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FIJI LOCALLY-MANAGED MARINE AREA NETWORK

Fiji

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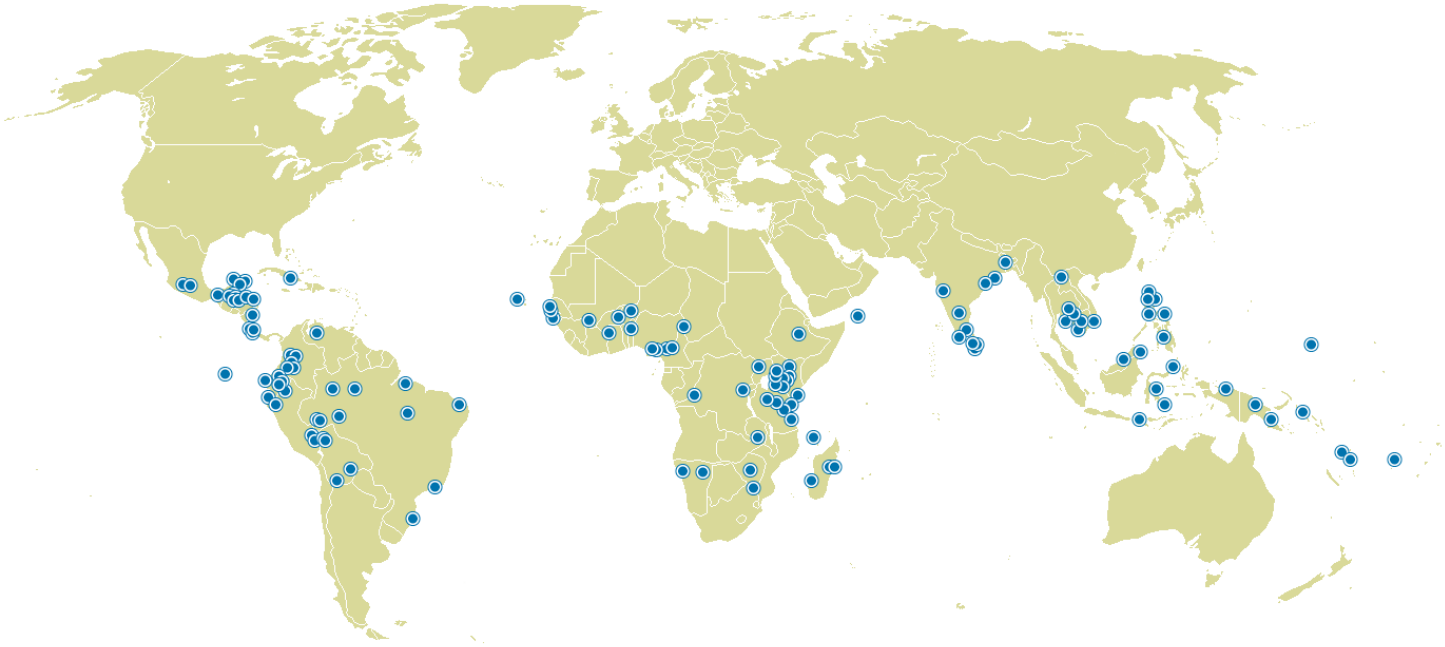
Local and indigenous communities across the world are advancing innovative sustainable development solutions that work for people and for nature. Few publications or case studies tell the full story of how such initiatives evolve, the breadth of their impacts, or how they change over time. Fewer still have undertaken to tell these stories with community practitioners themselves guiding the narrative.

To mark its 10-year anniversary, the Equator Initiative aims to fill this gap. The following case study is one in a growing series that details the work of Equator Prize winners – vetted and peer-reviewed best practices in community-based environmental conservation and sustainable livelihoods. These cases are intended to inspire the policy dialogue needed to take local success to scale, to improve the global knowledge base on local environment and development solutions, and to serve as models for replication. Case studies are best viewed and understood with reference to '*The Power of Local Action: Lessons from 10 Years of the Equator Prize*', a compendium of lessons learned and policy guidance that draws from the case material.



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Fiji

PROJECT SUMMARY

The community of Ucunivanua on the eastern coast of Fiji's largest island was the site of the first locally managed marine area (LMMA) in Fiji in 1997. Scientists from the University of the South Pacific supported environmentalists and local villagers in declaring a ban on harvesting within a stretch of inshore waters for three years, building on the tradition of taboo prohibitions for certain species. After seven years of local management, the clam populations had rebounded and village incomes had risen significantly with increased harvests.

The success of the Ucunivanua LMMA spread rapidly, and a support network – the Fiji Locally Managed Marine Area Network – grew from this. By 2009, the network had increased to include some 250 LMMAs, covering some 10,745 square kilometres of coastal fisheries, or more than 25% of Fiji's inshore area. The network has also inspired replication in countries across the Pacific.

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KEY FACTS

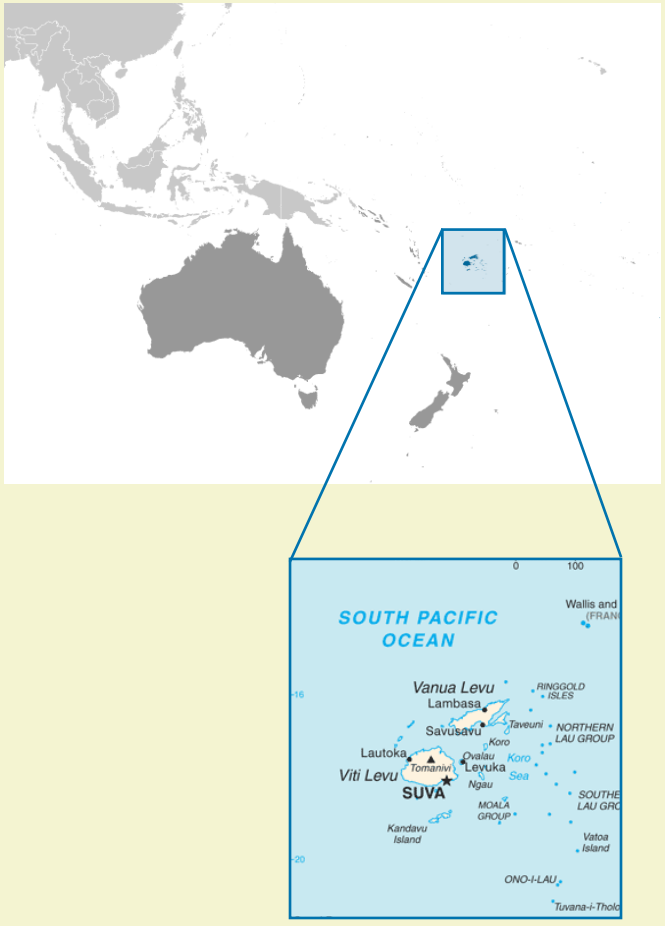
EQUATOR PRIZE WINNER: 2002

FOUNDED: 2001

LOCATION: Throughout Fiji

BENEFICIARIES: Rural fishing communities

BIODIVERSITY: Over 250 locally-managed marine areas



Background and Context

Blue anthias and staghorn coral, Navakavu MPA. Photo: Toni Parras

Fiji is an archipelagic state of some 300 islands located in the South Pacific. As a small, tropical island country, Fiji's marine and coastal ecosystems provide significant physical, economic, social and cultural benefits to its people. The country's abundance of forest, marine and mineral resources has allowed it to become one of the most developed economies among Pacific island nations. However, Fiji's rural communities, which constitute approximately half of the country's 900,000-strong population, remain heavily reliant on traditional, subsistence livelihoods, drawing on marine resources to meet daily protein needs and provide cash income.

Traditional marine management areas called qoliqoli (traditional fishing grounds under the control of the communities adjacent to them) have been implemented for hundreds of years in Fiji. Decisions about the management of these areas are taken by tribal chiefs, through village councils which often work together at the district level to coordinate planning. This customary resource management system is typical of many Pacific islands in which communities have long imposed traditional management methods such as seasonal bans and temporary no-take areas.

These methods are based on a system of community marine tenure – the right to own or control an inshore area – that is recognized informally by local authorities. In Fiji, qoliqoli are officially referred to as 'customary fishing rights areas'. They are mapped in records maintained by the Native Fisheries Commission. There are 385 marine and 25 freshwater qoliqoli in Fiji and their marine resources support the livelihoods of approximately 300,000 people living in coastal communities.

In recent years, however, the livelihoods of Fiji's rural fishing communities have increasingly come under threat as the fragile balance of this system has been disturbed by human pressures from overfishing, the advent of a cash-based economy, insufficient implementation of regulations, and the adoption of unsuccessful approaches to resources management, resulting in decreasing availability of marine resources. While the specific causes of marine resource depletion vary from village to village, a common trend of rising poverty has been the result, and by 2005, approximately 30-35 per cent of rural households in Fiji were living below the poverty line.

Ucunivanua Locally-Managed Marine Area

By the early 1990s, the scarcity of marine resources had become apparent to the residents of Ucunivanua village, on the eastern coast of Viti Levu, Fiji's largest island, when the women of the community found themselves spending ever longer collecting kaikoso clams (*Anadara antiquate*) from the village's mudflats. These clams are a staple food for the local population and an important source of cash income. The community's observation of reduced clam numbers illustrated a decline in the community's natural resource base which reflected a larger pattern of resource depletion occurring throughout Fiji.

The community of Ucunivanua reacted to this worrying trend by establishing a locally-managed marine area (LMMA) in 1997. This took the form of a 24-hectare no-take zone on the mudflats and seagrass bed directly in front of the Ucunivanua village, and its aim was to restrict the harvesting of kaikoso clams to allow their numbers to regenerate and to encourage their settlement in neighbouring areas. This built on the existing tradition of enacting tabu prohibitions on fishing for certain species. The project was led by researchers at the University of the South Pacific in Suva, Fiji.

Following a series of workshops with the community, a management team of 20 local men and women worked with the chief and elders of the village to hold a traditional ceremony declaring the area closed for three years. Ucunivanua LMMA was the first in Fiji and it yielded dramatic results. Seven years after the implementation of community-based marine resource management in the village, the kaikoso clam was once again abundant and village incomes had risen significantly.

The development of the LMMA network

Since the establishment of the Ucunivanua LMMA in 1997, use of LMMAs to address overfishing has spread rapidly throughout Fiji. This is in part the legacy of a community-managed marine area pilot programme implemented by the Biodiversity Conservation Network in the late-1990s. In 2001, at the end of the pilot project cycle, project stakeholders, including NGOs, research institutes, government departments and community leaders, established the Fiji Locally-Managed Marine Area (FLMMA) Network as a forum for communities implementing LMMAs to share their methods and results.

The Network's objectives, as stated in its constitution, include encouraging collaboration between government departments, NGOs and communities to better manage Fiji's traditional fishing grounds; engaging in collective advocacy for LMMAs; creating joint policy briefs based on collective learning; and encouraging the use of adaptive management as a key to achieving best practice. The Network's constitution also emphasizes the importance of collecting data as a tool for learning, alongside on-site training workshops, cross-site visits and the sharing of logistical and technical information between communities.

The Network's approach recognizes local communities' autonomy in managing their marine resources, while simultaneously providing a network of support and guidance to help them achieve the best possible results. The Network is responsible for planning and facilitating the programme, while the decision making, implementation and evaluation are undertaken on the ground by the individual groups. Ongoing capacity building activities empower local communities with the necessary knowledge to reverse the decline of their natural resources. An adaptive management approach emphasizes participatory learning and action to ensure that communities remain the key agents in planning, decision making, and implementation of management actions. This approach ensures active leadership and participation of communities as custodians of their local resources.

In 2005, Fiji's network of LMMAs included nearly 60 LMMAs, involving 125 communities and covering about 20 per cent of Fiji's inshore fishery. By 2009, the network had grown to 250 LMMAs, covering 10,745 sq. km. By this time, the Network incorporated 235 management tools, such as Marine Protected Areas, and 208 management plans.

Villager at coral cultivation racks, Votua MPA, Fiji. Photo: Jimmy Kereseka

"Biodiversity depletion is a reality that is impacting the livelihood of the local people, the national economy and the biodiversity value of the country. Addressing it requires a holistic approach whereby the government provides the necessary legislative support, practitioners provide technical expertise, and communities take the lead in planning, designing and implementing management strategies"

Sakiusa "Saki" Patrick Fong, Fiji LMMA Network.

Key Activities and Innovations

Mangrove replanting in Tagaqe village, Korolevuiwai, along the coral coast of Fiji. Photo: Alifereti Tawake

The FLMMA Network works directly with communities to guide their conservation efforts, but also supports them in developing solutions to broader problems including a lack of alternative livelihood options. Advocacy and cooperation with local government departments is also a focus of the Network's work, to ensure rapid scaling-up and replication of this successful model.

Supporting communities

Once a community in Fiji makes its interest in local marine management known, the FLMMA Network and various partner organizations determine who will be the lead agency, and discussions are held with the community to ensure that the goals of all parties are clear and aligned. This initial planning and education process can take up to one year. Network staff then offers assistance through three types of workshop: action planning, biological monitoring, and socioeconomic monitoring. The action-planning workshops are adapted from Participatory Learning and Action (PLA) methods and include sessions on mapping the village, understanding historical trends, and identifying local stakeholders. The biological and socioeconomic monitoring components of the workshops focus on identifying resource use patterns, threats to local resources, and the root causes of these threats. Finally, a community action plan is developed.

While the establishment of a tabu area (where a no-take zone or ban on destructive fishing practices is declared) is usually a central part of an LMMA, the action plan also contains ways to address other issues faced by the community, such as lack of income sources, poor awareness of environmental issues, pollution, and sometimes, declining community cohesiveness. Agricultural and forestry practices are often examined, alongside vulnerability to climate change and the enhancement of available livelihood options. Socioeconomic monitoring tests whether these broader problems are being addressed. Ongoing assistance is provided to communities to help them carry out their plans, including practical assistance such as marking protected area boundaries, publishing LMMA rules, and training fish wardens to protect against poaching.

The work of the FLMMA Network goes beyond working with individual communities to support their resource management efforts, to address the wider needs of communities and offer input to higher level marine policy. The Network cooperates with local government authorities in the establishment of Marine Protected Areas, and promotes sustainable livelihood projects to underpin conservation efforts and compensate local fishers during tabu periods. These projects include mangrove rehabilitation and plantation, tree nurseries, ecotourism, apiculture, prawn fishing, freshwater fish farming and pearl farming, among others. By targeting income generation and business development activities at women, the Network has helped to encourage greater gender equality in communities.

The Network also plays a leading role in monitoring and quantifying results across project sites, producing a substantial body of knowledge on the linkages between sustainable resource management and poverty alleviation.

Education and capacity building

The Network conducts workshops and education programmes at the community level to address aspects of communal resource management. Programmes to increase capacity in village and resource governance, financial management, waste management, and sustainable livelihoods have been conducted to strengthen resource management in these communities. These programmes target women, youth, and key community leaders in particular, helping to build grassroots support and capacity. In 2009, 27 such workshops were held, involving 603 participants.

Impacts

Turtle calling point at sunset, Kadavu, Fiji. Photo: Toni Parras

BIODIVERSITY IMPACTS

Case 1: Tavua LMMA

The district of Tavua, on the northern coast of Viti Levu, is comprised of seven villages (Tavualevu, Rabulu, Vanuakula, Vatutavui, Korovou, Nabuna and Nadolodolo). The largest of these, Tavualevu, is the head village and hosts the paramount chief of the district (Tui Tavua). The Tavua LMMA, Fiji's second oldest, was established in 2003 following a management planning workshop hosted by the FLMMA Network and the University of the South Pacific's Institute of Applied Science (USP-IAS). The Tavua LMMA aims to eliminate the destructive practice of dynamite fishing, a method which yields a higher catch in a shorter period of time than traditional net fishing, but has a devastating impact on coral reefs.

Tavua's LMMA comprises nearly 700 sq. km of fishing ground, and includes within it a 14 sq. km Marine Protected Area (MPA). The remainder of the LMMA remains open to fishing for the people of the district and a select group of commercial fishermen issued licences to fish there. Within the entire LMMA, the following practices are banned: the use of destructive fishing techniques including dynamite fishing, undersized net mesh, and cyanide fishing; unlicensed fishermen; poaching from the MPA; and the dumping of waste into the marine ecosystem.

Management of the LMMA is undertaken by the Tavua Qoliqoli Committee, which consists of a member of each clan and village in the district, registered fish wardens, and the paramount chief (Tui Tavua). In addition to the initial management planning workshop, the FLMMA Network and USP-IAS have carried out workshops on dynamite awareness-raising (2004), biological monitoring training and management plan reviewing (2005), and baseline biological monitoring and socioeconomic surveys (2006). The Network's researchers also briefed a Tavua District Council Meeting on the need to increase the licensing fees for commercial fishing in 2007. Numerous publications and reports have been produced based on these workshops. The reef, while still showing some evidence of having been blasted, is showing signs of ecological recovery. Live corals abound, as do fish and invertebrates, including high-value species such as snapper and sea cucumber.

Success throughout the network

Tavua LMMA is just one example of the positive impact Fiji's coastal communities have had on their local marine environments through the FLMMA Network. Positive results have been replicated across more than 250 FLMMA sites and the Network has brought together researchers from local universities to assist in monitoring ecological impacts. Techniques differ from site to site but have included underwater visual census, and belt and line transect sampling.

These monitoring data show that, in many cases, previously extirpated (locally extinct) species have returned, and marine specimens have increased in number, species diversity, and biomass. For instance, a new species of seaweed was recently discovered in the Natokalau site. The outcome of such species sightings has been increased recognition of the benefits of maintaining long-term MPAs as safe havens for significant food fish species and other over-exploited animals and sea plants. A study conducted by Conservation International at three LMMA sites (Navakavu, Malolo and Waitabu), found all three sites to have significantly greater mean total fish biomass and mean targeted fish biomass compared to control sites.

Additional positive indicators reported across FLMMA Network sites include growth in the number and sizes of clams and crabs inside and outside tabu areas, and the return of marine life such as stingrays to offshore mudflats. Navakavu witnessed the return of the smooth or red-spotted box crab (*Calappa calappa*, known locally as burebure matatolu) after a 50-year absence. They were last seen in the area in 1953.

At Fiji's first LMMA, in Ucunivanua, community members were trained by USP-IAS experts to monitor the clam population. A comparison of the resultant data from 1997 and 2004 demonstrated a dramatic increase in the number and size of clams, in both the tabu and adjacent harvest areas (Aalbersberg et al., 2005; see Table 1). While, at the start of the project, it was extremely rare to find clams bigger than five centimetres in diameter the Ucunivanua community today routinely finds clams over eight centimetres in diameter in the tabu area. Due to its success, the Ucunivanua tabu area, which was initially intended to be closed to fishing and collection for just three years, was extended indefinitely. Impressive results from the monitoring of shellfish have also led the community to set up no-take areas in the mangroves and coral reefs to encourage lobster and coral fish production.

Similar successes have been achieved throughout the FLMMA network. The village of Sawa, for example, imposed a tabu on a mangrove island, with the result that the number of the mangrove lobsters (*Thalassina anomala*) increased roughly 250 per cent annually, with a spillover increase of roughly 120 per cent outside the tabu area. In Nacamaki village on the island of Gau, meanwhile, one year after the declaration of a tabu area, the community harvested approximately eight tons of rabbitfish in one week.

SOCIOECONOMIC IMPACTS

In addition to biodiversity monitoring, the FLMMA Network has also undertaken extensive socioeconomic monitoring using such techniques as household surveys and catch-per-unit-effort (CPUE) data, with resultant data demonstrating the correlation between biodiversity conservation and poverty alleviation. Booklets have been issued to communities for recording CPUE data, which quantifies the time taken, the distance covered, the number of people involved, and the equipment used, to catch a given amount of fish. Increases in this index indicate an improvement in stocks of commercial marine species, and, therefore, fishers' livelihoods. Specific socioeconomic benefits of the initiative include increased household income, improved livelihood options, diversified income sources, improved diets, greater gender equality, and substantially strengthened local management capacity. Two specific cases, those of the Navukavu LMMA and the Korolevu-i-wai LMMA, are described below, with additional data referenced from across the FLMMA Network.

Case 2: Navukavu LMMA

The Navukavu community, located on Viti Levu's southern coast, is comprised of four villages (Muaivusu, Nabaka, Waiqanake and Namakala) which share customary rights to the Navukavu qoliqoli. The community is situated less than 10 kilometres from the capital city, Suva, which serves as the island's main port. In recent years, the community's ability to harvest sufficient marine resources to meet their basic needs has been severely impacted by the presence of waste from the nearby city, and from large container ships that travel along the coast, littering the shoreline. Corroding metal from rusting, sunken ships washed up by heavy storms has damaged coastal reefs and poisoned marine life. Being located close to an urban centre has also increased pressure on the area's marine resources. The community established an LMMA in 2002. Although efforts to restrict poaching in the LMMA by outsiders have been partially successful, thanks to the authority to arrest intruders, granted by the local government, reliance on volunteers and a non-confrontational approach has left the community unable to adequately defend the qoliqoli against armed poachers.

Despite such challenges, studies have shown the LMMA to have had positive impacts on the social and economic situation of the Navukavu community. A 2007 study (van Beukering et al., 2007) on the linkages between LMMAs and poverty at the Navakavu site showed monthly income to be far higher there in comparison to a control site. A survey of 300 households found that monthly income in Navakavu averaged FJD 418 (USD 251), while income in control sites with similar demographic and geographic characteristics averaged only FJD 197 (USD 118) per month.

Another important benefit of LMMAs identified by various studies has been increased household consumption of fish. In Navakavu, around 75 per cent of surveyed households reported eating more fish in 2007 compared to five years previously, while a similar proportion of households in non-LMMA villages reported eating less fish. A second study analysing changes in finfish catch over time in Navakavu suggested that there had been an average increase of three per cent per year in catches between 2002 and late 2007. This increase, worth a total of around FJD 630,000 (USD 378,000) to the community, was attributed to the establishment of the LMMA (van Beukering et al., 2007).

Table 1: Trends in Clam Size and Abundance, Ucunivanua (1997-2004)

	Number of clams (per 50 m^3)			
	Tabu Area		*Adjacent Harvest Site*	
Size class (cm)	**1997**	**2004**	**1997**	**2004**
<2.5	0	3502	1	532
2.5-3.5	5	1546	7	622
3.5-4.5	12	935	14	385
4.5.-5.5	13	570	9	221
>5.5	8	530	1	91

Source: Aalbersberg et al., 2005 after Aalbersberg and Tawake, 2005

In an effort to reduce their dependence on marine resources, the community is also exploring new potential sources of income. A women's group, established to explore new livelihood projects, has sought funding from the International Oceans Institute (IOI) to purchase sewing machines. Workshops have been held by USP-IAS and the FLMMA Network on conservation, community-based marine resource management, and biological and socioeconomic monitoring to build the capacity of the community to manage their LMMA. The case of Navakavu illustrates the Network's multi-faceted approach, helping rural communities overcome the range of challenges they face.

Case 3: Korolevu-i-wai LMMA

Approximately 130 kilometres west of Suva, the Korolevu-i-wai district qoliqoli spans six sq. km and encompasses four adjacent villages, with a tourism resort situated in the middle. The Korolevu-i-wai qoliqoli includes mangroves, seagrass beds and coral reefs, and is home to mangrove crabs, clams, octopuses, lobsters, sea urchins, trochus, and reef fish such as emperors, parrotfish, grouper, and mullet. Damage from destructive fishing methods (undersized fishing nets, poison fishing, and breaking corals and rocks to catch octopus), coral harvesting, pollution, and damage to coral from tourists, prompted the local village chief to initiate discussions with other chiefs and the local tourism resort. After hearing about the Fiji LMMA Network through radio broadcasts, the Korolevu-i-wai stakeholders contacted the Network for assistance, and the Korolevu-i-wai LMMA was established.

Within the LMMA, the area of reef directly in front of the resort was subjected to a tabu that prohibited fishing. After 18 months of operation, initial biological monitoring indicated that key species, such as mullet, were recovering, while survey results indicated an increase in the abundance of groupers, parrotfish, octopuses and lobsters both within and outside the tabu area.

The Korolevu-i-wai community has established a mutually beneficial relationship with the owners of a beach tourist resort whereby, in return for making the fishing ground available to the resort for low-impact tourism activities, the community receives substantial financial and technical assistance. The resort owners have provided a television for village youth, computers for schools, buoys for the MPAs, building materials, and furniture, in addition to providing scholarships for local school children, as part of an agreement that has endured for over a decade.

With technical advice from USP-IAS and the FLMMA Network, the LMMA management committee launched a coral farming project along reefs adjacent to the resort, at Tagaqe village. The resort hired a marine biologist to help establish the coral farming programme and to train hotel staff. Visitors to the resort can now take part in a 'reef walk' (a tour along a carefully marked path through the reef) to appreciate the marine environment and to view the coral racks. For a fee of USD 5.00, they can sponsor a coral in their name with the proceeds split between the Tagaqe Village Environment Trust Fund and the resort (to cover expenses). Several youths from the village are now employed by the resort to guide tourists to a coral garden, plant corals, and help police the protected area. The number of tourists engaged in the project increased from 16 per month in August 2003 to 62 per month in March 2004.

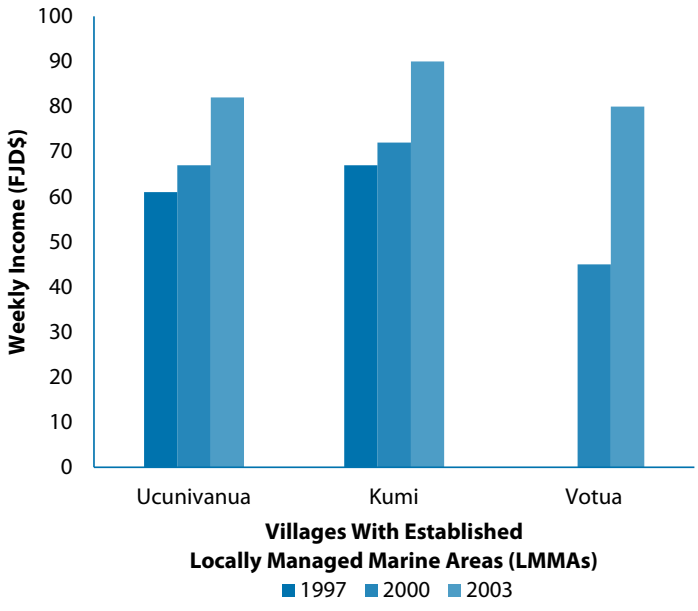
Research on the Korolevu-i-wai LMMA identified notable positive outcomes in its first two years of implementation (Fong, 2006). As well as comparing favourably to former attempts at resource management, the LMMA system was shown to have strengthened social cohesion amongst the community members. The average CPUE and the income level of fishers in the district also increased.

Positive socioeconomic impacts, such as those described in Navukavu and Korolevu-i-wai have been noted in communities throughout the FLMMA Network.

Increased household income

In Ucunivanua, a study that described the increased abundance of mangrove lobsters by approximately 250 per cent annually (Aalbersberg et al., 2005) also detailed how average household income rose from just over FJD 430 (USD 258) per month in 2002 to about FJD 990 (USD 594) in 2006, an increase of 130 per cent. Similarly, the community of Daku in Kadavu province experienced an increase of just over 30 per cent in average income in one year, from about FJD 235 (USD 141) per month in 2005 to FJD 307 (USD 184) in 2006. Across the communities of Ucunivanua, Kumi and Votua, all with LMMAs, household income increased by an average of 43 per cent between 2000 and 2003, as illustrated in Figure 1.

Fig. 1: Weekly household income from sales of marine products (1999-2010)



Source: Aalbersberg et al., 2005

Various studies have examined the wider economic impacts of Fiji's LMMAs as part of studies of the role of MPAs in poverty reduction. Van Beukering et al. (2007) claim that LMMA sites generated about three times the income from fishing that non-LMMA sites generated, and argue that the ability of fishers from LMMA villages to secure

larger fish catches from a smaller harvest zone was evidence of substantial spillover effect from tabu areas into the harvesting zone.

Shrimp at the Suva market. Photo: Toni Parras

Diversified income sources

Interestingly, despite the above claim, other studies have noted that households in LMMA villages were likely to be less reliant on income from fishing than households in non-LMMA villages. Twenty-eight per cent of households near LMMA sites have alternative income sources versus only 17 per cent in comparable, non-LMMA villages. Income diversification is a key component in ensuring ecosystem-based resilience, and LMMA communities have substantially increased their ability to withstand threats to future fisheries income from the impacts of reef degradation due to coastal pollution, severe storms and climate change. This resilience is underpinned by additional LMMA-related benefits as well, such as improved planning and management skills and closer community cooperation.

Strengthened community cohesion

Beyond producing economic benefits for individual households, the ongoing work of the FLMMA Network has strengthened channels of communication and cooperation within LMMA communities. In some cases, this has helped in conflict resolution between clans or villages. In Votua, for example, social cohesion was seen to have improved after three years of LMMA work that facilitated dialogue between three clan chiefs after decades of dispute. The emphasis placed on collective decision-making regarding resource management has revitalised traditional systems of community cooperation, with a survey of villagers in the Navakavu revealing that over 80 per cent of villagers felt there had been a higher level of participation in community meetings, that women had a stronger voice, and that the community had become more united, since the establishment of the LMMA (van Beukering et al., 2007).

LMMAs have also played a role in fundraising efforts for communal purposes, such as supporting local schools or churches as households earning additional income from selling surplus fish and shellfish are better able to meet their traditional social obligation to contribute to village fundraising. In Waiqanake village in Navakavu, for example, a community fundraising project amassed some FJD 20,000 (about USD 12,000) in donations, three quarters of which came from the sale of fish and shellfish from the LMMA.

Empowerment of women

Furthermore, the FLMMA Network has begun to confront the prevailing culture in which women are typically excluded from decision-making processes. This situation has proved to be a particular disadvantage, as women are often those most involved in collecting inshore marine resources and have unique knowledge of them. In Verata, for example, only the women of the community knew how to locate and accurately count kaikoso clams. Although women typically collect seafood for the community, it is men who traditionally make all decisions regarding the management of such activities. The inclusion of women on LMMA committees has addressed this disparity somewhat. Collaboration with outside researchers has also helped to boost the profile of women at LMMA sites, while the network has introduced a gender programme in which meetings are held with local women's groups to discuss progress of LMMA action plan.

POLICY IMPACTS

Among the positive results of the FLMMA Network's growth has been greater bargaining power and advocacy capacity of LMMA communities to affect policy change at the national level. Organizing communities into a network has given them greater access to decision makers and greater influence in the policy making process.

The efforts of the FLMMA Network have helped to secure recognition by national governments of the value of traditional resource management approaches, and of the importance of local communities as stakeholders in resource governance. Indeed, Fiji's government has formally adopted the LMMA approach and has devoted a division of the Fisheries Department to coordinate with the Network to promote inshore conservation. The FLMMA Secretariat is now housed in the Fisheries Department. Establishing locally managed marine areas has been enabled to some degree by customary fishing rights regulations under Fiji's Fisheries Act, while the decentralized nature of the FLMMA Network has encouraged the active engagement of provincial and district governments as stakeholders in LMMA management processes. The FLMMA Network has also played an advisory role in the country's National Biodiversity Strategy and Action Plan.

The success of the initiative has also driven national level policy change in support of sustainable fisheries management. In 2004, during a Small Island Developing States (SIDS) conference in Mauritius, the Fijian Government declared that, by 2012, 30 per cent of Fiji's Exclusive Economic Zone (EEZ), including both inshore and offshore marine borders, would be established as protected areas. The FLMMA Network was tasked with overseeing the implementation of this commitment within Fiji's internal waters, while the government oversees its implementation in offshore waters.

Community-based resource management programmes that result in the establishment of locally-managed MPAs contribute to the commitment made by Fiji. To this end, the Network held a workshop that resulted in the creation of a 20-year provincial vision for marine resource management and conservation within the traditional fishing grounds surrounding Kadavu, including moving toward establishing a community-led, provincial network of MPAs. The process and activities used during this workshop are to be adapted for future application within other Fijian provinces as a step toward the creation of a national MPA system.

The creation of environmental committees at the district level has helped to streamline the work of local government and community stakeholders. Meanwhile, the devolution of resource management to the grassroots level has been supported by legislative efforts to reduce large scale pressures on marine resources. As a result of community pressure on the Fisheries Ministry, Fiji implemented a 12-nautical-mile limit to keep foreign fishing vessels from qoliqoli. This is expected to reduce external pressures on fishing grounds from commercial activities. Meanwhile, the government enacted the Environment Management Act in 2007 to tackle the issues of waste management and Environmental Impact Assessments.

Constrained by insufficient enforcement powers

One constraint to the effectiveness of LMMA sites remains the inability of local communities to effectively enforce their marine resource use regulations against unlicensed poachers. In some sites, the effects of poaching have led community members to lose faith in the sustainable management approach as they fail to reap the rewards of their own efforts. Greater legal recognition of community-managed marine areas would help to strengthen the enforcement of customary regulations. As of 2009, however, only one site in Fiji had been legally gazetted by the government. There, community fish wardens have been trained and given the legal power to arrest offenders, but in most cases, this process relies on volunteers and amicable conflict resolution with poachers.

Inconsistent support from regional and national officials and inadequate resources both cause problems. Fish wardens often experience difficulties carrying out their assigned duties due to a lack of resources. Many LMMA villages consider the availability of a specially designated, motorised patrol boat a prerequisite for successful enforcement, particularly in areas of conflict with commercial fishers. While some communities have been able to secure the use of such a boat, they often lack the means to purchase fuel for it. Only sanctioned fish wardens have the right to take individual violators to the police. Some transgressors may be brought before community meetings for traditional forms of punishment, such as shaming, but a general lack of consistency and the occasional unwillingness of official law enforcement agencies to get involved often undermine the effectiveness of enforcement. New inshore fisheries legislation will establish clearer regulations for tabu areas, greatly increase fines for violators and give more support to fish wardens, which it is hoped will improve the situation.

Virimi placing the nets at high tide on Nukunuku reef off the coast of Korotubu village. Photo: Meghan Kelly

Sustainability and Replication

Teeming fish life (bigeye trevally and jack) in the Namena Marine Reserve, Fiji. Photo: Stacy Jupiter

SUSTAINABILITY

Various factors have ensured that individual LMMA sites and the FLMMA Network as a whole enjoy relatively high levels economic and social sustainability. The LMMA extension and scaling approach is a highly participatory one, requiring strong commitment from the communities themselves. This tends to enhance the resilience of individual sites, reinforced by visible, positive economic benefits. These benefits also arise within a relatively short timeframe: even a fairly limited no-take zone restriction can have the positive result of improved fish catches. Rigorous monitoring and data collection have also helped to provide a quantitative evidence base for the efficacy of the LMMA approach. Experience with the earliest established LMMAs indicates that most communities engaged wholeheartedly in the collective efforts needed for successful ongoing resource management.

Value for money

Another factor contributing to the rapid uptake and replication of the LMMA approach is the relatively low cost of creating and managing a site. For instance, the total cost of establishing Navakavu LMMA was estimated at less than USD 12,000 over five years, a modest investment that has led to a doubling of average household income for about 600 people. A separate study in Navakavu showed that the increase in fish caught over the same timeframe provided about USD 37,800 in benefits to the community.

In addition to the benefits of increased fishing yields, individual sites have been able to develop supplementary sources of income to defray the costs of LMMA management. As part of the conservation initiative in Verata, the community agreed to a bio-prospecting arrangement with a pharmaceutical company, under which the community was paid licensing fees for samples of medicinal plants and marine invertebrates collected in their district. These activities earned the community USD 30,000, which was put into a trust fund to sustain their local fisheries work.

At another site, a hotel pays USD 2 to a community trust fund for each scuba diver that utilizes the village's protected area. This provides an income of roughly USD 1,000 per year. Yet another village has 'planted' artificial live rock in its tabu area to sell to exporters for the aquarium trade after marine life has colonized it. A company makes the artificial live rock substrate, brings it to the village, and assists in placing it on the reef. Within a year, the company harvests the rock with local help. The potential return to the community is USD 4,000 a year. Although these sums are not often large, they are at least sufficient to cover LMMA management costs.

The country-wide network also generates management costs. The estimated cost for the initial suite of community workshops provided by the FLMMA Network is about USD 3,000 per site in the first year, USD 1,000 in the second year, and USD 500 per year thereafter. However, the costs of replicating the LMMA approach have decreased as a result of province-wide approaches established in Kadavu and other provinces of Fiji. This decentralised extension network model is a highly effective, low cost method for extending LMMA work to remote sites. Continued training is needed across sites, however, due to personnel changes over time, as well as with LMMA Network partner organisations such as government ministries.

External funding covers the operational costs of the Network. The total cost of the FLMMA Network's core operations, including workshops, monitoring equipment, and buoys for demarcating tabu areas, is about USD 500,000 per year, much of which has historically been supplied by US-based charitable organizations, including the MacArthur Foundation and the Packard Foundation. It has been challenging for the Network to secure additional sources of financial support, however, especially for core costs. An FLMMA Network Trust Fund has been established to cover ongoing site assistance costs. This was originally established with prize money from international awards for the Network's work, but has also received some funding from Conservation International.

Tailoring to local needs

Additional factors contribute to sustainability at the local level. Needs assessments are conducted with participation from community members during the LMMA preparation process, ensuring that the resource management systems established are tailored to meet local needs, rather than adhering to a generic, one-size-fits-all model. Secondly, the various capacity building workshops undertaken have focused on skills such as financial management, leadership, resource governance, and waste management, ensuring a high degree of local management capacity. This also helps communities to withstand external shocks and adapt to changing conditions, increasing their resilience and sustainability.

REPLICATION

From a single village in 1997, Fiji's LMMA Network model grew to include some 213 LMMAs by 2007, involving 279 villages and covering almost 8,500 sq. km (850,000 ha) of coastal fisheries, or about 25 per cent of Fiji's inshore area. By 2009, this number had increased again to 250 LMMAs, covering 10,745 sq. km. This rapid replication has been mirrored across the Pacific, as other countries have followed Fiji's example, with flourishing LMMA networks developing in areas of Indonesia, Micronesia, Papua New Guinea, the Philippines, and Solomon Islands.

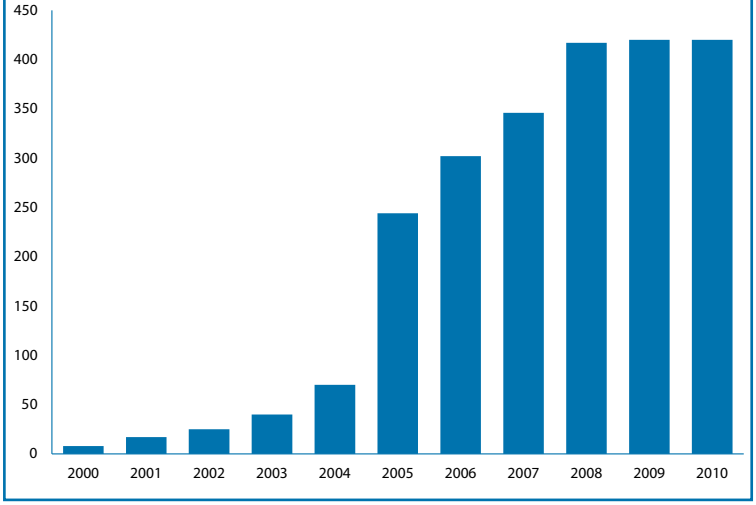
The Pacific island LMMA network has facilitated the international dissemination of the LMMA approach through workshops, site visits and the coordination of a range of publications documenting the success of local marine management in the region. Fiji is the LMMA Network's flagship country network, accounting for more than half of the total number of LMMAs in the Pacific.

Within Fiji, various strategies have been used to communicate the success of the LMMA approach. News of the Network has been disseminated through newspaper articles, radio shows, television broadcasts, newsletters and brochures, leading to request for technical advice from individual communities.

Replicating LMMAs through sub-networks

A particularly effective method of enabling replication has been the creation of sub-networks to extend LMMA work to more remote areas of Fiji. This is being carried out by province-wide teams which provide systematic support to communities. Qoliqoli Management Support Teams (QMST) are comprised of community members, fisheries officers, overseas volunteers, USP-IAS students, and provincial government officials. They hold management planning workshops and link LMMA groups across provinces. The approach has worked especially well in Kadavu, Fiji's fifth largest island, located to the south of Fiji's main island of Viti Levu, where communities rely heavily on fishing and farming for their livelihoods. Kadavu QMST's efforts to extend the LMMA approach throughout the province resulted in a rapid increase in the number of communities that have established tabu areas, from five in 2002, to 30 in 2005, to 52 in 2008. The provincial council endorsed the team's work and has passed a resolution calling on every community to set up both terrestrial and marine protected areas. Similar province-wide approaches are also being pursued in Cakaudrove and Macuata, two of three provinces based on Vanua Levu, Fiji's second largest island.

Fig. 2: Growth of number of sites in the LMMA Network (Fiji, Indonesia, Micronesia, Papua New Guinea, the Philippines, and the Solomon Islands), 2000-2010



Source: LMMA Network http://www.lmmanetwork.org

PARTNERS

The University of the South Pacific's Institute of Applied Science (USP-IAS) collaborated with the FLMMA Network in the implementation of training workshops. As well as an initial management planning workshop, these have included workshops on dynamite awareness-raising (2004), biological monitoring training and management plan reviewing (2005), and baseline biological monitoring and socioeconomic surveys (2006). USP-IAS also provided technical advice for the launch of the Tagaqe village coral farming project.

The Government of Fiji has supported the FLMMA Network through its Fisheries Department (a department of the Ministry of Fisheries and Forests). The government has formally adopted the LMMA approach and has devoted a division of the Fisheries Department to coordinate with the Network to promote inshore conservation. The FLMMA Secretariat is now housed within the Fisheries Department.

The MacArthur Foundation and the Packard Foundation have both contributed significant amounts to help cover the costs of the FLMMA Network's core operations, which come to about USD 500,000 per year. Conservation International has contributed funds to the establishment of the FLMMA Network Trust Fund to cover ongoing costs.

World Wildlife Fund (WWF), the Wildlife Conservation Society (WCS) and Fiji Institute of Technology have also contributed to the success of the initiative.

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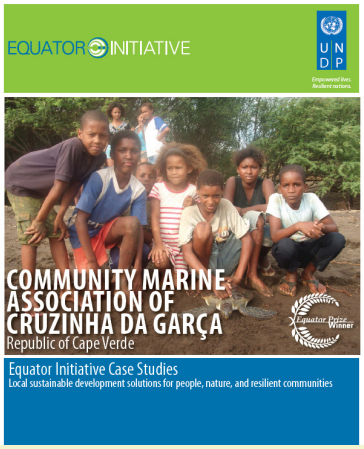

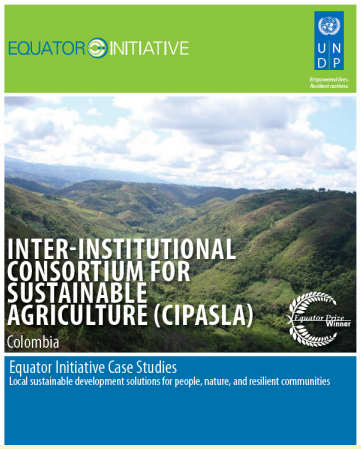

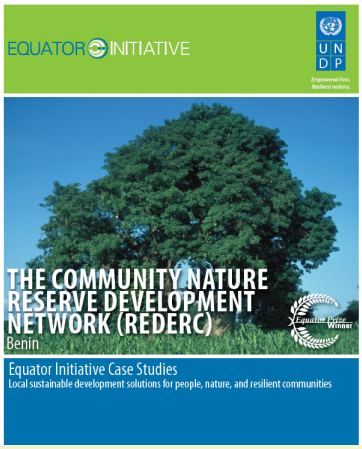

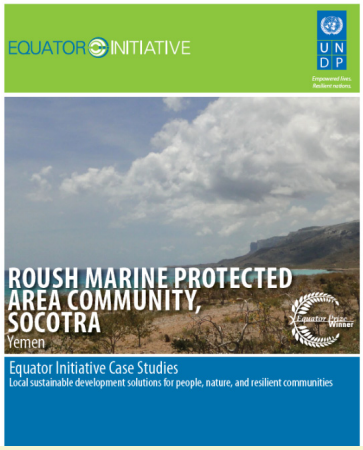

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