Indigenous institutions, resilience and failure of co-management of rain forest preserves in Samoa

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Abstract

In Samoa, an archipelago in the western part of Polynesia, local societies use an array of institutions and management techniques to cope with uncertainties in their environment. Tropical cyclones are highly unpredictable both on a temporal and spatial scale and may cause widespread destruction of villages and plantations. Examples of institutions and resource management systems used under these circumstances include a sophisticated land tenure system enabling a buffer capacity for growing crops, the use of taboos for protecting specific species and techniques for long-term storage of food and. The extent of damage to crops by cyclones is very variable both within and between crop species. Interviews of farmers support the idea that the polyculture of many crops species in fact may be a system maintained as part of a strategy to increase resilience in the face of large unpredictable disturbances.

After cyclones, species specific taboos are often used to protect certain forest species that show marked declines. In addition, this traditional taboo system has also recently been applied on the ecosystem level. Several local indigenous initiatives to conserve biodiversity were taken in the early 1990's and resulted in village-based rain forest preserves that are owned, controlled and managed by the villagers. Although these preserves appear to be a robust local approach to rain forest conservation, their establishment resulted in significant conflicts between the villagers and Western NGOs that assisted in raising funds for the preserves. The principles of indigenous control were unexpectedly difficult to accept by some western conservation organizations that ultimately were unwilling to cede decision-making authority to the indigenous leaders. In this case, co-management failed completely when a village decided to severe all relationships and refuse any further financial assistance from the Western NGOs. The reasons for co-management failure need to be analyzed in the context of the crucial role of local institutions and the importance of mutual trust.

Introduction

The role of biodiversity for the long-term sustainability of ecosystem processes is often emphasized and the maintenance of biodiversity as an insurance for resilience and buffering of large-scale disturbances is viewed as necessary (e.g. Peterson et al. 1998). Large-scale natural disturbances are inherent to the internal dynamics of most ecosystems (Holling et al.1995) and in this paper I will explore how small-scale societies may cope with disturbances where such societies have a limited capacity to substitute their direct reliance on local products. They may therefore instead actively respond to episodic or rare events by way of flexible institutions and management practices that reduce the risk of large-scale ecological crises.

As in most tropical areas, traditional agriculture in Polynesia could be characterized as an advanced polyculture with annual crops mixed with a large number of shrub and tree species (also referred to as e.g. agroforestry, tree gardens, multicropping) (Kirch 1991). This highly variable and sophisticated system provides in addition to a diverse food supply, a large number of goods and services for local farmers. The large number of trees and shrub species present have been suggested to provide shade, erosion control, soil improvement, wind protection, weed/disease control, timber, fuel wood, weapons, ornaments, medicines, oils, rubber, subjects of religious and mythological value etc. (Clarke and Thaman 1993). Recent evaluations of advanced polycultures in the Pacific have pointed out that they represent highly productive systems with a strong positive net energy yield, while at the same time being independent of fertilizers and

pesticides. Maintenance is usually based on renewable resources and polycultures may in severely deforested areas serve as important refugia for many endangered wild species of plants and animals (Clarke and Thaman 1993). Historically, this sustained-yield agricultural system may have partly developed as an adjustment to the degradation caused by humans themselves during the initial colonization phase of islands (Kirch 1997). An initially rapidly growing human population may have reached carrying capacity relatively soon after colonization (Kirch 1997). This may have resulted in widespread famines (e.g. Kirch 1991) and a pressing need to develop more sustainable agricultural methods (Clarke and Thaman 1993).

Today, the global market economy, governmental policies, agricultural subsidies and decreased tenurial security contribute to a decline in the practice of advanced polyculture throughout the Pacific (Clarke and Thaman 1993, Clarke et al. 1999). However, within Polynesia, a large variation exists between areas, in e.g. Samoa, polyculture is still practiced to a large extent, while in other areas (e.g. Cook Islands and French Polynesia) it has virtually disappeared and is replaced by cash crop monocultures (Clarke and Thaman 1993). The reasons for this regional variation are likely to be complex and involve colonial history, the extent of outside subsidies, and market relations, as well as the specific environmental conditions the farmers are operating in. Here I will focus on one such environmental condition, the infrequent but severe tropical cyclones affecting agricultural practices.

Cyclones and their effects on crops

Cyclones are unpredictable events both in a temporal and spatial sense and in cyclone prone areas agricultural production may be severely reduced at variable intervals. In Samoa, located in the western part of Polynesia, cyclonic storms are relatively frequent with more than 40 recorded since 1831. Severe cyclones may occur at intervals of 20-30 years (based on records during the last 160 years). In the early 1990s two very severe cyclones hit the Samoan archipelago within a 22 month period. On February 1-3 1990, cyclone Ofa, the most severe storm in more than 160 years, hit the islands, with the eye passing ca. 80 km west of the island of Savai'i, Western Samoa. Winds, recorded up to 216 km/hr caused severe forest damage. A SPOT-SAT satellite false colour image, taken two weeks after the storm, showed that only small patches, comprising less than 1% of the primary forest, retained normal foliage on the eastern third of Savai'i. This area includes the Tafua peninsula, which was just prior to the cyclone established as a rain forest preserve under indigenous control (Cox and Elmqvist 1991). Twenty-two months later, on December 6-8, 1991, tropical cyclone Val, a storm of comparable intensity, struck the islands, with the eye this time passing in a north-south direction directly over Savai'i. Again forest damage was extensive, with more than 90% of the primary forest defoliated (see Elmqvist et al 1994). A post-cyclone study of effects on agricultural production was carried out in the traditional village of Tafua (Lindberg and Mossing 1996). From this study and a study made by Clarke (1993) it was evident that there was a great variation in the extent of damage to crops (Table 1). Cash crops were more damaged in general than subsistence crops. Also within crop species differences occurred between genetically distinct varieties (coconut, *Cocos nucifera*) or between trees of different sizes (breadfruit, *Artopcarpus altilis*) or derived from cuttings or seeds (cocoa, *Theobroma cacao*) (Table 1). Recovery varied greatly both within and between crops, from minor damage and short recovery (taro), major damage and short recovery (banana), to major damage-long recovery (breadfruit) (Table 1). The major crop, taro with minor damage and short recovery suffered a substantial damage six months after the cyclone due to insect outbreak. Furthermore, in 1993, the taro blight *Phytoptera colocasiae* destroyed 90% of all taro.

From these observations it is possible to conclude that:

1. in areas where tropical cyclones occur with some frequency a diverse set of crop species and cultivars reduce the risk of a total loss of food supply.
2. the most important cash crops were among the most damaged
3. the crop species that tended to best survive the cyclones, taro, was subsequently severely reduced by insect attacks and fungal pathogens
4. a minor crop, yams, became the most important for an extended period of time
5. in the absence of outside subsidies, farmers would take a very high risk by investing all in monocultures of cash crops or taro.

Interviews with farmers also support the idea that advanced polyculture may in fact be an agricultural system maintained as part of a bet-hedging strategy in the face of large unpredictable disturbances. In a survey shortly after the cyclones, 19 farmers in Tafua, were asked the question *"What could you do to reduce the effects of another cyclone?*" The three most frequent responses were: *1. pray, 2. diversify my crops, and 3. work harder* (Lindberg and Mossing 1996). It was also evident from these interviews that planning, at least in a European short-term sense, does not exist and the concept itself appears to be alien. If the future is perceived as intrinsically unpredictable, short term planning as a tool to avoid crises probably makes much less sense than the belief in polyculture as a viable bet-hedging strategy. Although this study was limited to one village it may well be representative for the thinking among subsistence farmers who have to cope with severe crises without, or with only limited, subsidies from the outside (cf. Lockwood 1971).

Local institutions for crisis management

The various ecosystem and species associated with local commons are often managed by way of local-level institutions that regulate access and use rights to resource in time and place. Such institutions can be defined as codes of conduct that define practices, assign roles and guide interactions; the set of rules actually used. Institutions can also be defined as humanly devised constraints that structure human interaction. In Samoa, the maintenance of polyculture as a sustain-yield agricultural system is embedded in a sophisticated institutional structure, land tenure and reciprocal gift giving system. In a traditional village, a number of chiefs (*matai*) of different ranks, each representing an extended family, form a village council (*fono*). The *fono* decides on overall direction of agriculture and the use of communal land. Part of the traditional role of the chief is to organize community response to periodic environmental disasters. Each extended family cultivates a house lot and plantation lots which have defined boundaries and where the control of land traditionally is linked to a specific chief title. Beyond the plantation lots are family reserve land, in which only portions are cultivated at any given point in time. Further away from the village center are village lands, ultimately controlled by the village council and serving as a buffer. On this land a whole village may come together to plant taro to be used in village ceremonies or to support some village project, or to provide the village with more food after a crisis. This social system, with buffers of land at different levels of organization and control, from family to village level, provides flexibility in food production and maintenance of both a high social and ecological resilience.

Another component of a strategy to cope with unpredictable disturbances may be the use of techniques for emergency food storage. A tradition in many Polynesian islands is a sophisticated technique of fermentation of breadfruit in pits (Ragone 1991). This fermentation process made long-term storage of food possible in a hot and humid climate. Pit size could vary from one meter in depth up to 9 meters in large storage pits, and these would keep the fermented bread-fruit in good condition for a year or in some cases for decades (Ragone 1991). Pit fermentation is rarely used today in Polynesia, but was practiced again in several villages in Savaii just after the cyclones (Lindberg and Mossing 1996). The cyclones thus resulted in a revitalization of this food storage technique and an opportunity for young people to learn in full scale the different steps and procedures of making a good fermentation pit. Hence, large-scale disturbances may not uncommonly be perceived as also having positive influences by strengthening social organization and revitalizing the practice of traditional techniques and methods in agriculture, food preparation, house construction etc. For example, the villagers in Tafua were asked whether they perceived that anything good came out from cyclone disturbances, and the majority gave a positive answer (Lindberg and Mossing 1996).

Throughout the Pacific, human societies have had to adapt to pulses of natural disturbances such as cyclones, drought, tsunamis and flooding (Kirch 1997). In many cases anthropogenic impacts such as clear-felling of forests on steep slopes made the human societies even more vulnerable to flooding events and may have further enforced e.g. terrace constructions and other means of hill slope stabilization (Kirch 1997). Such “landscape enhancements” (Spriggs 1997) increased the resilience in the landscape and safety in food production. The interviews of Samoan farmers support the idea that the widespread tradition of simultaneously growing many crops species and cultivars in fact may be a system maintained as part of a strategy to increase resilience in the face of large unpredictable disturbances.

In Polynesia, cyclones decrease in frequency when moving from western into central and eastern Polynesia. This spatial and temporal variability provide an interesting setup where components of resilience and sustainability in agriculture may be analyzed by comparing agricultural management in areas frequently and severely damaged (several times within a human generation, e.g. Samoa) with areas very seldom hit (once every second or third generation, e.g. eastern Polynesia). In eastern Polynesia, polyculture has today largely been replaced by monocultures of cash crops (Clarke and Thaman 1993) and in the event of a severe cyclone, the farmers are forced to rely on outside subsidies for survival.

Resilience, forest conservation and failure in co-management

Recent studies show that indigenous knowledge of ecological zones, natural resources, agriculture, aquaculture, forest and game management, is far more sophisticated than previously assumed (Gadgil et al. 1993, Folke et al. 1998). Protection of specific habitats is commonly found among local resource users from various parts of the world (Hughes and Chandran 1998). Such protection is often enforced due to strong religious beliefs and social conventions. In many places these habitats are viewed as ‘sacred’ and local communities enforce strict institutions, such as taboos, for their protection. Often, whole forests, forest patches, coast stretches, rivers, or ponds may to a various degree be protected from human resource use. Such a “social fencing of ecosystem types” (Ramakrishnan 1998) may provide for a number of ecological services on which humans depend. These include the maintenance of landscape patchiness, preservation of biological diversity, provision of habitat for threatened species, regulation of local hydrological

cycles, prevention of soil erosion, pollination of crops and plants, preservation of locally adapted crop varieties, and serving as wind and fire barriers. Such services build social-ecological resilience both in a temporal and spatial context by their functioning as refugia for ecosystem renewal after perturbations. Thus, sacred groves may provide for spatial resilience by acting as important recruitment areas for the recolonization of species in disturbed ecosystems.

In Samoa, forest land is under communal tenure and is managed through decisions of the village council. Management of particular resources is executed through specific taboos (*tapu*) that may regulate resource use (e.g. hunting of birds or flying foxes) in a certain geographical area (*faasao*) or during a certain season. In the late 1980's and early 1990's, several preserves in Samoa were created using the principles of indigenous control (Cox and Elmqvist 1991) and based on traditional practices of *faasao* (sacred areas). The reserves proved to be important refugia for many species of birds and flying foxes (*Pteropus tonganus* and *P. samoensis*) during and after the cyclones (Elmqvist et al. 1994 and Pierson et al. 1996). Interestingly, among established seedlings in the most severely disturbed area, those belonging to species known to be dispersed by birds and/or flying foxes had significantly higher relative abundance than species not known to be so (Hjerpe et al. 2000). In this example vertebrate frugivores may be viewed as keystones in the reorganization phase, where their absence would have forced succession into a different pathway dominated by wind- and passively dispersed plants and perhaps also resulting in a great risk of invasion of wind-dispersed exotic opportunistic species. The reserves thus represented an important contribution to the spatial resilience in the landscape for successional processes.

However, the process of co-managing these village preserves failed and it is important to analyze the chain of events that resulted in the collapse. In 1990, a covenant was signed between the Swedish Society for Conservation of Nature (SNF) and the village of Tafua on the Tafua peninsula on Savaii. The covenant established the Tafua Rainforest preserve in exchange for SNF contributions to build an elementary school for the village. In the covenant, the Samoan language version was considered authoritative and the SNF agreed to recognize "the sovereign rights of Tafua village to control their forest and their land".

Initially relations between SNF and Tafua village were very good. However, profound cultural differences became apparent during the course of the project. Up until 1991, SNF had direct liaison with the traditional leaders of Tafua village. In 1991, however, SNF staff sought to place a new NGO in control of the project. The NGO, although small in size, consisted of westerners and western-educated Samoans largely resident in the capital city of Apia. Although they were residents of the same country, cultural differences between staff of the local NGO and the villagers rapidly emerged. For example, important meetings in Tafua village are always preceded with ceremonial administration of kava, a beverage made from water infusions of the roots and rhizomes of *Piper methysticum*. On such occasions, ancient rhetorical forms are observed. However, the NGO requested that no kava ceremonies be held before important meetings. Obviously uncomfortable with traditional forms of village etiquette, the NGO staff increasingly requested village leaders travel to their Apia-office for meetings.

Incongruities in the relationship between the village and the local NGO continued. The original idea of indigenous control of the project was gradually eroded as more and more power and authority was transferred by SNF staff from the village councils to the NGO for allocation of

funds and decision-making authority. On January 23, 1993, three years after initially signing the rain forest covenant, Tafua village renounced any continued association with SNF and refused any future financial assistance from them. The announcement received considerable television and newspaper coverage in Sweden.

The conflicts between SNF and Tafua eventually ended when the president of SNF personally came to the village and apologized. The president reassured that SNF from now on would listen to the village people and respect their wishes. The president also reassured Tafua that the covenant was signed by two equal parties, and that the local NGO in Apia would be removed from further interference in the relationship between Tafua and SNF. Even though these conflicts gradually became quite severe, a positive reconciliation process was initiated. Now, seven years later, the situation has finally stabilized.

There are several lessons to be learned from these events in Samoa. Originally designed as an exercise in indigenous control- empowering the local people to own, manage, and administer a rainforest reserve- the Tafua rainforest preserve inadvertently brought an entire village into direct and deep conflicts with a Western environmental bureaucracy (Cox and Elmqvist 1997).
The lesson of trusting local institutions, such as village councils, is applicable to conservation and development projects elsewhere.

Conclusions

In Samoa, local societies still today use an array of institutions and management techniques to cope with uncertainties such as cyclones e.g. through polyculture of many crops species and cultivars, a land tenure system enabling a buffer capacity for growing crops, techniques for long-term storage of food and the use of taboos for protecting species or habitats. Although in a Samoan context, locally controlled preserves appeared to be a robust approach to rain forest conservation and resilience maintenance, their establishment resulted in significant conflicts with a long reconciliation process between the villagers and Western NGOs.

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Table. 1 The effect of cyclone Ofa on crop production and recovery rates (adapted after Clarke 1993 and Lindberg and Mossing 1996)

	Diet (%)	**Damage**	**Recovery**	**Comments**
Staple food				
Taro *Colocasia esculenta*	39-43%	minor, <5%	2-4 months	severely attacked by *Spodoptera litura* 6 months after cyclone
Banana *Musa spp.*	16-23%	major, 90-100%	9-10 months	damage differed between varieties
Breadfruit *Artocarpus altilis*	16-19%	major, 50-90%	10-15 months	large trees recovered very slowly, fermented fruits traditionally used as emergency food
Taamu *Alocasia macrorrhiza*	15-19%	minor, <5%	5-7 months	traditionally used in times of food shortage
Yam *Dioscorea sp.*	Minor	minor, <5%	5-7 months	became the staple in areas with no taro
Commercial crops	**Importance**	**Damage**	**Recovery (partial)**	**Comments**
Coconut *Cocos nucifera*	Major	moderate -major	>10 months	damage varied spatially and between varieties
Cocoa *Theobroma cacao*	Major	moderate -major 20-30%	>24 months (need shade for good production)	damage varied spatially and between varieties, trees derived from cuttings more susceptible than those from seeds