Environmental Conservation **30** (1): 79–90 © 2003 Foundation for Environmental Conservation DOI:10.1017/S0376892902000079

Traditional agroecological knowledge, adaptive management and the socio-politics of conservation in Central Sulawesi, Indonesia

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Date submitted: 28 November 2001 Date accepted: 25 September 2002

SUMMARY

This paper illustrates the opportunity for conservation offered by linking traditional agroecological knowledge and advances in adaptive management theory and practice. Drawing on examples from the Banawa-Marawola region of Central Sulawesi, Indonesia, a suite of traditional resource management practices premised on principles of adaptive management are identified and assessed, including: (1) resource management practices and regulations that are associated with the dynamics of complex systems; (2) procedural, planning and decision-making processes that foster learning; (3) sanctions and taboos that act as social mechanisms for the management and conservation of natural resources; and (4) ceremonies and social interactions that promote cultural internalization of the various practices, procedures and mechanisms. In addition, an emerging socio-political movement in the Banawa-Marawola region is explored. Premised on the strengthening of traditional rights and practices, the nascent *Kamalise* movement potentially provides the socio-political, institutional and organizational context needed to link traditional agroecological knowledge and adaptive management with broader conservation goals. Based on this analysis, two opportunities to enhance conservation in the region are identified: first, maintaining traditional agroecological systems and the associated adaptive resource management strategies used by local groups, and second, building upon the Kamalise movement to forge conservation alliances among communities, non-government and government organizations in which locally-evolved adaptive resource management strategies can be effectively applied. Both opportunities to combine traditional knowledge, adaptive management and conservation, however, are linked to the development aspirations of traditional groups: self-determination, acquisition of land rights and controlling the impacts of changes in livelihood.

Keywords: agroecosystems, community-based management, ecosystems, environmental policy, indigenous knowledge, resource management, sustainability

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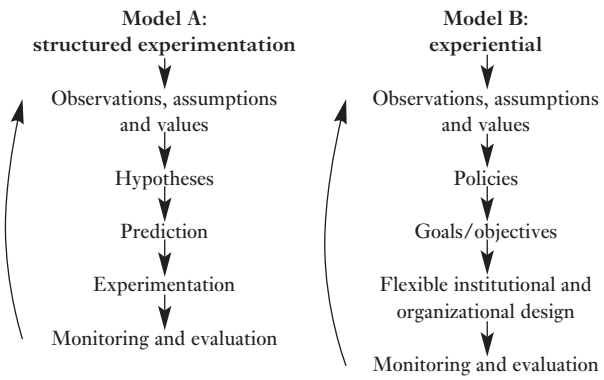
INTRODUCTION

Adaptive management, a learning process focused on improving policy and practice in the face of uncertainty, is often presented as a tool to frame the philosophical, methodological and practical challenges associated with the management of natural resources (Holling 1978; Walters 1986; Walters & Holling 1990; Lee 1993; Gunderson *et al*. 1995; Gunderson 1999). The premise is simple: policies are experiments; learn from them (Lee 1993). As Grumbine (1994) noted, adaptive management assumes scientific uncertainty and offers an approach that traditionally encourages continuous learning through both structured experimentation and management flexibility. Increasingly, adaptive management is also presented as an integrative tool to help address the complexities and broader challenges of conservation (Berkes & Folke 1998; Scoones 1999; Agrawal 2000; Salafsky *et al*. 2001), in spite of the many socio-political and institutional variables that influence the feasibility of this approach. Adaptive management is, ultimately, a political process and sensitivity to the contextual conditions that surround the approach is necessary. Political uncertainty, institutional capacity limitations, financial constraints, existing power relationships among resource users and diverse world views are significant impediments to its adoption (Lee 1993, 1999; Gunderson *et al*. 1995; McLain & Lee 1996; Gunderson 1999; Johnson 1999*a*, *b*).

The actual implementation of adaptive management, moreover, has taken many forms and greater sensitivity to issues of definition is required. It is important to differentiate, at a minimum, between 'active' adaptive management and 'passive' adaptive management (see Lee 1993; Walters & Holling 1990; McLain & Lee 1996; Gunderson 1999). Active adaptive management is a structured experimental or quasi-experimental approach used to test different resource management prescriptions, strategies or policies. Passive adaptive management implies a learning process or experiential approach associated with the design and implementation of projects, programmes and policies supported by flexible institutional and organizational arrangements. Monitoring is a central component of both, although the applicability of the different models of adaptive management depends on a range of enabling conditions (see Fig. 1; Table 1).

It is in the context of this latter definition that significant potential exists to enhance conservation by linking adaptive management and the experiential knowledge possessed by traditional societies, a potential that has been neglected to

Figure 1 Two idealized models of an adaptive approach.



date (Berkes 1999; Berkes *et al*. 2000; Ford & Martinez 2000). Locally evolved resource management systems often illustrate and apply adaptive management principles, namely an emphasis on learning, innovation and flexibility, recognition of inherent uncertainty in social-ecological systems across scales, and a non-deterministic world view in response to system uncertainty (Netting 1968; Moran 1991; Gadgil *et al*. 1993; Agrawal 1995; Berkes *et al*. 2000; Fernandez-Gimenez 2000; Olsson & Folke 2001). Adaptation and innovation at local scales, however, are typically facilitated by a learning-by-doing approach based on experiential knowledge, rather than knowledge gained through structured experimentation (Berkes & Folke 1998; Berkes 1999; Olsson & Folke 2001). Based on a number of case study analyses and a review of the international literature, Berkes and Folke (1998) have developed and modified (Berkes *et al*. 2000) a framework which summarizes a range of traditional strategies, socio-cultural processes and associated belief systems that foster adaptive management principles, including: (1) traditional management practices based on ecological knowledge; and (2) the social mechanisms (folklore, rituals, ceremonies) that support those management practices. Still, despite compelling evidence of links, traditional knowledge systems and resource management practices have not adequately contributed to the theory and application of adaptive management (Olsson & Folke 2001). As importantly, where connections between traditional knowledge and adaptive management are made, inadequate attention has been given to the necessary socio-political and institutional context in which those linkages may be meaningfully applied, a theme of central importance in this analysis. While traditional resource management practices, and the knowledge of ecosystem processes upon which they are based, are embedded in often elaborate social institutions and world views that govern human behaviour, the broader socio-political context in which they can be applied to facilitate conservation planning, management and monitoring has not been given adequate treatment.

Drawing on examples from Central Sulawesi, Indonesia, this paper analyses how linking traditional agroecological knowledge and advances in adaptive management theory and practice may enhance conservation practice. Having defined adaptive management and highlighted the links between adaptive management and traditional knowledge, this paper will: (1) identify and assess the traditional knowledge framework and resource management practices used by individuals and communities in the Banawa-Marawola region of Central Sulawesi, illustrating their value as a basis for conservation practice; and (2) explore an emerging institutional and organizational framework in the region that provides the needed socio-political context for an adaptive approach to conservation. This physiographically and socio-culturally heterogeneous region was identified as a valuable context in which to explore the intersection of traditional agroecological knowledge, adaptive management and the socio-politics of conservation for several reasons. The sub-montane and lowland forests of Sulawesi are noted for their regionally high degree of endemism in a range of taxa (Whitten *et al*. 1987; PSL/UNTAD [Pusat Studi Linkungan/Universitas Tadulako] 2000), and as a result, the World Wildlife Fund USA (Olson & Dinerstein 1998) identified tropical forest systems in Sulawesi as an outstanding example of the world's diverse ecosystems and one of 200+ priority targets for conservation action. Between 1992 and 1997, however, the total area under forest cover in Central Sulawesi declined by 15% (Bappeda/BPS [Badan Pusat Statistik] 1996, 2000), while the total area of land under cocoa production in Banawa increased from 2154 ha (4%) in 1994 to 6486 ha (12%) in 1998 (BPS Kabupaten Donggala 1999). In addition, there are dynamic processes of political and institutional change that

Table 1 Characteristics of two models of adaptive management.

Characterization	*Active*	*Passive*
Process and methods	Learning through structured experimentation (assisted by simulation models, workshops, etc.)	Learning-by-doing (assisted by participatory analysis and workshops; application of local and/or traditional knowledge and management practice)
Primary intended outcome	Management of populations or harvestable resources using a complex ecosystem approach	Institutions and organizations focused on testing and exploring integrated policy prescriptions and strategies in complex social-ecological systems
Implementation context	Typically the formal bureaucratic and administrative agencies and organizations concerned with natural resource management	Formal and non-formal institutional and organizational structures including traditional or customary practices and institutions

https://doi.org/10.1017/S0376892903000079 Published online by Cambridge University Press

influence opportunities to link traditional agroecological knowledge, adaptive management and conservation efforts in the region. This includes the emergence of a traditional rights movement in the Banawa-Marawola area, as well as the nationwide regional decentralization agenda (for example, Law 22/1999 on Regional Autonomy). Finally, a traditional resource management system and local knowledge framework premised on principles of adaptive management continues to be used in the Banawa-Marawola region. Communities in the region have generated a cumulative framework of ecological knowledge that has evolved, and continues to evolve, through a process of adaptation and learning.

It is worth clarifying, finally, how the term 'conservation' is used in this paper. Conservation refers to the maintenance of essential ecological processes and life-support systems, the preservation of biodiversity and the sustainable use of wildlife and ecosystems (see IUCN/UNEP/WWF [World Conservation Union/United Nations Environment Programme/Worldwide Fund for Nature] 1991). Protected areas play a central role in this regard (Brandon *et al*. 1998). However, given the paucity of formal protection strategies in most landscapes and regions, opportunities to address conservation goals should emerge as well from efforts to foster local resource-use practices that encourage sustainable use and the conservation, rather than destruction, of natural resources in the broader landscape (i.e. the 'working' agriculture-forestry-settlement landscape; see also Robinson & Redford 1991; Redford & Padoch 1992). This latter derivation of conservation is important in the Banawa-Marawola region because there are no organizations or government initiatives actively promoting parks, protected areas or other exclusionary zones. Rather, conservation goals will be more likely to be achieved in the short term by recognizing and using traditional adaptive management strategies, namely those employed by local people that indirectly and directly foster sustainable use and the conservation of natural resources. Such strategies, however, can contribute more formally to conservation objectives only if broader socio-political, institutional and economic development issues are also addressed: the strengthening of land rights, ensuring opportunities for greater self-determination, and maintaining the traditional agroecological systems currently under threat in the Banawa-Marawola region, for example, from intensified estate crop agriculture and aquaculture development (see PSL/UNTAD 2000; Armitage 2002).

STUDY AREA AND METHODS

Study area

The Banawa-Marawola region of Central Sulawesi, Indonesia, incorporates upland and coastal villages in an area of nearly 1360 km^2. Altitudes range from zero to over 2000 m above sea level, and soils are typically composed of fragile, weakly developed fluvisols and regisols in coastal areas, along with podzols and lithosols in upland regions. Threatened endemic species in the region include the maleo (*Macrocephalon maleo*, a small forest bird whose eggs are harvested by local people), anoa (*Anoa* spp., a small forest buffalo), ebony (*Diospyros celebica*), and the black orchid (*Phalaneopsis celebiencies*) (Whitten *et al*. 1987; PSL/UNTAD 2000). Land-use activities in the region include agricultural production (shifting cultivation, dry and wet rice farming, development of cocoa plantations), small-scale harvesting of timber and non-timber forest products, the conversion of mangrove forests to fishponds, irrigation works, as well as transmigration and settlement schemes (PSL/UNTAD 2000). Primary groups in the region include the indigenous Kaili, along with Mandar, Buginese, Javanese, Sundanese and Torajanese. The Kaili further subdivide themselves into several distinct linguistic groups, of which the Da'a, Unde and Ledo are the most common in the area. Population densities vary dramatically between coastal and upland communities, although the average population densities in Banawa and Marawola are 92 people km^{-2} and 41 people km^{-2}, respectively (BPS Kabupaten Donggala 1999). In comparison, the average population density in Central Sulawesi is 32 people km^{-2}, while the population growth rate in the region is 2.46% $year^{-1}$ (Bappeda/BPS 2000).

Methods

Research was conducted over a period of six months in 2000 and used a participatory rural appraisal approach (Chambers 1992) involving application of a suite of techniques designed to facilitate shared learning and analysis among local people and external agents. The techniques included mapping, preparation of seasonal calendars, semi-formal interviews with key community informants, transects and community-based workshops. Activities were undertaken in eight coastal and upland villages in the Banawa-Marawola region, chosen to represent the diverse land, resource and socio-cultural characteristics of the area (Table 2). A total of five maps and four seasonal calendars were prepared by community focus groups of between 10–15 people composed of a purposively selected cross-section of men, women and youth. Participatory mapping of village lands was used to identify key resource management issues and to focus discussion on land transformation processes in the region. Local residents sketched the maps using large sheets of paper and multiple-colour pens. Among the variables mapped by community members were key landscape features, geographical points of reference, property rights and tenure issues, areas of resource use and protection zones. Both current and historical community maps were prepared and contrasted to determine the rationale for certain land-use types and the existence of any regulations or strategies that promote conservation. The participatory maps were used as a reference in other research activities (for example, workshops). Similarly, preparation of seasonal calendars was undertaken to explore cycles of resource-use decision making and assess social-ecological

Table 2 Summary of participatory appraisal activities undertaken in study area.[1] The congress in Dombu was organized and facilitated by Yayasan Pendidikan Rakyat, a local non-governmental organization.

Method	*Village*							
	Tolangano	*Lalombi*	*Salumpaku*	*Mbuwu*	*Lumbumumara*	*Lumbulama*	*Soi*	*Dombu*[1]
Participatory mapping	✓	✓	✓	✓	✓			
Seasonal calendars	✓	✓		✓		✓		
Semi-formal interviews	✓	✓	✓	✓	✓	✓	✓	✓
Transects	✓		✓	✓	✓	✓	✓	✓
Workshops	✓	✓		✓				✓

interaction in the agroecological practices of both upland and coastal communities. Seasonal calendars were also drawn on large sheets of paper by local residents in the context of group discussions and included historical dimensions. Depending on the community, calendars included a range of variables, such as the time of resource harvests, rainfall, cropping patterns, key rituals and ceremonies. Information derived from these two participatory appraisal techniques was supplemented with approximately 10 semi-formal interviews with local leaders (village heads and traditional leaders), which provided an opportunity to obtain further information as required about social and ecological issues.

Three formal transects were undertaken in coastal, middle hill and upland zones in seven of the eight villages in order to make observational notes and cross-check the information obtained from other data collection activities. Transect lines were purposively selected in collaboration with local individuals who suggested routes and trails that would lead through a diverse range of land-use types. The first transect was a circular route approximately 2 km in length which traversed coastal areas (mangroves, aquaculture and agricultural areas). The second transect was approximately 10 km in length and traversed several villages in the coastal and middle hill regions. The third transect was approximately 25 km in length and required three days to complete as it involved traversing the uplands from west to east. All transects were undertaken with knowledgeable local individuals who could discuss resource management strategies and land-use practices. Detailed notes from conversations and observations were recorded in a field book, along with coordinates of important features using a handheld geographic positioning system (GPS).

Three community-based workshops lasting approximately two hours each were also conducted in the region. The workshops focused on identifying institutional designs and practices that could foster collaborative learning and adaptive management of land and forest resources. The number of participants ranged from 12–22 and included those involved in the previous participatory appraisal process, as well as key informants (formal and informal village leaders). An additional workshop (an indigenous people's 'congress') organized by a local non-governmental organization was also attended, in which discussions focused on a number of interrelated conservation and development issues. A short questionnaire was further administered to 15 senior provincial, regional and district government officials, mostly in the central administrative city, Palu, in order to gather additional empirical data and insight on the management perspectives of various governmental agencies. The results of these activities offer insight into the socio-political context required for the integration of traditional agroecological knowledge and adaptive management with conservation. Finally, research findings were also drawn from, and triangulated with, the results of participatory research activities undertaken in the southern portion of Banawa in 1999 and 2000 by the Environmental Study Centre, Tadulako University (PSL/UNTAD 2000).

RESULTS

Individuals and communities in the Banawa-Marawola region actively employ traditional resource management strategies, customs and practices that: (1) provide the basis upon which to build adaptive management strategies based on experiential knowledge; and (2) foster conservation by helping to protect biodiversity, maintain ecological processes and promote sustainable use. A description of the traditional knowledge framework and adaptive resource management strategies identified in the Banawa-Marawola region is provided below and organized according to five broad themes, the first four of which are adapted from Berkes and Folke (1998): (1) resource management practices and regulations that are associated with the dynamics of complex systems; (2) procedural, planning and decision-making processes that foster social learning and innovation; (3) the sanctions and taboos that act as key social mechanisms for management and the conservation of natural resources; (4) ceremonies and social interactions that facilitate cultural internalization of the various practices, procedures and mechanisms; and (5) socio-political and institutional mech-

Table 3 Traditional agroecological knowledge framework for adaptive conservation practice, Banawa-Marawola region. Sources: key informant interviews, focus group discussions and transects completed during field work in 2000 (see text for further details); framework for organization of the table adapted from Berkes and Folke (1998).

Selected practices, procedures and mechanisms	*Key implications and application*
Resource management practices and regulations: (a) *Olo*: long-term restriction and/or protection of resource, habitat, species or place (b) *Ombo*: temporal or seasonal restriction on resource, habitat, species or place (c) *Ova/Pangale*: fallow lands and forested areas maintained in successional process through selective use and resource rotation system (d) *Mompepoyo*: multi-factor soil fertility assessment and land-use decision system in uncertain environments which involves the slaughter of a chicken and the divination of its liver and bile (if the liver and bile are black, soil conditions at the site chosen for clearing and planting are considered fertile) (e) *Mantulu/metovo*, *mompovai*, *metunju*: key processes used in the agroecological system in upland areas that employs clearing, drying, and fire to create conditions for cultivation	*Practices associated with the dynamics of complex sociobiophysical systems:* (a) protection of specific habitats/resources (e.g. water sources, large trees such as *Ficus* spp., etc.) and ensuring sources of ecosystem renewal (b) temporal restrictions on harvesting (harvesting during vulnerable stages in the life cycle of certain species (e.g. *Chanos chanos*) (c) rotation of resource harvesting and land-use impacts across landscape (e.g. swidden system with micro and macro-rotational patterns) (d) multiple species management that facilitates the maintenance of ecosystem structure and function (e) responding to and managing pulses and surprises through resource rotation practice and use of fallow lands in non-determinate fashion (f) managing ecological processes at multiple spatial and temporal scales (rice and corn at 1–2 year cycles at cultivated plot scale; taro and banana at 2–10 year cycles in fallow lands; trees and forests at cycles of 10 years and more across the landscape) (g) management of succession and landscape patchiness (cultivated plots, regenerating fallow lands, secondary forest)
Procedural, planning and decision-making processes: (a) *Nolibu*: traditional decision-making process used in the region, *Ntodea*: community meeting, *Medika*: leadership meeting, *Magavi*: top leadership meeting (b) *Mosi pengawa*: community-based mutual assistance process and mechanism for information dissemination/learning	*Processes that foster social learning and innovation:* (a) continuation and renewal of local knowledge systems (b) transmission of folklore and knowledge (c) vehicle for intergenerational transmission of knowledge (d) geographical diffusion of knowledge (e) use of consensus-based, collaborative decision-making process
Sanctions and taboos: (a) *Sala kono*: clear guilt established (b) *Sala baba*: accidental harm (c) *Sala mbivi*: lies, misstatements intended to avoid guilt (d) *Pandoli*, *vatu* and *vatu di air pedidi*: mechanisms/rituals for determining guilt (e) *Viyata*: spirits contained in living (trees) and non-living (mountains) entities that can create sickness if disturbed (f) *Ramaiya*: custom requiring that cultivation takes place in the ova (fallow lands)	*Critical social mechanisms for resource conservation and management:* (a) provides historical and cultural continuity (b) local recognition of a sanctioning system that is considered more just and humane by local populations
Ceremonies and social interactions: (a) *Movae*: post-harvest ceremony (b) *Motamba*: ceremony to request assistance from spirits before and after harvest (locally applied) (c) *Motamba ridombu*: similar to motamba but applied to whole community and held in Dombu, the cultural centre of the Da'a (undertaken only in times of great difficulty) (d) *Momperoya*: seeds not planted are covered and placed in a hole in the centre of the ova (form of offering) (e) *Montilu*: process where older men plant first, followed by others (rationale not determined, although may show sign of respect) (f) *Mosambalu*: ceremony directed at warding off or guarding against pests and disease (g) *Montuvu*: offering of food to spirits near cultivated fields	*Mechanisms for cultural internalization:* (a) rituals and ceremonies that internalize core practices, systems and beliefs (b) provision of cultural framework for agroecological systems (c) opportunity to operationalize world view (e.g. Tanaku Indoku, Umaku Langi: the land is my mother, my father the sky)

https://doi.org/10.1017/S0376892903000079 Published online by Cambridge University Press

anisms that provide essential context for the integration of traditional knowledge, adaptive management and conservation practice (Table 3).

Resource management practices for dynamic systems

A number of resource management strategies used by individuals and communities contribute to the maintenance of ecological processes and the protection of biodiversity in the Banawa-Marawola region. For example, the *olo* and *ombo* regulations in use in the region are environmental protection strategies based on traditional agroecosystem knowledge. Under an olo classification, specific areas, habitats, resources or species are protected from harvesting and extraction over the long term. Examples of areas or resources classified as olo by local people include large trees (typically *Ficus* spp.) that may possess spirits, sites suitable for harvesting of honey, areas of steep slopes (for example, Bambakeanu in Marawola), and important water catchment areas (such as *Gunung Payu* (Umbrella mountain) in Salumpaku, Banawa). The ombo classification used in the Banawa-Marawola region likewise applies to specific areas, habitats, resources or species that are protected from harvesting and extraction for a specific period of time. Examples of such temporal restrictions on harvesting in the region include areas of mangrove habitat in the coastal zone of Banawa, in which the harvest of milkfish (*Chanos chanos*) have historically been restricted during spawning and post-spawning periods. Additionally, an ombo can be placed on key social functions. For example, during post-harvest ceremonies and celebrations (see Table 3), the customary or *adat* leader may be placed under an ombo, which limits any discussion of personal or community issues or problems for a period of up to three months.

With olo and ombo classifications as core components, a traditional zoning system can be identified in the Banawa-Marawola area. Although it has not been given an explicit name by local people, the spatial demarcation of lands associated with traditional agroecological practices in the region includes areas of protection (i.e. olo and ombo), forested zones (*pangale*), areas of cultivation (*nivai*), specific sites for cultivation and fallow (*ova*), as well as settlement area (*ngata*). In accordance with seasons, the cyclical patterns of nature, and in response to evolving ecological and social conditions, the spatial framework is modified to promote opportunities for ecosystem renewal and is well suited to dynamic ecosystem conditions in the region. For example, the upland farming system involves the management of individual crops (rice and corn) on a yearly basis, taro, banana and supplementary crops in early and mid-stage regenerating fallow lands over a period of several years, tree products in later-stage regenerating fallows in longer 10–20 year cycles, as well as mature forest. Furthermore, the swidden system of upland groups in the region results in the indirect creation and management of successional disturbance across the landscape. While crops are growing on one site, regenerating forest on fallow lands is creating conditions for renewal.

The locus of these indirect ecological influences is the resource rotation practice linked to the *mompepoyo* soil fertility assessment ritual, a ritual that contributes to the management of ecological processes at a range of temporal and spatial scales by influencing decisions about where to plant (Table 3). The very nature of the swidden system fosters disturbance patterns across the landscape that allow for both the production of food resources and opportunities for ecosystem renewal (such as fallow succession). Rather than intensive and systematic attempts to overcome or manage seasonal variability, the influence of natural pulses and surprises (for example, climate fluctuations and pest outbreaks) is moderated over time. Thus, the agroecological practice of resource rotation and use of fallow lands, determined largely by the mompepoyo practice, is inherently more suited to local ecological variability and unpredictability than any attempts to directly manipulate a range of variables.

Processes for social learning and innovation

In the Banawa-Marawola region, two processes foster learning, adaptation and innovation, notably *mosi pengawa*, a community-based collaboration system, and *nolibu*, a traditional decision-making process. Mosi pengawa provides two important functions relevant to an adaptive management approach. First, mosi pengawa literally means a process of mutual assistance in which the community or groups within the community work together in order to ensure the success of all members. Second, this traditional process also functions as a learning system through which knowledge and ideas are transferred among community members. For example, if any one farmer seems to be particularly successful, the variables that produce that success are more likely to be transferred to others through this mechanism. Likewise, individuals and communities in the region perceive nolibu as a central institution for community development. In particular, nolibu engenders a more open discussion of issues among community members by limiting hierarchy, taking place in a communal gathering area, and providing a context in which all community members have the opportunity to be heard. In the formal, structured meeting formats held in official village offices and presided over by the village head, marginalized local people are less inclined to discuss and debate issues. In this context, the local elite typically set and structure agendas, and in the process, disengage the majority of local people from decision making. In contrast, nolibu supports procedural and decision-making processes that engender mutual learning based on local practices. Such mechanisms foster greater accountability and thus offer mechanisms for social learning and innovation that are fundamental to effective adaptive management.

Social mechanisms for conservation and resource management

Customary sanctions and taboos form an important component of local knowledge-based frameworks for adaptive

management in the Banawa-Marawola region (Table 3). For example, there are community taboos against the cutting of large trees, as they are perceived to house spirits (*viyata*) that will cause sickness and damage crops. Animistic beliefs surrounding the different viyata in mountains, trees and certain areas of land provide assurance that valued resources are (or more precisely were) not removed. Species of particular significance identified by local people include durian (*Durio ziberthinus*), beringin (*Ficus* spp.) and ebony (*Diospyros celebica*). For practical reasons as well, these same tree species are also protected by the very difficulty their removal would entail for local people equipped with machetes and other low-technology tools. In addition, a further belief, *ramaiya*, holds that failure to plant in fallow lands will lead to sickness, either for individuals, families or groups. As a consequence, individuals will plant rice in certain fallow lands even if they do not necessarily believe it will produce a good yield. In the Banawa-Marawola region, therefore, ramaiya seems to have an added ecological benefit of occasionally encouraging and/or ensuring that people return to fallow lands rather than open new lands or return to sites perceived to be the most fertile or advantageous.

Taboos are only one type of social mechanism of value to conservation and resource management. For example, in the Banawa-Marawola region, any contravention of olo or ombo regulations could result in the application of sanctions to the offending individual or group, although the diminished power of traditional regulations in the region has undermined local sanctioning power. However, the relative effectiveness of traditional regulations vis-à-vis formal regulation is supported by their recognition and understanding within local communities and their intrinsic value in the local socio-cultural framework. Three levels of sanctions or 'charges' have been identified in the Banawa-Marawola region: *sala kono, sala baba* and *sala mbivi* (Table 3). The actual sentence or punishment imposed on an individual by adat leaders varies according to the specific contravention, as well as an individual's initial response when confronted. If individuals do not admit guilt but are later found to be guilty, the punishment may be doubled. Punishments and fines typically include repayment to the harmed party, or in the case of a contravention of olo and ombo, repayments in the form of livestock (chickens, pigs) or ceremonial plates (*dulang*). For those lacking the resources to pay fines, customary leaders may offer assistance, provided the individual originally admitted guilt. Local communities feel strongly that this traditional system of regulations and sanctions is more recognizable, just and humane than the formal regulatory and sanctioning system currently in force. There is a clear preference for the strengthening and application of customary law (*hukum adat*) in the Banawa-Marawola area because local individuals and communities find resonance in the historical and cultural continuity it provides.

Mechanisms for cultural internalization

Several rituals, ceremonies and other traditions play a central role in the process of cultural internalization of traditional knowledge and institutions in the Banawa-Marawola region. For example, the mompepoyo soil fertility ritual helps people to remember the intrinsic rules of nature-society interaction, and how to interpret ecosystem change in accordance with broader world views. Ceremonial traditions (Table 3) such as *motamba*, *movae* and *montuvu* also link nature and society, and provide avenues to internalize those core practices, systems and the beliefs that guide local communities. Finally, the world view of traditional communities in the region provides the broader religious and ethical context in which rituals, ceremonies and resource practices evolve. In the Banawa-Marawola region, a world view has been captured in a socio-political movement based on traditional rights and knowledge (see below). The slogan of the movement is *Tanaku Indoku, Umaku Langi* (The land is my mother, my father the sky).

Socio-political and institutional mechanisms

As previously argued, inadequate attention has been accorded the socio-political context in which the links between traditional knowledge, customary strategies and adaptive management can be integrated with conservation practice. For example, workshop participants highlighted that: (1) customary leaders and institutions should play an active role in community-based decision making about who has access to certain resources and how those resources should be used: this is currently not the case in the formal village governance structures adopted during the Soeharto era; (2) specific customary practices and processes should be re-established or reinvigorated to support conservation efforts (for example using the nolibu process when decisions are made about the granting of forest concessions or other access rights to external groups); and (3) customary sanctions should be applied to those who contravene customary regulations (such as removing forest cover in protected zones). In the Banawa-Marawola region, the focus of efforts to re-establish hukum adat and the capacity of communities to influence conservation and development efforts is a socio-cultural and political movement loosely defined as the *Keluarga Besar Masyarakat Adat Da'a* (roughly translated: the large family of the traditional Da'a community) or the *Aliansi Masyarakat Adat Kamalise* (The Alliance of the Traditional Community of Kamalise). The Kamalise movement corresponds to a spatially explicit traditional territory covering the upland and hill slopes of a large portion of the sub-districts of Banawa and Marawola, and extends into coastal regions in some areas. The vision of the traditional groups that have historically inhabited the Kamalise territory, such as the Da'a, Unde and several other related Kaili sub-groups, is to promote a return to traditional laws and regulations regarding social relationships and nature-society interaction, while also taking a more

https://doi.org/10.1017/S0376892903000079 Published online by Cambridge University Press

active role in the planning of programmes implemented by government agencies.

Efforts to implement the Kamalise movement led to several traditional people's congresses held in the village of Dombu (Marawola) in 2000 and 2001. At one of the meetings, individuals from 57 villages and sub-villages in five sub-districts arrived to address several specific tasks, including: (1) encoding and writing down the traditional regulations, laws, practices and customs of the Kamalise people; (2) meeting to discuss the key issues around strengthening of traditional institutions; (3) planning future activities and future developments in the community; (4) seeking to change the terminology that people in urban areas use when referring to them; and (5) discussing the need to receive formal recognition from the District Head to enable a return to a more effective use of hukum adat and the strengthening of local institutions. In contrast to the dynamic socio-political and institutional change desired by workshop and congress participants, the position of the formal bureaucracy concerning the integration of customary practices with adaptive conservation efforts in the region is less open. Most government representatives interviewed recognized the increasing role that village-based institutions (formal and informal) will have in decision making, especially given the implementation of Law 22/1999 on Regional Autonomy. However, a number of constraints to the emergence of traditional knowledge systems in the region were raised by, or illustrated in the responses of, government representatives, including:

- Mainstream cultural processes that influence how decisions are made, such as the emphasis on paternal authority, hierarchy and status within the formal government bureaucracy, as well as the role of patron-client relationships among the bureaucratic, political and private sector elite;
- A lack of political and informational openness that constrains the ability of individuals, communities and civil society groups from engaging in innovative planning and management, or establishing new institutional frameworks;
- World views that represent traditional and/or rural agrarian communities as irrational or backward; and
- Entrenched power inequities among different sectors of society, including regional-local, upland-coastal, urban-rural and formal–informal leaders, which undermine efforts to foster adaptive management and better use traditional knowledge.

DISCUSSION

A traditional agroecological knowledge framework and suite of resource management practices have been identified in the Banawa-Marawola region that provide the basis for innovative conservation practice anchored on principles of adaptive management: a focus on learning, innovation and flexibility, recognition of inherent uncertainty in social-ecological systems, and a non-deterministic world view. A nascent socio-political movement in the region that is focused on restoring traditional rights and supporting customary practices has also been explored. What, therefore, are the implications for the integration of traditional agroecological knowledge and adaptive management in the region? And how might conservation goals be achieved in this context? Two primary opportunities emerge to address these issues: (1) maintaining traditional agroecological systems in the region; and (2) building upon the socio-politics of the Kamalise movement in an effort to forge new conservation alliances among communities, non-governmental and governmental organizations in which the adaptive resource management strategies used by local people may be formalized. In both cases, opportunities to link traditional knowledge, adaptive management and conservation are tied to broader socio-political and development issues: self-determination, acquisition of land rights and the impacts of changes in livelihood.

Maintaining traditional agroecological systems

In the absence of formalized conservation programmes in the Banawa-Marawola region, opportunities to maintain essential ecological processes, protect biodiversity and encourage sustainable use will most likely be achieved by maintaining traditional agroecological systems and adaptive resource management strategies. Several elements of the traditional knowledge framework identified in the region emphasize resource use strategies and processes (such as ombo, olo and mompepoyo) that account for and function within ecological cycles of renewal, namely maintaining habitat for a range of species and supporting the conditions required for soil rejuvenation. Consistent with the findings in other contexts (Berkes *et al.* 2000; Fernandez-Gimenez 2000; Olsson & Folke 2001), the traditional knowledge framework in the Banawa-Marawola region is analogous to adaptive management because it integrates uncertainty into management and emphasizes practices that seek to sustain the capacity of the agroecological system to undergo disturbance (clearing of lands) while maintaining ecosystem processes. For example, anthropogenic creation and management of habitat mosaics through moderate disturbance of relatively low intensity can facilitate propagation of species at habitat and landscape scales (see also Schelhas & Greenberg 1996; Smith & Wishnie 2000). Moreover, since the traditional resource practices and strategies associated with communities in the region respond to and manage feedbacks instead of attempting to control or block them out, the management system seeks to avoid ecological thresholds at scales that threaten social and economic viability. In addition, adaptive management is fundamentally about learning, and central to the traditional knowledge framework identified in the region is the transmission of knowledge and understanding at the level of individuals to society that has evolved through a process of trial, error and feedback.

It is important to note, however, that local resource management traditions and forms of social organization are dynamic institutions that have evolved, and which continue to evolve, in response to internal and external forces, including demographic change, the penetration of markets, and other political and economic influences. Policy prescriptions for conservation practice derived from ahistorical generalizations of indigenous societies in harmonious equilibrium with their ecological contexts are likely to prove as ineffective as those policy prescriptions that fail to recognize local roles and practices (see Ellen 1999; Scoones 1999; Smith & Wishnie 2000). Consequently, the capacity of the locally-evolved traditional knowledge framework and resource management system in the region to provide a basis for adaptive conservation should not be linked solely to the historical coexistence of traditional societies and intact ecosystems (such as maintenance of forest cover). To suggest that purposive conservation is commensurate with sustainable use achieved through low population density, limited technology or restrained resource demands is a 'causal misattribution' (Smith & Wishnie 2000). Similarly, the existence of holistic world views and beliefs regarding society and nature that are evident in the region do not themselves suggest deliberate conservation practice. Without recognition of the presence or absence of purposive conservation, descriptions and analyses of local resource management strategies and institutions in the Banawa-Marawola region, as elsewhere, are at risk of becoming ideologically biased. For example, subsistence practices in the region are likely directed at maximizing efficiency (agricultural yield versus labour input required), rather than purposive attempts to maintain ecological processes and/or promote biodiversity. While resource rotation practices have ecological benefits, the patch switching identified in the region is designed not for conservation, but to maximize production return. Likewise, it is unlikely that the application of harvesting restraint (olo, ombo) is explicitly crafted to conserve natural resources. Rather, the restraint on harvesting is as likely related to cultural or religious factors (for example, a concern about disease or spirits) or an economic decision (such as maximizing economic control or returns on labour in uncertain conditions) with valuable conservation implications that should not be ignored.

In the context of external pressure from market, political and religious forces in the region, however, the ability to retain key practices, rituals, ceremonies and world views has been challenged. In particular, policies promoting the settlement of upland groups and increased agricultural intensification undermine the importance of traditional agroecological systems in the region and the attendant practices, strategies and mechanisms that can facilitate conservation. The role of government-led spatial planning exercises recently completed in the region (Bappeda Kabupaten Donggala 1999) in undermining the traditional land-use framework is a prime example. In the absence of both rights to land and an effective institutional framework supportive of customary practice, a consequent decline in the prominence and authority of traditional customs and rituals should be expected.

Forging new conservation alliances and formalizing adaptive management

Recognizing the value of traditional knowledge systems and resource management practices in an adaptive approach to conservation is a central theme of this paper. However, without a corresponding institutional and organizational framework in which to foster and use this knowledge, efforts to enhance conservation practice are constrained. In Central Sulawesi, the paucity of reliable formal organizations and administrative frameworks to foster such learning, and the constraints identified by government representatives and officials, suggest serious impediments to the application of adaptive management principles. As previously outlined, however, the emergence of a nascent socio-political movement in the region (Kamalise) offers new opportunities to link traditional knowledge and adaptive management with conservation practice by reasserting common property resource rights, advocating formal recognition of customary practices and demanding a greater role in local, regional and national political and decision-making processes (see also Alcorn & Royo 2000; Atok & Petebang 2000; Li 2001). Indeed, an important opportunity to foster adaptive conservation practice involves forging new alliances among the Kamalise movement, communities, conservation organizations and government agencies. Certainly, it would appear that evolving legal mechanisms in Indonesia (i.e. Law 22/1999 on Regional Autonomy and Law 25/1999 on Fiscal Decentralization) provide the latitude for this type of institutional and organizational experimentation, even if the significant political will and ingenuity required for innovation have not yet coalesced.

The emergence of Kamalise, however, should not be simply cast as an attempt by local communities to protect traditional agroecosystems and subsistence modes of production. Rather, the goals of Kamalise are centred on renegotiating traditional power inequities created by colonial intervention, decades of centralized, military-backed State control over resources, and the exclusionary legal criteria used to delegitimize customary claims to lands and resource (see Peluso 1995; Li 1999, 2001). In the Banawa-Marawola region, such concerns are augmented by past experience with government agencies that have moved groups of people from protected forest, only to then grant forest concession rights to logging companies. Thus, the focus on using traditional knowledge frameworks, resource management practices and institutions is an attempt by individuals and communities to use their strong cultural heritage as a basis for renegotiating partnerships and power relationships. In this regard, the Kamalise movement does not seek to replace formal government apparatus, but has an expectation that regional and district governments provide the broader institutional and organizational framework in which traditional norms,

practices and systems are sufficiently free to provide locally relevant solutions and insights into conservation challenges.

With the Kamalise movement acting as a catalyst, shared values and objectives could be identified among partners of a conservation alliance, such as a focus on community conservation efforts based on traditional knowledge frameworks, adaptive resource management practices and the local institutions that support them (such as rituals, ceremonies and laws). Strategies and policies could use, as appropriate, the principles of adaptive management and experiential knowledge of individuals and communities in the region. This could include exploring opportunities to establish more formally protected habitats using the olo and ombo concepts previously described, or by drawing upon the locally-evolved spatial zoning framework to encourage an evolving and dynamic patchwork of mature forest, areas of resource use, and lands in multiply-aged successional stages. Structures and decision-making processes inherent in nolibu and mosi pengawa could be used to form community conservation advisory groups or co-management structures. With time, effort could be made to use traditional knowledge and resource management strategies in the context of a more 'active' adaptive management approach. This could include, for example, establishing an experimental or quasi-experimental treatment to compare the implications on biodiversity associated with different resource use strategies: areas reforested following traditional swidden strategies, areas of cocoa plantation, and/or forest protected under an olo regulation. Finally, the ecological knowledge of traditional resource users in the region could be further elaborated and analysed in an effort to generate indicators for monitoring ecological (and social) change that are easily measured, scientifically defensible and culturally appropriate (see Fernandez-Gimenez, 2000), and which could be linked to formal programmes supported by mainline government agencies and other partner groups. The traditional knowledge framework and adaptive resource management strategies used in the region (Table 3) provide a conceptual and operational framework for monitoring social-ecological interactions and their influence on the maintenance of ecological processes, biodiversity protection and the use of natural resources.

Efforts to link traditional agroecological knowledge and adaptive resource management strategies with conservation in the region can be greatly enhanced by the institutional and organizational vitality of an emergent socio-political movement like Kamalise working in collaboration with conservation organizations and appropriate government agencies. As with other socio-political movements of its kind (see Bebbington 1996; Alcorn & Royo 2000; Li 2001), the Kamalise movement is a form of social resistance concerned with issues of historical domination, exploitation, lack of participation in decision making, and the marginalization of local identity. At the same time, it is imperative that the populist appeal of movements like Kamalise are not accepted in an uncritical manner; that is, ignoring the complex power relations that exist within local or traditional communities and uncritically accepting local people, place, and culture, or what Watts (2000) refers to as 'agroecological populism'. The current theory and practice of adaptive management, however, neither adequately accounts for, nor explicitly encourages recognition of, the opportunities and challenges of such socio-political realities.

CONCLUSIONS

Adaptive management is increasingly presented as a framework in which a full range of system stakeholders can explore and use complex system understanding to protect biodiversity, maintain ecological processes and promote sustainable use. Yet, there is a need to reframe interpretations and conceptualizations of adaptive management theory and practice, focusing not so much on the data, methods and technical facets of the approach, as on building the context in which the core principles can be promoted and used in the design of conservation strategies: acceptance of uncertainty and surprise, encouraging a non-deterministic world view, learning from experience (whether experiential or through structured experimentation), elevating the importance of monitoring, and focusing on innovation. The suite of traditional agroecological and resource management practices, strategies and institutions identified in the Banawa-Marawola region engender these principles and provide a potentially valuable basis for an adaptive approach to conservation.

It is within the milieu of politics, democracy, community and governance, however, that adaptive management must be applied. The new socio-politics of conservation are very much centred on autonomy, self-determination and a reaction against those influences (such as globalization) that threaten to further undermine or homogenize local traditions (see Norgaard 1994; Peet & Watts 1996; Zerner 2000). An adaptive approach to conservation practice, therefore, should encourage strategies that offer local communities the opportunity to transform traditionally disadvantageous power relations and engage in politics that are more responsible, accountable and equitable (Peet & Watts 1996; Zerner 2000). Such an approach must identify and develop institutional and organizational mechanisms that link traditional agroecosystem knowledge and resource use strategies with monitoring, collaborative learning and effective management of complex social-ecological systems. Nested within the socio-politics of conservation, the challenge for adaptive management is to determine how local institutions or rules-in-use can become embedded in equitable forms of decision making and governance.

ACKNOWLEDGEMENTS

I acknowledge the financial and logistical support of the International Development Research Centre and the Canadian International Development Agency (through the University Consortium on the Environment Project, a

subcontractor to the Collaborative Environmental Project in Indonesia). I also thank the many individuals in Indonesia who offered their time, insight and support, as well as the assistance provided by the Environmental Study Centre at Tadulako University, Palu, Central Sulawesi. I further thank two anonymous reviewers and the Editor for providing valuable input, and Bruce Mitchell for providing helpful comments on an earlier draft.

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