Chapter 11
Western Pacific

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Abstract The forests of the Western Pacific range from tropical in Oceania to cool temperate in the Australian state of Tasmania, and all have been manipulated by humans for thousands of years. Indigenous communities across the Western Pacific used forest resources for food, medicine, and raw materials, based on an intimate knowledge of local ecologies, understood though a cosmological lens. Differing colonial histories have influenced the degree to which traditional knowledge has been retained and valued. New Zealand Maori and Aboriginal Australians lost their land and much associated knowledge, whereas customary forms of land tenure are largely intact across the oceanic Pacific, where traditional knowledge continues to underpin integrated systems of subsistence agriculture and forest use. Traditional forest-related knowledge is threatened by modernity across the Western Pacific, and its diminution has been linked with deforestation in the Pacific Islands, with calls by non-governmental organisations (NGOs) and local people to replace large-scale commercial logging with more sustainable systems

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that give more credence to traditional knowledge. In Australia and New Zealand, indigenous people are partnering with government agencies to ensure their cultural values are adequately recognised and protected in publicly owned forests.

Keywords Australia • Cultural expression • Forest history • Forest management • Indigenous peoples • New Zealand • Non-timber forest products • Oceania • Traditional agriculture • Traditional knowledge

11.1 Introduction

There is an emerging body of populist and scientific literature urging modern society to look to indigenous societies and their traditional knowledge for guidance on the sustainable use of natural resources (e.g., Knudtson and Suzuki 1992; Sveiby and Skuthorpe 2006; Jansen and Tutua 2001). It has been suggested that sustainable forest management in a modern world would benefit from increased recognition and application of the knowledge and traditions of indigenous peoples (Colfer et al. 2005).

This chapter explores the state of traditional forest-related knowledge (TFRK) and its potential contribution to sustainable forest management (SFM) in the Western Pacific, an area comprising many Oceanic islands and the larger land masses of Australia, New Zealand, and New Guinea. Indigenous peoples of the Western Pacific are culturally diverse, reflecting different origins and geographical locations, as well as the varying effects of colonial history, particularly on customary land ownership. Equally diverse are the forests of the Western Pacific region, being mainly tropical, with the vegetation of New Zealand and Australia largely temperate. Many indigenous populations in the Western Pacific rely on forest products for their livelihoods, and across the region, forests continue to have spiritual and economic values that are deeply embedded in cultural traditions.

Contestations over forests are a political and social reality in many Western Pacific countries and many are grappling with social, environmental, and economic problems that are having direct and indirect impacts on forests. Global concern continues to be expressed over unsustainable logging and land conversion in the larger Melanesian countries of the Solomon Islands and Papua New Guinea (Siwatibau 2009; Kanowski et al. 2005). Unstable governments, internal conflict, contested land tenures, poverty, and economic constraints of small islands all contribute to unsustainable forest management. But solutions must go beyond forest policies or codes of logging practice, to address the underlying social causes, many of which are embedded in an intercultural space where modern and traditional practices are not fully reconciled.

Due to space limitations, this chapter is not able to provide comprehensive coverage of the state of traditional forest-related knowledge across the entire Western Pacific. For example, little attention has been paid to the islands of Micronesia. Rather, the links between traditional forest-related knowledge and sustainable forest management are explored through specific themes and geographical locations.

This chapter recognises that indigenous societies inhabiting small Oceanic islands have both differences and similarities with those of New Zealand, Australia and New Guinea in regard to culture, governance and history. While it has been a challenge to treat the Western Pacific as a single unit for the purposes of the book, it hopefully enables a deeper understanding of how traditional forest-related knowledge has evolved across this vast area.

In this chapter, the word forest refers generally to natural forests, whilst recognising that most have been subjected to human influences over many millennia, particularly in Australia. Agroforestry describes the traditional process of Pacific agricultural peoples in habitual, deliberate manipulation of certain native tree species by transplanting or encouraging their growth for a desired product.

11.2 Overview of the Western Pacific

The Western Pacific can be defined geographically as the area between latitudes 10° and 50° S and longitudes 120° and 130° W. It straddles the Equator and the international dateline and falls eastward of Wallace's Line[1] (Fig. 11.1). The thousands of islands, comprising 22 countries and territories, are scattered across 180 million km^2 of the Pacific Ocean, with the larger landmasses of New Zealand, New Guinea, and Australia delineating the southern and western/northwestern edges respectively.

The region is often referred to in terms of its cultural sub-regions Australasia, Melanesia, Micronesia, and Polynesia, although the terms 'Near' and 'Remote' Oceania are also used, based on linguistics, degrees of insular isolation, and human adaptation to living on small islands (Merlin 2000). The human history of the Western Pacific is immensely long, with settlement beginning around 40,000 years ago in the Pleistocene continent of Sahul (Australia and New Guinea), through to settlement of New Zealand, around 1,000 years ago. The past 3,000 years of history are characterised by ocean navigation over vast distances, dispersing cultural traditions, people, their material culture, and their domesticated plants and animals throughout the Pacific islands.

Today, there are significant differences between Australia/New Zealand and the rest of the Western Pacific in relations between indigenous and non-indigenous populations, reflecting a complex mix of historical, political, and socioeconomic factors. These political and economic circumstances often determine how forests are valued and used at national and local scales, which in turn are influential in the retention, recognition, and application of traditional forest-related knowledge.

[1] Wallace's Line is the boundary between two major biogeograhical provinces.

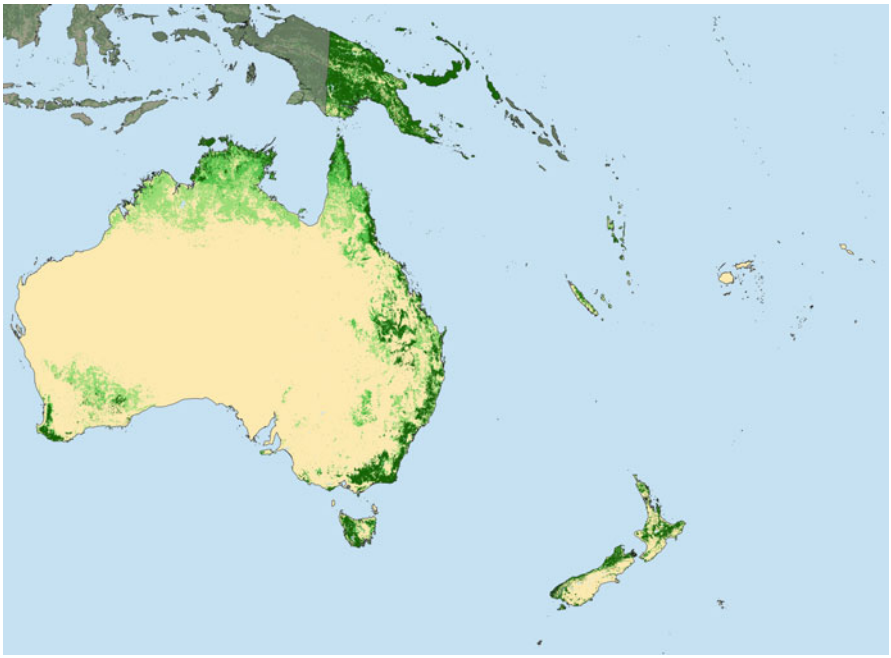

Fig. 11.1 Forest and woodland cover in the Western Pacific (Source: Adapted from FAO (2001)). Key: *Dark green* = closed forest; *light green* = open or fragmented forest; *pale green* = other wooded land; *yellow* = other land

11.2.1 New Zealand and Australia

The nation states of New Zealand and Australia have advanced economies, stable democracies, and rich resources (especially Australia). However, their indigenous peoples are minority populations who occupy a 'fourth world'[2] position in society. In both countries, usurping of land by British colonisers in the eighteenth century jeopardised the existence of customary land tenures and the traditional systems that underpinned them.

In New Zealand in 1840, the British Government and 50 Maori chiefs signed the Treaty of Waitangi, which guaranteed Maori in possession of land, forests, fisheries, and other property, in return for ceding Maori sovereignty to the Queen (Sinclair 2000). Many of the promises of the Treaty were never honoured and in 1975, the Waitangi Tribunal was established for assessing claims brought by Maori relating to actions or omissions of the Crown that breach promises made in the Treaty of Waitangi, including the return of forest land.

[2] A term describing minority and often marginalised indigenous peoples encompassed within modern nation states (Manuel and Polsuns 1974).

In Australia, traditional indigenous knowledge has been profoundly compromised by colonisation and successive government policies of exclusion and assimilation of indigenous people. A declaration by the landed British in 1788, that Australia was 'terra nullius'[3] was followed by a mostly brutal colonial history. Absence of a treaty and forced movements of people from their lands into institutions where speaking native languages was forbidden have all contributed to this loss. Social reforms since the late 1960s, passing of state and territory land rights legislation, and belated passing of the Native Title Act in 1993 have gone some way to addressing the impacts of colonisation.

Today, Maori constitute approximately 15% of the New Zealand population, with approximately 6% of land owned by Maori under communal title. In Australia, Aboriginal people constitute 2.5% of the total population and communally own approximately 20% of the continent, mainly in remote areas of the Northern Territory (Pollack 2001). Both Maori and Aboriginal populations fare poorly according to national indicators of economic and social well-being.

11.2.2 Oceania

The island states of Oceania comprise thousands of small islands, many uninhabited. Most are defined as Small Island Developing States (SIDS), recognised since 1991 with the establishment of the Alliance of Small Island States (Wilkie et al. 2002). Many Oceanic SIDS are well-endowed with forests (e.g. Cook Islands, Palau, Vanuatu, and the Solomon Islands), whereas others have less than 10% cover (e.g., Tonga). Generally, indigenous people constitute the majority of the SIDS populations.[4]

Sixteen Pacific Island countries are self-governing states identified as the Pacific Island Nations, while others are territories of other countries, including French Polynesia, New Caledonia, and Wallis and Futuna (France); American Samoa (United States); and Irian Jaya/West Papua (Indonesia).[5] Some have stable governance systems while others have been torn by internal conflict and ethnic tensions.[6]

[3] Literally 'belonging to no-one,' i.e., indigenous systems of ownership of land and resources were not thought to exist and were not recognised.

[4] Fiji's population is approximately 44% Indian, descended from 60,000 indentured labourers brought over to work in the sugar cane plantations. Melanesians constitute less than half the population of New Caledonia, owing to the presence of a French penal colony in 1864 (Crocombe 1989). French Polynesia is characterised by a mixing of ethnic groups, with Polynesians constituting around 66% of the population.

[5] See: http://www.forumsec.org/pages.cfm/about-us/

[6] In the Solomon Islands, the conflict of 1999–2003 led to a failed state and regional partners, including Australia, established the Regional Assistance Mission to Solomon Islands (RAMSI) to restore law and order and address the serious fiscal situation. Political unrest has occurred in PNG, and ethnic and political tensions are current in Fiji.

Despite colonisation and missionaries, indigenous populations have persisted as the dominant ethnic groups and, importantly, most land is still owned under systems of customary land tenure. These are inherited through traditional kinship systems and rely on traditional knowledge to identify boundaries and proscribe rights.

The mostly rural populations depend on subsistence farming of root crops—primarily taro, cassava, and yams—and continue to apply traditional systems of agroforestry to supplement the diet and provide medicines and raw materials. Many SIDS have low export capacity, with increasing reliance on cash crops such as copra and cocoa. Timber production is a major industry in Fiji, PNG, Samoa, Solomon Islands, and Vanuatu, much of which is at unsustainable levels (Wilkie et al. 2002).

11.2.3 Wood and Cultural Expression

No contextual section on the Western Pacific would be complete without reference to its diverse and beautifully crafted wooden material culture. Some examples are more utilitarian, such as the unique Australian boomerang and the magnificent ocean-going canoes of Oceania (Fig. 11.2a). Others, such as wooden carvings and personal adornments (Fig. 11.2b), are deeply symbolic and highly valued components of ceremonial life (Moore 1995).

The manufacture of wooden and other forest-based items of material culture for an expanding tourism market is becoming increasingly important as an economic base for many impoverished communities across the Western Pacific. Knowledge about these ancient crafts is privileged through customary law, but its application in the market economy is both a positive and a negative. Traditional knowledge can be kept alive and relevant, but economic imperatives can override tradition, leading to unsustainable or inappropriate use of the forest resource.

The 'high' art of Aboriginal people from northern Australia, stemming from traditional techniques of painting with ochre on bark, is perhaps the best known

Fig. 11.2 (**a**) Maori canoe prow (Source: Wikimedia Commons)

Fig. 11.2 (**b**) Face mask, Torres Strait islands. Rietberg Museum, Zürich (Source: Wikimedia Commons) (**c**) Ochre on bark painting of a traditional story from Blue Mud Bay, Northern Territory Australia. Private Collection

example of the commodification of culture. Many modern artists are merging traditional stories with contemporary expression, in perhaps one of the most powerful demonstrations of cultural response to modernity (Fig. 11.2c).

11.3 Environmental and Social History of the Western Pacific

The term 'traditional knowledge'[7] has come into popular use, where its meaning has become blurred and its cultural and historical contexts frequently missing. It is not possible to fully understand traditional knowledge without understanding how it has evolved and continues to evolve. Hence, this section begins by journeying back to the time when indigenous peoples and natural forests co-existed prior to white settlement.

Broadly speaking, archaeological, linguistic, and anthropological research points to a history of human occupation of the Western Pacific from around 40,000 years ago in the Pleistocene-aged Sahul landmass of a joined Australia and New Guinea (White and O'Connell 1982). Much later and separately, it moved eastwards into the islands of the Pacific Ocean culminating in settlement of New Zealand around 1,000 years ago (Bellwood 1979).

The nations that make up the Western Pacific have both shaped and been shaped by their land and seascapes over many millennia. A distinctive difference exists

[7] This term is used interchangeably with 'indigenous knowledge,' 'traditional ecological knowledge,' and 'traditional forest-related knowledge.'

between the larger land masses of New Zealand, New Guinea, and Australia, and the increasingly smaller and more isolated Oceanic islands moving eastwards to island Polynesia and northwards to Micronesia. Table 11.1 contains basic data on people and forests in the Western Pacific, and gives an indication of the relative status of forests in each country.

11.3.1 Biogeography

The region is geologically varied and spans a great period of time, with modern vegetation communities in New Zealand, Australia, and New Guinea owing much to their Gondwanic origins (Paijams 1976). Nutrient-poor lateritic soils of Gondwana evolved a diversity of major vegetation communities, from cool temperate beech forests to tropical rainforests (Specht and Specht 2005).

Eastward from New Guinea, curving to the south, tectonic activity formed the rest of Melanesia in a broad arc of islands composed of continental rocks of volcanic, sedimentary, and metamorphic origin (Howells 1973). This area lies within a zone of seismic instability, and volcanic eruptions are common (Bellwood 1979). Volcanic eruptions can destroy forests and gardens but they also produce the rich volcanic soils that benefit subsistence agriculture. Further eastward, the Polynesian islands (except New Zealand) are small and widely separated, the result of volcanic activity and subsequent erosion (Bellwood 1979).

Continental and island origins have produced different soil types, which have, in turn, been a major determinant of the nature and extent of original forest cover and of subsequent agroforestry and agricultural development by their human inhabitants. The rich volcanic soils of the high islands and continents contrast with the coral-based infertile soils and lack of potable water on atolls (Wilkie et al. 2002). The isolation and limited size of Oceanic islands have had a dominant impact, not only on humans, but on the entire island biota (Kirch 1979).

11.3.2 Human Colonisation

The Pleistocene landmass of greater Australia (or Sahul)—comprising New Guinea, Australia, and Tasmania—was colonised by humans from Southeast Asia around 40,000 years ago, during a period of low sea level (White and O'Connell 1982). There is also evidence for human settlement in island Melanesia (New Ireland and Solomon Islands) soon after (Mountain 1993). The first inhabitants were hunter-gatherers, but pollen and archaeological evidence suggest that techniques of plant management through forest burning and small-scale clearing were being practised and developed in the New Guinea highlands long before full agriculture commenced around 10,000 years ago (Mountain 1993). Indigenous societies practising early forms of agriculture would have still relied on wild resources to supplement the products of untested food production techniques. While some of

Table 11.1 Key statistics about forests and people in Oceania

Sub-region and country	Land area (sq. km)	No. of islands	Population 2002 (1000)	Population density people/sq.km	Forest area per capita (ha)	Forest area (1000 ha)	Forest area % of land area
Australasia							
Australia	7,687,000	1 mainland + 1 L	19,547	2.5	8.3	164,000	21
New Zealand	268,680	2 L	3,910	15	2.1	8,200	30
Melanesia							
Fiji	18,380	2 L + 300	856	47	1	935[a]	51
New Caledonia	18,575	1 L + 11	208	11	1.8	370[a]	20
Papua New Guinea	462,243	Mainland + 7 L + 593	5,172	11	6.5	36,000[a]	78
West Papua	421,981	Mainland + 12	c.2,200		–	33,000[a]	81
Solomon Islands	28,370	7 L + 985	495	17	5.9	2,200[a]	88
Vanuatu	12,190	80+	196	16	2.4	914[a]	75
Micronesia							
Federated States of Micronesia	702	607	136	702	0.1	[a]	–
Guam	541	1	161	293	–	[a]	–
Marshall Is	181	34	77	181	–	[a]	–
Nauru	21	1	12	587	–	[a]	–
Northern Mariana Is	471	17	77	162	0.2	[a]	–
Belau	488	200	19	42	1.8	35[a]	76
Polynesia							
American Samoa	200	5 in 2 groups	69	199	0.2	12	60
Samoa	2,935	8	179	61	0.6	105	37

(continued)

Table 11.1 (continued)

Sub-region and country	Land area (sq. km)	No. of islands	Population 2002 (1000)	Population density people/sq.km	Forest area per capita (ha)	Forest area (1000 ha)	Forest area % of land area
Tuvalu	26	9	11	429	–	[a]	(77% coco-nuts)
Kiribati	810	33 in 3 groups	96	119	0.3	28[a]	70
Cook Islands	240	15 in 2 groups	20	87	1.2	[a]	–
French Polynesia	3,521	118 in 5 groups	258	62	0.5	–	–
Niue	258	1	2	8	3	6	25
Tokelau	12	3	1.5	125	–	[a]	–
Tonga	649	170	106	142	–	4[a]	6
Wallis & Futuna	255	3	16	57	–	–	–

Source: Kanowski et al. (2005)
Notes: Data correct for 2005
L large island
[a]Forests either largely agroforestry systems (AFS) or combined AFS and natural forests

the food resources—for example, wild yams and bananas—may have been known to the colonisers; others would have required trial and error in the domestication process (Powell 1976).

Later arrivals, the Austronesians, brought already domesticated crops, and these were incorporated into established systems situated between horticultural and hunter/gatherer socioeconomic cultures.[8] The production of food crops and manipulation of forests to increase food supply foods and other products would have brought a new dimension to the corpus of traditional knowledge centred on the natural environment and its resources (see next section).

Farther south in what is now the Australian mainland, archaeological evidence indicates that Aboriginal people used the resources of all forest and woodland ecosystems from at least 40,000 years ago (Mulvaney and Kamminga 1999; Feary 2005), although intensive utilisation of tropical rainforests may have been more recent. One of the features of the pre-contact history of Aboriginal society is a continued reliance on hunting and gathering of wild resources, while the majority of the world's cultures became sedentary agriculturalists. There are various explanations for this phenomenon, one being the absence in Australia of fauna and flora suitable for domestication and/or a climate of unreliable rainfall, combined with generally poor soils. Alternatively, the presence of rich and varied foodstuffs supplied by nature throughout the year on a seasonal basis may have nullified the need to develop reliable sources of food through agriculture (Sahlins 1972).

The islands of remote Oceania are eastward of a major biogeographical boundary, Wallace's Line, where many naturally occurring edible plant foods do not occur. This has had important consequences for humans, who needed to bring in their own domesticated crop plants (and associated traditional knowledge) in order to colonise new islands (Kirch 1979). Production of food crops and development of shifting/swidden agriculture of root crops characterises all countries of the Western Pacific except Australia. Agroforestry systems for managing and manipulating tree crops and the forests surrounding the gardens were and are integrated with management of root crop staples (Kennedy and Clarke 2004). (See next section for discussion of traditional agroforestry).

The islands of Polynesia were the last places on earth to be settled by humans. Pottery and linguistic and other evidence point to a culture that grew out of the earliest settlements in island Melanesia around 3,000 years ago. Settlement occurred first in western Polynesia and spread to the tiny remote islands of eastern Polynesia (Gathercole 1977).

Campbell's rendition of the discovery of the islands of Tonga epitomises the early history of Oceania:

> An adventurous, sea-faring people capable of undertaking long sea voyages and of transporting colonising groups that had all the necessitates for survival in an exotic and

[8] Austronesians are people with a shared ancestry belonging and belong to a widespread family of languages with a possible origin in Taiwan around 5,000 years ago (Bellwood et al. 1995).

> impoverished environment. In other words, colonists of both sexes made up the parties; there were probably older people and children, as well as men and women in their prime; they took with them seeds and roots of important plants that would supply not only food but also building materials, clothing, dyes, cosmetics and medicines. Seedlings of tree species that would enable the future construction or more sea going canoes must also have been included….. The food plants they brought with them to Tonga were the same as were used elsewhere in the pacific—the coconut, talo [taro], breadfruit, yam and banana (Campbell 1992, p. 18).

New Zealand was the last island group to be colonised by Polynesians, and Maori demonstrate a remarkable level of 'cultural localisation' (Gathercole 1977). Many economically important plants found in the rest of Polynesia such as coconut and pandanus did not exist in New Zealand but could not be grown because it was too cold. Maori adapted weaving traditions to make use of the locally available flax plant comprising several genera and species, producing the distinctive storytelling patterns of Maori weaving (Riley 2005).

This overview demonstrates that traditional forest-related knowledge of the people of the Western Pacific is not only about the resources and cultural values of natural forests but also about their modification in the context of horticulture and agroforestry. Nevertheless, natural forests remain an important source of food, raw materials, and medicines. Polynesians are described as horticulturalists who continued to appreciate the nutritive and economic value of many wild plants and animals, particularly when yields from domesticates were unavailable or low (Gathercole 1977). The languages of Polynesia demonstrate the relative importance of crop plants and forest foods. Kai (food) comprises two elements; 'staple starches', such as the cultivated taro and yams, and the 'relishes.' The latter includes opportunistically harvested nuts and fruits from the forest, and while considered to be highly desirable, they do not constitute a meal (Kirch 1979).

11.3.3 Human Interactions with the Environment

Human settlement of the scale and longevity described above could not have happened without environmental consequences. All the forests of the Western Pacific have been altered by human settlement and there is sound palynological and geomorphological evidence that swidden agriculture and agroforestry in the New Guinea Highlands has resulted in major changes to the forested environment over the past 10,000 years (White and O'Connell 1982; Paijams 1976; Golson 1977). Recently, new paradigms have emerged, advocating a greater role for climate change in modifying forests in Micronesia, which has implications for interpretation of landscape change elsewhere in the Pacific (Hunter-Anderson 2009).

In New Zealand, a third of the original forest was cleared for gardens prior to the arrival of the British (Roche 1990; Guild and Dudfield 2009). The slash-and-burn techniques the Polynesians brought with them from the tropics were unsuitable in the temperate climate, and the cleared forests did not regenerate, resulting in major deforestation in the North Island (Metcalf 2006).

Vegetation communities in most of islands of the Pacific are now dominated by secondary regrowth in abandoned gardens and highly altered forests manipulated over millennia to favour certain species. Primary forests contain shade-tolerant, long-lived trees, but thousands of years of agroforestry have replaced many of these with secondary forests of shade-intolerant, short-lived tree species. Most modern forests are a mixture of native species, early introductions, and later introductions (Mueller-Dombois 2008).

Traditionally, indigenous people were part of a functioning socioeconomic system in which the natural environment was managed and its resources used through a cosmological lens. Application of traditional law ensured that a particular resource was not overexploited. However, it is clear that early agricultural systems did lead to unbalanced and degraded ecosystems. It has been argued that Pacific Islanders 'prospered by disturbing the natural order' (Sauer, cited in Clarke and Thaman 1993). Newly arrived swidden agriculturalists cleared forest patches to plant the root crop plants they had brought with them, and established tree crops by selective planting and manipulation. Clarke and Thaman (1993) argue that modification of the closed forests rendered the islands more productive of food and more congenial to human occupation. Similarly, Geertz has argued that mixed planted crops eventually resemble the bush they have replaced; a 'natural forest is transformed into a harvestable forest' (Geertz, cited in Kirch 1979).

The extent to which Aboriginal people have altered Australia's vegetation is a contentious area of debate in both the scientific and populist literature. On the one hand it has been argued that modern Australian landscapes are a direct reflection of thousands of years of farming by fire and digging stick, for example (Gammage 2003; Rolls 2005). Others have taken a more precautionary approach by recognising that Aboriginal burning may have changed the floristics and structure of some forest types, but it is difficult to disentangle climatic from anthropogenic effects, especially prior to 10,000 BP (Head 1993).

As hunter-gatherers looking to maximise returns from the natural environment, Aboriginal people manipulated certain species and excluded use of others through religious taboos. Evidence for replanting the tops of harvested native yams and protecting the seedlings of certain species germinating around campsites in the Northern Territory is well-documented (Hynes and Chase 1982; Berndt and Berndt 1981). Aboriginal people living in the fertile and productive Murray Darling basin were observed harvesting *Panicum* grasses to enhance dispersal of seeds (Allen 1974), and there is some evidence to suggest that the economically important cycads were transplanted into different forests (Boutland 1988).

Following the late Rhys Jones' seminal paper on fire stick farming (Jones 1969), management of the land and its resources through judicious use of fire has become a central premise of reconstruction of traditional Aboriginal life (e.g., Hallam 1979; Hill 2003). In fact, an increased frequency of high-intensity wildfires has been attributed by some Aboriginal people and researchers to the cessation of traditional burning practices, which kept fuel loads at low levels (Langton 1998). Ethnohistorical and ethnographic sources referring to Aboriginal burning have been used to justify proposals for frequent, broad-scale burning to reduce fuel loads, particularly following

catastrophic bushfires, but this has come under criticism (Benson and Redpath 1997). Nevertheless, palynological research has demonstrated major changes in Quaternary vegetation that can be reasonably attributed to Aboriginal burning (Singh et al. 1981) and this, together with early records, suggests that fire was a major management tool, used according to customary laws of land ownership and kinship, for a wide range of reasons. Oral traditions and fire management by traditional owners in northern Australia are testimony to a long history of land management by fire. However, the same cannot be said of much of southern Australia, where historical legacies have denied Aboriginal people the fire ecology knowledge that could have been passed on to subsequent generations.

Throughout the Western Pacific, traditional ecological knowledge bonded human societies to these ancient settings to form an integrated, holistic system. The forests and the manipulation of them by fire, clearing, and planting contributed to provision of food and raw materials that sustained traditional socioeconomic systems. The next section explores the cultural filters—the traditional knowledge—that determined how societies connected with these settings.

11.4 Understanding Traditional Forest-Related Knowledge

The traditional forest-related knowledge of indigenous peoples is embedded in their oral traditions, much of which is still extant in the Western Pacific, particularly in Oceania and Northern Australia, where people still speak their languages and practice customary forms of land management. Indigenous knowledge is also documented in the early records of non-indigenous explorers, settlers, and government officials, many of whom kept detailed accounts of their encounters with indigenous peoples. While both have inherent limitations—reliance on a flawed memory on one hand, and the selective, value-judged observations of the colonial imperialists on the other—together they provide a valuable insight into traditional indigenous cultures.

Traditional forest-related knowledge in the Western Pacific can be understood as a spectrum. Beginning with the western edge of the region, the ancient, primarily hunter-gatherer knowledge of Aboriginal Australians grades eastward through Oceanic cultures' integrated knowledge of natural and modified environments. Successful settlement, especially the depauperate islands of eastern Polynesia, relied on application and modification of traditional knowledge to new environments for successful propagation of root and tree crops and a concomitant decrease in use of natural forests.

11.4.1 Cosmologies

As with traditional knowledge systems worldwide, those of the indigenous people of the Western Pacific are embedded in complex and ancient spiritual connections

with the natural world. The material world is suffused with spiritual forces which must be respected for continuation of human survival and well-being (Reid 1995).

Cosmologies of the Western Pacific's indigenous peoples include stories relating to the origin and creation of the world and its human inhabitants by gods or spirit beings. They link the present to the past through the actions of ancestral beings and impose responsibilities on humans in their relations with the natural world. In Australia, the term dreaming is ascribed to a time before, but which still exists, when creation beings made and named all the features of the natural world and all the plants and animals, including humans. These ancestral beings are everlasting and remain as part of nature and people. Anthropologist Debbie Rose comments that 'country' is the manifestation of creation, so everything that happens has creation as its precondition. Knowledge—local, detailed, tested through time—is the basis for being in country (Rose 1996).

Polynesian societies ascribe similar connections between people and the environment. In Tongan society, 'fonua' invokes a cosmology in which the environment is regarded as an extension of human society (Francis 2006). As a result, human agency is integral to a physical landscape that includes the land, the ocean, and the sky. The concept of fonua 'people of/and place' described a local territorial entity that incorporated the land and natural surrounds associated with a chiefly title holding, and the people residing on that land. Fonua is also a descriptive term for the soil that grips the roots of plants when pulled from the earth. The old Tongan word for placenta was fonus, a reference to the practice of burying the placenta after birth of a child (Francis 2006). Similarly in New Zealand Maori cosmology, the word for land, whenua, is the same as that for placenta (Walker 2004).

Cosmologies include improvements to the land for sustaining humans. At specified times of the year, Aboriginal Australians conducted increase ceremonies, asking the creation beings to maintain and replenish wild resources (Berndt and Berndt 1981). Similarly, the yam planting cycle in Oceania is intricately tied to human health and well-being. Yams are one of the most important crops in Oceania and New Guinea, with great utilitarian as well as symbolic significance. Historical accounts of traditional Kanak life in New Caledonia state that people perceived themselves by analogy with objects of nature such as the yam, whose cycle symbolised the cycle of life (Dahl 1989).

Forests, trees, and plants feature strongly in the cosmology of Western Pacific indigenous cultures. In Vanuatu, the Banyan tree is the most prominent arboreal symbol of place (Patterson 2002). Banyan trees are also important in Aboriginal cosmology, as expressed by Yolngu leader Galarrwuy Yunupingu:

> That tree is a special place, inside it are important things. Its like the heart of the country, our beliefs about our land reside in that tree and at the site of the tree, they reside in the rocks, in the waters and in our minds. We know these things to be true (Sculthorpe 2005, p. 172).

A powerful creation story in Maori lore concerns the kauri *Agathis australis*. This majestic tree was not only the god of the forest but also the creator of the first humans (Fig. 11.3).

Fig. 11.3 The New Zealand Kauri (*Agathis australis*), Tāne mahuta (Lord of the Forest), North Island, New Zealand. This tree is at least 600 years old Waipoua Forest (Source: Wikimedia Commons)

> Tāne created the forests when he separated his parents, Ranginui (the sky father) and Papatūānuku (the earth mother), and let light into the world. As Tāne Mahuta he is god of the forest, presiding over its plants and birds. As Tānenui-a-rangi he is creator of the first human. Respect for Tāne's forest was shown by performing certain tikanga (customs). Their importance is reflected in the story of Rātā. Rātā went into the forest, cut down a tree, and began to carve it into a canoe. When he returned the next day to continue his task, the tree was miraculously standing in its original position. He felled it again and set to work, but the same thing happened the following day, and the next. Finally, Rātā hid behind a bush and saw the hakuturi (forest guardians in the form of birds, insects and other life) replanting the tree. When he confronted them, they told him he had failed to perform the appropriate rites. He then did so, and the hakuturi released the tree.
>
> The great trees of Tāne, god of the forest, were called Ngā Tokotoko-o-te-rangi (the posts that hold the heavens aloft) because they held Ranginui (the sky father) above Papatūānuku (the earth mother) (Te Ara–the Encyclopedia of New Zealand 2009).

Taboos or tapu acted as a sustainability measure in traditional forest use and are usually imposed by village chiefs to prohibit use of a particular resource. The prohibitions generally related to resources in decline, with strict punishments for ignoring the bans (Government of Samoa 1998; Nalail 1996). In Australia, the sacred prohibitions on exploitation of certain species could be due to totemic associations with an individual, or exclusion of certain forest areas from burning or exploitation (Rose 1996).

Sacred trees and magic plants are also part of the cosmos. For Nyungar people living in the forests of southwest Western Australia, the karri (*Eucalyptus diversicolor*) and jarrah (*E. marginata*) trees were part of women's dreamings, while the marri was identified as male (Crawford and Crawford 2003). The changing nature of vegetation is an important symbolic representation of continuity and change in Aboriginal society, as are unusual ecological contexts such as species on the edge of their range or relict vegetation communities (Cooper 2000). Planting of *Cordyline fruticosa* in specific areas of Melanesian gardens was done to secure protection by the ancestors (Manner 2005).

The tall eucalyptus forests of southeastern New South Wales in Australia are home to the Doolagarl, a supernatural being who acts as a guardian of the forest—taking care of people who belong there and harming people who do not (Rose 1996). The Doolagarl is believed to be represented in some of the rock art paintings in the area and his presence continues to be a powerful one for local Aboriginal people (Feary 2007).

11.4.2 Traditional Forest-Related Knowledge of Aboriginal Australians

As hunter-gatherer peoples, Aboriginal Australians were intimately concerned with the growth cycles of the plants and animals on which they depended, and a detailed and precise knowledge of the local natural environment was essential for survival (Berndt and Berndt 1981). The life cycles of plants and animals and best times of year for harvest or hunting were learned by young people through observation and as part of gendered storytelling and ritualised passing on of information. Reading the landscape ensured that forest products were hunted or harvested in a sustainable manner. The finely detailed knowledge of relationships between living things—the seasonal calendar—informed knowledgeable humans of when a particular resource was ready to be exploited; for example, middle Victoria River crocodiles are laying their eggs when the jargala tree (*Sesbania formosa*) is flowering (Rose 1996).

Aboriginal people classified the landscape according to its biophysical and cosmological values. The Yankunytjatjara people of the Western Desert recognise five major ecosystems, and specialised techniques were used for the seasonal procurement and processing of their resources (Table 11.2)

As well as remembered oral traditions, archival records of the early colonial era often contain great detail on Aboriginal use of plants. Although relatively late, Donald Thomson's seminal work on seasonality in Aboriginal communities in far north Queensland (Thomson 1939), is a sympathetic and detailed evaluation of traditional life that showcases the critical role of indigenous knowledge of the local environment in maintaining a balance between resource availability and use. Thomson makes many references to the use of forests by Aboriginal people and provides detailed information on the different wood types used in manufacturing implements, such as the use of lancewood (*Acacia rothii*) for making hunting and fishing spears.

Table 11.2 Traditional ecosystem classification of desert Aboriginal communities

APU	Karu	Tali	Puti	Pila/Uril
Rocky outcrops, hills, ranges	Watercourses (gullies, creeks, rivers)	Sandhills, sand dunes, sandhill country	Woodlands, shrublands	*Spinifex* grasslands, plains/open country, grasslands, plains
Sparse vegetation with *Spinifex* and wattles (*Acacia* spp.)	Wide sandy riverbeds, adjacent floodplains, Seasonal wet/dry	Open, sparse shrubland, *Spinifex* dominant groundcover	Collectively the most important sandplain vegetation communities, mulga the dominant species	

Source: Institute for Aboriginal Development 1985

Bush foods and bush medicines and their ethnotaxonomy are a familiar manifestation of traditional forest-related knowledge in Australia, and there are literally hundreds of books on the subject by Aboriginal people (e.g., Thancoupie 2007), botanists (e.g., Maiden 1889), and for a general audience (Cribb and Cribb 1974; Isaacs 1987). The most insightful are collaborative, where a non-Aboriginal person converses in the local language or dialect, as this picks up the subtleties of the relations between resource use and cultural practices, such as participatory research with the Yankunytjatjara people in central Australia (Institute for Aboriginal Development 1985).

Specific records of Aboriginal forest use are more elusive than those for other ecosystems such as savannahs or the coast. This is probably due to several reasons. Forests occur in the high rainfall belt on the edge of the continent, where colonisation had the most and earliest impacts, leaving little time for detailed observation of traditional lifestyles. Furthermore, much forest-based activity was carried out by women, whose activities may not have been noticed by the predominantly male early settlers and anthropologists. Evidence from the rainforests of New South Wales in the nineteenth century comes from explorers who observed groups of Aborigines in the rainforests, although their camps appear to be outside or on the edge of the rainforest. They left detailed descriptions of organised game hunts by Aboriginal groups of men and women. Aboriginal women were observed twisting the large leaves of the Bangalow palm to make a waterproof container. The bark of the stinging tree *Laportea gigas* was processed and woven or knotted into dilly bags, or made into fishing and hunting nets (Byrne 1984). Sullivan's analysis of ethnographic records from northern New South Wales demonstrates the considerable economic and social importance of subtropical rainforests in secular and sacred life (Sullivan 1978), and Campbell (1978) discusses the highly specialised techniques required for processing many rainforest plants.

Ethnoecological research by David Harris demonstrated that Aboriginal people of the rainforests of northeastern Queensland were morphologically and culturally distinct from other Aboriginal groups. In addition to the ability to processes toxic cycads, rainforest people constructed dome-shaped thatched huts in forest clearings, made bark cloth from hammering the inner bark of fig trees, and wove sieve

bags from lawyer cane and rush for leaching toxic tubers (Harris 1978). Specialised nut-cracking stones were used for opening the hard but highly nutritious nuts of rainforest trees, whose prolific production during the fruiting season supported large numbers of people gathering for ceremonial activities including the spectacular bunya festivals (Huth 2001). Although the colonisers stopped the festivals, the associated traditional knowledge has been kept alive (Haebich 2005).

Specific uses have been recorded for parts of a wide range of *Eucalyptus* species (Macpherson 1939), and a database of timbers used traditionally by Aboriginal people was put together in 2002 (Kamminga 2002).[9] It currently contains around 300 entries, listing the botanical name, the ethnographic source of the information, and the observed use of the timber. While compiled primarily for the purposes of demonstrating the relationship between woodworking properties and wooden implements, it has much broader application.

11.4.3 Traditional Forest-Related Knowledge of Agricultural Societies

Agricultural peoples of the Western Pacific have worldviews that maintain strong connections between their living space and the surrounding forests. Mosko (2006) describes the traditional classificatory patterning of 'inside' and 'outside' spaces with reference to the North Mekeo people of the central province of Papua New Guinea. Mekeo daily life is divided between the village and the bush, with constant movements and transformations between the two. The village is conceptualised as the outside space, which was initially 'cleared out' of the inside space of the bush. This means that the outside village contains much that originated in the inside bush and is a metaphor for transformations between the human body and the outside world.

Within this broader cosmos, traditional forest-related knowledge of agriculturalists focuses on cultural relationships with the biota of native forests and with 'transported landscapes' of agroforests, irrigated swamps, dry field agriculture, and a suite of consciously and accidentally introduced organisms. Merlin (2000) provides an excellent analysis of ethnobotanical research in remote Oceania, noting that observations of traditional plant use and agroforestry have been occurring since the voyages of Captain Cook in the late eighteenth Century.

For Papua New Guinea, Powell provides an excellent synthesis of previous ethnobotanical research. Based on this and his direct observation, he gives comprehensive species lists of plant foods, distinguishing six main categories of levels of plant domestication and use by local indigenous people. Powell's analysis indicates that staple foods are primarily starchy underground roots and tubers, whereas supplementary foods are a very wide range of fruits, nuts, and greens. No wild foods were cultivated as staples, although wild forms of root crops such as taro and yam exist.

[9] Held by AIATSIS in their Aboriginal studies electronic data archive, but it is not currently active.

Most forest foods were identified as supplementary foods and many wild foods are transplanted and cultivated as crops within forests or as productive trees around villages (Paijams 1976).

Farther south, in New Zealand, the large forest tree, totara (*Podocarpus totara*) was used by Maori for fire-making, manufacturing canoes, and carving. A new totara tree had to be planted each time one was felled, to appease Tane, the god of the forests, for removing one of his children. This practice also ensured sustainable practices for use of valuable trees. The tall, straight kahikatea (*Dacryridium dacryoides*) bears sweet fruits that were highly prized by Maori. Fruits of the Miro (*Prumnopitys ferruginea*), are very attractive to the New Zealand pigeon, and Maori used to place snared water troughs in miro trees so the pigeons could be caught while drinking (Metcalf 2006).

Letters from John Deans to his father in 1845 contained observations of traditional Maori life in the Riccarton-Christchurch region of the South Island, where a sophisticated socioeconomic system produced surplus goods for trade and supported powerful tribal chiefs:

> Effective techniques for obtaining the different foods, while at the same time conserving the resource, had been perfected, and a sophisticated social system had been developed to do the required work…. Each whanau (extended family) had its allotted rights to take its requirements within the rules laid down, and its allotted part to play in producing a surplus for the tribal headquarters, and for the use of groups in other parts of the tribal territory, who would supply something else in return. Thus a Maori community living at Putaringamotu would specialise in products from the local forests—preserved pigeons, carved totara and canoes…. (Molloy 1995, pp. 3–4).

11.4.4 Cultivated Landscapes of the Western Pacific

Today approximately six million Pacific Islanders rely on traditional agriculture for their subsistence needs (Manner 2005). Most traditional agricultural systems depend on connections with a range of natural ecosystems, and the original Pacific Islanders were geographic opportunists and ecological practitioners who recognised the capabilities and developed different methods for their exploitation and maintenance (Manner 2005). Many terms have been used to describe land use practices in the Pacific; for example, agroforestry, agroecosystems, arboriculture (Kennedy and Clarke 2004; Thaman 1989), and classificatory systems have been developed to describe the various methods of cultivation and land use (Manner 2005). The term cultivated landscapes is used here, after Kennedy and Clarke (2004), who use archaeological, geographical, and anthropological sources to demonstrate the antiquity of forest transference and manipulation within a broader socioeconomic system of landscape management.

All traditional agroforestry systems across the Pacific exhibit common characteristics of high species diversity, incorporating cultivated and protected native and introduced tree species (up to 300 on the larger Melanesian islands). These include tree crops such as coconuts, breadfruit, and bananas as well as a wide range of fruit and nut

species, either deliberately planted, encouraged, and protected in the regeneration of regrowth, or spared when clearing new garden plots (Thaman 1989). Within a given species of tree or root crops there are many locally differentiable cultivars and varieties, with variable yields and seasonalities, spreading distribution of food more evenly across the annual cycle. Different cultivars exhibit differential adaptations to ecological conditions such as salt spray, pest and disease resistance, soil type, and shade tolerance, and each was selected for a specific use (Thaman 1989).

Siwatibau (1984) discusses traditional environmental practices in Fiji to demonstrate that Fijians had developed methods of shifting cultivation that optimised resource utilisation without depleting the resource base. The optimum location for a new garden was carefully chosen and the garden was established by slashing the primary or secondary forest, often leaving the large trees. Ground disturbance was minimised (and effort reduced) by leaving tree stumps to rot. The slashed vegetation was burnt and weeded, and if slopes were steep the rubble was placed along contours to reduce soil erosion. New crops were then planted using methods appropriate to the plant species.

Manner (2005) also notes that in swidden preparation, not all trees and shrubs are killed; some are cut off and allowed to sprout, to enhance reforestation. Nitrogen-fixing plants such as *Causarina oligodon* were planted to enrich the soil. Thaman et al. (nd) note that Pacific Island agricultural and land use systems were built on a foundation of protecting and planting trees, and were developed and managed for both human need and ecological services.

Traditional land management in Tonga involves a complex mix of trees, shrubs, and short-term ground crops incorporated into short-term shifting agriculture on small plots of land (Fig. 11.4). Cleared vegetation is allowed to dry, and is then burnt. Large, important food trees (cultivated or native) are left. Some are pruned to

Fig. 11.4 A typical Polynesian garden within a forest. Ha'apai, Tonga (Photo: S. Feary)

allow light in and to produce leaves, which fall to the ground and act as mulch. Larger branches are used as trellises for the yams, and then as firewood after yam harvest. Trees such as *Pandanus* or *Hibiscus* are planted along garden edges to act as boundaries and windbreaks and to provide food and other products.

Living fences could consist of important timber trees such as *Casuarina* spp. The root crops are planted and harvested sequentially, and the cycle can be extended by planting kava or paper mulberry for making tapa cloth. The garden returns to fallow over 4–10 years, and the existing trees continue to provide food, medicines, and other products.

The vignettes presented above demonstrate that traditional land use systems at the time of European contact were productive and efficient. Such systems could not operate without detailed local knowledge of the natural and cultural environment. Thaman et al. (nd) aptly describe these systems as 'long term investment of time, knowledge and effort in a living, growing bank account.'

However, non-indigenous people often do not see these systems as being productive and have endeavoured to change them, as described in a narrative from Papua New Guinea (Box 11.1 and Fig. 11.6).

11.5 Contemporary Forest Management in the Western Pacific

> Indigenous peoples are often closely associated with forests; forests provide habitat and are important to them for economic, social and cultural reasons. Concerns about conserving and managing forests often coincide with concerns about the survival and integrity of the cultures and knowledge of Indigenous peoples (Ruis 2001, p. 8).

International forest debates on sustainable forest management have been important for bringing indigenous rights and forest management into the same discourse (Feary et al. 2010). The Convention on Biodiversity has also influenced the global dialogue on forests by supporting recognition of forest-related knowledge of indigenous and forest-dependent people and raising issues of intellectual property rights (Ruis 2001).[10]

Sustainable management of forests is an important global issue. Current discourse on climate change has identified Western Pacific countries with significant areas of forests, such as Papua New Guinea and the Solomon Islands, can potentially contribute to amelioration of greenhouse gas emissions (von Strokirch 2008). Furthermore, many of the low-lying atolls of Polynesia are the most vulnerable places on earth to even minor rises in sea level.

The 'developed' nations of New Zealand and Australia have both undergone major reforms in forest management over the past 30 years, resulting in a greater recognition of indigenous interests and rights over forests, although many would argue that there is still a long way to go.

[10] See http://www.biodiv.org/convention/articles.asp

Box 11.1 Felling Trees on Top of the Garden—Revealing 'Monocultures of the Western Mind' by D. Eastburn

When an Australian patrol officer first conducted a survey and census of the people living in the rainforests of the Great Papuan Plateau in southwestern Papua New Guinea, he was confronted with an unusual agricultural practice of planting crops under the forest canopy, and when they begin to grow, felling trees on top of them. To his 'Western eyes' that process appeared outrageous, 'inferior even by primitive standards,' and he estimated that 'as much as 40% of the crop was destroyed' (Schieffelin 1975, p. 31).

The unusual method of cultivation while mechanistically apparently outrageous is in fact ecologically brilliant. It is uniquely suited to maintaining the resilience of the high rainfall lowland rainforest environment by minimising soil disturbance and enabling the area to be quickly reclaimed after the garden is abandoned. No fire is used in the preparation of the garden. The undergrowth beneath the forest canopy is first cleared, and planting material such as taro tops and banana suckers, is planted into the minimally disturbed humus on the forest floor with only a few centimetres showing above the surface. The canopy protects the new garden from rain and filters the sun in its first weeks. Each tree in the garden area then has a scarf cut into one side to direct its fall, and after a few weeks when the crop has 'taken root' a large tree is cut, creating a 'domino effect' resulting in all of the trees falling 'slowly' together in a tangled mass. The fall is also softened by the branches breaking and dissipating energy like the safety 'crumple zone' of a car. Anthropologists, who have studied the process, have found that the impact on the crops ranges from 'virtually no damage' to less than 5% (Schieffelin 1975, p. 31), and the food plants can easily grow through the tangle and quickly form a structure like a microcosm of the surrounding forest.

Other advantages of this method of agriculture include the protection of the soil from leaching and baking by the initial mulch of leaves and twigs, the release of nutrients as the mulch decomposes, and breaking up heavy raindrops by the tangle of fallen trees preventing erosion from runoff. The original condition of the forest floor is maintained enabling a quick reversion to rainforest after the garden is abandoned. Additionally, it is a low energy method of clearing in a sparsely populated area, and the fallen tangle of trees form an excellent defence for houses built in the centre of the garden area, as well as a ready supply of firewood and fencing materials.

In the early 1970s an agricultural officer (Didiman–Melanesian Pigin) trained in Western science cleared bare a rectangular patch of rainforest as a 'demonstration plot' to teach the local villagers, who use the same methods as described above, how to make a 'proper' neat garden. Unfortunately the timing,

(continued)

Box 11.1 (continued)

during the heaviest rainfall period, was not good. The exposed soil was leached and its surface packed by the impact of the heavy rain, and the sun baked it hard. The officer attempted to recover the situation by ordering a large amount of artificial fertiliser that was delivered by government-chartered aircraft. When I visited the area around a decade later, the 'Didiman's Demonstration Plot' remained like an oversized abandoned tennis court in the forest.

Fig. 11.5 Felling trees on top of the garden, Papua New Guinea (Photo: D. Eastburn)

11.5.1 New Zealand

Since the citizen debates over logging in the 1980s, most native forests in New Zealand are now in Crown-owned conservation reserves. However, Maori own 29% of the privately owned native forests, the majority occurring in the North Island (Hammond 2001). Some Maori landowners wish to derive economic benefits by harvesting and selling the timber from their forests, but some such as the *Nothofagus* (Beech) forests in the South Island, originally granted to Southern Maori under the South Island Landless Natives Act 1906, have been identified as having high conservation value (Wheen 2002).

New Zealand's Indigenous Forest Policy has introduced Nga Whenua Rahui covenants as a way of preserving significant natural ecosystems on Maori land. Similar

covenants exist in relation to non-Maori land, but Nga Whenua Rahui recognises the unique situation of Maori, who can seek compensation for loss of income from the merchantable timber (New Zealand Department of Conservation 2006).

Forestry in New Zealand is heavily dependent on plantations for commercial timber, particularly the exotic species *Pinus radiata.* Maori have extended their cultural connections to native forests to embrace exotic commercial forestry as an 'adopted son' who protects remaining lands and provides employment and economic benefits (Miller et al. 2007, p. 15).

Maori now own 14% of the planted forest estate although most of this is managed by the Crown or private forestry on behalf of Maori owners. In recent years, however, Maori interest in more active involvement in forestry operations has increased, as a way of providing employment and training opportunities to young Maori (Thorp 2003). For example Ngati Porou Whanui Forests, Ltd. is a Maori-owned company currently managing 10,000 ha of forest in a joint venture arrangement with a Korean company (Miller et al. 2007).

11.5.2 Australia

After decades of citizen unrest over logging practices in public forests, the Commonwealth Government formulated a National Forest Policy Statement (NFPS) in 1992, which is an agreement between the Commonwealth and state governments about objectives and policies for the future of Australia's public and private forests (Commonwealth of Australia 1995). The NFPS committed to protecting Aboriginal values of forests and linked a potential enhanced employment in forest industries with an increased capacity to utilise traditional knowledge (Commonwealth of Australia 1995). State based regional Forest Agreements (RFAs) have been criticised for not giving sufficient recognition to native title rights (Dargavel 1998; Lane 1997) and Aboriginal people in most states have expressed some level of dissatisfaction (Lloyd et al. 2005; Engel 2000). Other researchers considered that Aboriginal interests had been defined too narrowly (Rangan and Lane 2001) and that there was a tendency for the RFAs to look backwards into Aboriginal culture instead of forwards (Lane 1997).

In 2005, the Australian government released a National Indigenous Forestry Strategy (NIFS) with the aim of establishing a framework for facilitating greater involvement by Indigenous people in the forestry industry, with the ultimate goal of alleviating economic and social disadvantage (Commonwealth of Australia 2005). Improved forest management is an objective of the strategy, but its narrow focus on employment in mainstream forest industries limits the strategy's ability to incorporate Aboriginal values and knowledge into forest management (Feary 2007).

Approximately 14% of Australia's forest and woodland area is under Aboriginal communal ownership (Fig. 11.5). This includes timber production forests, plantations, and forest ecosystems of high conservation value (Montreal Process Implementation Group 2008).

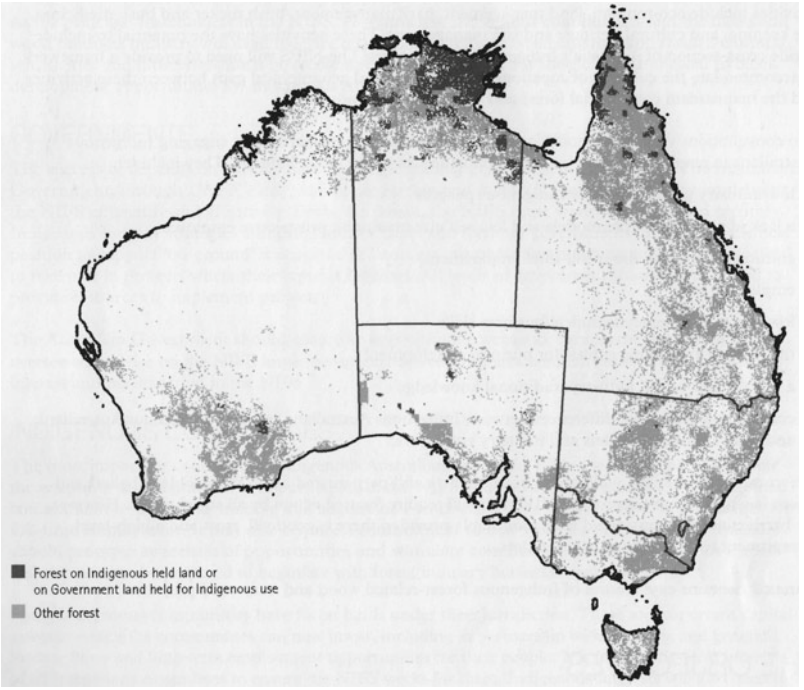

Fig. 11.6 Map of forests owned by Aboriginal Australians (Source: Commonwealth of Australia (2005). National Indigenous Commonwealth of Australia (2005). The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) is an independent research agency of the Australian Government)

11.5.3 Pacific Countries

Sustainable forest management (SFM) is currently an unachieved goal in the majority of Pacific countries, and the prognosis for SFM continues to be a negative one (Siwatibau 2009). Over the past decade or so, reviews by international organisations such as FAO have expressed concern over forest management in most Pacific Island countries, especially the larger Melanesian islands of Papua New Guinea and the Solomon Islands (e.g., Brown 1997; Hammond 1997; FAO 2000). The Pacific is often combined with Asia in international reporting, and detail on specific Pacific countries can be lacking (e.g., Brown and Durst 2003).

Recent reviews (Bond 2006; von Strokirch 2008) have used deforestation statistics to paint a gloomy picture for the Pacific Islands, and concluded that the major primary natural and accessible forests of the Pacific will be logged out by 2020. Bond states that impacts of commercial exploitation of forests can be indirectly linked to impacts on human health; for example, HIV/AIDS incidence is relatively higher around remote logging camps (Bond 2006).

The two principal causes of unsustainable forest management have been identified as high levels of forest clearing for subsistence agriculture and cash cropping, and poor logging and silvicultural practices (von Strokirch 2008). Increasingly, damage from cyclones is also contributing to deforestation. While the diversity of situations across the vast area of the Pacific eludes generalisation, the reasons behind unsustainable forest management are closely tied to a range of social, economic, and political factors affecting both the informal, subsistence economy and the formal market economy. They are a direct result of population increases and efforts to achieve economic development goals and move into the mainstream market economy.

Addressing unsustainable forest management it is proving difficult for a number of reasons. These include poor quality forest data and unreliable forest inventories, under resourced and ineffective government departments, and lure of alleged benefits and royalties to local land owners from large-scale logging. Business ignorance of landowners and disputed land tenures are contributing factors (Wilkie et al. 2002).

Development of sound forest policy which is effectively implemented and monitored is a critical step towards sustainable forest management, and several Pacific countries have or are developing forestry and land use policies. Two examples are discussed below—one each from Melanesia and Polynesia.

11.5.3.1 Samoa

The independent country of Samoa is the only Polynesian island with significant forest cover, primarily tropical rainforest, and is notable for its unique forest biodiversity (FAO 2000). The Village Fono Act of 1989 recognises traditional management systems for control of village resources and village management (Government of Samoa 1998). Despite the existence of customary systems, the forests of Samoa suffered extensive deforestation from land conversion and logging operations between 1977 and 1990 (Government of Samoa 1998). Logging on the main island of Upolu was halted in 1989 and it was predicted that all merchantable forests would be gone within the next 5–6 years at the current rate of clearance (Groome Poyry 1993; Brown 1997). Since this time, Samoa has undertaken major reforestation, with the German Government Aid agency (GTZ) running a project on natural forest management of logged-over forests on the island of Savaii.

Samoa ratified the Convention on Biodiversity in 1993 and formulated a National Forest Policy in 1994 (Government of Samoa 1998). A revised policy in 2007 included two objectives relevant to traditional forest-related knowledge—economic and social benefits arising from pharmaceuticals based on native plant species, and ecotourism development. The first draws attention to the need for protection of the intellectual property rights of Samoans.

Samoa has a strong commitment to conservation and participatory approaches to forest management, and a number of community forest conservation projects have been established (FAO 2000), which are based on traditional rainforest preserves (Cox and Elmqvist 1994). In American Samoa, the national park concept fits well

with the traditional Samoan way of life, the fa'asamoa. In keeping with the meaning of the word Samoa—'sacred earth'—the park helps protect fa'asamoa, the customs, beliefs, and traditions of Samoan culture.

11.5.3.2 Vanuatu

The republic of Vanuatu is one of several Melanesian islands where forestry is important to rural communities, and is one of their main sources of cash income (Gerrand and Bartlett 2001). As with all Pacific nations, forests are also important in the subsistence economy of most 'ni-Vanuatu' and have been managed as part of customary socioeconomic systems. Today, most land is under inalienable customary land tenure and traditional laws governing use of land and its resources have been enshrined in the constitution since independence in 1980,[11] although policy debate around land reform has been limited (Manning and Hughes 2008).

The 1998 National Forest Policy recognised that forests are vital to the country's cultural heritage, with resource owners not only beneficiaries of the forests, but also managers and developers of this resource (Tamla 2002). The policy's vision was for the government to achieve sustainable forest management through working cooperatively with landowners, customary chiefs, and forest industries (Gerrand and Bartlett 2001). Several components of the policy are related to traditional forest-related knowledge, including respecting traditional tapus, recording traditional knowledge, and benefitting holders of that knowledge via profits arising from its commodification.

A review of Vanuatu's Forest Policy implementation noted that many of the problems identified during policy development had been addressed, due primarily to the inclusive approach adopted with landowners; clear recognition that responsibility for policy implementation and sustainable forest management is shared across the key stakeholder groups; and effective consultation (Gerrand and Bartlett 2001). A more targeted review is required to address the issues specifically related to traditional forest knowledge; although there are many improvements, it is difficult to determine to what extent traditional forest-related knowledge has been a contributing factor.

11.6 Traditional Forest-Related Knowledge in a Modern World

History has shown that the Western Pacific's indigenous cultures have been remarkably resilient to the impacts of outside cultural influences. Changes in language, material culture, and cultural behaviours attest to a shaping by external forces, to which local cultures responded by ignoring or by adapting them to existing cultural systems

[11] Vanuatu was once known as the New Hebrides and managed jointly by the UK and France from 1880s until independence movements resulted in Vanuatu becoming a republic in 1980.

(Sahlins 2005), despite efforts to overwhelm them by 'civilising forces,' especially Christianity. More than 200 years of cross-cultural interaction have resulted in hybrid cultural systems, emergence of a neo-traditionalism, or in some cases, a complete loss of traditional knowledge. Studies of cultural change in Australia suggest that modern Aboriginal culture reflects a shared history (Wolfe 1994), where the 'traditional past' is not replaced by a 'changed modern' version of culture (Suchet 1996), but contains both a continuity of cultural traditions and deliberate cultural reconstruction.

11.6.1 Threats to Traditional Forest-Related Knowledge

Despite this resilience, traditional forest-related knowledge and the socio-cultural systems in which it is situated are under threat across the globe. Pacific Island countries face additional pressure from their reliance on international donor agencies advocating increased economic development that can potentially undermines traditional land management (Thaman 1989).

Generally, as indigenous cultures modernise and become part of the market economy, traditional systems and knowledge become less relevant, particularly for younger generations. For example, in Vanuatu, the Vanuatu Cultural Centre is concerned that traditional systems of sustainable development could disappear as a result of alienation of youth from cultural traditions and the increasing demand for a Western education (Nalail 1996).[12] Siwatibau (2009) refers to trained foresters conducting inventories without recourse to the knowledge held by local villagers. In regard to the application of traditional knowledge to forest conservation in Papua New Guinea, local villagers articulated the tensions between modern education and traditional knowledge in the following way:

> We cannot use the same practices used by our ancestors nowadays, because educated people do not respect and listen to the village elders. Educated people are proud of themselves, they think they have been to school and are more knowledgeable than the village elders. Therefore, if village elders make rules to conserve a certain area, people that have some form of western education will not adhere to those rules (Ellis 1997, p. 57, cited in Filer 2000, p. 14).

Traditional systems based on localised laws and cosmology can be undermined by pressure from the market economy. In Pacific Island societies, chiefs play a vital role in regulating use of certain resources through applying taboos on their exploitation. The power of chiefs and elders is compromised if international aid agencies or government bureaucracies do not heed their position in indigenous societies. The May 2000 Country report for Vanuatu noted that economic development was leading to a loss of purpose for traditional taboos and a reduction of their effect on conserving resources, including trees (Republic of Vanuatu 2000). Furthermore,

[12]The Vanuatu Cultural Centre is a national statutory cultural heritage management body comprising all the major cultural heritage institutions apart from the National Archives. See http://www.vanuatuculture.org/.

even traditional societies are not immune to greed, treachery, and disloyalty (Hooper 2005). The erosion of the ability of traditional forces to hold these in check has resulted in numerous examples of chiefs doing deals with big logging companies to further themselves and their families rather than for the greater good of the community.

There are other, more insidious threats to the retention of traditional forest-related knowledge. Villagers in Melanesia may be reducing their exploitation of local forest resources in order to disassociate themselves from the hallmarks of tradition and their associated stigma of 'primitivism' (Filer 2000). In Australia's Gulf Country, some Aboriginal people place culture in a past they perceived to be largely irrelevant to the present (Trigger 1997).

Indigenous people are therefore placed in a difficult situation of not wanting to be seen to be opposing development or 'living in the past' but are also fearful that modernisation will render traditional ways redundant (Horowitz 2002).

Exposure of many Pacific countries, especially Melanesian countries, to the global market economy has resulted, in many instances, to the dominant values of forests being equated with large-scale timber extraction (Lindberg et al. 1997). Growth of large-scale logging is a major economic shift away from traditional forest uses (Cashore et al. 2006), and although forest owners have strong bargaining power through ownership, agreements tend to work in favour of big logging companies and a few individuals, which destabilises and undermines customary practices (Wairiu 2006, p. 143).

Severing connections between indigenous people and their land is a significant factor in loss of traditional knowledge. Colonial dispossession and forced removal of half-caste children from their families had a devastating effect on traditional Aboriginal life in much of Australia. Elsewhere in the Pacific, a lack of understanding by donor agencies and other external parties, of the collective and communal nature of indigenous land ownership has been a major cause of historical unrest and conflict. Traditional ideas about land and territorial entitlements within the region have had to be constantly renegotiated (Reuter 2006a, b). Today, some customary land tenure systems are subject to new and rapidly changing forces, severely testing their ability to adapt (Commonwealth of Australia 2008). Reuter's volume of case studies explores social change relating to traditional land rights in Pacific countries and identifies sources of conflict and tension, including state appropriation of customary land for timber companies (Reuter 2006a, b).

It follows that conflicts over land property and resource rights have the potential to erode the knowledge systems that codify the landscape. Furthermore, modern Western economic practice favours the individual or corporate over the communal and there are few tools for accommodating communalism. Communal land ownership is therefore often identified as a barrier to economic development, and some international aid agencies call for an abolition of collective land tenure in the Pacific. Neo-liberal advocates in Australia have also attempted to bring in individual land ownership but with little success thus far.

The Australian Agency for International Development (AusAID), in its comprehensive investigation of land policy reform in the Pacific, has recommended improve-

ments in tenure security, which would result in fewer disputes over land, access to finance for new businesses or housing, and greater investment by government in social services and infrastructure. AusAID advocates establishing better links between customary and formal land institutions through the formal registration of customary land title, which is effectively a documentation of the oral traditions that give credence to an individual's connection to place (Australian Government 2008). This can contain detail of reciprocal obligations; for example, a family or individual may be granted rights to harvest timber for subsistence use on the condition that they help the group to defend the forest (Vegter 2005).

11.6.2 Linking Traditional Forest-Related Knowledge with Sustainable Forest Management

Loss of traditional forest-related knowledge has consequences for both people and forests in Western Pacific countries. The more altered the natural landscape, the more people become disconnected from it, with a concomitant reduction of an appreciation of its social, environmental, and economic values (Filer 2000). Deforestation and forest clearing for cash cropping in the Pacific islands has gone hand in hand with erosion of people's knowledge of nature, together with decreasing respect for their relationships with it. Loss of forest species has also led to people becoming less reliant on forests and thus losing their appreciation and knowledge of forests (Siwatibau 2003, 2009). A study in the Solomon Islands showed that instead of the 87 plants harvested from forests less than 50 years ago, there are now fewer than 10 still being utilised. Thus, forests are no longer perceived as a culturally valuable, multi-functioning phenomenon, capable of sustaining humans, but as more of a commodity (Jansen and Tutua 2001).

Basu (2000) states that large-scale logging and other extractive activities are creating environmental imbalances that affect the lifestyle of traditional people and create a cultural vacuum. The push for economic development has side effects that have posed serious threats to the natural environment and traditional life and culture, with youth resorting to violent crime because of the loss of their traditional roots. Lindberg et al. (1997) argue that forest destruction undermines the capacities of forest-dependent people to survive, economically, culturally, and spiritually. Most Pacific cultures still practice traditional swidden agriculture, but increasing population numbers, especially on the small atolls, have resulted in more forest clearance for gardens, much shorter fallow cycles, and subsequent degradation of forest biodiversity and soil quality. Expanding human populations are also placing much greater demands on the forest for fuelwood, which is an essential ingredient for cooking, light, and warmth. Because of a shortage of forest-based fuelwood, communities are using the waste from gardening and food processing, such as coconut husks, instead of putting them on fallow gardens as mulch and to replenish soil nutrients. With this practice no longer occurring, soil quality is diminishing, resulting in long-term consequences for livelihoods and health (Clarke and Thaman 1993).

Thaman (1989) coined the term 'agrodeforestation' to describe the fact that present generations of Pacific Islanders are planting fewer trees around their villages; trees that traditionally would have been used for a wide range of purposes. This reduction in tree number and diversity is a major issue on small atolls where there is little native forest to provide supplementary foods and raw materials for building and fuelwood. Thaman (1989) notes the absence of any strong policies for retaining and enhancing traditional agroforestry systems, which inevitably leads to loss of traditional forest-related knowledge and associated ideologies and worldviews about the trees and their products.

11.7 Making a Difference with Traditional Forest-Related Knowledge

The 'healthy people healthy country' paradigm has considerable resonance in Australia, where links have been made between the health and well-being of indigenous peoples and their ability to learn, retain, and apply traditional knowledge systems through being 'on country,' including being involved in forest management (Baker et al. 2001). Recent studies in Australia have provided conclusive evidence that being involved in keeping the country healthy assists greatly in improving the health and well-being of Aboriginal people (Petty et al. 2006).

Acknowledging the existence of traditional forest-related knowledge as a valid knowledge system is one thing; applying it in a modern world is quite another. Much traditional knowledge has been lost or is fragmented because of the impacts of time on generations of orally transmitted information, colonial history, and modernisation. Many aspects of traditional knowledge are inappropriate or irrelevant in a contemporary context, and it is unrealistic to believe they offer a panacea for overcoming environmental or social problems (Howitt et al. 1996).

At the other end of the scale, economists tend to ignore the informal economy and its associated traditional knowledge systems. Economic development for indigenous people in Pacific countries needs to focus on a broad and more complex conceptualisation, made in socioeconomic, rather than economic categories (Hooper 2005). In the Pacific, the informal economy of customary landowners is not inconsequential, as subsistence agriculture continues to be practiced by the majority of the population. A series of papers on culture and sustainable development by practitioners working in the Pacific, while not idealising cultural traditions, recognise that 'culture' is a powerful political and social force (Hooper 2005). Similarly in Australia, the Centre for Aboriginal Economic Policy Research (CAEPR) undertakes extensive research in remote Aboriginal communities, exploring ways to achieve economic independence while retaining customary knowledge, beliefs, and traditions. Among remote Australian Aboriginal communities, a hybrid economy has been identified that includes the customary sector (hunting and gathering); monetary input and capacity building by the state (training, grants, etc.); and employment provided by the private sector (usually resource companies) (Altman 2001a, b).

11.7.1 Alternative Economic Activities to Large-Scale Logging: Mobilising Traditional Knowledge for Economic and Social Development

The development of commercial alternatives to large-scale logging and mining in Pacific countries is being increasingly sought by indigenous communities desirous of conserving their forests and their culture (Wilkie et al. 2002). Apart from concerns about the sociological and environmental effects of large-scale resource extraction, there is growing domestic and international concern over the effects of logging on non-timber forest products (NTFP), such as many of the indigenous nuts found in the region. This has hastened the need to attach an economic value to NTFPs by developing them commercially, both to provide an alternative to logging and to support their conservation (Stevens et al. 1996).

11.7.1.1 Non-timber Forest Products: Traditional Forest-Related Knowledge for Commercial Benefit

Thousands of years of plant domestication and a wealth of ethnobotanical knowledge have the potential to return financial benefits to indigenous communities in parallel with continuing subsistence and cultural uses and retaining the integrity of forests and agroforests. The *State of the World's Forests 2009* report (FAO 2009) identified commercialisation of NTFPs as an alternative to large-scale logging and a key area of FAO's forestry programme.[13] The successful commercialisation of NTFPs relies on intact traditional forest-related knowledge and intact forests; thus there are links between development of these industries and conservation of forested areas, although development and conservation goals do not always align (Arnold and Ruiz-Perez 2005).

In 1994 a workshop was held to examine the commercial potential of a range of South Pacific nut species (Stevens et al. 1996). Commercial harvesting and processing of species such as *Canarium indicum* and *C. harveyi* (ngali nut) in the Solomon Islands are based on traditional knowledge, as are the same two species (nangai) in Vanuatu. Development of export markets for ngali nut products would help preserve the rainforest by providing an income for producers, and as the tree is a protected species, its presence helps to restrict destruction of the rainforest, particularly at the forest edge (Roposi 1994).

Food products based on traditional bushfood are enjoying increasing popularity in Australia. Figure 11.7, illustrates a product made from wild bush tomatoes marketed under the Outback Spirit brand by Robins Foods Pty Ltd. This is an Australian owned company and family business comprising the Robins and the company's Indigenous suppliers. The Outback Spirit Foundation also funds sustainable agricultural programmes in remote Aboriginal communities, to achieve economic independence and maintain cultural traditions.[14]

[13] See http://www.fao.org/forestry/nwfp/en/

[14] http://outbackspirit.com.au/

Fig. 11.7 Outback tomato chutney. One of the many bushfood products from the Outback Spirit range (Image courtesy of Robins Foods PL)

One of the advantages of bushfood businesses is that they enable Aboriginal people to remain on their land when there is otherwise no other source of employment or income. However, distance from markets, lack of business training, and tensions between cultural and economic values can be problematical.

Although there are links between conserving forest areas and non-traditional forest product industries, in the absence of land use planning, extensive cash cropping of NTFPs can lead to deforestation. Commercialisation of the kava/sakan plant, *Piper methysticum,* on the Micronesian island of Pohnpei is a case in point. This plant has been used for centuries in remote Oceania to produce a psychoactive drink prepared traditionally from chewing and pounding the roots of the tree. Kava is a sacred plant to many Oceanic peoples and its use was controlled through customary law, being restricted to chiefs, religious people, and for medicinal purposes. The non-traditional use of kava has caused both social and environmental problems in Pohnpei, particularly destruction of the montane forests (Merlin and Raynor 2005).

However, a partnership between a non-governmental organisation (NGO) and local community groups has enabled an integration of cash crops, including kava back into the traditional agroforests, rather than have farmers neglect their subsistence activities to concentrate on cash cropping (Merlin and Raynor 2005).

11.7.1.2 Ecotourism/Cultural Tourism: Traditional Forest-Related Knowledge for Education

The *State of the World's Forests 2009* report (FAO 2009) identifies ecotourism as an increasingly important industry in the Asia-Pacific, and a way for local communities to benefit from protected areas.

A review of ecotourism across the Asia-Pacific identified that community-based social forestry, with its focus on sale of non-timber products for the tourist market,

can raise local revenue and may be a viable alternative to such activities as poaching wildlife in protected areas (Lindberg et al. 1997).

Although the report does not make specific reference to connections between ecotourism and traditional forest-related knowledge, it implies that the visitor experience is greatly enhanced when traditional peoples articulate traditional beliefs, values, and knowledge.

Ecotourism is a significant factor in the economic growth of some Pacific Island countries, although it is has been argued that it would never be as financially lucrative as, for example, large-scale logging, because it is ecologically rather than economically driven (United Nations 2003). The United Nations report emphasises that culturally responsible ecotourism should allow local people to set the acceptable levels of impact on cultural traditions and to decide how to interlink traditions and ecotourism activities. The report's review of ecotourism in ten Pacific countries demonstrates the great variability across the region. In American Samoa, ecotourism includes homestays in villages, learning about traditional and medicinal plants, and traditional fishing with local indigenes. The key selling point for the tiny, isolated Federated States of Micronesia is the 'pristine' natural environment and an intact traditional culture.

Tourism based on Aboriginal culture is an important component of tourism in Australia and there is a growing interest in 'Aboriginality' by overseas visitors. Indigenous Tourism Australia was established in 2005, and in 2007 the website listed 282 indigenous tourism operators. This list demonstrates that there is a demand for Aboriginal cultural tourism, and that Aboriginal organisations are active participants in the tourism industry (Feary 2007).

A consequence of cultural tourism across the whole region has been a revival of interest in cultural traditions and a realisation that traditional knowledge about the natural environment and utilisation of its resources can attract revenue. A review of ecotourism ventures in Fiji concluded that it strengthened social cohesion and helped local people to recognise and value the preservation of their culture and heritage. The review noted that sustainable ecotourism fits more appropriately into the traditional economy than does large-scale resource extraction such as mining and logging, and 'helped to save indigenous knowledge' (United Nations 2003, p. 66). Commodification of culture in this way also has its disadvantages, and tourism is itself an agent of social and cultural change, with traditional dance, material culture, etc., being repackaged to suit the market. Although tourism has a role to play in the preservation of cultural knowledge, it can also lead to loss of authenticity and ultimately a bad experience for the ecotourist, although it is difficult to draw the line between authenticity and cultural change (Dallen and Prideaux 2004).

In New Zealand, Kaupapa Maori development is a unique values-based Maori approach whereby sustainable economic development is based on a distinctly Maori epistemology, with the aim of protecting and developing Maori social and cultural capital. Kaupapa Maori has been applied to Maori tourism to counteract misrepresentation of Maori culture in tourism. Nine interrelated cultural values were identified as essential for Maori-centred tourism, which recognise the desire of Maori to protect and develop Maori cultural and intellectual property (McIntosh et al. 2004).

11.7.2 Land and Resource Management

11.7.2.1 Pacific

Application of traditional forest-related knowledge in the Pacific occurs primarily on customary lands, where subsistence farming competes for space with cash cropping and commercial timber production. Thaman and others argue that integration of traditional agroforestry practices into appropriate cash cropping systems is essential for well-being and sustainable development of Pacific societies (e.g., Thaman 1989; Kennedy and Clarke 2004). They argue that in order to maintain species diversity there needs to be a balance between monocropping of commercial export crops and subsistence crops, and between modern agroforestry and preservation of traditional polycultural agroforestry. Thaman is a strong advocate for a more traditional, less capital-intensive, and less monocultural approach to modern agricultural economies in the Pacific, through legislation and systems for protecting and promoting important or endangered tree species as part of agricultural programmes. This would involve going back to traditional holistic approaches rather than government or overseas aid-driven, compartmentalised approaches (Thaman 1989, 2002).

Replanting with traditional species and other reforestation programmes can be effectively developed through forestry and agricultural extension programmes. Many local farmers are keen to plant in current or old garden sites, especially if they are provided with seedlings free of charge. These programmes are also an effective way to retain and pass on knowledge about traditional agroforestry. Local farmers want to grow cash crops but need adequate planning and training to ensure that forests are not cut out as a consequence. Donor support will continue to be required but capacity is being built; there is also a need to involve women forest owners, who are often excluded from negotiations.

The Traditional Tree Initiative[15] is a practically based programme aimed at restoring and applying traditional knowledge about local tree species; their products and uses; and their application in sustainable economic development, resource conservation, and food security. Landholders seeking information on tree species to use for a wide range of purposes are encouraged to use local and native trees rather than introduced ones, which may pose biological threats. The project arose from recognition that although public interest in agroforestry and tree crops was increasing, information on local tree species for the region was scarce, difficult to access, and failed to provide the detail required to make informed decisions about effective integration of local tree species. One of the many benefits of expanding the planting and conservation of native and traditional trees across the landscape is a strengthening of traditional tree-based land use practices, which can in turn promote sustainable development and protect the culture and ecology of the region.

The Traditional Tree Initiative has produced fact sheets covering 50 of the most important species in the region. There is an electronic information resource for

[15] See http://traditionaltree.org/ for more information.

reforestation, conservation, and agroforestry, *The Overstory,* which has subscribers in more than 170 countries.

In Vanuatu, the Cultural Centre has entered into several programmes aimed at restoring traditional knowledge into modern agricultural practice. The Vanuatu Environment Unit's Landholders' Conservation Initiatives project aims to establish a database to improve access to information relating to traditional biodiversity knowledge and management practices. This database will be an important mechanism in making appropriate knowledge accessible for policy, planning, educational, and community needs.

The Cultural centre is also developing a joint project with the Ministry of Education, the Environment Unit, and UNESCO/LINKS titled 'Strengthening Indigenous Knowledge and Traditional Resource Management through Schools.' This project will involve a partnership among local communities, teachers, resource managers, and culture specialists, which aims to implement the incorporation of traditional resource management knowledge into the formal school curriculum.

The Okari Enterprise in the Managalese plateau of Papua New Guinea used participatory processes to incorporate indigenous knowledge into the design and implementation of the project. Types of knowledge contributed by local communities included: a preliminary record of local customary practices of tenure and rights of access; baseline data on land use patterns; current slash-and-burn agricultural practices; management of sacred forest plots; current forest harvesting practices; locally appropriate nut-cracking technology; and locally appropriate packaging and transport from the forest to roads and airstrips (Olsson 1994).

Programmes such as the Babatana forest project, implemented through the Kastom Garden and the National Herbarium Ethnobotany programmes in the Solomon Islands, is an example of small-scale, practical, village-based natural resource management initiatives that strengthen indigenous knowledge. The programme uses participatory approaches with local communities that strengthens and improves traditional life rather than undermining it (Jansen and Tutua 2001).

11.7.2.2 Settler Societies

In the settler societies of Australia and New Zealand, indigenous knowledge has been supplanted by Western science in modern forest management. Movements for land rights and social justice over the past 30 years have fostered a reassertion and renegotiation of traditional forest-related knowledge in modern management, which has occurred principally through participation in natural resource management and protected area management, rather than in commercial forestry operations (Feary 2007). Additionally, numerous studies have demonstrated that there are significant environmental benefits to involving Aboriginal people in natural resource management programmes 'on country' (Gillespie et al. 1998). Access to land is seen as a critical factor in addressing social and economic disadvantage in symbolic and practical ways. It can be shown that being 'on country' contributes strongly to improved health and well-being (Petty et al. 2006; Kingsley et al. 2009). Indigenous people talk constantly about land in relation to their health and feelings of well-being (Rose 1996).

Co-management of national parks in Australia is aimed at finding a balance between the interests and rights of traditional owners and the need to conserve natural systems; it involves a partnership between protected area managers, local Aboriginal communities, and traditional owners (Smyth 2001). Joint management arrangements encourage integration of modern scientific knowledge with traditional local knowledge; for example, in far southeastern New South Wales (NSW), local Aboriginal land councils are working with the NSW Department of Environment, Climate Change and Water[16] in undertaking field surveys to detect koala and other wildlife species (Kilham 2004). In the jointly managed Kakadu National Park, scientists are using knowledge from traditional owners in seeking the reasons for declines of several ground-dwelling marsupial species (Woinarski et al. 2007).

Outside of jointly managed parks, a large proportion of the Aboriginal-owned estate in Australia is of high conservation value and makes a substantive contribution to the conservation of biodiversity (Altman et al. 2007). A proportion of this land, 23 million ha, comprises the Indigenous Protected Areas (IPA) network, which is a national system of land management and tenure where Aboriginal-owned land of high nature conservation value is incorporated into the national reserve system (Commonwealth of Australia 2009). While most IPAs are over deserts in Central Australia, many incorporate woodlands, and those in southeastern Australia include significant tracts of forest. Cultural values are equal to the natural values, and Aboriginal owners have a major say with regard to land and resource management (Smyth and Sutherland 1996). As with joint management, one of the goals of the IPA system is to integrate scientific land management with local Indigenous knowledge.

Numerous funding programmes exist at national and state levels to encourage Aboriginal people to undertake natural resource management, including management of forests on crown land and on their own land. Any programmes aimed at keeping Aboriginal people on their traditional country and assisting in its sustainable management automatically fosters revival and revitalisation of traditional knowledge, and assists in building self esteem and cultural identity as well as developing capacity in modern land management (see papers in Baker et al. 2001).

11.7.3 Certification

Forest certification arose from realisations by scientists and citizens in the 1960s that forests were under stress from uncontrolled exploitation across the globe. Because of the comparatively greater impact of unsustainable forest practices on indigenous and forest-dependent people, their calls for recognition of their rights and livelihoods, supported mainly by non-governmental organisations, have been a driving force behind some certification schemes, such as the Forest Stewardship Council (FSC)

[16]This department is responsible for administering the National Parks and Wildlife Act 1974, which protects Aboriginal heritage in New South Wales.

(Kanowski et al. 1999; Fanzeres and Vogt 2000). Forest certification demonstrates that a forest is being sustainably managed, and since indigenous participation is one of the platforms of sustainable forest management, it follows that certified forests are more likely to reflect an indigenous perspective in their management.

11.7.3.1 Australia and New Zealand

Two forest certification schemes operate in Australia—the international Forest Stewardship Council (FSC)[17] and the Australian Forestry Standard (AFS).[18] Principle No. 3 of the FSC identifies the 'legal and customary rights of indigenous peoples to own, use and manage their lands, [and] territories,' and that 'resources shall be recognized and respected.' Recent research in Australia has identified that FSC certification held by the large plantation company, Integrated Tree Cropping, was a driver for employing local Aboriginal people in plantation management (Feary 2007).

Benchmarking of the AFS showed that it comprehensively recognised 'the traditional uses of forests as well as the socioeconomic benefits that forests and timber processing may have to local communities' (Oy 2003). The AFS also compared favourably against Canada's National Sustainable Forest Management Standard in regard to 'respect for Aboriginal rights, traditional knowledge and values' (Abusow International Ltd and Canadian Standards Association 2004).

There are currently no certified Aboriginal-owned forestry enterprises in Australia. By contrast, in New Zealand, the Lake Taupo Forest achieved Forest Stewardship Council (FSC) Certification in 2002. The Lake Taupo Forest comprises around 22,000 ha of planted *Pinus radiata* harvested at a level of 480,000 m^3 per annum, on a 30-year rotation. The forest is administered by The Lake Taupo Forest Trust (LTFT), a Maori authority representing the interests of almost 10,000 owners of 65 separate Maori land titles located on the eastern shores of Lake Taupo, in the middle of the North Island. The Lake Taupo Forest Trust aims are: 'to protect the integrity and ownership of *Nga Taonga tuku iho* (core asset of land and resources)' administered by the Trust on behalf of the beneficial owners, and 'to strive for optimal and sustainable asset growth and financial returns through development of the Trust assets to assist the long-term social, cultural and economic development of the beneficial owners' (http://www.ltft.co.nz/default.asp?cid=1). The forest has no traditional associations for Maori (although the land it is on may have) and is managed under contract to a forest management agency. Therefore, the benefits of certification for retaining traditional forest-related knowledge may be limited in this instance, although it has the capacity to generate wealth for Maori to pursue cultural activities (see Sect. 11.5).

[17] See http://www.fsc.org/ for information on the FSC.

[18] See http://www.forestrystandard.org.au/ for information on the AFS.

11.7.3.2 Pacific

Forest certification has advanced little in the Pacific. Cashore et al. (2006) have identified several constraints to certification, including political instability, lack of community skills in managing forests for commercial production, disputes over forest tenure and resource allocation, and weak and/or corrupt governments that cannot or will not enforce logging codes and that condone illegal logging.

These countries have no national certification schemes, and foreign logging companies are generally not interested in becoming certified. Most forest is under customary land tenure, and forest owners and non-governmental organisations (NGOs) are working together to develop viable, more culturally appropriate alternatives to reliance on large-scale destructive logging, which destroys forests, marginalises customary resource owners (especially women), and often does not deliver on the promised financial returns. NGO certification programmes are designed to address illegal logging and to prevent more community forestland from being granted as concessions through unsustainable logging agreements with landowners. Certification of these small-scale, community or village based operations is seen as a tool for addressing unsustainable and illegal logging. In Papua New Guinea and the Solomon Islands, ecoforestry certification has been developed through collaboration between Greenpeace New Zealand and the International Tropical Timber group, tailored for community-owned and run forestry operations. This simplified and less costly certification scheme is aimed at assisting communities to build capital and skills to proceed to full FSC certification (McDermott et al. 2006).

A recent assessment of forest certification in the Solomon Islands is indicative of the situation more widely in the Pacific. Wairiu (2006) has shown that certification has had little effect on the forestry industry in the Solomon Islands. Reasons given are lack of demand for certified timber by the market, close relations between the government and foreign-owned timber companies, negative consequences of adopting sustainable forest management (e.g., loss of jobs), and lack of government support. Over the past 15 years, a number of landowners with assistance from NGOs have developed small-scale operations that involve all tribal members, in an effort to attain maximum community benefit from forest exploitation. If certified, these operations can earn more than large-scale logging (Wairiu 2006). NGOs such as Greenpeace and World Wildlife Fund (WWF) are working with landowners in raising awareness of sustainable forest management, small-scale forest enterprises, and forest certification. In 1998, an eco-certification called Solcert was set up and adapted FSC principles to local conditions to improve the chances of take-up by local communities. However, response has been poor, due primarily to socio-cultural factors. One argument against certification is its requirement for continuity of a labour force to meet the market demand. This takes men away from their customary work in the gardens, leaving women to shoulder the additional burden. The quantity and regularity of timer demand does also not fit well with needs of landowners who may only need to extra cash at certain times of the year.

Although prospects are not good for FSC-type certification in the Asia-Pacific generally (Cashore et al. 2006), some social benefits were identified in the Solomon

Islands study, especially in the area of community capacity and skill building. Some communities were able to halt commercial logging in their forest areas through awareness training in certification standards. The earnings shared from sale of certified timbers also reinforce traditional social networks of wealth redistribution by chiefs (Wairiu 2006).

11.7.4 Timber Production

11.7.4.1 Pacific

Numerous projects in the Pacific are aimed at improving the sustainability of forest management on customary land. The most successful use participatory processes and involve capacity building and two-way knowledge exchange. The SPC/GTZ Pacific-German Regional Forestry project is an example of an internationally funded project that has used participatory land use planning to assist landowners to develop a sustainable forestry enterprise in Fiji. An essential component was reaching agreement among landowners over forest areas to be excluded from exploitation (SPC/GTZ 2005). In the Solomon Islands, the Australian Centre for International Agricultural Research (ACIAR) is funding a project to interplant commercially valuable teak with Pacific agroforestry species. This recognises community reluctance to thin teak by encouraging wide planting and interplanting of traditional agroforestry species that can be commercially harvested early. It also provides training and capacity building and is of a scale appropriate for smallholders.[19]

The portable sawmilling industry is one seemingly well-suited to traditional sociocultural systems and offers an economic alternative to large-scale logging. Returns from small mills have also been shown to be greater and more equitable than from logging royalties. Portable mills can potentially lead to improved livelihoods through sustainable use of the forest resource, while retaining land, forests, and traditions. Using portable mills keeps people on their land, is low-impact, small-scale, locally controlled, and not highly mechanised. Not surprisingly, the industry has expanded rapidly in the Pacific over the past 20 years, with the support of NGOs that envisage that more sustainable forest management will arise from the increased local participation.

A recent review of the use of portable sawmills in Papua New Guinea and the Solomon Islands identified around 7,000 portable sawmills (Holzknecht and James 2009). Importantly, the review noted that performance could not be measured solely on commercial objectives, as many mills did not have commercial success as their primary function. Often a family or village operated a mill only to meet short-term requirements such as school fees or purchase of material goods. The existence of coherent and functioning customary social units such as clan or family groups operating on their own lands was found to be critical to the success of the operation (Holzknecht and James 2009).

[19] http://aciar.gov.au/project/FST/2007/020

Fig. 11.8 Kgwan community members establishing a portable sawmill, near Gembogl, Papua New Guinea Highlands (Photo courtesy Julian Fox)

Nevertheless, lack of knowledge by villagers about silvicultural practices and commercial forest management has lead to unsustainable forestry practices. Various ecoforestry projects in Papua New Guinea are demonstrating that these can be overcome by appropriate training and participatory learning. The KGWan Eco-Habitat Project[20], in the Chimbu Province of the Eastern Highlands, is run by Village Development Trust (VDT), an eco-forestry based local NGO. VDT has assisted setting up and operating a small-scale sawmill and is facilitating the sale of locally milled *Nothofagus grandis* as Community Based Fair Trade product to an Australian timber merchant (Fig. 11.8).

The Solomon Islands Forestry Management Project is encouraging purchase of timber from landowners cutting trees on their own land and producing sawn timber using chainsaws or portable sawmills. They maintain a directory of suppliers and the timbers they can supply and potential uses; for example, rosewood (*Pterocarpus indicus*) is good for furniture and boatbuilding.

11.7.4.2 Australia

Portable mills are also being used in Australia by some remote Aboriginal communities, to produce timber for the domestic and overseas market. Although fell-

[20] http://www.forestscience.unimelb.edu.au/research_projects/ACIAR_Projects/PNG_Project/Kgwan_Project.html

ing whole trees is not a traditional Aboriginal activity, research into the economic potential of Aboriginal-owned forests on Cape York Peninsula in far North Queensland has demonstrated that local communities support logging as a culturally appropriate activity generating employment and reducing welfare dependency (Venn 2004). The participatory processes used in assessing the economical potential demonstrated a complex mix of economic and socio-cultural values placed on forests by Aboriginal people that defied conventional economic approaches. Venn was told by elders that they were to be consulted over the intensity of logging operations to determine whether they were culturally appropriate for the forest being harvested (Venn 2004).

Culture is evident in the management of sawmilling operations elsewhere on Cape York, which are based on customary social boundaries and a desire to build social capital rather than maximise profit. Until recently, Darwin stringybark (*Eucalyptus tetrodonta*) forests in the lease area of the mining company Comalco were cleared and burnt to allow access to the bauxite layer beneath (Annandale and Taylor 2007). In the early 1990s, an Aboriginal-owned business was established to run a portable sawmill, at the Aboriginal settlement of Napranum on the western side of Cape York, to harvest timber prior to mining. Nanum Tawap, Ltd. is set up along traditional lines of land tenure and power relations, with management by the five clan groups whose traditional country is covered by Comalco's mining lease.[21]

A recent evaluation of the timber resource indicated that the sawmill's capacity would need to be substantially increased to maximise economic returns from timber salvage operations (Annandale and Taylor 2007). The Nanum Tawap Steering Committee supported a business model that would maximise local employment by having three small sawmills, one in each community, rather than a single large mill requiring fewer people with high levels of technical skills. This decision is significant for demonstrating that building social capital in local communities can take precedence over maximising economic returns (Feary 2007).

It has been argued that it is not always necessary to separate business from other community activities in order to achieve success (Altman 2001a); however, like any other small business, Nanum Tawap's main objective is to make a profit, and the approach taken has been to separate the business from the activities of the rest of wider Aboriginal community. Mark Annandale, then project manager with Queensland's Department of State Development and prime mover behind the project, attributes its success to local Aboriginal control and ownership, with the latter recognising customary boundaries and systems. He is a strong supporter of a separation between business and social customs:

> One of the things that was actively worked on and identified by community leaders was that the sawmill was business… that they don't want to mix all other elements of the social

[21] Tawap is an acronym formed from the names of the five clan groups: **T**hanikwithi People, **A**nathangayth People, **W**athayn People, **A**lngith People and **P**eppan People.

> environment with that because that's what always happened in the past and the business failed…it's been very conscious, there's a big line there. *Leave it at the gate for the operational* [author's emphasis]. (Feary 2007: 168)

Mark Annandale summed it up:

> I guess it's more accurate to say that the operational side of Nanum Tawap is removed as best they can from that [social and cultural life], but the broad policy direction is not (Feary 2007: 169).

11.7.4.3 New Zealand

Maori are major actors in New Zealand's timber production, owning 29% of private native forests and 14% of the planted forest estate (Miller et al. 2007). From the 1960s a significant proportion of Maori-owned land was committed to pine plantations under long-term leases, with the idea of guarding ownership of Maori land while fostering their development and use by forestry organisations (Nuttall 1981). Although royalties were paid to Maori landowners, the forestry company lessee was the major beneficiary of the timber, and promised employment opportunities for Maori in rural areas did not always eventuate (Nuttall 1981). The Waitangi Tribunal has had impacts on the forest sector in relation to benefits flowing to Maori landowners (Caddie 2003).

Plantation forestry on Maori land continues to be distinctively different from that on non-Maori land (Thorp 2006). One of the major differences is recognition by most owners that they have limited time as kaitiaki (custodians) and are obliged to leave the asset in good condition for future generations. A study of the Lake Taupo Forest Trust (see Sect. 11.4) showed that traditional and recreational use, especially pig hunting, was considered as one of the main benefits of owning forests. Recreational use maintains connections to the land, and many elders are comforted by younger Maori also using the lands. The Lake Taupo Forest Trust lands also contain many sites with strong associative historical value such as old pa sites (traditional fortified villages, often located on terraced hillsides), graves, and pathways. Forest management ensures that these sites remain unplanted or are blessed before any work occurs on them (Thorp 2006).

Maori response to Western systems of forest management in New Zealand is a holistic decision-making framework called the 'Mauri' model. This sustainability model, based on that used by indigenous people in Canada, allows for preservation of indigenous lands, sovereignty, and culture, while supporting economic development, capacity building, and technological advance. 'Mauri' is the binding force between the physical and the spiritual and is a common attribute of all things, reflected in the traditional stories relating to forest use. These stories demonstrate the importance of knowing the rites, reciprocity, and knowledge associated with taking natural resources. Felling trees without appropriate ritual, sawmilling, and large-scale forest clearing damage the life forces of the timber (Morgan 2007).

11.8 Conclusion

With the use of specific examples, this chapter has explored the state of indigenous forest-related knowledge across the Western Pacific and concluded that it continues to have great relevance to the cultural identity, behaviours, and belief systems of indigenous people. Pacific Islanders rely on traditional forest-related knowledge in subsistence agriculture and use the surrounding forests for many foods, medicines, and raw materials. Aboriginal Australians and New Zealand Maori also retain a significant amount of traditional forest-related knowledge, despite having lost ownership of most of their forests as a result of colonisation.

Traditionally, forests were managed as part of complex socioeconomic systems, where spiritual beliefs about the forests played a significant role in their use. Thus, from a historical perspective, traditional forest-related knowledge is intrinsically valuable as a repository of information about a particular type of relationship between nature and culture that existed for millennia before Western civilisation came to the Western Pacific. However, the relevance of traditional knowledge across the Western Pacific is being severely threatened by the market economy and modernity. Outside of New Zealand and Australia, a striking feature of forest management in the Pacific countries is the power of international donor agencies, whose economic development imperative drives the processes that undermine traditional knowledge, including extensive cash cropping and encouraging large-scale timber extraction to be seen as the major forest value.

Traditional forest-related knowledge relies on transmission of oral information across generations, but it is the youth who most question its relevance. Poor health of community elders, increasing urbanisation (especially in New Zealand and Australia), loss of traditional social structures that enable knowledge transference, and education of Pacific children in distant cities exacerbate this situation. Both indigenous and non-indigenous people have expressed alarm at loss of traditional forest-related knowledge and argue that it is directly connected with both loss of social well-being and loss of forests, with a concomitant view that both can be restored through revitalisation of traditional knowledge in forest management.

There is evidence to suggest that traditional forest-related knowledge is more likely to remain relevant if it can be tied directly to economic development and the cash economy, to the extent that modernity becomes ‘indigenised,’ rather than the other way round. The latter sections in this chapter have described a wide range of programmes for recognising traditional knowledge as a valid knowledge system that can be used for economic development rather than be overwhelmed by it. The way forward embraces participatory processes that enable a mingling of traditional knowledge with scientific approaches to forest management. These include such activities as ecotourism, replanting of useful trees outside forests, using local species in agroforestry, mobile sawmilling, and protected area management. And, while traditional forest-related knowledge per se may appear be of limited relevance to some activities, the critical importance of customary processes for resolving disputes over land and payments in logging areas must not be forgotten.

Like any other knowledge, traditional knowledge is fluid and dynamic and capable of adapting to new situations, challenging paradigms of what is or is not 'traditional,' as was seen in the example of modern Aboriginal art. The challenge across the Western Pacific is to establish mechanisms for balancing protection of forests for their social, cultural, and environmental values against the need for economic development. Finding such a balance first requires a respect for and recognition of the applicability of traditional systems by both resource owners and governments. Respecting the non-utilitarian component of the forest may challenge its economic viability; provision must be made for consultation and adherence to cultural protocols in the use of forest resources. Modern economics will need to adapt to ensure the survival of traditional forest-related knowledge.

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