mays*, *Oryza sativa* is also mentioned and said to be eaten mostly by Europeans (Cinatti 1964:13).

In 1702, a letter from Coelho Guerreiro (the first appointed Governor of Solor and Timor) to the Viceroy of India, adds to Dampier's list the following species: *Phoenix dactylifera*, *Cinnamomum zeylanicum*, *Calamus rotang* and *Cassia fistula* (Cinatti 1964:13). In 1737, in a letter from Barreto da Gama e Castro (Governor of Timor) to the King, *Coffea arabica* is for the first time added to the list of domesticated plants. Said to have been introduced to Java in 1690, it reached Timor possibly via Kupang (Cinatti 1964:13, 14). Later in that century, in 1788, Alberto de S. Tomás produced a manuscript with drawings and the uses of some plants from Timor. Cinatti (1950b) identified some of these to genus and species, ascribing them some of the uses they are known for: *Sesbania grandiflora* (medicinal, fruits not eaten), *Moringa oleifera* (drupes, flowers and leaves eaten), *Calophyllum inophyllum* (medicinal; fruits are edible but mildly poisonous; they are usually crushed and used as candles), *Psidium guajava* (fruits eaten; medicinal), *Aegle marmelos* (fruits eaten; medicinal) and *Alstonia scholaris* (medicinal). The whole work was later published as a facsimile (Tomás 1969).

A report from J. José de Sousa (Governor of Timor) in 1800 mentions *Triticum* spp. for the first time in Timor (although another account refers to its presence in the Moluccas as early as 1561). Cinatti notes that by 1858 the quantity of wheat exported by customs at Dili reached 26,000 kilograms, its destination being mostly the Dutch East Indies and Australia (Cinatti 1964:14). In 1801 and 1818, Freycinet and Gaudichaud registered the presence of food plants not mentioned before: *Appium graveolens*, *Allium cepa*, *Allium fistulosum*, *Allium ascalonicum*, *Pisum sativum*, *Brassica juncea*, *Spinacia oleracea*, *Ficus indica* and *Ficus religiosa*.

Wallace [1869] noted that *Zea mays* was the main staple food in Timor, confirming Dampier's observation 150 years before. Reference was also made to rice growing well on "marshy flats which often fringe the coast" (Wallace 1962:151), presumably corresponding to some of the same coastal alluvial plains where that crop is still being planted today. *Triticum* spp. and *Solanum tuberosum* are the other two crops referred to by Wallace and said to be grown in abundance from 3000 to 3500 feet above sea level (Wallace 1962:147).

As others before him, Forbes [1885] also described the main staple in the island to be *Zea mays*. Other food plants referred to by Forbes and not mentioned before included *Phaseolus* spp. and various herbs. With the exception of bananas, Forbes did not observe many fruits. *Artocarpus heterophyllus* was said to be abundant in some places and specially praised for its seeds. *Artocarpus altilis*, although not observed, was said to exist in great numbers. After being well cooked (due to its toxicity), the “local kutu” (*Lablab purpureus*) was also referred to as a famine food (Forbes 1989:438).

In 1900, under the government of Celestino da Silva, the first experimental stations were established in Portuguese Timor. Amongst some of the more important new crops grown at the time were *Coffea liberica* and *Coffea robusta*, *Elaeis guineensis*, *Camellia sinensis*, *Hevea brasiliensis*, *Theobroma cacao*, *Bixa orellana*, *Cinchona succirubra* and “several varieties of subsistence plants, mainly vegetables” (Cinatti 1964:16). Other plants mentioned by Cinatti as having an economic use at the beginning of the 20th century included *Corypha utan*, *Morinda citrifolia*, *Indigofera tinctoria*, *Ceiba pentandra*, *Tectona grandis*, *Nephelium litchi*, *Garcinia mangostana*, *Averrhoa carambola*, *Averrhoa bilimbi*, *Pangium edule*, *Achras sapota*, *Passiflora quadrangularis* and *Persea gratissima* (Cinatti 1964).

4.2.1 Metzner’s ethnobotanical work

Besides describing the floral composition of the area he investigated in East Timor, Metzner also characterised the types of land use there. He described Timorese agriculture as mainly at a subsistence scale and as in transition between the root crop system and irrigated rice cultivation (Metzner 1977:116).

The main type of land use (and land ownership) identified by Metzner was the “halo to’os” (**bush fallowing or shifting cultivation**). In Tetun, “halo to’os” means “to work the garden”, involving clearing/slashing, burning, and cultivating permanent gardens and shifting plots. This still is the most common system used in East Timor today, and it is usually enclosed. In this system, trees are generally spared when cutting the bush to clear land, either for their wood or food. These include *Intsia bijuga*, *Sterculia foetida*, *Pterocarpus indicus*, *Corypha utan*, *Borassus flabellifer* and *Casuarina junghuhniana*. As it takes longer for vegetation and soil to recover in drier areas (such as the one around BCUM), the fallow period there is longer, which results in a lower population density. The “halo to’os” can be divided in two types of processes, usually repeated every year:

a) “Lere rai” (or “ai leren”): defined as “land rotation, combined with fallow periods of varying length” (Metzner 1977:119). It is done every year and it involves slashing, burning, and directly planting after making holes with a digging stick. This process usually dominates in more steep and forested areas where after clearing no tillage of the soil is required, and is also said to be the most ancient;

b) “Fila rai”: it involves tillage of the soil with digging sticks. It is usually done every other year during the first years, and then annually from July to October (depending on the region). “Fila rai” is a very intensive-labouring and time-consuming process, described as taking up to 20 times longer than “Lere rai” (Metzner 1977:120). However, it is also more effective in retaining soil moisture and in yielding higher results.

The main crop identified by Metzner in the “to’os” (the garden) is maize. Together with maize, other crops are planted, such as beans (the kernels of *Lablab purpureus* are usually placed together with maize), dry-land rice, and a variety of tubers, including *Manihot esculenta*, several *Dioscorea* yams (e.g. *D. alata*, *D. esculenta* and *D. hispida*), *Pachyrrhizus erosus*, *Colocasia esculenta*, *Alocasia* spp. and *Ipomoea batatas*. Metzner (1977:125) observes that “to avoid seasonal shortages root crops are kept at several stages of development”.

Together with root crops, a number of pulses are also planted, many of which were introduced after European contact. These include *Arachis hypogaea*, *Vigna unguiculata*, *Lablab purpureus*, *Vicia faba*, *Phaseolus* spp., *Cajanus cajan* and *Glycine max*. Besides pulses, other introduced vegetables include *Allium cepa*, *Cucurbita* spp. (cucumber, squash and pumpkin), *Solanum tuberosum*, *Anacardium occidentale*, *Sesamum indicum*, *Ricinus communis*, *Saccharum* spp. and *Piper* spp.

Besides shifting cultivation and where water availability allows it, **wet rice cultivation** (“natar” in Tetun) is also practised. However, as pointed out by Metzner, “while almost every Timorese has a to’os, only a fraction of the cultivators has a *natar*” (Metzner 1977:127). Wet rice cultivation is highly dependent on local environmental conditions, and is usually practised in flood plains, in the vicinity of springs, or in coastal swamp lands. Only a single crop of rice per year is harvested within the area that is worked, and rice yields are usually extremely low. The methods of paddy cultivation are complex, and were grouped by Metzner into two main groups:

a) Broadcasting: defined as “kare hare” in Tetun, it is the most traditional and widespread method used in East Timor. It involves little labour but produces low yields. It requires the use

of buffaloes (sometimes horses) to trample the soil, which is usually done once or twice; repairing of ditches and drainage of the water inside; and sowing the seeds. Five days after sowing water is again let into the field, and when four to five rice leaves appear, the field is drained and irrigated on alternate days. In this system, tending is rare and weeding is seldom done more than once. As the grain matures, farmers spend nights in a small hut in the fields scaring away looting birds. Harvesting, usually by women, is done by cutting the rice stalk about 20/30 centimetres below the panicles with a small knife. Drying in the sun takes 4 to 5 days, after which the rice is threshed (usually by men), winnowed, and stored. As Metzner points out, the best harvested grains are stored for seed, and “only that portion of rice that is each time assigned for immediate consumption is milled in the traditional way by means of pestles and wooden mortar” (Metzner 1977:131).

b) Transplanting: practised by a much smaller percentage of the population engaged in rice farming, it only differs from the broadcasting method in the sense that it involves the creation of a nursery bed in an irrigable site, and the use of seedlings. Although it is more labour-intensive, it also involves less seeds and yields better results.

According to the water source, Metzner also distinguishes between types of paddy fields. There are those inundated, which are completely rain fed and dependent on stored rainfall as well as runoff water from higher grounds; and those that are irrigated, either from a nearby spring or a river dam. Where freshwater is available throughout the year, double cropping on paddy fields is common, sometimes together with irrigated maize, sweet potato or onion crops in the dry season.

Finally, there is the **permanent garden, or house garden** (“to'os kiik”, in Tetun). According to Metzner and in contrast with bush fallowing, these conspicuous mixed gardens are “cultivated permanently on individually owned house sites.” (Metzner 1977:136). They are mostly composed of fruits, vegetables and tubers planted throughout the year. Some of the more prominent plants cultivated in house gardens include fruit trees such as *Artocarpus altilis*, *Artocarpus heterophyllus*, *Mangifera indica*, *Mangifera caesia*, *Syzygium* spp., *Citrus* spp., *Carica papaya*, *Cucumis melo*, *Annona muricata*, *Annona reticulata*, *Aegle marmelos*, *Canarium indicum*, *Ceiba pentandra*, *Anacardium occidentale*, *Aleurites moluccana* and *Cocos nucifera*. Underneath these trees one can usually find *Musa* spp. (bananas and plantains), *Saccharum officinarum*, *Manihot esculenta* and *Dioscorea* spp.. The area around BCUM, however, is not as diversified in terms of fruit trees. As Metzner says, “while most useful trees listed above occur in the moist zone south of the central uplands, there is only a small assortment of them to be

found in the dry region of the north." (Metzner 1977:138). These include *Aleurites moluccana*, *Artocarpus heterophyllus*, *Morinda citrifolia*, *Annona squamosa*, *Aegle marmelos*, *Citrus reticulata* and *Mangifera indica*.

A diversified array of vegetables, tubers, cereals and spices usually constitutes the ground cover of these house gardens. Besides those species found in the "halo to'os", the smaller permanent gardens include *Piper betle*, *Gossypium* sp., *Pimenta dioica*, *Sesamum indicum*, *Sesbania grandiflora*, *Ricinus communis*, *Nicotiana tabacum*, *Capsicum annum*, *Cucurbita maxima*, *Cucurbita moschata*, *Momordica charantia*, *Cucumis sativus* and *Sorghum bicolor* (said to be rare in the area investigated).

Metzner (1977:138), citing a Food and Agricultural Organisation (FAO) report from 1960, states that the list of cultivated plants in East Timor is one of the shortest within the Lesser Sunda Islands. He suggests that this may be the result of long dry seasons and the fact that Timorese still rely considerably on wild plant resources. According to Metzner, the list of trees and bushes grown in houses in other parts of the archipelago but still considered wild in East Timor include *Tamarindus indicus*, *Psidium guajava*, *Metroxylon sagu*, *Cordyline fruticosa*, *Bauhinia tomentosa*, *Leucaena leucocephala*, *Arenga pinnata* and *Zizyphus mauritiana*. This definition of "wild" is somewhat contentious and shall be further discussed in chapter 9.

Finally, Metzner notes that land use is closely related to issues of land ownership, stating that most land has only usufruct rights and that some important individual trees are personally owned (Metzner 1977:147). The relations between customary law and agriculture in East Timor, which have recently been readdressed by McWilliam (e.g. 2001, 2003, and 2006), are further developed below.

4.2.2 Other ethnobotanical works of relevance in Timor

Apart from Metzner's work described above, the ethnobotany of food plants in Timor has seen little advancement throughout the second half of the 20th century. As with archaeological work, this can partially be explained by the fact that East Timor was under Indonesian occupation for almost half of that period. Another reason has to do with the lack of ethnobotanical work aimed at detailing agricultural practices and the use of specific plant species. Most anthropological research done in more recent times only vaguely describes these, focusing essentially on land tenure and ownership, and on more general issues related to customary practices. The following is a brief account of other more recent ethnographic and

anthropological works that hold some useful information regarding the use of plants as food resources.

Nordholt's work with the Atoni of central (West) Timor focused particularly on their political system. In 1947 he organised a competition at local schools, involving naming the largest number of trees, shrubs and animals. Results revealed that Atoni communities (and even children) shared a strong sense of familiarity with most plants growing in the vicinity of their homes. According to Nordholt, this exercise revealed that the Atoni showed "strong attachment to his natural environment, in particular to plant life" (Nordholt 1971:34). No specific plant names are given, but he comments on two points worthy of notice. The first is the suggestion that such large inventories (a girl, with the help of her family, named 311 plants, and the winning school named 670), suggest that people are able to distinguish between plant kinds, and to some extent are familiar with their uses. The second is that the winning village, Kefamnanu, is located in the mountains, a region where a greater diversity of plants exist. The difference between these inventories and the one I was provided with in the much-degraded environmental zone of the Baucau Plateau (approximately 70 species) is quite significant.

The work done by King (1963) in eastern Timor contains little ethnobotanical information of use to the present study. It is mostly descriptive of general agricultural practices across the country, confirming slash-and-burning as common (King 1963:117) and making few references to plant species.

In 1972-74, Traube carried out anthropological survey within the Mambai geographic area, especially in the central mountain chain around Aileu. Most of Traube's work relating to agriculture focuses on ritual relations between people and their land and very little is mentioned about the use of specific plant species as food. Swidden agriculture and subsistence farming are once again referred to as dominant practices, based essentially on maize, rice, cassava, sweet potatoes, yams, and several varieties of beans (Traube 1986:26).

Friedberg's (1990) work on the Bunak, involving fieldwork in western Timor, is a very relevant ethnobotanical account on the use of food plants by that language-speaking community. Friedberg's list of all relevant food plants used by Bunak people includes a diversity of tubers (both domesticated and wild), cereals, legumes and trees. This list is too long to be given here in detail, especially since the area analysed is considerably distant from the one under investigation here. However, references will be made to her work when discussing the uses of some of the plants identified in the archaeological record.

Some of the work done by McWilliam in East Timor in the last few years has looked into forest management practices and the importance of forest resources in Timorese economy. This is of paramount importance when considering that approximately 80 per cent of Timorese subsistence farmers are dependent upon small scale garden agriculture (McWilliam 2003:307). Despite the existence of small forest patches, many of them preserved or little modified due to their "lulik" (sacred) status, McWilliam argues that "the long-term history of forests and forestry on the island of Timor is generally agreed to have been one of inexorable encroachment and conversion of natural forest reserves into swidden garden lands and degraded secondary bushland" (McWilliam 2001:89).

A more recent study on forest tenures in the Conis Santana National Park, suggested the current use of some forest species by communities living in that area. Some of these include *Intsia bijuga*, *Ficus* spp., *Syzygium* spp., and plants of the Anacardiaceae, Sterculiaceae, Apocynaceae and Sapotaceae families (McWilliam 2006:274). These, however, are not necessarily used as food plants. Another recent work involved the identification of plants used as social constructs by the Meto ethnic community, in western Timor (McWilliam in press). As shall be discussed in chapter 10, the relation between agricultural practices and forest resource management is a complex and intricate one, often dependent upon customary law, and defying common notions of wild and domesticated plants.

Two other recent accounts describe the ethnobotany of medicinal plants used by specific communities in East Timor. In the first one, Collins et al. (2006) describe and compare the medicinal uses that communities from two villages in the districts of Manufahi and Manatuto make of some plants. The second account (Collins *et al.* 2007) also details the medicinal uses of plants, this time among the Fataluku people of the Lautem district, during the resistance to Indonesian occupation.

Despite the new palaeoenvironmental record provided by the phytolith study in this thesis, the dearth of modern ethnobotanical and botanical studies in East Timor, especially regarding the use of food plants, still is a limiting factor when analysing plant remains from archaeological sites.

