CHAPTER 1

Introduction

Roy Ellen

Background

The 1990s witnessed a growing acknowledgement world wide of the importance of local ecological knowledge in the context of food security and sustainable development (Warren, Slikkerveer and Brokensha 1995; Sillitoe, Bicker and Pottier 2002; Pottier, Bicker and Sillitoe 2003; Bicker, Sillitoe and Pottier 2004). Much has been written of how this knowledge can help us avoid the problems associated with top-down development strategies, how it can provide cheap and appropriate solutions in the absence of modern health-care delivery systems and the drugs on which they depend, and how it can help conserve local habitats and maintain genetic diversity. It is argued that local knowledge is by definition culturally relevant, improving rural livelihoods, nutrition and general well-being, while encouraging a more rational use of natural resources. Moreover, it is said to strengthen local institutional capacity, leaving a general capital surplus for financing other initiatives (Alcorn 1995: 1). Less attention has been paid, however, to the particular role local knowledge might have in providing a set of responses to which populations may resort in times of political, economic and environmental instability, or to how traditional knowledge strategies are used as responses to specific natural, economic and social disasters (but see Walker 1995).

The period 1996–2004 in island southeast Asia presents an instructive test case for understanding how coping mechanisms based on essentially local strategies might work, as the period has witnessed multiple socio-economic and ecological crises following on from – for the most part – a period of sustained economic growth and modernization (approximately between 1965 and 1996), which itself provided the assumed conditions for the erosion and neglect of traditional knowledge. In an attempt to plug

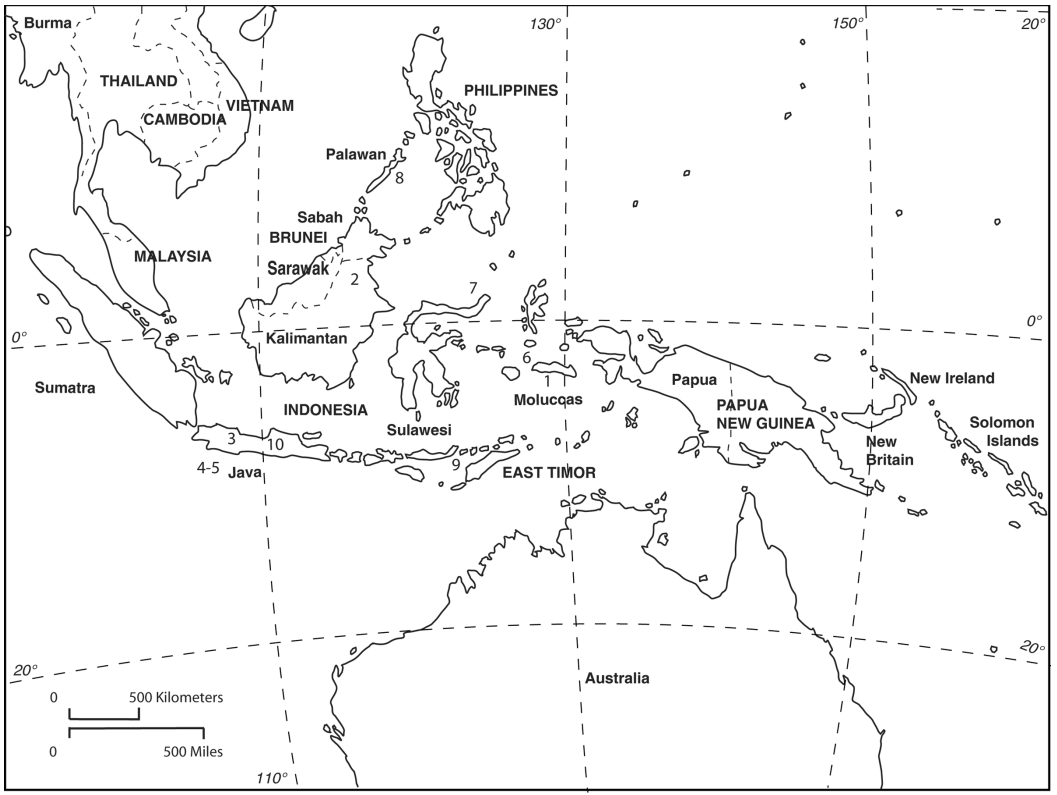

Figure 1.1. Island Southeast Asia, showing location of case studies discussed in text. Numbers refer to chapter. 1, Nuaulu, south Seram; 2, Penan and Kenyah, east Kalimantan; 3, Kasepuhan, west Java; 4-5, Baduy, west Java; 6, Buano, central Maluku; Minahasa, north Sulawesi; 8, Batak, Palawan; 9, Oeucusse, East Timor; 10, Merapi, central Java.

this gap, this book explores how the decline of traditional environmental knowledge that has accompanied modernization in island southeast Asia has been challenged by recent natural disasters, economic problems and political conflict, and how the use of traditional knowledge, together with its innovative combination with new kinds of knowledge, continues to enable communities to manage the crises they face. The book, therefore, is concerned with the creation, maintenance, modification and transmission of ecological knowledge, and increasingly with the hybridization between traditional and scientifically based knowledge, but in the context of those local forces of instability that shape it. Although it focuses on a recent period in the history of island southeast Asia, there has been a continuous record of environmental and socially induced perturbation throughout its documented history and of local responses to this. While these latter have been constantly adjusting to new circumstances, they have evolved in their general principles over the long term. For this reason their understanding inevitably merges with general anthropological analyses of cultural and population adaptation.

The region selected for examination comprises the modern nation states of Malaysia, the Philippines, Indonesia, Brunei Darussalam and East Timor (Figure 1.1). Indonesia, inevitably, dominates the discussion, occupying as it does 75 per cent of the territorial space of the countries listed and, at 208 million, providing 68 per cent of the total population. Although no specific chapter is devoted to Brunei, Ellen (Ellen and Bernstein 1994, Bernstein, Ellen and Bantong Antaran 1997) has research experience in this country and some reference will be made to the situation there later in this introduction. Of the vast expanse of Indonesia, only Papua (Western New Guinea) is excluded, on biogeographic grounds, having more in common ecologically and culturally with the rest of Melanesia. The area covered, therefore, is what geographers, anthropologists and historians generally describe as 'island (or archipelagic) southeast Asia', an area that displays a high degree of homogeneity in terms of overall topography, climate, ecology, subsistence systems, languages and cultural histories, when compared with the areas surrounding it, and certainly when compared with the more encompassing and typologically more problematic notion of 'southeast Asia' (Fisher 1964: 3–10). The older term 'Malaysia' (or, in botany, 'Malesia': van Steenis 1948) and 'Indo-Malaysia' (Bellwood 1985) are sometimes used to describe the same area, though are not used here to avoid confusion with the nation state of Malaysia.

Whilst the last fifty years of the colonial period and the first years of independence in the states now comprising island southeast Asia can be arguably typified as a period of stability and steady improvement in the theoretical ability of central government and various agencies to manage the environment, sustained economic growth and modernization during

this time were not uniform across the region. The precolonial and colonial periods were typified by intermittent environmental hazards and disasters, whether of seismic, volcanic, climatic or biological origin. But in virtually every case these were magnified through human patterns of settlement, land use, social organization and economy. Throughout the nineteenth century the Dutch in Indonesia were unable to control the cycle of crop failure, famine and flood in Java, and before 1930 bad harvests were routinely followed by famine, cholera and other epidemics, which resulted in low population growth (Donner 1987: 32, 54). The 'new environmental history' of Indonesia has provided ample evidence for a continuous long-term experience of environmental perturbation, even away from the great agrarian centres (e.g. Knapen 2001).[1] In many cases the vulnerability to environmental hazard was induced by the advantages of living in certain locations. Volcanism, which was so often a catastrophe, was compensated for by the clear benefits that volcanic soils provided for local people, whether cattle keepers around Gunung Merapi or nutmeg producers on the Banda islands. And, while seismic disturbances were causally independent of human inputs, the food and water shortages that resulted were magnified by patterns of human landscape change, cultivation and domestication.

But unlike the arid lands of Africa and mainland south Asia and the densely populated lands of south and east Asia, the humid tropics of island southeast Asia have often been perceived as sharing a fundamentally benign human ecology, one historically dominated by rainforest, characterized by slight seasonal fluctuations in temperature and rainfall, and where levels of precipation encourage the rapid growth of crops and other edible vegetation. In such a region, the non-human preconditions for famine generally appeared not to be obviously ecologically endemic, and the instability that gave rise to intermittent hazards arose in large part from the inconvenient presence of the interfaces between the Indo-Australian, Philippine and Pacific tectonic plates (Whitten, Soeriaatmadja and Afiff 1997: 90–91), from factors emanating from a dynamic and emerging social system, or from socially mediated environmental factors. There were exceptions to this ecology, of course, such as challenging soils and topographies, but in many places long-term co-evolutionary processes had resulted in anthropogenic landscape transformation that had allowed local populations to manage these disadvantages. The main environmental handicaps lay in the dry areas of east Nusa Tenggara and Timor, and in Madura and Lombok; and it is hardly surprising that it is for these areas where the colonial records indicate repeated crop failures and drought (Ormeling 1956, Donner 1987: 9–10, 25, 181). In addition, it was, paradoxically, the very capacity of the humid equatorial rainforest environment to be ecologically, and therefore economically, productive that encouraged, over time, patterns and densities of human settlement

and agricultural intensification that destabilized these environments and made them more vulnerable to resource shortages. Under colonial conditions, these vulnerable areas tended to be the same as those in which European rulers sought to maximize surpluses and where the local response, given the proximity to carrying capacity, was what Geertz (1963) has famously called 'agricultural involution'. Involution involved, in general terms, a kind of specialization within the context of long-term ecological simplification: biodiversity and other forms of ecological diversity declined except for the diversity of focal crops. Thus, under conditions of involution we would expect rice landrace diversity to increase as a way of coping with the uncertainties of intensive production and the risks that these entail in terms of water shortage under irrigation and pest infestation (see Lansing 1991). The modernizing lowland systems under high colonialism and postcolonialism have the characteristics of incremental emergent openness: increasing demands were being made on the local system by the wider system, the market simultaneously simplifying and destabilizing the local system by demanding higher productivity through a more specialized division of labour, and providing a means of reproductive maintenance through the greater emphasis placed on wider system organization, logistical infrastructures and institutions of social control (Ellen 1982: 273). It is these latter features that permitted rapid food transfer when, paradoxically, local systems periodically collapsed due to the very forces that gave rise to the higher productivity in the first place. In contrast, upland societies, with low population densities, less market integration and under less pressure to intensify, were more buffered internally against shortages than lowland societies, maintaining higher levels of diversity of all kinds (Li 1999).

The Modernization Project and the Decline of Local Knowledge

The context of the studies collected together here is the growth, development and modernization of postcolonial states in island southeast Asia, and the way in which these processes have undermined traditional forms of environmental knowledge. The powers, which relinquished control of their colonies and dependencies in island southeast Asia with the independence of, first, Indonesia (1946) and the Philippines (1947), then Malaysia (1957) and finally East Timor (1999), had each moulded them to suit the interests of the metropolitan economies. In some respects, therefore, the problem of development that the newly independent states faced was to create an infrastructure and economic base that served the interests of the new states themselves rather than their erstwhile rulers. And yet, in order to survive in the postcolonial world, they also needed to continue

to work within an international market structure that itself was the creature of the late colonial period.

The colonial period had given rise to what Boeke (1966; see also Higgins 1955) controversially described as 'dual societies': ones in which there was a capital-intensive growth sector, involving extractive industries, manufacturing and estate agriculture, and an 'underdeveloped' subsistence sector. This duality had consequences in terms of the retention of 'local knowledge'. In the capital-intensive sector the conditions favoured a narrow focus on single resources of strategic commercial importance and the discouragement of traditional knowledge, while the subsistence sector still heavily depended upon it. Indeed, in the context of the involutionary process described by Geertz (1963), the attempt by the metropolitan economy to ensure more surplus from the subsistence sector in Java resulted in increasingly ingenious permutations of local knowledge to maintain living standards and pay taxes, in ever more restricted geographical niches. The discouragement of much local knowledge was also linked to another contentious element of Boeke's theory, that an 'anti-growth' subsistence sector was maintained by a 'peasant mentality', by which was understood fatalism, effort minimalization and short-termism (e.g. Alatas 1977). These ideological components had, once functionally inverted, an afterlife in the work of Chayanov, through Sahlins (1972; see also Smith 1979), and Scott (1976), where they become instead virtues, rationally consistent with the expectations of a backward-sloping supply curve in the first case and with the cunning 'moral economy' of the peasant in the second. In these theoretical versions we can see both a framework to socially contextualize otherwise semi-detached accounts of traditional technical knowledge and coping strategies, as well as a powerful legitimation that has given that knowledge political credence. Ironically, much modernization theory has sought to transform the subsistence sector by undermining its knowledge base through replacement with 'modern' knowledge. As we shall see below, this happened classically in the case of the green revolution, where short-term benefits were gained at the expense of long-term security, mainly because the terms of development aid were tied in a dependency loop rather than providing sufficient reform and capital with which to radically transform the subsistence sector.

In the post-1945 period, the most successful socio-economic transitions were in Malaysia-Singapore and in the Philippines. Both Britain and America conceded the political opposition to colonialism and effected a relatively smooth pathway to independence: one that maintained the key relations of production intact, preserving in a modified form the colonial social and economic structure: the production of raw materials, free trade with the metropoles and the preservation of the prerogatives of foreign capital (Catley 1976: 266). This was especially so in Malaysia, the relative

prosperity of which by the late 1960s was due largely to the plentiful supply of accessible land, state subsidies and the political retardation of emancipation movements (Wertheim 1968: 21; Lim Teck Ghee and Said 1989). In the Philippines land reform was suppressed without any obvious economic compensating factors for local farmers, and economic policy led to a more unequal distribution of income, more dependency and stagnation (Stauffer 1985, Fegan 1989). In Indonesia, where there had been a war of independence and the consequential expropriation of Dutch economic interests, the achievement of a new capitalist mercantilism only really arrived in 1965–66 with the overthrow of Sukarno and his socialist experiment. Under the New Order foreign capital was restored and more encouraged, but under military supervision. In other words, in the most populous countries of island southeast Asia we find quite different regimes of state patronage (Hart 1989).

By 1980 a sea change had taken place in the island southeast Asian economies. Singapore was independent and pursuing its own industrial course to development. Malaysia had achieved a degree of political stability, which enabled it to benefit from combined manufacturing and agricultural strategies. Indonesia was always going to be the hardest case, given its size, geography and poor infrastructure, and inherent potential for political destabilization; and yet here too, with the authoritarian stability the New Order regime had brought, Indonesia developed through a combination of exporting its natural resources and through green revolution technology.

The green revolution (GR) had a major impact on local knowledge: in the lowland rice-producing heartlands of Malaysia, in the Philippines (especially central Luzon) and in Indonesia (especially Java). Indeed, the policy and science that drove this initiative emanated from the International Rice Research Institute (IRRI), itself in island southeast Asia, at Los Baños, less than one hour south of Manila. GR technology reached villages as part of a government or non-governmental organization (NGO) assisted package, always persuasively wrapped. The package consisted of new high-yielding (HYVs) varieties of rice, plus equipment that would allow the maximum benefits to be obtained (chemical fertilizers, pesticides, intermediate petrol-driven equipment), plus agricultural extension knowledge that extolled the values of modern agriculture. The cost of GR capital and technology came from outside, but the strategy also involved new non-financial outside linkages: information networks, credit institutions and marketing boards (White 1983). In addition, GR technology was part of a larger ideologically motivated development package in which all traditional practices, deliberately or by implication, were seen as inferior. Under these conditions traditional knowledge could only survive if people were incredibly resistant (as with the Baduy: see Iskandar, this volume) or where the GR package clearly did not work

from the beginning. Inevitably, the main casualties were self-reliance and poor people (Pottier 1999: 50–51). Traditional landraces disappeared locally, or remained only important for specific ritual purposes (such as glutinous varieties), while non-rice production systems were dis-incentivized (e.g. Persoon 1992). The outcomes tended to reinforce the very images of peasant mentality that the package was supposed to liberate people from: images of dependency and alienation. While GR technology raised rice output dramatically overall, it did not solve the problem of poverty or land reform, and it led to greater polarization amongst the rural classes (Collier 1973; Utrecht 1973; Griffin 1974: xiii). The introduction of HYVs without land reform led to more land concentration and a decline in the economic status of women (Gerdin 1982: 127–30). And, as Gerdin describes for Lombok, peasants faced special problems growing HYVs compared with traditional landraces. Although neither Gerdin nor Geertz developed this point, the introduction of HYVs and the downgrading of women in the production process, between them, led to a loss in knowledge, since it was largely women who were closely involved in the process of seed selection, the identification of new landraces and the decision-making involved in planting different varieties. We can see this in the Kasepuhan case reported in detail by Rini Soemarwoto in this volume. In Bali, the attempts to introduce GR technology and to bureaucratize and interfere with the fine ritual-tuning of the traditional irrigation system not only led to a decrease of traditional rice varieties, which Balinese farmers were forbidden to plant, but completely upset efficacious local ways of controlling weeds and crop pests through 'folk' hydrological and biological management (Lansing 1991: 111–27).

In Indonesia the green revolution and its consequences happened in the context of the New Order five-year development plans, between 1969 and 1994. Implementation resulted in a transition from a situation in which the country was a net importer of rice in the early 1970s to one in which it had achieved national self-sufficiency in rice production by 1984, and was generally lauded as a 'success story' (Booth 1988: 1). Institutionally, the plan was effected through BIMAS (*Bimbingan Massal*: 'Mass Guidance'), which mainly coordinated the logistics, but which also subsidized fertilizer, banking, transport and storage (Fox 1991). The problem with this colossal and, by any measure, impressive economic engineering feat, was that in turn it was accompanied by an increase in population from 119 million in the late 1960s to 210–216 million in 2000. The management of *sawah* (wet rice field) environments was transformed as a result of the intensification programme, but in ways that were not exclusively beneficial. Thus, in 1982 Bernstein, Siwi and Beachell calculated that there existed 8,000 traditional rice cultivars in Indonesia, but that the introduction of modern IRRI-derived varieties had led to a dramatic loss of genetic diversity (Fox 1991: 67). By the 1990s it had become clear that

Indonesia needed to urgently restore the breadth of the genetic base of the rice crop to avoid problems in the future (Fox 1991: 74).

But the disadvantages of the Indonesian GR were not simply technical, in the sense of exterminating local rice landraces and the 'extinction of experience' (Nabhan and St. Antoine 1993) that went with it, but also sociological. The BIMAS regime favoured richer peasants, who were able to buy out their poorer neighbours, who then either migrated to the cities, added to the total of rural landless labourers or became available for transmigration. Other small peasants who clung on were only able to do so using an alternative strategy of maintaining their independence by differentiating their economic activity, resorting to 'shared poverty' and other moral economy strategies (Geertz 1963, Scott 1976; Hart, Turton and White 1989). As Breman and Wiradi (2002: 105, 115, 140) have been able to show, GR technology decreased employment opportunities in the countryside outside the peak periods in the agricultural calendar, had a negative impact on females in particular and gave benefits to larger rather than smaller farmers. Overall, the scheme favoured the Suharto government by demonstrating what was achievable through central planning, by apparently ensuring food security for most of the population and by leading to a decisive shift in the rural and national power structure (Hart, Turton and White 1989: 2). A similar process occurred with respect to materia medica, though it is less written about. Processes of government intervention in health-care delivery, both in theory and in practice, led from the end of the colonial period to a preference for biomedical remedies where these were available and affordable. With the crises experienced from 1996 onwards, such remedies were less available and less affordable. This resulted in a reversion to traditional remedies where these were accessible – as amongst the Nuaulu people on the island of Seram – and created problems where traditional knowledge had been eroded.

Only in Brunei was the green revolution not the key cause of the undermining of traditional knowledge and agrobiodiversity. Although Brunei, like other parts of postcolonial southeast Asia, had been subject to conventional government-led strategies of agricultural development, by the 1970s, the country was already so dependent on oil production that the green revolution, from a national point of view, was an irrelevance. Most Bruneians could obtain state employment, and there was much migration from the countryside, particularly the uplands, and a dependency for most food and much labour on imports from Malaysia and Indonesia. In this context there was not only a decline in traditional agricultural methods, but also a rapid decline over a few generations in subsistence knowledge (Ellen and Bernstein 1994; Bernstein 1996: 436). Swidden cultivation was maintained in some areas only for cultural reasons, in order to ensure the survival of traditional varieties that people valued and that were part

of their identity, an identity often contrasted with that of the dominant Muslim majority. In this situation the hydrocarbon economy buffered the local people against most short-term subsistence risk, but arguably, as the national economy became increasingly dependent on a narrow base, the underlying resource of which was declining, opened up problems for the future.

The green revolution in island southeast Asia exemplifies a classic example of top-down modernization policy, which appeared to work but, like other forms of agricultural and subsistence modernization, it increased productivity on the assumption of particular conditions of ecological and social stability. Where the stability actually achieved was sustained over the long term, and where greater yields arose from technological innovation, regular income levels and an experience of rising living standards, the traditional knowledge base tended to erode. Know-how and practices that previously provided a 'buffer against uncertainty' were seen more and more as unnecessary and 'old-fashioned'. Where ecological and social disruption came after such a long period of stability and improvement in living standards, erosion of traditional knowledge frequently led to problems; but, where it was still extant or recoverable, it sometimes became a significant component in the strategies people employed to respond to shortfalls in production and to natural calamities. In some cases, we have evidence of people actively seeking new ways of coping that rely on elements of traditional knowledge systems and that blend those elements with introduced knowledge in ways that are both original and effective.

Detailed studies of environmental knowledge erosion of the kind that are now available for some parts of the world (e.g. Zent 2001) are not presently found in anything but an incipient form for island southeast Asia (e.g. Bernstein 1996; Florey and Wulff 1998; Florey 200; Christensen 2002: 247; Hoare 2002: chapter 5, 229–30; though for mainland southeast Asia see Sowerwine 2004). However, there are plenty of general statements to the effect that knowledge erosion is occurring and indirect proxies and circumstantial evidence for it having happened: language loss, rural-urban migration, schooling, religious conversion, biodiversity reduction, agrobiodiversity simplification, technological globalization, and so on. We now know that there is a convincing correlation globally between loss of local languages, loss of biodiversity and loss of local knowledge (Maffi 2001, 2004), and there is no reason to think that this works any differently in island southeast Asia. This is partly because local language encodes knowledge and when it goes it is difficult – literally – to speak about; but most often language decline and knowledge decline are the twin outcomes of modernization processes, in which cultural changes (such as learning Indonesian or Malay or Tagalog) and changing technical practices are part of the same package.

Ecological, Economic and Social Crises in Island Southeast Asia: 1996–2004

The developmentalist model of change based on assumptions of incremental progress was severely challenged by environmental, economic and political events that occurred during the late 1990s. As Oliver-Smith (1986, 1999) has pointed out, natural hazards are rarely factored into development plans, and such plans sometimes undermine those pre-existing features providing for ecological and social resilience that reduce vulnerability. We suggest here that the erosion of traditional forms of knowledge in many places compounded the problems, that, in other places where such knowledge persisted, it provided a buffer against disaster, and that responses to subsistence stress generally display a remarkable resilience and creativity in combining new techniques with old.

The first crises that began to reveal themselves were local environmental problems that were a consequence of economic growth itself: forest fires, reef and mangrove degradation, pollution of waterways with fertilizers and mine tailings and coastal despoliation. For example, around 90 per cent of the wildfires reported for Indonesia during the 1980s and 1990s occurred in areas with rubber and palm-oil plantations, production forest plantations or transmigration projects (e.g. Gellert 1998). These developments were accompanied by a gradual scientific understanding of how essentially local events were related to global processes (Leighton and Wirawan 1986), such as global warming in relation to sea-level rise (a real hazard for low-lying coral atolls throughout the archipelago) and the El Niño southern oscillation (ENSO). Otto Soemarwoto (1991: 227, 232), for example, had early noted the El Ninõ of 1982 as a potential hazard, though the impacts of this phenomenon were not widely or publically appreciated in a southeast Asian context until the 1997/98 El Niño-La Niña events (Fox 2001). It was rapidly established that these had direct consequences for forest ecology and biodiversity, such as the reduction in the volume of mast fruiting in dipterocarp forests (Curran et al. 1999), coupled with knock-on effects in the context of logging operations and forest fire. In Indonesia, devolution following unrestrained Reformasi, where administrative infrastructures and (for example) national park protection were weak, led to continuous extractive attrition of timber in Kalimantan in the late 1990s (Donovan 1999; Murphy 2001; Barr and Resosudarmo 2002; Sunderlin 2002; Smith et al. 2003; Curran et al. 2004). The long-term consequences of climate change – sea-level rise, more frequent El Niño events, increases in the frequency of crop failure and drought, flooding and soil erosion (Curran et al. 1999), as well as the incidence and severity of forest wildfires – have now become a major issue for both people and wildlife throughout the region (FAO 2001), while higher temperatures are reducing primary productivity due to increased respiration (Sodhi et al. 2004).

But these extreme environmental events cannot be disconnected from the social contexts in which they took place (Oliver-Smith 1986, 1999) and the extreme social behaviour that so often magnified them. To many local peoples it must have seemed as if they were witnessing a cataclysmic cosmological transformation (Budiman, Hatley and Kingsbury 1999; Schwarz 1999; van Dijk 2001; Wessel and Wimhöfer 2001; Colombijn and Lindblad 2002), and in retrospect we may indeed be able to use models drawn from catastrophe theory to make sense of it all. As Henk Schulte Nordholt (2002: 33) puts it, 'Indonesia became entrapped in a threefold crisis': the monetary crisis (*Krismon*, or *krisis moneter*), which combined with an ecological crisis, and which resulted in total political crisis (*Kristal*, or *krisis total*).

In Indonesia in particular, there was a veritable 'paroxysm of violence' (Schwarz 1999: x) throughout the late 1990s, almost a counterpoint to the 'ecological violence'. In 1998 (the year in which the Suharto regime fell), there was anti-Chinese rioting in Jakarta and other parts of Java, which continued earlier disturbances that had occurred during 1996. Elsewhere, conflict fell along the fault line between Christianity and Islam: in central Sulawesi (Aragon 2001) and in Maluku (Aditjondro 2001; van Klinken 2001; Goss 2004), in each case leaving many thousands of casualties. In west and central Kalimantan (though the proximate causes were in each case rather different) there were repeated clashes between Madurese transmigrants and local Malays and Dayaks from 1996, and witch-hunts in east Java from 1998 onwards. In 1999, after calls for a UN referendum on independence, violent conflict broke out in East Timor fomented by local militias, leading to widespread population displacement and destruction, as well as lesser conflicts in parts of Nusa Tenggara, such as Sumba (Vel 2001). And then there were the continuing problems in Aceh and Papua. Events in different parts of the country fed on each other, through the effectiveness of modern electronic communication and by appropriating the same kinds of ideological discourse (jihadist, separatist, racial, or whatever). All of this generated between half a million and two million deaths (depending on which estimates you trust) and well over a million displaced persons. With Reformasi, the strong centralized military force employed so effectively by the state under the New Order was fragmented, the chain of command collapsing, and the level of army violence escalated (Colombijn and Lindblad 2002: 22). Locally, many of these problems were about scarce resources, though this is certainly not to reduce them to such, any more than we should reduce them to reified ethnic and religious confrontations.

The Asian financial crisis of 1997–98 (which, incidentally, coincided with the 1997 El Niño, together with its attendant spate of forest fires) caused major problems for the whole region, but the scale and intensity varied greatly between countries (Ananta 2003; Strauss et al. 2004). Some

countries were already recovering by 1998. In Malaysia, for example, inflation was brought under control and financial institutions reformed without triggering a political crisis. But Indonesia was the worst case: depreciation of the currency leading to political crisis, IMF intervention and, in May 1998, the end of the New Order regime (Sharma 2001). This in turn was followed by turmoil and ethnic and religious violence. But the impoverishment, unemployment and general economic chaos predicted did not happen. The inability to import instead led to the growth of local small-scale enterprises, old traditions of artisanship and trade were rediscovered, customary local markets were boosted, and there were diversification in the kinds of capital accumulation and a general boom in the small-scale sector (Jellinek and Rustanto 1999; Breman and Wiradi 2002: 2, n.1). There was more hardship in urban than in rural areas. In Java, agricultural work increased, and cultivation was resumed in dry fields and home gardens, which had been neglected during the good times when rural peoples sought work in urban areas (Manning 2000). People also moved into hawking. However, the view of the rural economy as a safety valve and of its coping methods as 'compensating' (Manning 2000: 4) is probably both exaggerated and simplistic, and there is no doubt that *Krismon* widened the gap between rich and poor (Breman and Wiradi 2002: 6). From the evidence accrued by Breman and Wiradi (2002: 271–74, 307) in their studies of two villages on the coastal plain of west Java, the informal sector appears to have suffered no less than the formal sector, and the kind of institutionalized arrangements that Geertz (1963: 99–100) associates with 'shared poverty' could not be found (see also White 1983). The *Krismon* brought back memories of earlier threats to survival for the villagers, e.g. famine during the Japanese occupation, and food shortages of the early 1960s (White 1983: 299). Even if we do not accept the worst reading of the consequences of the financial crisis, it was still a serious blow to what had been perceived as a success story of Rostowian modernization theory.

The consequences of the crises in the context of the erosion of traditional knowledge and resources were predictable. Drought and environmental problems put pressure on HYVs, which required plentiful water and which were over optimised to particular conditions. The inability of farmers to purchase the fuel or equipment to cultivate HYVs viably, and the inability of a government to provide them, led to a downturn in production. With traditional varieties gone, farmers could not fall back on traditional strategies to combat drought and cash shortages. Chedd (1970), and a few others, had predicted this problem with the green revolution package, what Otto Soemarwoto (1991) alerts us to as an ecologically dangerous 'monophagous' trend. He sugggested reintroducing crop rotation, including nitrogen-fixing plants, and advocated less irrigation and more non-rice food diversification. But the green revolution, though

perhaps the one most identifiable complex of factors undermining traditional ecological knowledge, here serves equally as a leitmotiv for all those other simplifying and destructive changes: the shift to plantation agriculture, industrial fishing, coastal erosion and – perhaps most obviously as far as upland and interior peoples are concerned – deforestation. In the longer term, whatever its proximate (see, for example, Barber and Talbott 2003) and ultimate causes, deforestation in southeast Asia, as elsewhere, has contributed to the extinction of local languages, knowledge and entire peoples, and as we have already seen, there is a convincingly close association between levels of biodiversity, local biological knowledge and linguistic diversity (Chin et al. 1992; Sutherland 2003; Puri and Donovan 2004).

The Rediscovery of Traditional Knowledge: Indigenous and Exogenous

In southeast Asia, as in other parts of the developing world, the failure of top-down projects encouraged professionals to take another look at traditional knowledge, but, more significantly, local people themselves, unable to sustain modernist solutions with a requirement for high levels of capital investment, were forced back on to local solutions. Reformasi in Indonesia, following the fall of Suharto in 1998, with its wave of democratization, led to the exponential growth of political parties and NGOs (Soemarwoto 2004: 34–36). The growth of these NGOs, at both a national and a local level, in part responded to the greater public awareness of environmental issues, such as wildfires; but at the same time there was a development of a collective consciousness amongst groups who labelled themselves *masyarakat adat*, including the foundation of the Aliansi Masyarakat Adat Nusantara (AMAN, Alliance of Indonesian Adat Communities). Although traditional or indigenous movements had been evident in Malaysia and the Philippines (e.g. Brosius 2001; Aquino 2004) and generally (Gray 1995; Kalland and Persoon 1998), under Soeharto's authoritarian New Order, indigeneity was not part of an acceptable vocabulary (and in the circumstances was utterly misleading). The nearest equivalent category was *suku-* or *masyarakat-terasing*, an official designation identifying 'backward' or isolated groups targeted for certain kinds of 'development' aid. Part of the role of these NGOs was to foster respect for traditional forms of knowledge, which underlay identity issues and issues relating to resource access; and in many cases they fused environmental consciousness, political self-interest and traditional knowledge (Dove 1998). We can see this well exemplified in the literature relating to NGOs in Maluku promoting the value of traditional ritual arrangements (*sasi laut*) for regulating access to marine resources (Zerner

1994), and in the role of the NGO supporting Baduy environmental and cultural interests (Iskandar 1998).

At the same time, the growth of local interest in traditional knowledge was encouraged by a growing academic and professional concern for the role of ethno-ecological knowledge and its application in development contexts. Until the 1980s ecological studies in anthropology, despite having the concept of cultural adaptation at their core, were concerned with relatively steady-state populations and with the long-term adaptive strategies that prevented populations from exceeding their carrying capacity. The work of Vayda (e.g. Vayda and McCay 1975) on local responses to natural hazards began to change that, just as the work of Conklin (e.g. 1957) had begun to demonstrate the relevance of local environmental knowledge two decades earlier. This new response to the perceived deficiencies of systems-oriented approaches had been theoretically inspired by the methodological individualism of economic formalism and evolutionary ecology, but focused on how people actually coped with the environmental hazards, the actual empirical events they confronted. In many parts of the world the partnership between an academic interest in ethno-ecology and local peoples' interest in their own traditional knowledge was also well advanced (e.g. Warren, Slikkerveer and Brokensha 1995). Strangely, the application of such approaches in island southeast Asia – with the possible exception of the Philippines – were slow to get started, stunted perhaps by the apparent and real successes of the green revolution and other centralized development projects, and by the high levels of capitalization experienced in Malaysia and their seemingly complete irrelevance in Brunei.

Typologies of Crisis and Their Social and Cultural Embeddedness

What I have so far provided in this introduction is essential background, but we have yet to define some key terms of reference: the kinds of crises upon which we are focusing, and how we might best theorize the responses they prompt amongst local peoples. I shall discuss these in the following two sections.

It is conventional to distinguish (1) natural hazards, such as climatic fluctuations or earthquakes, what some economists call output uncertainty, and which can influence production activity; from (2) economic uncertainty, or the unpredictability of markets, and which particularly affects cash cropping, fishing and forest extraction; from (3) social and political uncertainty, which may affect differential control over resources (as, for example, in landownership) and the unpredictable behaviour of those in power (e.g. the events that led to the overthrow of Suharto).

The kinds of crisis described in this book are those characterized by unexpected acute resource failure, which may have as their immediate or distant causes a variety of geological, climatic, biological or social factors, or a complex combination of one or more. Table 1.1 provides an approximate typology of crises, which may serve as a working framework. Susceptibility to particular kinds of hazard is limited geographically. Thus, earthquakes are widespread in the region, linked to a distinctive geography of joins between tectonic plates, and, on the whole, Indonesia is more vulnerable than the Philippines, and the Philippines are more vul-

Table 1.1. A tentative typology of natural disasters and other production crises for island southeast Asia

Cause	Effect
Physical crises	
Seismic	
Earthquake	Settlement destruction (including rice barns and other means of storing food), transport dislocation, mud slides and landslips, which destroy orchards and other crops
Tsunami	May follow from terrestrial or submarine earthquake or volcanic eruption: flooding, crop and habitation destruction, loss of potable water, disease epidemics
Volcanic eruption	Fire, suffocation, rock falls, whirlwinds, hot gas clouds, scorched earth, ash cover, atmospheric pollution; lava and ash may cause crop failure, block water sources, cause mud slides, kill vegetation, pollute potable water, destroy wild foods, animals and human settlements
Landslips	Settlement destruction, transport dislocation, loss of crops on hillsides, siltation of water sources for fishing and drinking
Climatic	
El Niño southern oscillation	Precipitation and temperature extremes: see below
Heavy rain	Flooding, soil deterioration, erosion and compaction, damage to irrigation systems, infrastructure damage to roads, sluices, dams, channels, bridges, runoff, mud slides and landslips; impacts on pest outbreaks
Extreme temperatures	Drought, forest fires, death of natural vegetation and crops; frost damage at higher altitudes
Strong winds (cyclones, hurricanes, typhoons, tornadoes)	Increased evaporation rates, structural damage to crops, vegetation and buildings, tree falls; water contamination, flooding

Table 1.1. Continued

Cause	Effect
Sea-level rise	Flooding, loss of potable water, crop destruction
Biological crises	
Human population growth	Intensification of production; settlement on reclaimed land and coastal fringes, on low-lying areas suject to flooding
Crop pest outbreak	Food shortage, famine
Animal disease epidemics	Food shortages
Human disease epidemics	Labour shortages
Agro-economic crises	
Reduction of fallow length, over-planting and other forms of agricultural intensification	Degradation of soil quality, habitat loss, loss of useful species in secondary growth
Chemical fertilizer and pesticide use	Water pollution, human health issues
Mine tailings	Water pollution, human health issues
HYV and GM crop introduction, crop specialization	Genetic erosion, problems of weed control
Irrigation	Water shortage, interference with upland hydrological cycles
Land acquisition and clearance	Forest and other fires
Over-extraction of non-timber forest products	Destruction of forest and modification
Over-extraction of firewood	Deforestation
Social, economic and political crises	
Communal, ethnic conflict and political instability	Market dislocation, loss of access to production land and other resources, increased rates of human disease and mortality, loss of labour
Financial crash, inflation	Unavailability of import items, fallback on local resources (endangered or protected species involved in wildlife trade, or in protected areas, especially vulnerable)
Commercial cash-cropping	Deforestation, forest fires, atmospheric pollution
Commercial logging	Deforestation, forest fires, atmospheric pollution; forest roads increase population access for settlement and extraction, soil erosion
Road-building	Increase population access for settlement and extraction

nerable than Malaysia (Whitten, Soeriaatmadja and Afiff 1997: 93). The same gradient of susceptibility applies to volcanism (with 155 centres of active volcanism in Indonesia), and, of course, within high-risk areas, on the whole, it is those human populations within the immediate vicinity of volcanos who are most at risk. Tsunamis are only a problem in coastal areas, but, as the December 2004 tsunami has dramatically taught us, these may affect a very wide area around an epicentre. Wildfires are a problem mainly in forested or recently deforested areas (and within these in areas with peat or subsurface coal deposits), and it is these that appear to have been most susceptible to El Niño effects. Drought is mainly a problem in areas that are highly dependent on water, especially for irrigation, mainly in lowland deforested areas; upland dry-field cultivation is less at risk, except where steep slopes tend to be associated with thinner and rockier soils and where – as in Nusa Tenggara and southern Maluku – extreme seasonality increases vulnerability. Sustained flooding, rather than flash floods, is a feature of flat lowlands with high water tables.

What is immediately apparent from an inspection of Table 1.1 is – apart from the range of causes – the way in which different causes may have the same outcomes for human populations (disease, crop failure), or the way in which different hazards combine to extenuate the outcomes and increase the level of risk. Thus, while El Niño increases the risk of wildfires, these are accentuated by deforestation, deliberate fires to establish claims or to clear land and the inadvertent ignition of dry trash left by plantation work and logging operations. Similarly, tsunami damage and flooding is increased by concentrated settlement on narrow coastal strips and lowland reclamation.

In order to understand how people respond to such disasters we need to know how they conceptualize them in local cultural terms, in other words what framework they have for making sense of them and responding to them. This involves, in part, subjective judgements of probability, of 'perceived risk', and may include both rational and irrational calculations. One thing we can be clear about is that contemporary traditional societies – including all those discussed in this book – are at the intersection of two systems for making sense and dealing with uncertainty and risk. The first is embedded in a cosmology in which environmental events are linked causally to morally loaded social behaviour (e.g. Soemarwoto 2004). In terms of such a framework, perturbations in the natural realm may be interpreted as presaging perturbation in the social realm. Thus, the eruption of Merapi was for many Javanese a symbol of the overthrow of Suharto, and raised questions both about the ability of rulers to protect subjects and about their legitimacy to rule (Dove, this volume). In the second, risk and uncertainty are perceived through an abstract framework of game theory and pragmatic risk analysis, perhaps most obviously exemplified in this volume by Platten. In this latter causal system, risk is the

probability of a material event being detrimental to the survival and reproduction of an individual or a population, and its degree of uncertainty. The two 'systems' mutually coexist and interconnect, but may be disconnected to make best sense of any particular event in its local context. For this reason, and for others, phrases such as 'systems of knowledge' – as Dove points out – can be highly problematic.

Anthropologists have written a lot about how people conceptualize misfortune. For the Nuaulu of central Seram in the Indonesian province of Maluku, sickness or the failure to catch game or fish is described as *mahesae*, and, in a society where people depend on their own success in fishing or hunting, failure to catch game or fish is a major concern. The cause of the failure to catch game or fish is usually gender pollution, although sorcery is sometimes responsible. Because Nuaulu interpret the causes of many misfortunes in terms of cosmological infringement, ancestral disapproval, spirit attack or sorcery, most misfortunes are of this kind. However, Nuaulu also now use the word *siraka* for disaster, a transliteration of the Indonesian word 'celaka', the dictionary gloss of which is 'misfortune' or 'accident', and we can perhaps see in this the clearer emergence of the two explanatory systems outlined in the previous paragraph. However, in the Nuaulu case *siraka* is used specifically to refer to disasters such as village attacks or someone being killed, although it can also be used to refer to more minor problems such as stealing. The 1998–2003 'Maluku wars' were, for the Nuaulu, an unmitigated *siraka*, but they also resulted in multiple local instances of *mahesae*.

Local Responses to Crisis: the General Picture

The automatic and ethically understandable assumption is that people in 'crisis', 'disaster' or extreme 'hazard' situations need external assistance, and there are often very clear and inflexible official views as to what form this assistance should take (Scott 1998). Thus, state administrations and agencies may assume that the appropriate long-term response to continued disaster is, say, transmigration, resettlement in gridiron layouts or bureaucratized irrigation, or one 'miracle' high-yielding variety of rice rather than a messy collection of different landraces with varying properties, or rice rather than sago. Occasionally, administrations may be completely blinded by this kind of tunnel vision, such that drought relief programmes can neglect even bumper harvests of traditional crops, partly because they are officially invisible and partly because local people themselves may prioritize state-aided food despite adequate local provision for political or cultural reasons (Stini 1975; Wilmsen and Durham 1988: 84). As Dove points out in his chapter, the ideological stance of the nation state with respect to natural disasters is that poor villagers need to be saved

from volcanic eruptions, even if they have reached some locally acceptable workable accommodation. Similarly, it is on the face of it bizarre that people should deliberately concentrate on small volcanic islands or on small islands susceptible to annual sea-level rise – except when it becomes clear that the long-term benefits of clove and nutmeg production, on the one hand, and the trading advantages of being located in central places, on the other, are seen to override the short-term, uncertain and asymmetric disadvantages of flooding, salinization of drinking water, lava flows and fireballs (Ellen 1987, 2003).

The knowledge that accompanies state aid has been called by Jordan (1997) 'authoritative knowledge', the knowledge of those in power. If there are reasons to distrust it when it is part of a sustained, planned regime of knowledge transfer, is there any more reason to trust it when it is part of an emergency package? Authoritative knowledge, precisely because it is generic and because local people have no control over it, can never respond precisely to local conditions; indeed, it might be thought to be positively dangerous. When central government steps in, it often undermines the local village security system and bolsters pre-existing inequalities; at its worst, when major crises compel the internationalization of emergency services, it may sustain the inflexibilities, questionable practices and ethical dilemmas of 'disaster capitalism'. The new emerging consensus in the development aid field (Pottier 1999: 149) – in contrast – is that better relief comes from supporting local initiatives and coping mechanisms, which prevent the further liquidation of whatever local productive assets there might be, as often follows from external aid interventions. Although it is necessary to question the durability of local safety nets and the consequences of uninformed over-reliance on 'customary' arrangements for social and technical sharing, as the studies which follow show, local populations often have mechanisms specifically to deal with crises they might periodically expect, and even in times of unanticipated disaster always utilize local knowledge as a part of a strategy 'to cope'. Not to recognize this and, worse, to assume that local responses are inferior or inappropriate to introduced 'aid' and humanitarian programmes can marginalize important resources for survival, make interventions less effective than they might be and, worst of all, in themselves lead to the erosion of local knowledge and the creation of a dependency culture that can, over time, make populations more vulnerable to sudden change than they might otherwise be. Although in extreme and acute situations outside intervention may well be unavoidable, ideally it will always draw on local expertise as part of the solution.

In order to make sense of the studies collected together in this book, it is useful to clarify the kinds of graded response that local people often have available. For convenience I distinguish here: (a) predictors of irregularity and disaster: prophylactic steps that can identify the likelihood of

upcoming problems; (b) short-term cyclical failure, and (c) long-term irregular failure. The responses discussed here are all cultural, in the sense that they draw on skills or knowledge that have been acquired over many generations, even if they may be rapidly reconstituted and combined in novel ways. In addition, of course, human bodies respond to disasters through evolved biological responses, drawing, for example, on brown fat reserves in times of energy shortage (e.g. Speth and Spielman 1983). Also, since human populations have been responding to periodic crises for many thousands of years, very often these responses display a complex co-evolved form that involves mutually reinforcing cultural and biological resources, such as in the area of fertility control. Some biological anthropologists and nutritionists have recently become interested in those bio-cultural characteristics that might help people cope with uncertainties in food supply, including adaptation to seasonal protein and energy stress, as well as the epidemiology and seasonal pattern of both infectious (e.g. diarrhoea) and some non-infectious (e.g. malaria) diseases (Harrison 1988; Stini 1988).

Predictors of Irregularity and Disaster

Obviously the best response to impending disaster is to avoid it in the first place and to take preventive measures. In reports of the December 2004 Indian Ocean tsunami (e.g. Glass 2005), there were accounts of how some Andamanese and Nicobarese peoples had managed to avoid disaster by some kind of intuitive knowledge of the imminence of the event. This is, I think, entirely credible, in that many peoples of island southeast Asia are able to read what evidence there might be of approaching disaster, such as the behaviour of animals and subtle changes in winds and sea currents. Non-human animals often have a remarkable ability to pick up infrasonic or other indications of future environmental changes and threats, and certainly there were many reports of the low levels of wild animal deaths compared with those of humans in the 2004 tsunami. The problem with such reports as they apply to humans, however, is that they reinforce a particular stereotype of 'tribal' intuitive knowledge of nature, while denying that similar kinds of knowledge may be more widely distributed. Thus, in Chapter 4, Iskandar shows how Baduy anticipated the 1997 El Niño by employing a combination of traditional and innovatory strategies. A traditional agricultural calendar, astronomical and botanical indicators and varying the time of harvesting from sacred fields (*huma serang*) were all used to determine the date of the new agricultural year, so as to maintain the viability of traditional swidden practices under increasingly uncertain conditions. Similarly, Dove and Kammen (1997) have shown how forest-dwelling peoples of Borneo understand the dynamics of mast fruiting of dipterocarps, triggered by slight climate fluctuation, in places attributable

to the El Niño. These events are irregular and local, but result in the mass flowering and then fruiting of different dipterocarp species, which allow local people to both anticipate a perturbation and make use of a windfall source of food. Soselisa shows in Chapter 6 how in Ambon the appearance of the spawning *laor* worm in coastal waters serves the same purpose. Indeed, the importance of studying farmer awareness of weather fluctuations, the ethnoscience of seasonality and conceptions of time for studies of the socio-economic impact of climate change (Vedwan and Rhoades 2001: 109) is at last being taken seriously, as Chapter 2 by Puri exemplifies.

Responses to Short-term Cyclical Failure

Most global South agriculture assumes short-term seasonal or annual fluctuations in production. Strategies that make sense in such situations begin with storage. Thus, Nuaulu will store meat by smoking to ensure its availability for rituals during the wet season when hunting is difficult (Ellen 1996), while Baduy and Kasepuhan store rice in village barns for many years at a time. But strategies for coping with short-term cyclical failure also include social and market exchange, crop diversity, planting patterns, use of tolerant crop varieties, staggered planting schedules, technology such as irrigation and drainage, increased labour inputs and switching to other subsistence techniques (gathering wild resources, hunting, fishing). Of course, where the main occupation is fishing or hunting, then it may be agriculture that provides the backup. The strategies people employ in such situations are not always directly visible, given the methodologies of outside researchers. Thus, Nuaulu tend to make more use of fruits and wild sources of food during times of food scarcity, but, because these are often eaten opportunistically between main meals and away from the village, they are not easily open to techniques for recording food consumption. In such circumstances, as serious students of nutrition in developing societies know, methodologies involving total recall of all food consumed or spot checks are more accurate ways of ascertaining actual food consumption. As Puri points out in Chapter 2, seasonal variability in climate affects the scheduling of agricultural activities, such as the planting of staple rice crops, throughout island southeast Asia, and even the start dates and lengths of annual wet and dry seasons can vary from year to year. The numerous studies that have documented the ability of farmers to cope with these short-term variable conditions indicate that rarely do these conditions produce crop failures or food scarcity.

Responses to Long-term Irregular Failure

These are failures that people know historically will occur sometime, but that are difficult to predict. It is their very uncertainty that increases their

danger. Over time, if long-term irregular failure increases in frequency, people will develop permanent strategies to cope, and the patterns of response become more like those for short-term cyclical failures. But there are also events that are so rare that what memorate knowledge there is has not led to the introduction of specific intellectual or physical resources to cope with them, but instead people respond by using strategies developed for short-term cyclical failure and by innovating new appropriate responses. Thus, in Chapter 2, Puri shows how longer-term climatic variability, such as hundred-year floods, hurricanes, cold snaps, heat waves and droughts, tend to be unpredictable and overwhelm existing means for coping. There are, however, medium-term climatic events, such as the El Niño, which occur regularly, usually more than once in a lifetime, and yet can still have severe consequences for farmers, fishermen and even urban dwellers. Using data on Penan forager and Kenyah farmer responses to droughts in east Kalimantan caused by ENSO events in 1982/83, 1990/91, and 1997/98, Puri addresses the extent to which they and others distinguish these medium-term events from short-term climatic variation. He explores whether they involve different coping mechanisms, what specialized knowledge, ethnobiological or other, such responses utilize and how this is transmitted and preserved.

The terms 'crisis' and 'disaster' are, of course, ultimately relative, and depend both on people's experience of previous events of a similar kind and on cultural evaluations of what kind of event is more or less disastrous than another. The point at which a short-term failure becomes a disaster is not clear, neither is the difference between a short-term coping strategy and disaster or crisis management. They elide into each other. Sometimes there may be a hierarchy of responses depending on the severity of the perturbation. Thus, as Swift (1977) and others have shown, the immediate response to declines in production may simply be to increase effort in the same area. This 'escalation of effort' response is discussed here by Puri for foraging populations such as the Penan, who achieve this through increased diet breadth and search ranges in times of nutritional stress, consuming foods the location, harvesting and processing of which involve increasing amounts of labour. In many populations, if intensification is no longer viable, if it has declining or zero desired effects, then other more radical options will be considered, such as settlement movement. Slightly differently, Nuaulu intensify hunting efforts as returns decrease, though these often mean that return for effort declines further (Ellen 1996). If hunting for individuals or households shows chronically poor returns, then when cash is available these households may rely on purchased fish. It is only as the crisis intensifies that broad-spectrum strategies come into play. The periodicity and irregularity of a critical disaster event determine the calculation of risk and therefore the preparedness of people to cope with it.

One of the few detailed accounts we have of response to crisis while it is developing, and with a focus on process, is Raymond Firth's classic ethnographic study of the aftermath of the Tikopia hurricane and drought in 1952 (Firth 1959: 51–64). Firth shows that immediately following a hurricane food was not actually in short supply, but it was so later, and in a sense the famine could be planned for. He shows how over different months between March 1952 and June 1953 different foods became more or less important, and that food fluctuated in its availability, famine occurring during those months when few of the varied starch staples were available.

Famine and Fallback Foods

Conventional acknowledgement of the relevance of traditional knowledge to production crises is often bound up in the notion of 'famine food' or 'survival foods' (Carr 1943) or 'wild', 'supplementary' or 'emergency' foods (Irvine 1952, 1957) or, more prosaically, 'fallback' foods (Pollock 1992: 49): the idea that peoples have a knowledge of plants or animals that they somehow hold in reserve and utilize only when under subsistence pressure. This idea was anticipated in the previous section, in relation to the Penan and the Nuaulu. Such foods are usually reckoned to be those that would not normally be harvested because the costs are high or the nutritional benefits low or because they are unpleasant or of low status. Some extreme instances of these would include bark (Maxwell 1916), bamboo seeds (Rao, Jacob and Ramasastri 1969) or mango kernels (Wilkins 1942). The notion of famine food makes much more sense for agricultural peoples, where the risks of production failure are greater than amongst pastoralists or hunters and gatherers. Indeed, it has been suggested that this is the reason why, on a global scale, agricultural populations report more names for plants than non-agricultural peoples (Ellen 1999).

We begin to find an interest in documenting these kinds of foods in the late colonial period, as administrations begin to take a serious interest in responding to periodic famines, in India (e.g. Shortt 1887–88; Gammie 1902; Paton and Dunlop 1904,) or sub-Saharan Africa (e.g. Hely-Hutchinson 1898), a concern that has followed through into the postcolonial period for these same areas: see Gupta and Kanodia (1968) for India, Salih, Nour and Harper (1991) for Sudan and Zinyama, Matiza and Campbell (1990) for Zimbabwe. In the contemporary period international agencies are beginning to take seriously the role played by such foods in the context of their attempts to alleviate hunger (e.g. UNDP 2002). The accounts of famine foods tend to be for areas where levels of precipitation are normally low, desert areas (e.g. Bhandari 1974), or where human pop-

ulation densities are high, with access to little land and reliance on one main crop.

Published research on famine foods for island southeast Asia is less common than for India or Africa (see, for example, compilations such as Scoones, Melnyk and Pretty 1992: 99–117). This is partly because, although food shortages are far from unknown, the environment and food production system are, overall, much more reliable than in parts of India, sub-Saharan Africa or China (on the latter, see Read 1946; Christopher 1985). It is true that some general works cover the ground, e.g. Burkill (1935) for peninsular Malaysia, but we know less of the use of particular famine foods in particular places. This is partly because it is latent (often low-status) knowledge, but also because crises are themselves difficult to study, and because in many cases isolating specifically 'famine' foods is conceptually difficult. Thus, 'sago' is widely seen as a famine food in island southeast Asia (Ellen 2004b). But, although it may genuinely occupy this role in many places, for example amongst the Penan (Puri, this volume) and in Oecusse (Meitzner Yoder, personal communication), elsewhere it may only be reported as such because it is reputedly low-status. Moreover, to say as much glosses over the many different kinds of palms and cycads yielding sago, which often play very different kinds of roles in local subsistence systems. Frequently, a simple equation is drawn between a famine food and a rarely used wild food; and old journals in particular are full of (sometimes questionable) reports and lists of famine foods, as the references at the end of this chapter attest. Often, the most effective foods in times of crisis are not wild or unusual plants at all, but rather robust staples. Thus, in the wake of the December 2004 tsunami, coconuts proved to be ideal survival food, providing both sustaining flesh and nutritious fluid, both of which were protected from infection. The same might be said of manioc (*Manihot esculenta*) or sago (*Metroxylon sagu*), until, of course, the conditions are such that even these fail. In other places unambiguous non-staple fallback foods can be clearly identified and have been documented. Thus, in northern Timor, with reliable annual cultivated staple crop shortfalls for two to five months of the year, local expectations of the severity of the upcoming hungry season were tracked by Meitzner Yoder (personal communication) by noting how early people began collecting *Tamarindus indica* and other legumes: if the maize harvest was poor, collection began in June; in a better year, collection might not begin until October/November.

We can explore the notion of foods specifically flagged for use in times of crisis in relation to a specific example: the Nuaulu of south Seram in the Indonesian province of Maluku. Nuaulu do not have a concept of famine food at all, but they do have a clear notion of foods that can be eaten in the forest when other food is short, or when spending long periods in the forest on hunting or other trips (Table 1.2). These are just alternative

Table 1.2. Selected examples of Nuaulu (central Seram, Maluku) plant species used for water and food in emergencies

Nuaulu name	Scientific name	Source of
1. Forest plants used as source of water in emergencies		
meute wasaura	Young *Calamus* sp.	Water
bunara wane	*Piper corylistachyon*	Water
sopate wane	*Tetracera scandens*	Water
kapine wane	*Uncaria* sp.	Water
2. Forest and other non-cultivated plants providing fruits, shoots, roots and leaves		
tom-tom wesie	*Glochidion borneenisis*	Fruit
sune nimasae	*Artocarpus* sp.	Fruit, starch
komine	*Garcinia celebica*	Fruit
popote wane	*Ptemandra cordata*	Fruit
awane unie	*Rubus fraxinfolius*	Fruit
kikun werane	*Amomum aculeatum*	Seeds and roots
meute wasaura	Young *Calamus* sp.	Shoots
utatone	*Helmintostachys zeylanica*	Leaves
katue	*Oncosperma filamentosum*	Heart
katina wan anoi	*Melastoma affine*	Fruit
pitiri	*Passiflora foetida*	Fruit
ananione	*Horsfieldia bivalvis*	Fruit
popote putie	*Eugenia aquea*	Fruit
makakohi	*Amorum roseum*	Fruit
naine	*Stenoschlaena palustris*	Fern shoots
cintar manis	*Gynura procumbens*	Leaves and stalks
inene	*Gronophyllum microcarpum*	Young shoots
una mataponone	*Lenzites palisoti*	Bracket fungus
kaheo pukune	*Aleurites moluccana*	Nuts
3. Secondary garden crops		
saumahu	*Abroma* prob. *mollis*	Leaves
sesawi	*Brassica juncea*	Leaves

foods. Many of the forest fruits, though not the majority, are varieties of domesticates, and, although not necessarily taxonomically different, may be described as forest equivalents of well-known domesticates. Other species are seen as substitutes for important cultural items, such as for the stimulant *Areca* nut in the case of the fruits of *Nypa fruticans*, which is also occasionally eaten as a snack. Others still are noted for their utility in constructing forest shelters, such as the leaf and stalk of *Alpinia* sp., or for use as soft bedding, such as the lichen *ahane* (*Usnea* sp.). What is important is not, therefore, any one species, but the breadth of knowledge. The point about Nuaulu emergency reserve foods is not that there are just a few 'famine' species that can be used in difficult situations, but rather that there is a very wide reserve of edible forest fruits in particular. The Nuaulu Ethnobotanical Database (Ellen 1999a) lists 148 plants as

secondary foods, though these include both wild and cultivated plants, domesticates and non-domesticates, and incorporate the category of *aie wesie*, 'forest foods'.

But, as has emerged in debates about the human carrying capacity of tropical rainforest without cultivation, including for island southeast Asia (e.g. Headland 1987), the limiting factor for survival when faced with nutritional stress is not so much the number of different species that provide edible matter or the number of different fruits and potential green vegetables, as those that provide calories and protein. In the case of the Nuaulu, there is in this sense only restricted breadth. There are forest yams, but these are not found in great abundance and are no different from those planted in gardens. There are the edible seeds of pandans and bamboo shoots, but more importantly there are the high concentrations of *Canarium* trees, which provide a proteinaceous nut, which was almost certainly more significant formerly in the central Moluccas than it is now. There are numerous varieties of *Canarium commune* used, and also other species of *Canarium*, as well as *Celtis* and *Aleurites*.

The main Nuaulu starch staple, however, is sago from *M. sagu*, of which eleven different named types are recognized. Each of these differ in their culinary properties, rates of growth and growth conditions; but, if they fail, then there are other palms that are used for their pith. And if these are not available then the preferred form in which this starch is consumed (what the Nuaulu call *sonar* and the Ambonese *pepeda*) can be obtained by boiling the pods of the leguminous vine, *Mastersia bakeri*. However, *M. sagu* is a robust crop, which despite its reputation as a swamp species can survive in dry soils. It is prone to few diseases and, although its processing is hard physical work, the technical problems of production relate to water availability (essential for processing) rather than growth conditions. Although for the Nuaulu it has never been anything but their iconic source of sustenance, its consumption is increasingly replaced by, most importantly, rice and manioc. It has nevertheless been the resource of choice during periods of instability and imported food shortages, for example during the Pacific War of 1942–45, and during the conflict between the Republik Maluku Selatan and the Indonesian state (1950–65). With the collapse of the local cash economy after the civil disturbances between Muslims and Christians in 1999 and subsequent population displacement on a massive scale, the role of sago starch in the food security system not only of the Nuaulu (Ellen 2005), but of Maluku more generally, has yet again proved crucial (von Benda-Beckmann, 1990: 163; Brouwer, 1998). Sago provides greater continuity, stability and reliability than probably any other domesticated crop, is less influenced by seasonality and annual variation and less subject to pathogens.

What is significant about these various backup sources of starch and vegetable protein is that all the important ones now show clear evidence

of being cultivated or even domesticated, even if the cultivated-non-cultivated boundary is blurred, as it is for *Metroxylon*, *Canarium*, *Aleurites* and *Celtis*. It is not, therefore, that people resort to 'wild' sources of food in times of nutritional stress, but rather that these reserves of food, their properties and distribution, are themselves the outcome of local anthropogenic processes. There is a continuum between what people grow in their gardens and what they find in the forest. Pollock (1992: 49–51) suggests that for much of the Pacific fall-back foods are often cultigens surviving on abandoned land or secondary regrowth. Moreover, distinguishing between primary, secondary and fallback foods, she shows convincingly how cultivated species move between the three categories depending on the ecological and biocultural characteristics of a particular place. Thus, while in Raratonga taro and breadfruit are equally primary, arrowroot (*Tacca leontopetaloides*) secondary and *M. esculenta* fallback, on Pulau breadfruit is fallback, and in western Fiji *M. esculenta* is primary (Pollock 1992: 49–51). Pollock's tripartite scheme is reminiscent of Bates's (1985: 247) three plant resource pools: primary, secondary and tertiary. Bates is taking an aggregate global view, but it is worth remembering that if we apply the concept of plant resource pools to human populations in specific localities, while a similar tripartite, quantitative, broad-based pyramid applies, the location of a particular species in the three pools can change dramatically from place to place.

Case Studies of Local Knowledge Responses to Crisis, 1997–2003

In comparing the case studies presented in this volume, it is clear that for each population we must take into account: (a) local and historical specificity, (b) the way technical knowledge is embedded in social strategies; and (c) how both technical knowledge and social strategies are themselves situated in geographically discrete regional systems with their own unique properties. All of these combined make generalization hazardous.

Local and Historical Specificity

For virtually every case presented, the impact of the crises that erupted between 1997 and 2003 can only be understood properly in terms of much longer local histories of perturbation, resource pressure and conflict. Thus, for the Nuaulu, ecological pressure had been building up gradually over a thirty-year period, through logging, in-migration, population growth and road-building. With a broad-spectrum subsistence base and a largely intact repertoire of forest resources, they were insulated from many shortfalls of individual foods. But from 1990 onwards resource

pressure began to have consequences for communal relations, accentuated by their adoption of an overt environmentalist rhetoric derived from NGO and media discourses and by the combined impact of the 1997 El Niño, the 1997–99 economic crisis and political reforms from 1998 to the present (Ellen 2004a: 59). Although, during the communal conflict between Christians and Muslims between 1999 and 2003, Christian Nuaulu fled to settlements of co-religionists elsewhere on Seram and there were incidents involving the burning of ritual houses, Nuaulu subsistence life continued much as before, with no real impact on nutrition. The main problem caused by the political trouble was the blocking of access to distant swiddens and plantations (preventing harvesting) and the blocking of market access. Thus, paraffin and batteries were no longer available, and people had to resort to *kamane* resin torches (*Agathis alba*, *Shorea selanica*, *Canarium* spp.). Similarly, clove, coconut and other cash crops could not be harvested, and if they were harvested could not be transported and sold. Similarly, while the dry year of 2003 led to the death of fruit trees, and even sago, none of this had more than a marginal impact on bodily survival.

The socio-environmental situation in Maluku generally between 1999 and 2003 was very patchy and, in places, quite different from what was happening in south Seram. In Chapter 6, Hermien Soselisa examines the strategies employed by the people of Buano, a small island off the west coast of Seram. She shows how traditional coping mechanisms were used in response to dry periods between 1980 and 2003, and more recently in the context of communal unrest between Christians and Muslims and the population displacement and breakdown of market linkages that resulted from this. Soselisa reports drought and food shortages from Buano during 1997/98, and shows how these were alleviated only by traditional mechanisms (*ma'anu*) for acquiring sago from mainland Seram (also Brouwer 1998: 362–64). In a central Moluccan context, sago is still the cultural barometer of subsistence stress, but in some places (e.g. in semi-urban areas of Ambon island and in the transmigration zones of Seram and Halmahera) sago palms have been uprooted and land drained in order to enable alternative land uses, production levels have declined, the process of mechanization has stagnated, and the knowledge and social base necessary for effective extraction has been eroded (Brouwer, 1998). The destruction of sago palms and movement to other foods and material resources, together with the knowledge loss that accompanied this, reduced the ability of local people to cope under pressure, especially during the 1997 economic crisis, which led to increased pressure on sago (Brouwer, 1998: 366, 370). Even Butonese migrants in Ambon began to consume sago, and with less money to buy corrugated iron there was more use of sago thatch and leaf stalks (the traditional Moluccan building material), even though they were more difficult to obtain.

In the context of Indonesia, transmigration and population movement more generally pose a problem for the use of traditional knowledge. What is perhaps most adaptive about traditional ecological and biological knowledge is that it is local. Transmigrants, if they come with local knowledge at all, are attempting to transfer knowledge from the localities of their places of origin. Where this happens, it may work well – as with the introduction by Balinese transmigrants in southeast Sulawesi of the *subak* (irrigation association) system during the mid-1970s – but often persistent attempts to apply knowledge gained over generations elsewhere result in abject failure. Dove (2000) provides an example of this in connection with the introduction of *Hevea* rubber as a cash crop in Malaysia and Indonesia at the beginning of the last century. But while failure of migrants to learn the local knowledge of their new home may result in disaster, an ability to flexibly adopt new habits from indigenes, as have many Butonese migrants from southeast Sulawesi in relation to the extraction of sago on Seram, may make the difference between success and failure.

Social Strategies

So far I have referred mainly to quite specific instances of technical knowledge, but how people respond to individual perturbations is always situated in the ways they understand and organize social relationships. Thus, the same perturbation may elicit different responses from different social groups, and different perturbations may elicit the same response from the same group. Whereas the cultural values and social relationships of some populations described in this book can be generalized as 'risk-averse', some exhibit strategies that are in some sense more risk-prone, such as the inhabitants of the slopes of Gunung Merapi. As a distinction between different types of groups this is pretty coarse-grained, and on the whole, since social relationships are entirely strategies for maintaining security of one form or another, it might be more accurate to speak of degrees of risk-averseness. However, it is the case that some populations are more prepared than others to forgo potential higher returns for effort and tend to prioritize security of supply, whereas a few seek to maximize returns and emphasize security of tenure; some are more cooperative and some more individualistic in their responses (see, for example, Minnegal and Dwyer 2000). In the context of the present book, and in these simplistic terms, the rule-bound Baduy described by Iskandar are at the extreme collectivist end of the spectrum and the Minahasans described by Platten at the other, individualist, end. But, whatever the matrix of social norms and expectations, technical knowledge is innovated, transmitted, modified and utilized within them.

In some cases, the institutionalized relationships in which such knowledge is embedded are specialized institutions of resource regulation, such

as Kasepuhan *matuh-batur* or Moluccan *maano*. Much has been written about another Moluccan institution for spreading risk, *sasi* (Zerner 1994; von Benda-Beckmann, von Benda-Beckmann and Brouwer 1995), which has become the iconic and somewhat over-optimistic example of how traditional institutions conserve resources. Both governments and NGOs have sought to revive *sasi*. Quite frankly, much of what is written is idealistic but the institution may be plausily helpful in specific instances. The problem with *sasi* in the context of the crises of the late 1990s and early 2000s is that, precisely because the communities were disrupted, *sasi* and similar kinds of regulators could not be relied upon. For example, the *sasi* in the Seramese domain of Sepa was under the control of the (Muslim) raja and involved cooperation between Muslims, Christians and Nuaulu animists. With the Balkanization of Seram along strictly confessional lines, traditional *sasi* could not work properly, which was also the case for *maano* in west Seram, described by Soselisa. Meitzner Yoder, in Chapter 9, is dealing with a similar kind of institution in East Timor. Until 1975, local ritual authorities had elaborate mechanisms and strict regulations regarding sandalwood harvest, which effectively limited access to the traditional kings and colonial officials. During the Indonesian period from 1975 to 1999, the narrative of sandalwood decline parallels the traditional authorities' loss of power as their forest control functions were supplanted by a national forestry department. After East Timor gained independence in 1999, conservation and economic development plans aimed to 'reinstate' the ritual authorities, reinvesting them with their former sandalwood monitoring functions. In an ongoing national programme, government departments have supported the revived practice of this Timorese seasonal restriction on forest use (*tara bandu*), putting this re-formed tradition to the service of contemporary conservation programmes. This effort appeals to nationalist sentiment as one strategy to explain and to address the forest decline that occurred in recent decades.

Regional Systems

While it is important to focus on local knowledge and on individual strategies, it is equally important to note that these are not simply situated in their immediate social contexts, such as Moluccan sago extraction within notions of *ma'anu* exchange, or irrigation knowledge in relation to Balinese *subak* associations. They are also, invariably, simultaneously part of a wider geographical system that has evolved over the longer term, and that provides additional and more robust opportunities to cope with local subsistence stress, but opportunities that in themselves do not necessarily travel. Thus, in Maluku, zones of inter-island exchange and division of specialist labour, which exploit local terrestrial and marine ecologies,

have provided defences against volcanic eruption, sea-level rise, and local resource deficiencies over many centuries (Ellen 2003), allowing people to tolerate periodic 'disasters'. In Chapter 10, Michael Dove looks at another example of a complex multi-zonal agro-ecological system that embeds local strategies for coping with endemic volcanism. He notes that, while wider Javanese society places considerable credence in villagers' beliefs regarding volcano spirits and their ability to predict eruptions, it ignores the role of this high-elevation agro-ecological system in utilizing grasslands near the lava fields to stall-feed cattle and supply manure to intensively cultivated lower-elevation fields. This system is so successful that it seldom fails the villagers, despite the fact that death and destruction due to volcanic hazard are not uncommon. Public focus on the latter supports the state imperative to resettle people away from the volcano, whereas attention to the former would raise issues of competition with state elites for the fertile lands on the volcano's slopes. His analysis sheds light on what sorts of local knowledge become visible or not to wider societies and why.

Changing Knowledge Repertoires

The idea of a corpus of 'stock' (or off-the-shelf) traditional knowledge that can been deployed in moments of physical catastrophe or nutritional stress is, I have suggested here, almost always false. In virtually all cases, knowledge is constantly being spontaneously recombined and produced either during default times of normality in anticipation of production problems or in actual moments of crisis.[2] Island southeast Asia, no less than any other part of the world, has been a historical recipient of many new species, deliberately and inadvertently introduced. Many of these have been subjected to critical experimentation, which have increased the capacity to respond to crises and cope in times of hardship. The introduction of post-Columbian crops from the New World after 1500 not only challenged the status of traditional root crops (*Xanthosoma* at the expense of *Colocasia esculenta*, for example; and sweet potato (*Ipomaea batatas*) at the expense of other tubers, especially various species of *Dioscorea*), but, in the form of maize (*Zea mays*) and, most importantly, manioc (*M. esculenta*), provided crops that challenged the primacy of *M. sagu* as a robust food crop in times or areas of shortage, either raising productivity under normal conditions or being more resilient to pests and changing environmental conditions. Both maize and bitter manioc proved to be particularly crucial in Timor, the Kei islands and the southwest Moluccas, with their low precipitation levels and poor soils. And, within island southeast Asia, more productive and risk-averse species have over several thousand years replaced endemic ones: for example, *M. sagu* has steadily

moved westwards from New Guinea, supplanting other palms as the preferred source of stem starch (Ellen 2004c), while rice has moved eastwards, supplanting locally more ancient grains, such as millets, sorghum and *Coix lachryma-jobi* (Hill 2004).

The recent literature on indigenous, traditional and local knowledge has emphasized its provisional, dynamic and contingent character. Rather than conservatism characterizing most farmer knowledge, we now know it to be flexible and responsive to modification and innovation. This has been expressed in different ways by different authors. Scott (1998), for example, speaks of 'metis': knowledge needed to respond to changing circumstances; Richards (1993) speaks of 'performative' knowledge, of a toolkit of skills (see also Ellen and Harris 2000). What is particularly significant here is the way local savoir-faire can override local 'authoritative knowledge', including on occasion tabooed symbolic knowledge. Thus, Dove notes that throughout recorded history there has been great interest amongst Javanese in monitoring the behaviour of Merapi volcano. Analysis of public discourses preceding and following the last major eruption in 1994 showed wide recognition of three distinct sources of knowledge: the government volcanology department, the Yogyakarta palace, and also the local villagers, who, despite living high on the volcano's slopes, appear to behave in denial of the first two sources of authoritative knowledge. But local knowledge, while ultimately overriding other kinds of outside generic knowledge, also routinely hybridizes with new, often scientific, knowledge. Indeed, the process of hybridization is a protean, immanent and historically continuous one, not something that is especially new, except perhaps in terms of its scale. Moreover, we might almost say that individual local knowledges are nowadays all necessarily the outcome of the interaction of local and official/global knowledges (Dove et al. 2006).

Chapter 5, by Iskandar and Ellen, uses a case study drawn from the upland Baduy of west Java to address some fundamental issues concerning what we might mean by hybridization applied to ethnobiological knowledge, and the conditions that influence knowledge transfer. Baduy sacred law constrains the process of innovation, most new crops or cultivars being prohibited. However, Baduy are also committed to the practice of swidden cultivation in an area of depleted forest. After initial resistance, Baduy have successfully introduced the leguminous tree *Paraserianthes falcataria*, which reduces fallow length and has thus afforded some protection against further depletion of surrounding mature forest. Successful innovation in this instance is grounded in Baduy pre-existing understanding of other nitrogen-fixing plants, but they have also drawn on the resources available in government departments involved in farmer extension work. The innovation and its apparently successful outcome were achieved only after initial resistance, and then after a period during which the local

population could consider the advantages and disadvantages of the introduction and make the decisions for themselves. Similar examples could be demonstrated for other parts of island southeast Asia, for example the planting of the traditional fodder crop *lamtoro* (*Leucaena leucocephala*) along contour lines to form anti-erosion terraces in west Timor and Sikka (Metzner 1976, 1983).

Chapter 3, by Rini Soemarwoto, provides us with a case study drawn from the Kasepuhan, an upland cultural enclave in west Java, who, despite having accepted the use of high-yielding varieties (HYVs) of rice, continue to increase the total number of recognized traditional landraces. In 1997 146 extant rice landraces were reported by Kasepuhan, and in 1998 at least one new landrace was identified and validated. In her chapter Soemarwoto examines the process by which new traditional landraces are identified and culturally validated, and the local process for assessing introduced HYVs. She demonstrates how Kasepuhan balance the advantages and disadvantages of different landrace combinations and how this has been used as a buffer against uncertainty since the onset of the Reformasi period in Indonesia.

The responses to subsistence pressure reported for Baduy and Kasepuhan evinced gradual solutions to situations of cyclical subsistence failure. In the more acute crises faced by various localities after 1997, more drastic and rapid solutions were required. Thus, Soselisa addresses the question of how people innovate in situations where traditional subsistence responses are impossible, by combining local knowledge and market strategies. In particular she shows how an old exchange crop, the oil of *Melaleuca cajuputi*, previously neither husbanded nor harvested by Christian Buanoese, was collected, processed and the oil sold as a way of utilizing the market to obtain basic food supplies, at a time when they had no access to many gardens and plantations, following the breakdown of relations with neighbouring Muslims.

In Chapter 8 Dario Novellino shows how in the Philippines traditional knowledge and practices are tolerated by political elites for electoral reasons, choosing not to enforce restrictions on shifting cultivation during the national election. In this way, they gain the highest amounts of votes from their upland constituents. Local communities, such as the Tanabag Batak, take advantage of this opportunity to increase the size of their swiddens, and even to clear patches of old growth forest. Instead, during the two consecutive years preceding the election, most Batak will clear lands where only small-diameter trees and shrub vegetation are found. The Batak's attempt to adjust their agricultural cycle to the cycle of politics has crucial implications for the sustainability of their own swiddens, and for the way in which traditional ecological knowledge is rethought and transformed. This chapter argues that, to be resilient, Batak swidden practices must be structurally modified in a form of 'dependency' to state

demands and political contingencies. Furthermore, it proposes that any discrepancy between the official requirements and actual implementation of national laws blurs the distinction of what is legal and what is not. Today, to gain access to their natural resources, Batak have learned new strategies to make use of this vagueness (as well as of government institutional weakness, clientship and administrative inefficiency). These strategies may serve to counter domination by central authorities, but – unavoidably – they also foster government dysfunction and a state of permanent crisis in the uplands.

Finally, in Chapter 7 Simon Platten shows how Minahasa, a predominantly agricultural region of north Sulawesi, and one of the more developed agricultural areas of Indonesia outside Java, has a 'tradition of change'. Over 500 years Minahasa has become part of an increasingly global network of trade and influence that has radically altered the landscapes of the Minahasan plateau and the province in general. The introduction of maize, which allowed the expansion into the uplands of other areas in Indonesia, created a similar agricultural revolution on the Minahasan plateau, though in a somewhat different context. In the contemporary uplands of Minahasa, characterized by land fragmentation, new strategies have developed, locally orchestrated and yet building on existing patterns brought about through the conditions of colonial rule. This chapter explores the similarities between the contemporary agricultural system in the village of Rurukan, with its emphasis on carrots and cloves as a means of achieving stability, and the previous agricultural system based on maize and coffee that led the upland expansion into the area 150 years previously. Platten demonstrates that, although the building blocks of the agricultural system, the landraces and cultivars, have changed, culturally continuity with regard to the selection of cultivars in the agricultural system has remained intact. Here subsistence uncertainty is less important than market uncertainty; but with the erosion of many traditional agricultural practices, it is the market that has also become the main mechanism for responding to crises, supported through the endorsement of flexibility and change as dominant cultural values, and with social institutions that facilitate this.

Conclusion

So far in this introduction I have deliberately sidestepped addressing what might be considered the most crucial conceptual issue of all: what we might mean by 'crisis management' or a 'coping strategy'. What is clear from this account is that, on the whole, people do not have a discrete body of knowledge that comes into play as a response to acute or prolonged disaster. True, there may be some foods described as famine foods,

but generally speaking the responses employed, and certainly the successful responses, arise from a general strategy of maintaining high levels of diversity, and of implementing coping strategies that are constructed from a body of general principles people can resort to quickly and flexibly when required. Part of what makes for a successful response is simply the availability of resources constituting the long-term adaptation of a people to a particular set of circumstances, where the knowledge is, as it were, devolved in the ecology, distributed in a range of techniques, and not constituting deliberate remembered knowledge available when it is needed. The concepts of 'coping mechanism' and 'crisis management' in the context of our present understanding of traditional environmental knowledge, and people's general responses to environmentally and socially induced subsistence stress are somehow inadequate. A crisis for Gunderson (2003: 37) is a 'failure of policy' or of 'rules, norms, behaviours and infrastructure of management action'. But whose policy are we speaking of here? Although in extreme cases, such as the December 2004 tsunami, all stakeholders would easily agree that a crisis was what occurred; in other cases the notion of crises is itself culturally nuanced, as we have seen. To speak of 'management' suggests an overall planning strategy. Coping, in comparison, is a 'short-term process of stress reduction' through which individual organisms respond to fluctuations in the environment (Alland 1970). Coping is always opportunistic, intuitive, a tactical rather than a strategic process, always circumstantial, ad hoc, whereas crisis management gives the impression of being more strategic, planned in advance with set options for different eventualities: as found, for example in the bureaucracies of UN agencies, major aid-giving NGOs and government departments. Coping, of course, works as a response because certain bodies of knowledge and performative and intellectual skills are in place, but of itself it is spontaneous. It can anticipate outcomes to a degree, but must respond in a context of uncertainty about when those outcomes will occur and what form they will take. Much of the time cultural adaptation is about the constant reorganization of anticipatory behaviour in the context of previous anticipated and unanticipated events and outcomes, to resist future entropy and randomness. So what those in positions of power need to insist upon and ensure, whether governments, local administrations, agencies, NGOs or consultants, is simply that the conditions of development and disaster relief planning always leave space for the free and voluntary employment of local knowledge to find its way into the response patterns of those confronted with crises, by first of all valuing and not demeaning that knowledge, but also by proactively encouraging those conditions that minimize its erosion while at the same time identifying the kinds of situations where it is most relevant.

Acknowledgements

This introduction was written with support made available through ESRC grant RES-000-22-1106, 'The ethnography, ethnobotany and dispersal of palm starch extraction'. Through their chapters and abstracts, all authors of this volume have made a direct, and as they will note, a recognizable textual contribution, but I would like to thank the following in addition for their advice on various matters connected with its preparation and completion: Perpetua George, Piers Locke, Laura Meitzner Yoder, Dario Novellino, Raj Puri and Rini Soemarwoto. Simon Platten has prepared the map in Figure 1.1, and Rosemary Bolton provided some of the Nuaulu data. Earlier versions were presented at the University of Wageningen in the Netherlands, and at a conference at the University of Oxford in July 2005 to celebrate the half-century of Queen Elizabeth House. I would like to thank Patricia Howard in connection with the first, and Laura Rival with respect to the second, an event that was generously funded by the UK government Department for International Development.

Notes

1. Based on the Dutch colonial archives for southeastern Kalimantan, Knapen (2001: 41–45, 141) is able to discuss in some detail and with surprising accuracy the occurrence of dry years, including ENSO years, for 1748–1838, as well as floods, fires, earthquakes, devastating winds and the impact of epidemic diseases, such as smallpox. He is able to make the point most effectively that the image of Borneo as an environmentally stable area (when compared, for example, with Java) is difficult to sustain, ecological variation and unpredictability being much more pronounced than most people might expect (ibid., 367). See, especially, his meticulous 'Overview of disasters, 1747–1880' (ibid.: Appendix 1, 404–10), in which he logs recorded events for the following descriptors: heavy rain, drought, forest fire, cholera, smallpox, measles, rodent infestation and war.
2. Understandably, crises themselves are not moments that easily lend themselves to rational planning, and in such contexts some stock responses are essential. Equally, we know from the psychology of stress that this often provides the extra stimulus for the body and brain to go into coping overdrive (e.g. Cox 1978: 53–90), which may encourage especially innovative behaviour.

References

Aditjondro, G.J. 2001. 'Guns, Pamphlets and Handie-talkkies: How the Military Exploited Local Ethno-religious Tensions in Maluku to Preserve their Political and Economic Privileges', in I. Wessel and G. Wimhöfer (eds.), *Violence in Indonesia*. Hamburg: Abera, pp. 100–28.

Alatas, S.H. 1977. *The Myth of the Lazy Native*. London: Cass.

Alcorn, J. 1995. 'Ethnobotanical Knowledge Systems: a Resource for Meeting Rural Development Goals', in D.M. Warren, L.J. Slikkerveer and D. Brokensha (eds.), *The Cultural Dimension of Development: Indigenous Knowledge Systems*. London: Intermediate Technology Publications, pp. 1–12.

Alland, A. 1970. *Adaptation in Cultural Evolution: an Approach to Medical Anthropology*. New York: Columbia University Press.

Ananta, A. (ed.). 2003. *The Indonesian Crisis: a Human Development Perspective*. Singapore: Institute of Southeast Asian Studies.

Aquino, D.M. 2004. 'Resource Management in Ancestral Lands: the Bugkalots in Northeastern Luzon', doctoral dissertation. Institute of Environmental Studies, University of Leiden,

Aragon, L.V. 2001. ''Communal Violence in Poso, Central Sulawesi: Where People Eat Fish and Fish Eat People'. *Indonesia* 72: 45–79.

Barber, C.V. and K. Talbott. 2003. 'The Chainsaw and the Gun: the Role of the Military in Deforesting Indonesia', S. Price (ed.), in *War and Tropical Forests: Conservation in Areas of Armed Conflict*. Binghampton, NY: Food Products Press, pp. 137–66.

Barr, C.V. and I. Resosudarmo. 2002. *Decentralization of Forest Administration in Indonesia: Implications for Forest Sustainability, Community Livelihoods and Economic Development*. Bogor, Indonesia: Center for International Forestry Research.

Bates, D.M. 1985. 'Plant Utilization: Patterns and Prospects', *Economic Botany* 39: 241–65.

Bellwood, P. 1985. *Prehistory of the Indo-Malaysian Archipelago*. Sydney, London: Academic Press.

Bernstein, J.H. 1996. 'Higher-Order Categories in Brunei Dusun Ethnobotany: the Folk-classification of Rainforest Plants', in D.S. Edwards, W.E. Booth and S.C. Choy (eds.), *Tropical Rainforest Research – Current Issues*. Dordrecht: Kluwer, pp. 435–50.

Bernstein, J.H., R.F. Ellen and Bantong Antaran. 1997. 'The Use of Plot Surveys for the Study of Ethnobotanical Knowledge: a Brunei Dusun Example', *Journal of Ethnobiology* 17(1): 69–96.

Bernstein, R.J., B.H. Siwi and H.M. Beachell. 1982. *The Development and Diffusion of Rice Varieties in Indonesia*. Research Paper Series No. 71. Los Baños: IRRI.

Bhandari, M.M. 1974. 'Famine Foods in the Rajasthan Desert', *Economic Botany* 28: 73–81.

Bicker, A., P. Sillitoe and J. Pottier. 2004. *Development and Local Knowledge: New Approaches to Issues in Natural Resources Management, Conservation and Agriculture*. London: Routledge.

Boeke, J.H. 1966. *Indonesian Economics*. The Hague: W. van Hoeve.

Booth, A. 1988. *Agricultural Development in Indonesia*. Sydney: Asian Studies Association of Australia, Allen and Unwin.

Breman, J. and G. Wiradi. 2002. *Good Times and Bad Times in Rural Java: Case Study of Socio-economic Dynamics in Two Villages towards the End of the Twentieth Century*. Singapore: Institute of Southeast Asian Studies.

Brosius, J.P. 2001. 'The Politics of Ethnographic Presence: Sites and Typologies in the Study of Transnational Movements', in C.L. Crumley (ed.), *New Directions in Anthropology and Environment*. Walnut Creek, CA: Altamira, pp. 150–76.

Brouwer, A. 1998. 'From Abundance to Scarcity: Sago, Crippled Modernization and Curtailed Coping', in S. Pannell and F. von Benda-Beckman (eds), *Old World Places, New World Problems: Exploring Issues of Resource Management in Eastern Indonesia*. Canberra: Australian National University, pp. 336–87.

Budiman, A., B. Hatley and D. Kingsbury (eds). 1999. *Reformasi: Crisis and Change in Indonesia*. Clayton: Monash Asia Institute.
Burkill, I.H. 1935. *A Dictionary of Economic Products of the Malay Peninsula*, 2 vols. London: Crown Agents for the Colonies.
Carr, L.G. 1943. 'Survival Foods of the American Aborigines', *Journal of the American Dietetic Association* 19: 845–47.
Catley, R. 1976. 'The Development of Underdevelopment in South-East Asia', *Journal of Contemporary Asia* 6(1): 54–74.
Chedd, G. 1970. 'Hidden Perils of the Green Revolution', *New Scientist* 48(724): 171–73.
Chin, S.C., D. Jeyakuman, K. Jomo and K. Khoo. 1992. *Logging Against the Natives of Sarawak*. Kuala Lumpur, Malaysia: INSAN.
Christensen, H. 2002. *Ethnobotany of the Iban and the Kelabit*. Forest Department, Sarawak, Malaysia NEPCon, Denmark, and University of Aarhus, Denmark.
Christopher, T. 1985. 'The Famine Garden of Prince Chu Su', *Garden* [New York Botanical Garden] 9(May/June): 18–21.
Collier, W.L. 1973. 'Recent Changes in Rice Harvesting Methods', *Bulletin of Indonesian Economic Studies* 9: 36–45.
Colombijn, F. and J.T. Lindblad. 2002. 'Introduction', in F. Colombijn and J.T. Lindblad (eds), *Roots of Violence in Indonesia: Contemporary Violence in Historical Perspective*. Verhandelingen 194. Leiden: KITLV Press, pp. 1–31.
Conklin, H.C. 1957. *Hanunó Agriculture: a Report on an Integral System of Shifting Cultivation in the Philippines*. Forestry Development Paper No. 12. Rome: Food and Agriculture Organization of the United Nations.
Cox, T. 1978. *Stress*. London: Macmillan.
Curran, L.M., I. Caniago, G.D. Paoli, D. Astiani, M. Kusneti, M. Leighton, C.E. Nirarita and H. Haeruman. 1999. 'Impact of El Niño and Logging on Canopy Tree Recruitment in Borneo', *Science* 286: 2184–88.
Curran, L.M., S.N. Trigg, A.K. McDonald, D. Astianti, Y.M. Hardiono, P. Siregar, I. Caniago and E. Kasischke. 2004. 'Lowland Forest Loss in Protected Areas of Indonesian Borneo', *Science* 303: 1000–3.
Donner, W. 1987. *Land Use and Environment in Indonesia*. London: Hurst.
Donovan, D.G. 1999. *Strapped for Cash, Asians Plunder their Forests and Endanger their Future*. Asia Pacific Issues Paper No. 39. Honolulu, Hawaii: East-West Center.
Dove, M.R. 1998. 'Local Dimensions of "Global" environmental debates', in A. Kalland and G. Persoon (eds), *Environmental Movements in Asia*. Richmond: Curzon Press, pp. 44–64.
___. 2000. 'The Life-cycle of Indigenous Knowledge, and the Case of Natural Rubber Production', in R. Ellen, P. Parkes and A. Bicker (eds), *Indigenous Environmental Knowledge and its Transformations: Critical Anthropological Perspectives*. Studies in Environmental Anthropology 5. London: Harwood, pp. 213–51.
Dove, M.R. and D.M. Kammen. 1997. 'The Epistemology of Sustainable Resource Use: Managing Forest Products, Swiddens, and High-yielding Variety Crops', *Human Organization* 56(1): 91–101.
Dove, M.R., D.S. Smith, M.T. Campos, A.S. Mathews, A. Rademacher, Suk Bae Rhee, and L. Meitzner Yoder. 2006. 'Globalisation and the Construction of Western and Non-Western Knowledge', in P. Sillitoe (ed.), *Local Science Versus Global Science*. Oxford: Berghahn, pp. 129–54.
Ellen, R.F. 1982. *Environment, Subsistence and System: the Ecology Small-Scale Social Formations*. Cambridge: Cambridge University Press.

___. 1987. 'Environmental Perturbation, Inter-Island Trade and the Re-location of Production Along the Banda Arc; or, Why Central Places Remain Central', in T. Suzuki and R. Ohtsuka (eds), *Human Ecology of Health and Survival in Asia and the South Pacific*. Tokyo: University of Tokyo Press, pp. 35–61.

___. 1996. 'Individual Strategy and Cultural Regulation in Nuaulu Hunting', in R. Ellen and K. Fukui (eds), *Redefining Nature: Ecology, Culture and Domestication*. Oxford: Berg, pp. 597–635.

___. 1999. 'Modes of Subsistence and Ethnobiological Knowledge: Between Extraction and Cultivation in Southeast Asia', in D.L. Medin and S. Atran (eds), *Folkbiology*. Cambridge, MAS: MIT Press, pp. 91–117.

___. 1999a. 'Deforestation and Forest Knowledge in South Central Seram, Eastern Indonesia', End of Award Report R000 23 6082 for the Economic and Social Research Council.

___. 2003. *On the Edge of the Banda Zone: Past and Present in the Social Organization of a Moluccan Trading Network*. Honolulu: University of Hawaii Press.

___. 2004. 'Escalating Socio-environmental Stress and the Preconditions for Political Instability in South Seram: the Very Special Case of the Nuaulu', *Cakalele: Maluku Research Journal* 11: 41–64.

___. 2004b. 'Processing Metroxylon Sagu (ARECACEAE) as a Technological Complex: a Case Study from South Central Seram, Indonesia', *Economic Botany* 58(4): 50–74.

___. 2004c. 'The Distribution of Metroxylon Sagu and the Historical Diffusion of a Complex Traditional Technology', in P. Boomgaard and D. Henley (eds), *Smallholders and Stockbreeders: Histories of Foodcrop and Livestock Farming in Southeast Asia*. Verhandelingen van het Koninklijk Instituut voor Taal-, Land- en Volkenkunde 218. Leiden: KITLV Press, pp. 69–105.

___. 2005. 'Production and Consumption of *Metroxylon sagu* as a Buffer Against Hard Times in South Central Seram, Eastern Indonesia'. Paper presented at the Fourth International Congress of Ethnobotany, 21–26 August 2005, Istanbul.

Ellen, R.F. and J. Bernstein. 1994. 'Urbs in Rure: Cultural Transformations of the Rainforest in Modern Brunei', *Anthropology Today* 10(4): 16–19.

Ellen, R.F. and H. Harris. 2000. 'Introduction', in R.F. Ellen, P. Parkes and A. Bicker (eds), *Indigenous Environmental Knowledge and its Transformations: Critical Anthropological Perspectives*. Amsterdam: Harwood, pp. 1–33.

FAO (Food and Agricultural Organization). 2001. *Global Forest Resources Assessment 2000 Main Report*. Forestry Papers, 140. Rome: FAO.

Fegan, B. 1989. 'The Philippines: Agrarian Stagnation Under a Decaying Regime', in G. Hart, A. Turton and B. White (eds), *Agrarian Transformations: Local Processes and the State in Southeast Asia*. Berkeley: University of California Press, pp. 125–43.

Firth, R. 1959. *Social Change in Tikopia: Re-study of a Polynesian Community After a Generation*. London: George Allen and Unwin.

Fisher, C.A. 1964. *South-East Asia: a Social, Economic and Political Geography*. London: Methuen.

Florey, M.J. 2001 'Threats to Indigenous Knowledge: a Case Study from Eastern Indonesia', in L. Maffi (ed.), *On Biocultural Diversity: Linking Language, Knowledge, and the Environment*. Washington, DC: Smithsonian Institution Press, pp. 325–42.

Florey, M.J. and X.Y. Wulff. 1998. 'Incantations and Herbal Medicines: Alune Ethnomedical Knowledge in a Context of Change', *Journal of Ethnobiology* 18(1): 39–67.

Fox, J.J. 1991. 'Managing the Ecology of Rice Production in Indonesia', in J. Hardjono (ed.), *Indonesia: Resources, Ecology and Environment*. Singapore: Oxford University Press, pp. 61–84.

___. 2001. 'The Impact of the 1997–98 El Niño on Indonesia', in R.H. Grove and J. Chappell (eds), *El Niño, History and Crisis: Studies from the Asia-Pacific Region*. Knapwell: White Horse Press, pp. 171–90.

Gammie, G.A. 1902. 'A Note on Plants Used for Food During Famines and Seasons of Scarcity in the Bombay Presidency, India', *Botanical Survey Records* 2(2): 171–96.

Geertz, C. 1963 *Agricultural Involution: the Processes of Ecological Change in Indonesia*. Berkeley and Los Angeles: University of California Press.

Gellert, P.K. 1998. 'A Brief History and Analysis of Indonesia's Forest Fire Crisis', *Indonesia* 65: 63–85.

Gerdin, I. 1982. *The Unknown Balinese: Land, Labour and Inequality in Lombok*. Göteborg Studies in Social Anthropology 4. Göteborg: Acta Universitatis Gothoburgensis.

Glass, N. 2005. '"Stone Age" Life of Island Tribespeople Helped them Survive "Black Sunday"', *Independent on Sunday*, 16 January, 21.

Goss, J. 2004. 'Understanding the "Maluku Wars": Overview of Sources of Communal Conflict and Prospects for Peace', *Cakalele: Maluku Research Journal* 11: 7–40.

Gray, A. 1995. 'The Indigenous Movement in Asia', in R.H. Barnes, A. Gray and B. Kingsbury (eds), *Indigenous Peoples of Asia*. Monograph 48. Ann Arbor: Association for Asian Studies, pp. 35–58.

Griffin, K. 1974. *The Political Economy of Agrarian Change: an Essay on the Green Revolution*. Cambridge, MA: Harvard University Press.

Gunderson, L. 2003. 'Adaptive Dancing: Interactions Between Social Resilience and Ecological Crises', in F. Berkes, J. Colding and C. Folke (eds), *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press, pp. 33–52.

Gupta, R.K. and K.C. Kanodia. 1968. 'Plants Used During Scarcity and Famine Periods in the Dry Regions of India', *Journal d'Agriculture Tropicale et de Botanique Appliquée* 15: 265–85.

Harrison, G.A. 1988. 'Seasonality and Human Population Biology', in I. De Garine and G.A. Harrison (eds), *Coping with Uncertainty in Food Supply*. Oxford: Clarendon Press, pp. 26–31.

Hart, G. 1989. 'Agrarian Change in the Context of State Patronage', in G. Hart, A. Turton, and B. White (eds), *Agrarian Transformations: Local Processes and the State in Southeast Asia*. Berkeley: University of California Press, pp. 31–49.

Hart, G., A. Turton and B. White (eds). 1989. *Agrarian Transformations: Land Processes and the State in Southeast Asia*. Berkeley: University of California Press.

Headland, T.N. 1987. 'The Wild Yam Question: How Well Could Independent Hunter-gatherers Live in a Tropical Rainforest Ecosystem?', *Human Ecology* 15(4): 463–92.

Hely-Hutchinson, W.F. 1898. 'Famine Plants in Zululand', *Royal Botanic Gardens at Kew, Bulletin of Miscellaneous Information* 135: 52–54.

Higgins, B. 1955. 'The Dualistic Theory of Underdeveloped Areas'. *Ekonomi dan Keuangan Indonesia* 8(2): 58–78.

Hill, R.D. 2004. 'Towards a Model of the History of "Traditional" Agriculture in Southeast Asia', in P. Boomgaard and D. Henley (eds), *Smallholders and Stockholders: Histories of Foodcrop and Livestock Farming in Southeast Asia*.

Verhandelingen van het Koninklijk Instituut voor Taal-, Land- en Volkenkunde, 218. Leiden: KITLV Press, pp. 19–45.
Hoare, A.L. 2002. 'Cooking the Wild: the Role of the Lundayeh of the Ulu Padas (Sabah, Malaysia) in Managing Forest Foods and Shaping the Landscape', thesis submitted for the Degree of Doctor of Philosophy, University of Kent at Canterbury.
Irvine, F.R. 1952. 'Supplementary and Emergency Food Plants of West Africa', *Economic Botany* 6(1): 23–40.
___. 1957. 'Wild and Emergency Foods of Australian and Tasmanian Aborigines', *Oceania* 23(2): 113–42.
Iskandar, J. 1998. 'Swidden Cultivation as a Form of Cultural Identity: the Baduy Case', thesis submitted for the Degree of Doctor of Philosophy, University of Kent at Canterbury.
Jellinek, L. and B. Rustanto. 1999. *Survival Strategies of the Javanese During the Economic Crisis*. Consultancy Report. Jakarta: World Bank.
Jordan, B.1997. 'Authoritative Knowledge and its Construction', in R. Davis-Floyd and C. Sargent (eds), *Childbirth and Authoritative Knowledge: Cross-Cultural Perspectives*. Berkeley: University of California Press, pp. 50–79.
Kalland, A. and G. Persoon. 1998. 'An Anthropological Perspective on Environmental Movements', in A. Kalland and G. Persoon (eds), *Environmental Movements in Asia*. Richmond: Curzon Press, pp. 1–43.
Knapen, H. 2001. *Forests of Fortune? The Environmental History of Southeast Borneo, 1600–1880*. Verhandelingen, 189. Leiden: KITLV Press.
Lansing, J.S. 1991. *Priests and Programmers: Technologies of Power in the Engineered Landscape of Bali*. Princeton, NJ: Princeton University Press.
Leighton, M. and N. Wirawan (eds) 1986. 'The El Niño-Southern Oscillation Event in Southeast Asia: Effects of Drought and Fire on Tropical Forest in Eastern Borneo'. Report for IUCN/WWF, Project US-293.
Li, T.M. 1999. 'Marginality, Power and Production: Analysing Upland Transformations', in T.M. Li (ed.), *Transforming the Indonesian Uplands: Marginality, Power and Production*. Studies in Environmental Anthropology, 4. Amsterdam: Harwood, pp. 1–44.
Lim Teck Ghee and M.I. Said. 1989. 'Malaysia: Rice, Peasants and Political Priorities in an Economy Undergoing Restructuring', in G. Hart, A. Turton, and B. White (eds), *Agrarian Transformations: Local Processes and the State in Southeast Asia*. Berkeley: University of California Press, pp. 181–92.
Maffi, L. 2001. 'Introduction: On the Interdependence of Biological and Cultural Diversity', in L. Maffi (ed.), *On Biocultural Diversity: Linking Language, Knowledge, and the Environment*. Washington, DC: Smithsonian Institution Press, pp. 1–50.
___. 2004. 'Maintaining and Restoring Biocultural Diversity: the Evolution of a Role for Ethnobiology', in T.J.S. Carlson and L. Maffi (ed.), *Ethnobotany and Conservation of Biocultural Diversity*. Advances in Economic Botany, 15. New York: New York Botanical Garden Press, pp. 9–35.
Manning, C. 2000. 'Labour Market Adjustment to Indonesia's Economic Crisis: Context, Trends and Implications', *Bulletin of Indonesian Economic Studies* 36(1): 105–36.
Maxwell, H. 1916. 'Tree Bark as Human Food', *American Forestry* 22(May): 277–80.
Metzner, J.K. 1976. 'Lamtoronisasi: an Experiment in Soil Conservation', *Bulletin of Indonesian Economic Studies* 12(1): 103–9.
___. 1983. 'Innovations in Agriculture Incorporating Traditional Production Methods: the Case of Amarasi (Timor)', *Bulletin of Indonesian Economic Studies* 19(3): 94–105.

Minnegal, M. and P.D. Dwyer. 2000. 'Responses to a Drought in the Interior Lowlands of Papua New Guinea: a Comparison of Bedamuni and Kubo-Konai', *Human Ecology* 28(4): 493–526.

Murphy, D. 2001. 'The Rise of Robber Barons Speeds Forest Decline', *Christian Science Monitor*, 24 August.

Nabhan, G.P. and S. St. Antoine. 1993 'The Loss of Floral and Faunal Story: the Extinction of Experience', in S.R. Kellert and E.O. Wilson (eds), *The Biophilia Hypothesis*. Washington, DC: Island Press, pp. 229–50.

Oliver-Smith, A. 1986. *Natural Disasters and Cultural Responses*. Studies in Third World Societies, 36. Williamsburg, VA: Department of Anthropology, College of William and Mary.

___. 1999. '"What Is a Disaster?": Anthropological Perspectives on a Persistent Question', in A. Oliver-Smith and S. M. Hoffman (eds), *The Angry Earth: Disaster in Anthropological Perspective*. London: Routledge, pp. 18–34.

Ormeling, F.J. 1956. *The Timor Problem: a Geographical Interpretation of an Underdeveloped Island*. The Hague: Martinus Nijhoff.

Paton, D.N. and J.C. Dunlop. 1904. 'The Nutritive Values of Some Uncultivated Foods Used by the Bhils During Recent Famines', *Agricultural Ledger* 6: 37–73.

Persoon, G. 1992. 'From Sago to Rice: Changes in Cultivation in Siberut', in E. Croll and D. Parkin (eds), *Bush Base: Forest Farm: Culture, Environment and Development*. London: Routledge, pp. 187–99.

Pollock, N.J. 1992. *These Roots Remain: Food Habits in Islands of the Central and Eastern Pacific Since Western Contact*. Hawaii: Institute for Polynesian Studies.

Pottier, J. 1999. *Anthropology of Food: the Social Dynamics of Food Security*. Cambridge: Polity.

Pottier, J., A. Bicker and P. Sillitoe (eds). 2003. *Negotiating Local Knowledge: Identity, Power and Situated Practice in Development Intervention*. London: Pluto.

Puri, R.K. and Donovan, D.G. 2004. 'Asia's Tropical Forests in a Changing Global Context: Can Expert-led Policy Making Cope with Change?' *Proceedings of the International Symposium Tropical Forests in a Changing Global Context*, 8–9 November 2004. Brussels: UNESCO (MAB) and the Belgian Royal Academy of Overseas Sciences (RAOS).

Rao, P., C.M. Jacob and B.V. Ramasastri. 1969. 'The Nutritive Value of Bamboo Seeds', *Journal of Nutrition and Dietetics (Coimbatore)* 6(3): 192–95.

Read, B.E. (ed.). 1946. *Famine Foods Listed in the Chiu Huang Pen Ts'ao [of Ting Wang Chou]: Giving their Identity, Nutritional Values and Notes on their Preparation*. Shanghai: Henry Lester Institute of Medical Research.

Richards, P. 1993. 'Cultivation: Knowledge or Performance?', in M. Hobart (ed.), *An Anthropological Critique of Development*. London: Routledge, pp. 61–78.

Sahlins, M. 1972. *Stone Age Economics*. London: Tavistock.

Salih, O.M., A.M. Nour and D.B. Harper. 1991. 'Chemical and Nutritional Composition of Two Famine Food Sources Used in Sudan, Mukheit (*Boscia senegalensis*) and Maikah (*Dobera roxburghi*), *Journal of the Sciences of Food and Agriculture* 57: 367–77.

Schulte Nordholt, H. 2002. 'A Genealogy of Violence', in F. Colombijn and J. Thomas Lindblad (eds), Roots of Violence in Indonesia: Contemporary Violence in Historical Perspective. Verhandelingen 194. Leiden: KITLV Press, pp. 33–61.

Schwarz, A. 1999. *A Nation in Waiting: Indonesia's Search for Stability*. St Leonards: Allen and Unwin.

Scoones, I., M. Melnyk and J. Pretty. 1992. *The Hidden Harvest: Wild Foods and Agricultural Systems: a Literature Review and Annoted Bibliography*. London: International Institute for Environment and Development.

Scott, J.C. 1976. *The Moral Economy of the Peasant: Rebellion and Subsistence in Southeast Asia*. New Haven: Yale University Press.
___. 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition have Failed*. New Haven, London: Yale University Press.
Sharma, S.D. 2001. 'The Indonesian Financial Crisis: From Banking Crisis to Financial Sector Reforms, 1997–2000', *Indonesia* 71: 79–110.
Shortt, J. 1887/88. 'List of Wild Plants and Vegetables Used as Food by People in Famine Times', *Indian Forester* 3: 232–38.
Sillitoe, P., A. Bicker and J. Pottier. 2002. *Participating in Development: Approaches to Indigenous Knowledge*. London: Routledge.
Smith, A.E. 1979. 'Chayanov, Sahlins, and the Labour-Consumer Balance', *Journal of Anthropological Research* 35(4): 477–80.
Smith, J., S. Obidzinski and I. Suramenggala. 2003. 'Illegal Logging, Collusive Corruption and Fragmented Governments in Kalimantan, Indonesia', *International Forestry Review* 5(3): 293–302.
Sodhi, N.S., Lian Pin Koh, B.W. Brooks and P.K.L. Ng. 2004. 'Southeast Asian Biodiversity: an Impending Disaster', *Trends in Ecology and Evolution* 19(12): 654–60.
Soemarwoto, O. 1991. 'Human Ecology in Indonesia: the Search for Sustainability in Development', in J. Hardjono (ed.), *Indonesia: Resources, Ecology and Environment*. Singapore: Oxford University Press, pp. 212–35.
Soemarwoto, R. 2004. ' Changing Perceptions of Nature in Upland West Java: the Kasepuhan Case', Thesis submitted for the Degree of Doctor of Philosophy, University of Kent at Canterbury:
Sowerwine, J.C. 2004. 'Effects of Economic Liberalization on Dao Women's Traditional Knowledge, Ecology, and Trade of Medicinal Plants in Northern Vietnam', in T.J.S. Carlson and L. Maffi (eds), *Ethnobotany and Conservation of Biocultural Diversity*. Advances in Economic Botany, 15. New York: New York Botanical Garden Press, pp. 235–62.
Speth, J.D. and K.A. Spielman 1983. 'Energy Source, Protein Metabolism, and Hunter-Gatherers', *Journal of Anthropological Archaeology* 2: 1–31.
Stauffer, R.B. 1985. 'The Philippine Political Economy: (Dependent) State Capitalism in the Corporatist Mode', in R. Higgott and R. Robison (eds), *South East Asia: Essays in the Political Economy of Structural Change*. London: Routledge, Kegan and Paul, pp. 241–65.
Stini, W.A. 1975. 'Adaptive Strategies of Human Populations Under Nutritional Stress', in E. Watts, F.E. Johnston and G.L. Lasker (eds), *Biosocial Interrelations in Population*. The Hague: Mouton, pp. 19–41.
___. 1988. 'Food, Seasonality and Human Evolution', in I. De Garine and G.A. Harrison (eds), *Coping with Uncertainty in Food Supply*. Oxford: Clarendon Press, pp. 32–51.
Strauss, J., K. Beegle, A. Dwiyanto, Y. Herawati, D. Pattinasarany, E. Satriawan, B. Sikoki, Sukamdik and F. Witoelar. 2004. *Indonesian Living Standards: Before and After the Financial Crisis*. Singapore: Institute of Southeast Asian Studies.
Sunderlin, W.D. 2002. 'Effects of Crisis and Political Change, 1997–1999', in C.J.P. Colfer and I. Resosudarmo (eds), *Which Way Forward? People, Forests, and Policymaking in Indonesia*. Washington, DC: Resources for the Future and Center for International Forestry Research (CIFOR) and Institute of Southeast Asian Studies (ISEAS), pp. 246–76.
Sutherland, W.J. 2003. 'Parallel Extinction Risk and Global Distribution of Languages and Species', *Nature* 423: 276–79.
Swift, J. 1977. 'Sahelian Pastoralists: Underdevelopment, Desertification and Famine', *Annual Review of Anthropology* 6: 457–78.
UNDP. 2002. *Wild-food Plants in Ethiopia: Reflections on the Role of 'Wild-Foods' and*

'Famine-Foods' at a Time of Drought. UN Emergencies Unit for Ethiopia, United Nations Development Programme.
Utrecht, E. 1973. 'Land Reform and BIMAS in Indonesia', *Journal of Contemporary Asia* 3: 149–64.
van Dijk, K. 2001. *A Country in Despair: Indonesia Between 1997 and 2000*. Verhandelingen 186. Leiden: KITLV Press.
van Klinken, G. 2001. 'The Maluku Wars: Bringing Society Back In', *Indonesia* 71: 1–26.
van Steenis, C.G.G.J. (ed.). 1948. *Flora Malesiana*. Jakarta: Noordhoff-Kolff.
Vayda, A.P. and B.J. McCay. 1975. 'New Directions in Ecology and Ecological Anthropology', *Annual Review of Anthropology* 4: 293–306.
Vedwan, N. and R.E. Rhoades. 2001. 'Climate Change in the Western Himalayas of India: a Study of Local Perception and Response', *Climate Research* 19: 109–117.
Vel, J.A.C. 2001. 'Tribal Battle in a Remote Island: Crisis and Violence in Sumba (Eastern Indonesia)', *Indonesia* 72: 141–58.
von Benda-Beckmann, F. 1990. 'Sago, Law and Food Security on Ambon', in J.I. Bakker (ed.), *The World Food Crisis: Food Security in Comparative Perspective*. Toronto: Canadian Scholar's Press, pp. 157–99.
von Benda-Beckmann, F., K. von Benda-Beckmann and A. Brouwer. 1995. 'Changing "Indigenous Environmental Law" in the Central Moluccas: Communal Regulation and Privatisation of Sasi', *Ekonesia* 2: 1–38.
Walker, P.J.C. 1995. 'Indigenous Knowledge and Famine Relief in the Horn of Africa', in D.M. Warren, L.J. Slikkerveer and D. Brokensha (eds), *The Cultural Dimension of Development: Indigenous Knowledge Systems*. London: Intermediate Technology Publications, pp. 147–54.
Warren, D.M., L.J. Slikkerveer and D. Brokensha (eds), 1995. *The Cultural Dimension of Development: Indigenous Knowledge Systems*. London: Intermediate Technology Publications.
Wertheim, W.F. 1968. 'Changing Southeast-Asian Societies: an Overview', *International Encyclopedia of the Social Sciences* 1: 423–38.
Wessel, I. and G. Wimhöfer. 2001. 'Introduction', in I. Wessel and G. Wimhöfer (eds), *Violence in Indonesia*. Hamberg: Abera, pp. 8–14.
White, B. 1983. '"Agricultural Involution" and its Critics: Twenty Years After', *Bulletin of Concerned Asian Scholars* 15(2): 18–31.
Whitten, A., R.E. Soeriaatmadja and S.A. Afiff. 1997. *The Ecology of Java and Bali*. Oxford: Oxford University Press.
Wilkins, E.G. 1942. 'Mango Kernels as Food', *Indian Farming* 3: 636–37.
Wilmsen, E.N. and D. Durham. 1988. 'Food as a Function of Seasonal Environment and Social History', in I. De Garine and G. A. Harrison (eds). *Coping with Uncertainty in Food Supply*. Oxford: Clarendon Press, pp. 52–87.
Zent, S. 2001. 'Acculturation and Ethnobotanical Knowledge: Knowledge Loss among the Piaroa of Venezuela', in L. Maffi (ed.), *On Biocultural Diversity: Linking Language, Knowledge and the Environment*. Washington, DC: Smithsonian Institution Press, pp. 190–211.
Zerner, C. 1994. 'Through a Green Lens: the Construction of Customary Environmental Law and Community in Indonesia's Maluku Islands', *Law and Society Review* 28(5): 1079–122.
Zinyama, L.M., T. Matiza, T. and D.J. Campbell. 1990. 'The Use of Wild Foods During Periods of Food Shortage in Rural Zimbabwe', *Ecology of Food and Nutrition* 24(4): 231–55.