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Learning in Sustainable Natural Resource Management: Challenges and opportunities in the Pacific

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Abstract

The importance of learning in natural resource management (NRM) is being recognized by an increasing number of scholars and practitioners. A learning approach to NRM applies principles and theories of adult, organizational and social learning, and is underpinned by three core elements – systems thinking, negotiation and reflection. By combining learning theories with concepts from adaptive management, co-management, and participatory resource management, this article explores how the explicit inclusion of learning principles and processes can strengthen community based natural resource management. Case studies from the South Pacific are used to draw out lessons for the wider application of learning approaches to NRM.

Keywords: collaborative learning, social learning, negotiation, participation, participatory resource management, reflection, collaborative management.

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1.0 Introduction: Learning in Natural Resource Management

A learning approach to natural resource management (NRM) allows us to treat our interventions as learning processes that can contribute to continuous improvement and expand our understanding of the interactions between people and their environments (c.f. Daniels and Walker 1996 and 2001, Keen, Brown and Dyball 2005a, Lee 1993, Leeuwis and Pyburn 2002, Schusler and Decker 2003). A learning approach requires a shift from our conventional reliance on narrow bodies of knowledge, to more inclusive methods of generating knowledge that draw together a range of different types of knowledge (Jiggins and Röling 2002). In part this has been achieved through collaboration in NRM (c.f. Borrini-Feyerbend, Taghi Farvar, et al 2001; Dale 1989), but learning processes could be improved with a clearer understanding of how learning and knowledge sharing across stakeholders groups occurs.

Our analysis of the application of learning theories in NRM concentrates on three core elements of central importance – systems orientation, negotiation and reflection (adapted from Keen, Brown and Dyball 2005b). This article elaborates on these elements of learning, and uses case studies from the Pacific to draw out core principles for a learning approach to NRM. We focus particularly on learning in community based NRM programs in Small Island states, where resources are often community owned and managed, geographically remote, and ecologically fragile. These characteristics affect the sharing of knowledge, the breadth of the knowledge networks, and the responsiveness of the systems to interventions –issues relevant to small and remote communities all over the world.

2.0 A learning framework for NRM

The processes by which we learn in NRM are varied and complex. In the subsections to follow a brief overview of learning theory and its application to NRM is provided, followed by a description of three interlinked concepts – reflection, negotiation and systems orientation. Guiding questions are provided for each of these concepts to help the practitioner analyze learning in NRM, and are also used to analyze our own case studies. Together, these concepts, guiding questions and principles provide a framework for practitioners to use in designing and evaluating learning in NRM.

2.1 Learning in NRM

Learning is fundamentally about change, specifically the "act or process by which behavioral change, knowledge, skills, and attitudes are acquired" (Knowles, Holton and Swanson 1998). The theory of experiential learning, developed by Kolb, explains learning as a process of creating knowledge through the transformation of experience, or, more simply, learning by doing (Kolb 1984:26). Conceptually the process is expressed as a learning cycle involving four key stages (Figure 1). The learning cycle highlights that effective learning is iterative, reflective and contextual, combining direct experience and abstract conceptualization.

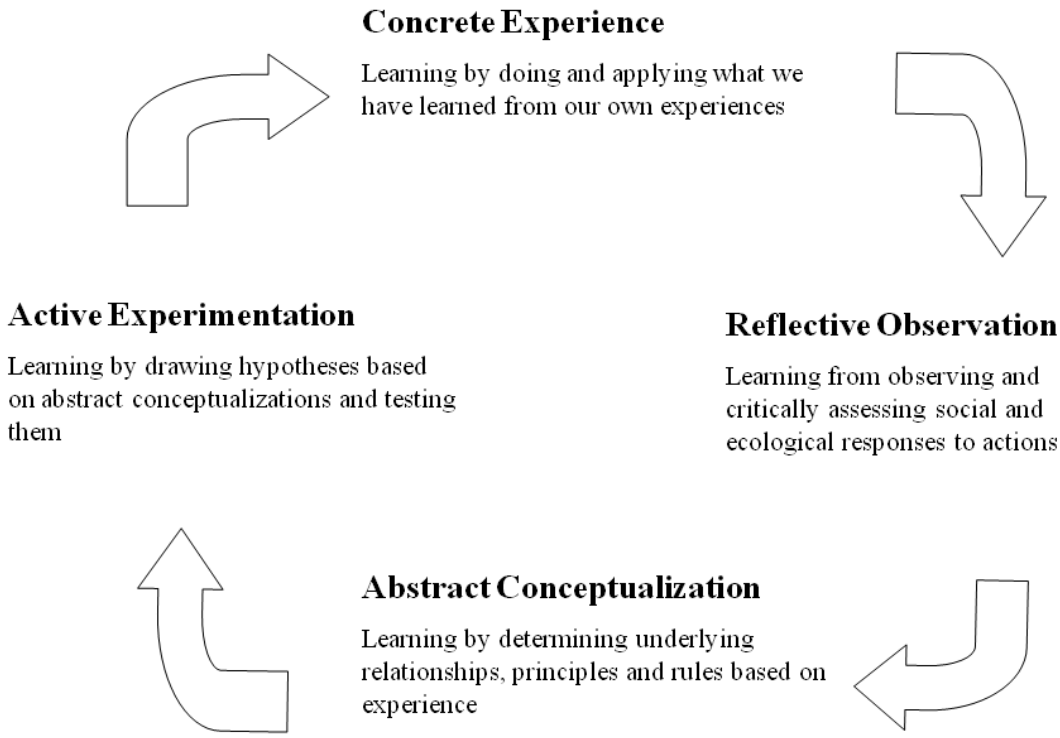

Figure 1 : Learning cycle (adapted from Kolb 1984)

Although useful, this conceptualization of learning is largely modeled on individual learning processes, and does not explicitly deal with inter-personal and social learning, which is central to NRM. When learning occurs between multiple stakeholders each stage becomes more complex. Dialogues between stakeholders are needed to address diverse knowledge, experiences, and values. Finally, individuals and social groups need to reflect on the learning processes and their meaning for individual and group behavior.

This approach to knowledge and knowledge making explicitly rejects objectivism in NRM, that is the idea that 'each objective thinker would reach the same answer, a myth that leads to the conclusion that it makes no difference who does the thinking' (Norgaard 1994:136). A learning approach to NRM must accept that knowledge can be generated in different ways, and that all knowledge can be contested. Thus, all learning processes are contextual – that is

they exist in relation to the place in which they occur, the experiences from which they arise, and the cultures with which they are associated.

Drawing on the growing literature concerning learning in NRM (discussed further in Keen, Brown and Dyball 2005a), three core learning concepts emerge:

- Learning through a systems orientation
- Learning through negotiation and dialogues
- Learning through reflection (see Figure 2).

Each of these concepts, their interations and their implications for NRM are considered in more detail below.

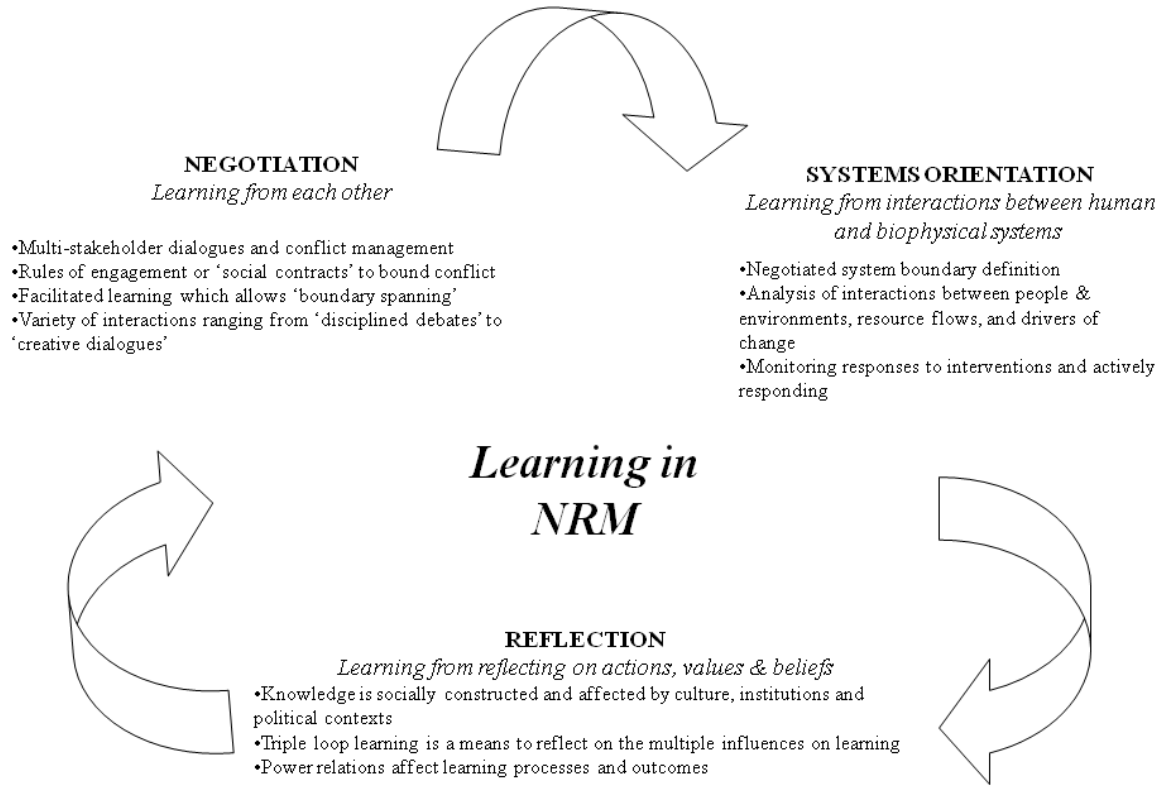

Figure 2 : Learning in NRM

2.1 Systems Orientation

Multi-stakeholder learning processes and the interactions between people and their environments are complex. Systems thinking can enable us to deal better with this complexity. It provides a structured way in which the relationship between people and environment can be understood, taking into account feedback, system constraints, and emergent properties (Dyball, Beavis and Kaufman 2005). In particular, a systems approach requires the perceived boundaries of the system to be defined, the flows of resources to be understood, and the drivers and impediments to change assessed.

Monitoring and reflection play a key role in facilitating feedback between and within the social and ecological systems. They support continuous learning by providing a structured approach to developing hypotheses about system interactions, testing them and critically reviewing and revising our actions to better accomplish our goals (Lee 1993). Applying a

systems orientation is valuable in pushing us to look beyond our own conceptualizations of a system and work with others to better understand boundaries definitions, events, behaviours, and interactions affecting system functions (Daniels and Walker 1996; Checkland 2000; Dyball, Beavis and Kaufman 2005).

Taking a systems orientation to learning in NRM, the practitioner may ask:

- How are the system boundaries being defined and is this consistent with the learning and management objectives?
- How have socio-economic factors (such as cultural beliefs, resource markets) and ecological functions interacted and affected environmental outcomes in the past?
- How do we expect the system to respond to our interventions, and how can we test these assumptions and learn?
- Who is monitoring the system and how are they doing it? Who is excluded?

2.2 Negotiated Learning

A learning approach to NRM that is based on a systems orientation requires the interactions of many stakeholders with diverse, and at times conflicting, perceptions, interests and understandings. From a learning perspective, conflict is necessary to detect errors and plan corrections; but conflict can become problematic when it is 'unbounded' (Lee 1993). Conflict can be 'bounded' by providing the forums in which debate and mutual learning can occur and by ensuring that exchanges between different groups follow some agreed rules of engagement. A useful set of ideas concerning rules of dialogue to promote learning has been elaborated by Bohm and others (Bohm 1996; Brown, Dyball et al 2005; Means and Josayma 2002). In particular, structured negotiations and learning processes encourage:

- early agreement on processes to cope with differences;
- all ideas being heard initially without judgement;

- ideas being assessed according to agreed processes which include consideration of the assumptions and interests from which they emerge; and

actions being taken, but subject to review as part of an adaptive management approach.

'Collaborative learning' processes involving multiple stakeholders have shown some potential in mediating NRM conflicts, but require a process of systematic and negotiated public involvement in policy processes (Daniels and Walker 2001; Leeuwis 2000). While differences may not necessarily be resolved, the negotiation process can go someway toward managing conflict to transform it into a positive learning process, or at the very least a minimal impediment to sustainable NRM (Brown, Ingle-Smith et al 1995).

The level and type of learning needed to support NRM initiatives depends strongly on the stakeholders involved and their ability to "create something in common, something that takes shape in their mutual discussions and actions, rather than something that is conveyed from one person who acts as an authority over the others" (Bohm 1996:3). This requires building bridges between interest groups and spanning socially constructed boundaries (Williams 2002). While 'boundary spanning' by facilitators or group leaders cannot alleviate power differentials and conflict, it can establish more equitable dialogues through which differences can be addressed and used as a catalyst for learning.

Effective learning dialogues require groups to move beyond ritualized discussions that go over old ground within highly constrained agendas, towards more creative processes that lead to the discovery of new insights, novel solutions and group development. Similar to Bohm, Gratton and Ghoshal (2002) argue that to create deep dialogues our attention needs to shift from focused programs and structured interventions, to a greater emphasis on processes that create the space and time for a range of different types of dialogue, in particular:

- *Disciplined debate*: facilitated meetings that aim to examine the assumptions, values and evidence relevant to an intervention. This involves internal and external inputs.

- *Interpersonal exchanges*: smaller group meetings to build trust and a learning environment where cognitive/factual and affective/experiential knowledge can be shared.
- *Creative dialogues*: regular meetings to nurture relationships between actors through discussions relevant to their interests. Agendas are left fairly open to allow for innovation.

When trying to structure dialogues and negotiations, the practitioner can consider:

- Has the full range of stakeholders been engaged so as to maximize their potential to contribute to the learning process and to act?
- Do the rules of dialogue include some guidelines concerning the processes of learning and interactions that will advance NRM outcomes?
- Are negotiations and dialogues facilitated to ensure that traditional or narrow social boundaries are being 'spanned' and dialogues are moving beyond ritualized discussions?
- Has a range of dialogue types been stimulated, including 'disciplined debate', 'interpersonal exchanges' and 'creative dialogues'?

2.3 Reflection

Reflection is a core phase in adult learning (see Figure 1). Reflecting on our experiences and ideas can help us to recognize that knowledge is socially constructed, rather than existing as an objective external truth. Reflection in environmental management is an important lever for social change because it can reveal how theoretical, cultural, institutional and political contexts affect our learning processes, actions and values (Alvesson and Skoldberg, 2000; Pedynowski 2003:80). Thus, learning can be conceptualized as a multi-layered and iterative process that examines our actions, assumptions/values and learning processes (see Figure 3). Argyris and Schon (1978) refer to this as triple loop learning. Within the context of NRM these learning loops can be described as:

- single loop learning which generates knowledge from doing,

- double loop learning which explores the underlying values and assumptions behind our knowledge and learning, and
- triple loop learning which reflects on the processes by which we have been learning (King and Jiggins 2002).

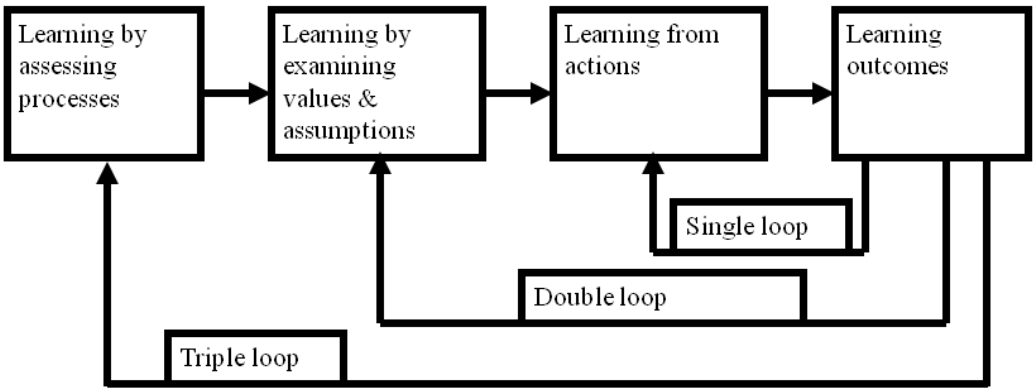

Figure 3 : Multi-layered learning in the NRM context (modified from Argyris 1999; King and Jiggins 2002).

Community based NRM projects can benefit from including all three layers of learning. Often monitoring processes focus on the impacts of specific actions and practices, but without explicit attention to the higher levels of learning we can become blind to biases and limitations in our learning processes. For example some types of knowledge can be discredited and excluded from the learning process because of the values and assumptions of dominant and powerful stakeholders. Reflection can help to understand the role of political contexts (Lee 1993), institutional arrangements (Milbraith 1989), power dynamics

(Maarleveld and Dangbegnon 2002) and identities (Wenger 1998), and therefore to clarify roles and responsibilities in decision making.

Given the dynamic nature of power relationships in NRM, (Flyvberg 2001:120), reflection processes can critically consider the roles of different stakeholders in decision-making, who makes the decisions based on what knowledge, and who has the power to resist? Because different types of power are exercised, the facilitator of a learning process needs to assess how power is gained (for example from knowledge, from culture, from gender).

From this very brief discussion of reflection a few key questions arise for practitioners:

- Does knowledge generation and sharing have a bias toward a particular type of knowledge, and with what implications?
- Do learning processes favour any particular stakeholder group?
- How are power relations and politics affecting learning processes and outcomes?
- How does learning translate into action?

3.0 Applying a Learning Approach in NRM

This paper applies the above concepts and questions to data gathered in qualitative studies of projects that were supported by or grew out of, the Biodiversity Conservation Network (Mahanty et al 1999, Mahanty 1999; Veitayaki 2003a, Veitayaki, Aalbersberg and Tawake 2003b). The Biodiversity Conservation Network (BCN) supported 20 conservation and development projects in 7 countries throughout the Asia-Pacific over six years; in some cases, such as the Arnavons project discussed below, BCN funded one component of a wider project being coordinated by other organizations. BCN supported projects were founded on a learning approach to NRM, engaging with local project staff and, in some cases, with individuals and groups from communities, to document learning across project sites on conservation impact, enterprise-based approaches and process lessons.

The data collected in the BCN study of stakeholder organisations included semi-structured interviews with key informants at four sites: Arnavon Islands (Solomon Islands), Kalahan (Philippines), West Kalimantan (Indonesia) and Garwhal (India). Project documentation and other relevant documents were reviewed, and an email survey of other BCN sites was conducted to compare the findings at the case study sites with the situation elsewhere. In this paper, we draw primarily on the Arnavons case in the Solomon Islands. The reason for this was our interest in exploring the use of learning approaches in the Pacific region, where we are engaged with current projects that are adopting a learning approach to NRM. Updated information on the project was obtained through email contact with current project staff. The findings from the BCN case were compared with data on current community based resource management programs in the Pacific Islands, which have been gathered through our own recent and past work (Pacific Islands International Waters Project, South Pacific Biodiversity Conservation Program), personal communications, and available literature (Locally Managed Marine Area Network, South Pacific Biodiversity Conservation Programme (SPBCP), BCN documents). A brief overview of the two main case study projects is provided below.

Arnavon Islands Marine Conservation Area

The Arnavon Islands lie between the islands of Isabel and Choiseul in Northwest Solomon Islands. A regionally significant Hawksbill Turtle rookery, the Arnavons have been managed as a community based marine protected area since 1994. The area is now managed by the Arnavon Community Marine Conservation Area Management Committee (referred to here as the AMC), a representative body involving the Ministry of Forests, Environment and Conservation (MFEC), The Nature Conservancy (TNC), provincial fisheries officers from Isabel and Choiseul, and the Kia, Waghena and Katupika communities (ACMCAMC, 1994).

Locally Managed Marine Areas

The Fiji Locally Managed Marine Area Network (LMMA) is a collaborative initiative aimed at bringing together different stakeholders including local communities, conservation practitioners, government officials and researchers to work together to define and address local coastal resource management issues. The LMMA has a strong commitment to using both traditional/local and scientific/expert knowledge. Locals define learning priorities for training and monitoring in collaboration with 'experts'. Learning is shared across villages through facilitated country level workshops. The LMMA now covers 10% of Fiji's total inshore marine area. Recently the government of Fiji has adopted the LMMA framework for local marine management, and the model received an award for 'Innovative Partnerships' at the World Summit on Sustainable Development

4.0 Findings from the Case Study Projects

4.1 Systems Orientation

A systems orientation to learning in NRM is a holistic approach concerned with the relationships between social and ecological systems. This raises issues and challenges in defining system boundaries, understanding inter-relationships and monitoring system responses.

Boundaries and inter-relationships

The definition of system boundaries in the Arnavons case occurred at two levels. Conservation activities focused on a small spatial area of about 83 square kilometers that was defined by experts on ecological grounds (in Leary 1993) and where stringent rules were put in place to manage resource use. However, this area was only one part of a wider social system involving kinship, livelihoods and customary tenure for the communities engaged in the project. During initial stages of the project the importance of the larger socio-ecological

system boundaries of the project became apparent. This larger areas taking in settlements and other livelihood activities needed to be included in management plans because it influenced people's patterns of resource use in the conservation area.

Moving beyond the local management scale, defining learning system boundaries has emerged as important in reviews of past conservation and development programs in the region and elsewhere (Hunnam and Baines 2002), and has been picked up in recent interventions such as the Fijian LMMA. In the LMMA case, a 'learning portfolio' is used by local communities to document and share learning between sites and communities (LMMA Network 2003). These examples reinforce the benefits of recognising linkages between local and regional learning networks. For the purposes of learning, system boundaries may reach far beyond the physical areas where the management is occurring.

Integrated learning requires an analysis of ecological and socio-economic dimensions of a system and the relationships between these. The Arnavons project started with information collection by project staff and other key stakeholders about socio-economic and ecological factors affecting resource use in the project area, and the relationships between these (Leary 1993; Leary and Mahanty 1993a, b & c; Mahanty 1995). These studies ensured external and local stakeholders gained a greater understanding of the socio-ecological context prior to the development of the management plan, and that livelihood and cultural interests of participating communities were taken into account along side of ecological considerations. For example, local subsistence harvesting of fish was allowed to continue in the conservation area, as this was a socially and economically significant use of resource and would not adversely affect the ecology of the conservation area. However, it was assumed that the commercial harvesting of certain resources would be detrimental to the area and alternative community enterprise activities were used to replace foregone income, which in turn stimulated a focus on learning around enterprise activities.

Monitoring system responses

Monitoring is a key component of a systems orientation because it enables learning about system responses to NRM interventions. To maximize learning potential, an integrated approach is required to monitoring impacts on social and ecological systems. However, most monitoring of NRM projects in the Pacific, and indeed in the Arnavons and the LMMA, has tended to concentrate most heavily on ecological outcomes. Biological surveys in the Arnavons were conducted before and after the closure of the area to commercial harvesting, and in reference areas that were not closed (Lincoln-Smith et al 2000). In contrast, socio-economic monitoring was much weaker, although there were initial efforts to develop a participatory socio-economic monitoring program, but this stalled due to a range of resource and political factors. This neglect of socio-economic systems in monitoring can weaken learning about:

- community compliance with, and views on, management regimes
- livelihood impacts associated with the project, and
- the fit between the management approach and the social and institutional context.

While negative relationships in these areas would eventually become evident through the resource status, gaining an early understanding of tensions can enable remedial actions to be taken, and management plans to be strengthened.

The lessons for adopting a systems orientation are summarized below (Box 1).

Box 1: Lessons for a systems orientation to NRM learning

Definition of boundaries needs to take account of relationships that span spatial scales and the links between local and regional learning networks. Systems analysis can enable critical relationships between social and ecological systems to be addressed in the design of community initiatives.

Continuing an integrated approach through monitoring processes is important – often priority is placed on biological monitoring, which can take time to show change.
Socio-economic monitoring of stakeholder views, relationships and interests can create a better understanding of changes in the system and allow us to learn and respond more quickly.

4.2 Negotiated learning

Negotiating the learning objectives of interventions has been identified as a critical basis for multi-stakeholder learning, as well as one of the major challenges (Guijt and Abbot 1998, Daniels and Walker 2001). Key issues include the use of explicit rules to guide negotiations, incentives for stakeholder engagement, and processes for defining learning objectives and processes.

Rules guiding negotiation

Clearly agreed and documented rules and norms to mediate stakeholder interaction play a crucial role in guiding processes of negotiation concerning learning agendas. In the Arnavon project, the multi-stakeholder AMC is a key forum for negotiating learning and project goals. The Committee has explicit rules concerning consensus decision-making, and conflict resolution processes. Well defined processes are in place to review management rules every six years and to apply lessons learned to research and monitoring. The process of documenting 'ground rules' for the Committee enabled stakeholders to become aware of and agree to negotiation procedures. In the Fijian LMMA, this challenge is addressed through a standard, non-legally binding social contract between all participants (LMMA Network 2003). The social contract clearly sets out the values, objectives and processes participants will share in common when engaging in LMMA projects. While not legally binding, these 'contracts' set the basic rules of engagement early on and create a sense of common purpose.

A second key point from the Arnavon experience is the emphasis on consensus decision-making. A former project manager described the decision-making process as 'circling to reach consensus'. For example initial discussions on the management plan involved close Committee scrutiny of each paragraph and adjustments to these until all the members were satisfied it would gain the approval of the three communities (Mayer and Brown n.d.). This helped to get broad support for management rules among representatives; and forced the different stakeholders to listen to each other's concerns and gain a stronger understanding of the complexity of issues. This process, while at times slow, established relationships and understandings that could be applied in future negotiations.

A requirement for the AMC to periodically review the management rules for the Arnavons also supports learning by enabling the group to apply the findings from the monitoring programs and issues raised during community consultations. These provisions make learning an explicit part of the agenda and 'business' of the Committee, although as noted in the previous section, the emphasis is on biophysical, rather than socio-ecological or systems based learning.

Stakeholder engagement in defining the learning agenda

In the Arnavons case, both the biological and socio-economic monitoring programs were principally designed by technical experts in their respective fields, but required a degree of stakeholder 'buy-in' and engagement. The monitoring plans had to be approved by the AMC, but the Committee did not reflect specifically on learning needs and how they could be best achieved. However, Committee involvement did broaden the learning agenda by requiring a shift from the original monitoring proposal where monitoring activities were to be undertaken solely by technically trained personnel to an approach where local people were trained and involved. However the locals had a limited role in designing the learning goals. Full

engagement of the community in designing and managing learning processes is important to their capacity to later implement their own learning initiatives (Hiyama and Keen 2004).

The question of who sets the learning agenda is a vexed issue when external agencies are involved in CBNRM. The involvement of the BCN in the Arnavons superimposed the BCN learning agenda, which was common to all of their project sites. Similarly, in the Fijian LMMA case, a common learning framework is used that includes common learning objectives and information sets, while the details can be specified by community participants at a site level. Given the accountability requirements of external funding agencies, a bias towards external learning goals is difficult to avoid, and in some cases a well designed common learning framework can help to ensure that common learning experiences are more easily shared. The weakness is that the monitoring may not have as much relevance for community members. Conversely, community set monitoring programs can neglect data collection important for the overall assessment of the program. For example, in some LMMA sites little information has been collected on the economic and social costs and benefits of the initiatives. The Arnavon and FLMMA cases highlight that there is a balance to be struck between stakeholder engagement in defining learning agendas in NRM and a systematic approach that promotes wider learning beyond a specific site. The level of stakeholder ownership of, and engagement in, learning processes is increased with joint definition of learning objectives and processes; yet it is important to take a systematic approach to learning to enable learning to be shared with other interested parties working in similar NRM initiatives.

The value placed on different modes of knowing has implications for the empowerment of particular stakeholders in learning processes; the ongoing and meaningful engagement of a wide range of stakeholders requires some valuing of the knowledge that those stakeholders bring to the NRM process. The Fijian LMMA achieves this through multi-stakeholder workshops which draw on the knowledge of government, NGOs and community members to

develop learning and action plans (see section on Processes of Reflection). However longer term learning may require support through collaboratively conducted learning needs analyses, still rare in most development projects, to identify opportunities and needs for training and knowledge sharing (c.f. Baines, Hunnam et al. 2002).

Another crucial issue for stakeholder engagement in learning is that of incentives: what benefit can stakeholders gain from engaging in learning processes, and how is their contribution recognized? Processes of reflection and learning may be unfamiliar to participants, take time and involve opportunity costs. Although project staff and donor agencies are compensated for efforts in these areas, incentives for local stakeholders can be less direct. In the socio-economic monitoring program for the Arnavons there was considerable discussion of whether time spent by community members on socio-economic monitoring should be compensated or not (Mahanty 1999). Incentives become a particular issue if monitoring is based around externally determined variables, and there is a lack of local ownership or direct relevance and benefit for participants. On the other hand, paying local participants for their participation in learning interventions may limit their engagement to instrumental skill based learning, not transformative learning.

Some lessons for negotiating learning are summarized in Box 2.

Box 2 : Lessons for Negotiated Learning in NRM

- Guidelines for negotiation and learning such as 'social contracts' can help establish common understandings of the 'ground rules' for negotiation amongst stakeholders.
- Explicit incorporation of learning in the agenda and 'business' of coordinating bodies helps to ensure learning processes are not neglected, and are facilitated through review requirements, monitoring and dialogues.
- Learning between stakeholders is important at all stages of a project or community initiative – collaboratively defining learning needs can enhance ownership, relevance and commitment to learning processes.
- Incentives for learning are important – stakeholders need to see the relevance and value of

learning processes to commit valuable time and resources; the issue of compensation for stakeholder engagement needs to assess and recognize individual versus community benefits, and be context sensitive.

- As with participatory NRM generally, power relationships affecting resource access, decision making and learning processes need to be considered through open and transparent dialogues with stakeholders.
- A balance needs to be struck between a participatory and systematic approach to learning. There are many more examples of systematic, expert driven approaches than of balanced and inclusive approaches in the Pacific.

4.3 Reflection in learning processes

CBNRM projects taking a learning approach need to critically consider how they can include processes of reflection and value knowledge across stakeholder groups. Processes of reflection allow us to consider what we know, how we know it, and what relationship our own knowledge has to that of others. The conceptual diagram of triple loop learning presented earlier is a good starting point for practitioners who wish to better integrate reflection into NRM projects. At a basic level, reflection will allow stakeholders to critically assess the relationship between project initiatives and outcomes. At a deeper level, reflection processes can assist people to better understand the assumptions and values that underlie their knowledge. At times these assumptions need to be challenged through exposure to other ways of knowing or creating knowledge.

In the Arnavons case, technical experts primarily determined what elements of social and ecological systems should be monitored in order to better understand the impacts of the project, based on discussions with communities and initial data collection. A workshop with AMC members in 1998 found that members had a very detailed understanding of the positive and negative impacts of the project to that point. Tapping into such local expertise provides

for richer reflection processes that use knowledge based on experience and observation of community processes.

It is often the case that learning processes in NRM do not successfully engage the knowledge of marginalized groups. In the LMMA, it was acknowledged that collaborative workshops aimed at planning participatory learning and action projects at one village (Ba) were successful in gaining growing participation over a 8 month period, but still had key groups missing – most notably women (Veitayaki, Aalbersberg and Tawake 2003b). In order to get fuller engagement in NRM learning, activities may need to be targeted and sensitively integrated into pre-existing decision-making frameworks. For example, women's groups can have separate workshops to determine important learning outcomes and these can be conveyed to decision making councils with the strong support of the funding bodies. Separate activities in Pacific communities for men and women are compatible with their separate NRM roles, and are now being more widely used.

While social context inevitably creates some divisions of knowledge and learning, techniques such as the participatory learning and action (PLA) used by the Fijian LMMA and the Arnavons project can go some way to facilitate a greater understanding and value of different types of knowledge (also noted by Zanatell and Knuth 2002). For example, these participatory planning techniques in multi-stakeholder workshops encouraged reflections on learning, knowledge, and approaches across stakeholder groups:

- resource histories from community members assist stakeholders to reflect on available resources and the changes that have been experienced over the last 30-50 years (Veitayaki, Albersberg et al. 2003; Mahanty and Leary 1993 a, b and c);
- joint preparation of the community marine management plan to avoid the 'one size fits all' approach and the domination of Western perspectives or powerful community interests Fijian LMMA (FLMMA);

- resource mapping and marine transacts to collaboratively assess resource availability and use based on mutually observed data (FLMMA);
- development of a monitoring plan to assess resource recovery that is compatible with community and funding interests (Veitayaki, Aalbersberg and Tawake 2003; ACMCAMC 2002).

Discussions with LMMA researchers highlighted the difficulties in sustaining learning processes over the long term (pers communication J Veitayaki and I Korovulavula, FLMMA, February 2003). In some cases, once the initial 'good' results were revealed, community members wanted to get on with livelihood pursuits in the marine areas and often failed to continue to monitor and learn. In some cases this would have resulted in a failure to recognize future degradation of local ecological resources when harvesting pressures increased again.

Another complication facing learning processes in NRM is the time lags in system responses, such as recognizable economic benefit flows or ecological degradation signs. Learning, and the effort it involves, can be frustrating when signs of change are slow to emerge. Often such lagged learning occurs because our indicators are too crude. This challenge can be partially addressed if the lessons of one community are efficiently and effectively transferred to other communities – especially in relation to monitoring and collaborative learning. LMMA has begun to address this issue through the use of shared learning portfolios (records of learning shared between communities); in the BCN case this was supported through regular documentation of project experiences and lessons learned. A mixed set of monitoring indicators, that track current processes and community behaviour in addition to resource status, can help to reduce this time lag. Such an approach is being used in a recent project, the Pacific Islands International Waters Program (Mahanty 2004).

Learning through knowledge sharing

The sharing of different knowledges between stakeholders is an opportunity and challenge in multi-stakeholder learning processes. In the Arnavons, expert led feedback sessions with communities presented results of the biological monitoring surveys, but some management committee members commented that the biological monitoring information was very technical and they were not sure how to use it (interviews February 1998). The interpretation of this information appears to have been simplified over time; for instance the final report includes a simplified interpretation of findings and their implications for the management of the area (Lincoln-Smith et al. 2000).

The 'language' of learning thus has important implications for who can partake in the learning process. Where findings are expressed in technical terms, it becomes difficult for a wide range of stakeholders to fully engage in learning (Hunnam and Schuster 2003). To address this problem of learning languages, the LMMA projects have trained individual community members in scientific methods and approaches in order to ensure that they were better able to convey community concerns to their NGO/university counterparts, and to help communities to understand the ideas, logic and assumptions behind these methods. In addition, only researchers/NGO people who were able to speak the local vernacular and had a sound understanding of the local context were engaged with the communities, in an attempt to ensure that the projects were context sensitive (Veitayaki, Aalbersberg et al. 2003).

There is little doubt that contextual learning has been important to many CBNRM projects, particularly when customary tenure and local institutions are used to manage resources and affect consumption patterns. However partnerships with external stakeholders and the application of scientific knowledge has also been important. For example, in FLMMA it was found that the size of the *tabu* (no take) area and the level of protection needed generally required some scientific input coupled with historical knowledge of ecosystem resilience.

Ensuring that management plans were respected and enforced outside of the community required the input of government and legal professionals with a greater understanding of national institutional arrangements.

For learning benefits to be maximized across scales, local and regional learning needs to be complementary, that is learning at the local level needs to be shared with regional and national agencies and *versa vice*. Interestingly in the FLMMA case, once government agencies understood the significant success the local projects were having, the FLMMA model with its emphasis on participatory learning and action was adopted by the Fijian Ministry of Fisheries and Forests as a basis for its assistance to customary fishing areas. The challenge for regional or inter-community learning will be comparing results from different communities all of which may be using slightly different indicators. Box 3 outlines a number of core issues for processes of reflection in NRM learning.

Box 3 : Lessons concerning reflection in NRM Learning

- Learning processes in NRM need to critically assess whose knowledge is being incorporated and how, and attempt to integrate diverse knowledges, including those of local 'experts' as well as marginalized groups.
- Learning languages affect who is engaged in learning processes and who is excluded; they also can convey an implicit valuation of different types of knowledge.
- Undertaking a learning needs analysis across stakeholder groups in the early stages of NRM can help to address issues of who, what and how to learn within the given context.
- Learning across scales requires that there be opportunities for sharing of experience, and that the language used be equally accessible to all parties.

Conclusions

Achieving sustainable NRM requires us to critically reflect on the nexus between our ways of knowing, our actions and environmental problems. The diversity of interests and actors engaged in NRM can be an asset if we can learn from the experiences and insights we each

hold. But such learning must be carefully negotiated and embedded within an adaptive and flexible NRM strategy that addresses learning needs. This paper has sketched a range of principles that can assist the practitioner to assess learning needs and establish more equitable and effective co-learning processes.

The learning process needs to be supported by sound learning frameworks that are collaboratively designed with stakeholders and address the core concepts of learning in NRM – systems thinking, negotiation and reflection. Learning in NRM requires commitment and resources – but these resources are not limited to the financial and the physical. Perhaps our most valuable resource is our diversity in knowledge and experience, and our capacity to learn. Learning processes in NRM that are founded on an understanding of learning needs, take account of the interactions between social and ecological processes, engage actors in effective dialogues and networks, and include reflective processes will enable us to harness this potential towards more sustainable resource management.

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