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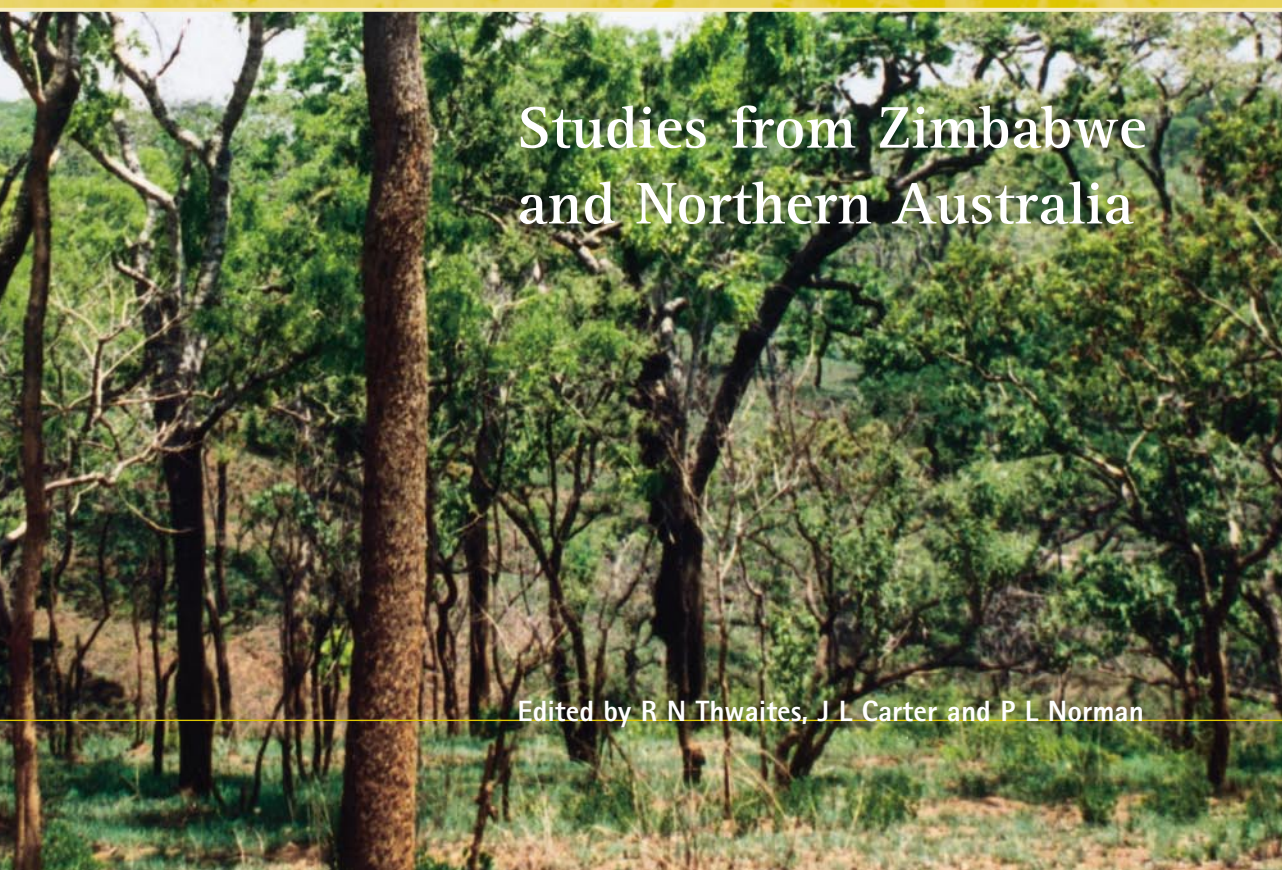
COMMUNITY BASED RESOURCE PLANNING

Studies from Zimbabwe and Northern Australia



Edited by R N Thwaites, J L Carter and P L Norman

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Australian Centre for International Agricultural Research
Canberra 2004

Acknowledgments

The team members who worked on this project would like to thank many people, in both Zimbabwe and Australia, for their time, knowledge, expertise and willing cooperation throughout the conduct of the study.
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The Australian Centre for International Agricultural Research (ACIAR) was established in June 1982 by an Act of the Australian Parliament. Its mandate is to help identify agricultural problems in developing countries and to commission collaborative research between Australian and developing country researchers in fields where Australia has a special competence.

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Abbreviations, acronyms and definitions

ACIAR	Australian Centre for International Agricultural Research (Aus)
AEZ	agro-ecological zones
AGRITEX	Agricultural Technical Services and Extension (Zim)
Balkanu	Balkanu Cape York Development Corporation (Aus)
CAMPFIRE	Communal Areas Management Program for Indigenous Resources (Zim)
CARD	Coordinated Agricultural and Rural Development (Zim)
CASS	Centre for Applied Social Sciences (Zim)
CHRRUP	The Central Highlands Regional Resource Use Planning Project
CIFOR	Centre for International Forestry Research
CIMMYT	International Maize and Wheat Improvement Centre
CIRAD	International Cooperation Centre for Agronomic Research for Development (Zim)
CIRM	Consortium for Integrated Resource Management (Aus)
CYPLUS	Cape York Peninsula Land Use Strategy (Aus)
CYRAG	Cape York Regional Advisory Group (Aus)
CSIRO	Commonwealth Scientific and Industrial Research Organization (Aus)
DPI	Department of Primary Industries Qld
DSS	decision support system
ESD	environmentally sustainable development
FESLM	framework for evaluating sustainable land management
FAO	(United Nations) Food and Agriculture Organization
GIS	geographic information systems
GPS	global positioning system
ICM	integrated catchment management
IES	Institute of Environmental Sciences, University of Zimbabwe (Zim)
MDBC	Murray–Darling Basin Commission
MZDP	Mid-Zambezi Development Project (Zim)
NAP	National Action Plan
NGO	Non-government organisation
NRM	natural resource management
PAR	participatory action research
PRA	participatory rural appraisal
PMP	Property Management Planning (Aus)
QDNRM	Queensland Department of Natural Resources and Mines (Aus)
RDC	Rural District Council (Zim)
RMD	resource management domains
RS	remote sensing
TCM	total catchment management
USDA	United States Department of Agriculture
UMP	the District containing the communal lands of Uzumba, Maramba and Phungwe (Zim)
UNCED	United Nations (World) Commission on Environment and Development
Vidco	Village Development Committee (Zim)
Wardco	Ward Development Committee (Zim)
WTMA	Wet Tropics Management Authority (Aus)

Preface

Woodlands are a major ecosystem in the subtropics and tropics of southern Africa and northern Australia. They provide important and diverse resources for many people, including a range of staples and cash commodities, a variety of timber and other products, and land for traditional shifting agriculture. Where they are largely undamaged as in parts of Africa and northern Australia, they have very significant biodiversity value, and are targets for ecotourism. Demands on tropical woodlands are increasing. As other ecosystems are becoming fully committed or exhausted and as population increases in Africa, tropical countries are increasingly looking towards their woodlands to contribute to economic growth.

This book arose from an ACIAR funded project on Enhanced Resource-Use Planning for Tropical Woodland Agroecosystems. The general need for a project of this nature was initially identified through visits by ACIAR staff to southern Africa. Research activities were conducted in Zimbabwe and northern Australia over four years, from 1998 to 2002. In southern Africa, the extensive miombo woodlands are under pressure because of increasing population pressure, leading to clearing for fuelwood, the conversion of marginal grazing lands for crop and pasture production and shortening of fallow periods. In northern Australia, Aboriginal land owners now control vast areas of woodland but population densities are low and traditional Aboriginal practices have little impact. However, as in Africa, there is a growing interest in deriving significant income streams from the woodlands.

It is likely that the pressures on these woodlands will continue to increase. The challenge is to find ways of allowing changes while avoiding the mistakes that have been made in other natural environments, arising particularly when resource ownership is unclear or disputed. The growing demands on tropical woodlands must be balanced against their considerable limitations.

Woodland managers and people living in these areas are faced with decisions about how they develop and to what extent they conserve this environment. This project was designed to provide an improved framework for resource use planning in tropical woodlands in southern Africa and northern Australia by producing a package of tools and processes to help in decision making.

The aim was to enhance the capacity of resource managers, in particular the local occupants to identify, plan and implement sustainable natural resource management options in tropical woodlands of Zimbabwe and northern Australia.

Throughout the work, the researchers used the techniques of 'action research' (or 'learning by doing') which enables local participants to take some responsibility for the progress of the research. All the results were shared with and evaluated by stakeholders during and after the project. This publication summarises the key findings of the project.

Peter Core
Director
Australian Centre for
International Agricultural Research

Summary

This monograph describes research activities and outcomes from the ACIAR funded project *Enhanced Resource-Use Planning for Tropical Woodland Agroecosystems*. The project was based in Zimbabwe and Australia and involved collaboration of government, non-government institutions and communities from both countries over a period of four years, from January 1998 to January 2002. Research activities were focused on two sites, one in north-eastern Zimbabwe and one in northern Australia.

The project arose from country visits to Southern Africa and northern Australia in 1996 by staff from ACIAR and the Australian lead research institutions, the University of Queensland and the Queensland Department of Natural Resources (now Natural Resources, Mines and Energy). These visits focused on concerns raised previously about rapidly increasing resource use pressures on woodlands and their consequential degradation. The observation that communities continued overexploitation and damaging practices, despite clear evidence (and recognition) of the resultant degradation, led to the central thesis underlying the project — that more effective planning is a key to addressing unsustainable resource use practices.

Project activities

The project aim is to develop and trial a framework of processes and tools for effective community-based planning towards sustainable resource management in tropical woodlands. Discussions during the initial visits indicated that whilst there had been considerable planning activity in both countries there was very limited evidence of these efforts having been effective. Review of the literature indicated that, to be successful, planning needed to include a balance of elements of 'bottom-up' or participatory approaches and 'top-down' or technocratic approaches. To this end, tools and techniques trialed in the project included: participatory methods, computer-based resource mapping and modelling, and, multi-objective decision-support systems.

Some of the project team members during a project workshop in Zimbabwe, L-R: Dr Paul Lawrence (QDNRM, Australia), Stephen Kasere (CAMPFIRE Association), A/Prof. Peter Frost (IES, Zimbabwe), Nicholas Ncube (AGRITEX, Zimbabwe), Philip Norman (QDNRM, Australia)

The project involved four sub-projects, namely:

1. the development of methods for data integration and interpretation
2. communications and decision support
3. support implementation and planning framework
4. evaluation and monitoring.

A participatory action research approach was adopted thoughout the project and each of the four major components of the study either linked to or drew upon one or a number of the other components. For example, an understanding of participatory action research provided a means for undertaking and developing a method for a communications model and the application of decision support systems for farmer-based decision-making processes.

Project team members at AGRITEX, Zimbabwe working on data from Karamba Ward, L-R: Mr Wilson Mutinhima (CAMPFIRE/AGRITEX), Dr Robin Thwaites (Univ. Queensland), Mr Wilson Magaya (CASS).

A number of unforeseen external factors were encountered during the course of the project that limited the full implementation of some aspects and tools. Actions by the national leadership of Zimbabwe, and subsequent elections brought about a national and international focus on land use reform within the country. Although the work of this project was not related to the compulsory land acquisition that was at issue, and was initiated prior to the undertaking of those reforms, it was still affected. At the operational level, circumstances led to the resignation of the project officer, the resignation of the AGRITEX (the lead agency in Zimbabwe) project manager, and the restructuring and eventual abolition of AGRITEX.

Sufficient progress was made, however, to draw some useful insights and conclusions about the utility of some individual tools and to postulate a new conceptual framework, 'planning space', for their application.

Key research findings

Key findings on the application of participatory processes and tools included:

- direct questioning and information extraction may not be appropriate
- knowledge exchange and information flow requires joint learning processes
- workshops and meetings may not be appropriate forums for facilitating a planning process

- work within local governance structures and clan-based social groupings rather than setting up new committees and consensus-based processes
- participation does not necessarily require a representative sample of community members
- maintaining traditional culture (such as language) is essential

Key findings on the application of agroecosystems processes and tools included:

- modelling shells such as Stella are useful for expressing complex relationships simply
- agroecosystem models are only useful as a communication tool if all stakeholders are involved in their development
- agroecosystem modelling is compatible with adaptive research and planning

Key findings on the application of decision support processes and tools included:

- decision-tools do not necessarily have to be technical or computer-based
- communication modelling is an extremely useful tool but needs to be applied early in the process
- decision power and processes vary with differing governance structures and different cultures.

'Planning space' is a model with the three characteristics we found to be the keys to successful community-based planning comprising the three dimensions. These are: institutional and organisational relationships, technical capacity, and motivation. A community's relative position within the 'planning space' provides an indication of the type of support required to facilitate the planning process.

Insights into project management and team dynamics

Key findings for the management of future similar projects included:

- get the people and their roles right at the outset

This requires: clearly defining personnel roles, recognising the importance of dedicated coordinators, and recognising the importance of the facilitator role and the particular set of specialist skills required to fill it.

- establish and maintain stakeholder relationships

This requires: ensuring communication, building on successful accomplishments, ensuring equity in allocation of project resource and ownership or outputs, looking for opportunities to increase ownership at the community level and with local representatives, allowing sufficient time, pre-planning community entry, working within existing governance structures, and respecting indigenous knowledge.

- secure long-term change

This requires: increasing exchange between countries and stakeholder groups, understanding that the process rather than the content is important, balancing short-term benefits with community ownership, building capacity two-ways, and reshaping institutional structures and policy.

The project brought together researchers with cross-disciplinary interests in resource use planning. This open exchange of ideas supported by a common interest in holistic planning methods provided opportunities for new perspectives to be fashioned within the project team and across organisational and institutional boundaries. At times, it was necessary to allocate additional time for complex ideas to be worked through to an agreed position that respected disciplinary rigour and was culturally acceptable. In effect, the project represents a merger of different sciences, and the ways in which a synergy is created by building on the strengths of individuals. On some occasions, the dynamics of personalities and perspectives created tensions that needed balance between individual contributions and team development. Perhaps one of the critical outcomes from the project is the need to adopt an adaptive approach to participatory project management when participatory research is a major component of the project methodology.

Table of Contents

List of tables

List of figures

PART 1

Introduction and literature review

CHAPTER 1

Background: The ACIAR project and basis for the monograph

P. Norman, R. Thwaites, P. Frost, W. Mutinhima



Introduction

Woodland ecosystems in many tropical nations are undergoing a period of profound and potentially irreversible change. Tropical woodlands have traditionally supported their human inhabitants at relatively low, yet apparently sustainable, numbers. Population growth and consequent demand for economic growth has led to the exhaustion or degradation of the more productive ecosystems (such as rainforests), and tropical nations are now looking to the inherently less productive woodlands to support their increasing populations. As woodland ecosystems are more intensively used, the challenge will be to limit demand to a sustainable level.

In parts of Africa, changes in resource management practices resulting from rural population growth and the increasing demand for food and income have led to environmental

pressures. Kowero (1996) projected that the capacity of Zambian and Zimbabwean woodlands and forests to meet domestic fuelwood needs would be exceeded within 10 years. Limited availability of arable lands decreases the fallow period between successive crops and, in turn, the fertility and productivity of the soil base. Marginal (formerly grazing) lands that are converted to cropping further accelerate the degrading of soil, and reduce the potential for use of draught power for cultivation and manure for soil improvement. In short, over-commitment of the relatively stable productive lands is leading to the inappropriate use of less stable, poorer productivity lands.

In Australia traditional Aboriginal management practices have been gradually replaced by European production systems, which focus on grazing and horticulture. These systems introduce infrastructure such as fences and dams, clear native vegetation and substitute exotic pasture species, and change management practices such as traditional burning regimes. These changes have frequently led to major degradation of both the productive and conservation value of woodlands. Forms of resource degradation include structural breakdown of soil, and loss of organic matter and nutrients, by water and wind erosion and salinisation. A reduction in pasture production results from competition between native species and invasive species such as woody weeds.

The research problem

The problem was therefore viewed as an investigation to overcome the land use planning problems in southern African and northern Australian tropical woodlands. The increasing ecological impacts on tropical woodland ecosystems due to increased pressures for productive use of the land drives the need to focus on resource use planning processes in these ecosystems. Key components of the problem that required addressing were the:

- ineffectual centralisation and institutionalisation of the land use planning processes
- associated exclusion of the land users from decision-making in the planning processes
- inflexibility in implementing non-dynamic land use plans
- inappropriateness of formal land use plans.

Background to the research problem

Considerable effort and technical expertise have been directed at resource use planning in tropical woodlands. Planning scales range from the individual landholder to national levels, and involve government agencies, non-government organisations (NGOs), the private sector, and community members such as farmers and traditional leaders. Many rural communities have traditionally relied on well-established cultural beliefs and social structures, which inherently support land use practices, to ensure the appropriate process for their decision-making. For example, in Zimbabwe an important role of village chiefs is to allocate areas for cropping to new settlers or expanding families. However, the accelerating pace of contemporary economic, technological and cultural change, and the imposition of western administrative systems, are increasingly challenging these traditional mechanisms, and communities are struggling to find a new way.

The benefits of effective resource use planning are just as relevant to national governments as to rural communities. Often, bureaucrats are faced with having to make increasingly complex

resource management decisions that encompass stakeholder values and aspirations as well as ecological components and their dynamics.

There is growing recognition that the solutions to the problems of unsustainable resource use practices lie in planning in a way that engages community, industry and government institutional levels in a holistic, adaptive and equitable process. Two key factors in these integrated approaches are that planning:

- is community-based but linked to stakeholder values and, as such, is potentially more self-sustaining
- incorporates the complexity of natural systems by integrating natural, socioeconomic and cultural environments.

A fundamental component of a community-based approach to resource use planning is that it provides a structured mechanism for identifying resource use issues and community aspirations, and for gaining agreement on, and implementing, actions. Other techniques that incorporate systems-based viewpoints, such as agroecosystem analyses, combine biophysical, social and civic understanding with processes that identify and link to community values and requirements.

These two key components of planning have resulted in a divergence of resource planning approaches. For convenience, these approaches are categorised simply as:

- the 'top-down' (or rational planning) model, which has historically dominated the approach by government agencies. 'Top-down' planning tends to place emphasis on the use of biophysical and socioeconomic data for assessing land capability. These data are collected by scientists but are often not well integrated for planners, who tend to use secondary, interpreted summaries to select preferred resource allocations.
- the 'bottom-up' approach, which is advocated by many NGOs and community groups. As normally practised, 'bottom-up' planning emphasises community participation throughout the planning process, uses more experiential and/or anecdotal data, and takes a flexible approach to decision-making.

The record for community acceptance and longer-term implementation of 'top-down' plans is often poor (Dale 1996). The risk with this form of planning is that excessive external control can result in low community acceptance (and hence implementation) of a plan, which does not reflect community requirements and aspirations. 'Top-down' planning tends to be rigid, or 'static', possessing a limited capacity to adapt to changing circumstances.

The 'bottom-up' or community-based approach to resource use planning has been more recently developed in response to the evident shortcomings of the 'top-down' model. Community-based planning tends to be slow and is initially resource intensive while community confidence in the process is gained. The risk with community-based plans is that insufficient technical support may constrain a plan so that community members fail to consider all potential options, or cannot effectively predict outcomes because of their limited knowledge of all ecosystem components. They often do not have an understanding of the 'bigger picture' for land use options. However, this approach can produce a more adaptable and dynamic outcome, with communities able to initiate, within their own resources, revisions of the plan to accommodate changed circumstances.

The optimal combination of these divergent approaches will vary according to the planning environment. There is considerable current research activity throughout the world dedicated to trying to establish the basis for such optimal outcomes.

Although the problem of persistent unsustainable resource use cannot be completely solved by resource planning, adopting and implementing an effective resource planning system should significantly contribute to its resolution. Perhaps the biggest challenge is that an effective planning approach must produce outcomes that are both scientifically sound and yet accepted and implemented by community members.

It is increasingly evident that, despite the efforts of government agencies, NGOs and rural communities, unsustainable resource use systems have persisted and inappropriate development pressures have, if anything, increased. The suggested reasons for this failure are many, including persistent structural inadequacies in national and international economic institutions, a failure of existing legislation to prevent inappropriate developments, the continued undermining and devaluation of traditional cultural values and knowledge, and the disempowerment of local communities and traditional institutions.

In Zimbabwe virtually none of the 600 or so plans produced in a period of four years were fully implemented (J. Makadho, Director of the national government agricultural extension agency (AGRITEX), pers. comm.). Past failures to adopt detailed, technically sound resource use planning systems can be related to a variety of institutional, cultural and biophysical constraints. Chasi (1997), in a review of AGRITEX's planning approach, pointed to four factors contributing to the lack of success:

- poorly defined and accepted administrative framework
- lack of clear definition of programme policy at the national level
- failure to adequately engage the community in the planning process
- inadequate financial and human resources for plan implementation.

Similarly, Dale (1991), while reviewing the participation of Aboriginal councils in resource use planning in northern Australia, found that only limited success was achievable at the time, due to:

- relative inexperience of Aboriginal groups in local government
- inappropriate community–government structures
- inadequate cross-cultural understanding of the function of local government
- failure of higher level government to relinquish control
- failure of higher level government to recognise the local government role of Aboriginal groups
- poor recognition of community resource rights
- community dependence on the state
- inadequate resources
- poor coordination.

In analysing these factors, Dale (1993) suggested effective community-based planning needed to be underpinned by three principles: (i) optimised community participation, (ii) competency in technical planning, and (iii) a commitment to effective bargaining and negotiation.

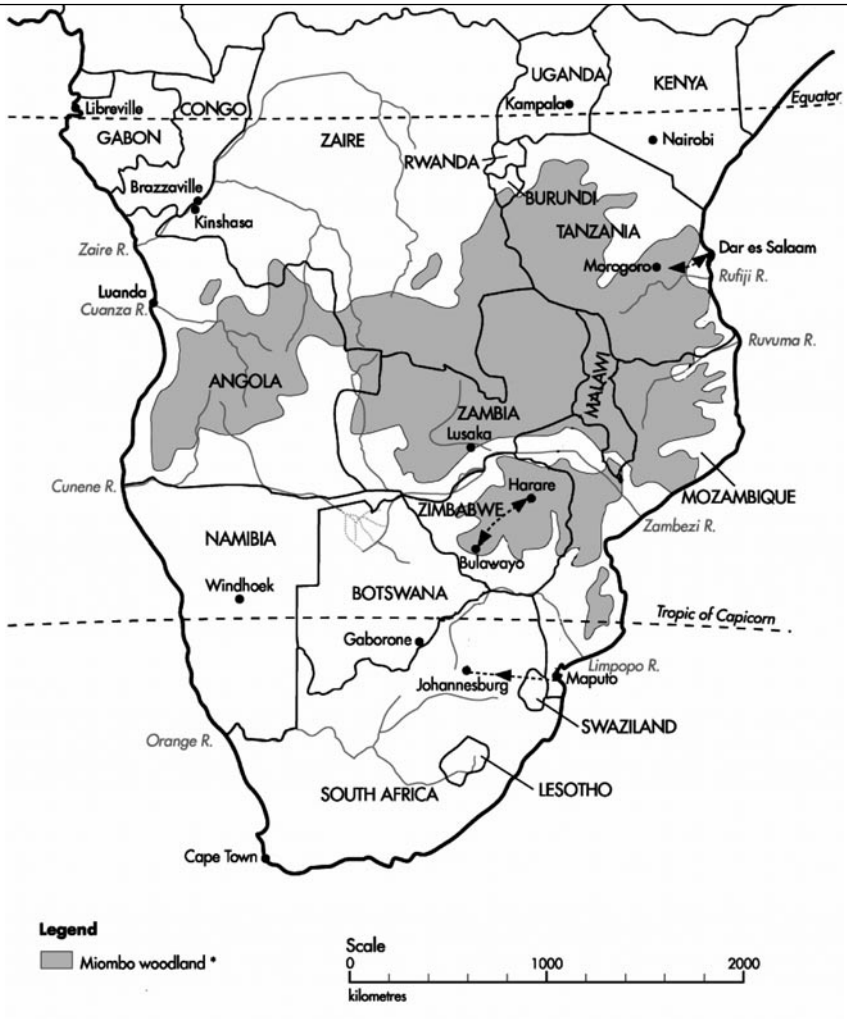
This project was initiated, therefore, to develop a community-based planning approach that results in plans that are both scientifically sound and the product of a process that represents a partnership between community, industry and government stakeholders.

The hypothesis is that an effective community-based planning framework must incorporate a balance of the 'top-down' approach (through the use of agroecosystem analysis and a structured decision-making model for technical advice) and the participatory elements of the 'bottom-up' approach (through the incorporation of local knowledge and/or experiential data and community participation).

Research aims and objectives

This monograph describes research activities and outcomes from a project funded by ACIAR (Australian Centre for International Agricultural Research) entitled *Enhanced Resource-Use Planning for Tropical Woodland Agroecosystems*. The project was undertaken in two countries: Zimbabwe and Australia. Tropical woodlands cover much of Zimbabwe (the miombo woodland: Figure 1) and are the major ecosystem in northern regions of Australia (Figure 2). The woodlands of Zimbabwe and northern Australia were chosen for this research because they have many biophysical similarities, and because of similar sociocultural change processes now occurring in both countries.

Figure 1. Geographic extent of miombo woodland in Southern Africa



* Miombo woodland after B. Campbell (ed) 1996 *The Miombo in Transition: Woodlands and Welfare in Africa.*

Zimbabwe and Australia have undertaken significant amounts of research in resource evaluation and resource use planning in an attempt to balance resource demand and capacity. This project was designed to complement existing initiatives by expanding and complementing current resource use planning programs through on-ground research, and to exchange experiences between countries.

Zimbabwean collaborators

The Zimbabwean component of the project involved collaboration of AGRITEX (the government agency responsible for village-level planning), a non-government organisation for community participation in resource management named CAMPFIRE (Communal Areas Management Programme for Indigenous Resources), and both the Centre for Applied Social Sciences (CASS) and the Institute of Environmental Studies (IES) at the University of Zimbabwe. These institutions were, at the time, involved in natural resource use planning in woodland environments, particularly the miombo, and with farmer groups. AGRITEX was established in the late 1980s with a major goal to develop agricultural resource plans for the nation's 6000 rural villages.

This project incorporates existing areas of specialised activity, such as CAMPFIRE's participatory approaches, and AGRITEX's collection and collation of biophysical data as well as its extension services for communication and information transfer. At the same time, the project provided input where local expertise was

Figure 2. Geographic extent of tropical woodlands in northern Australia

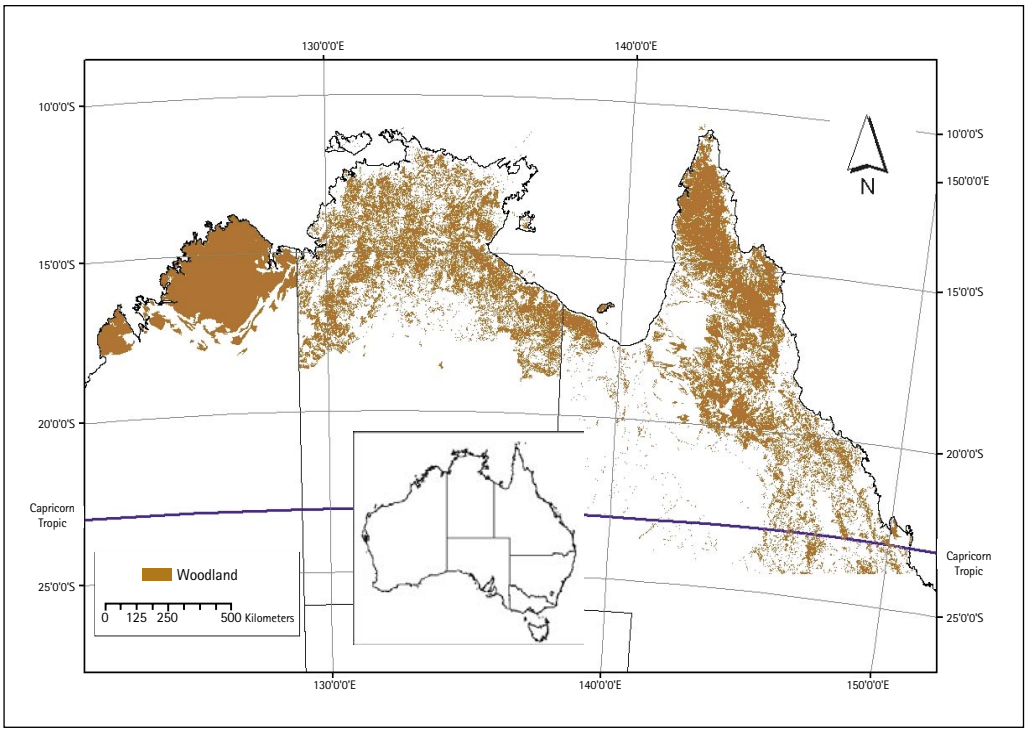
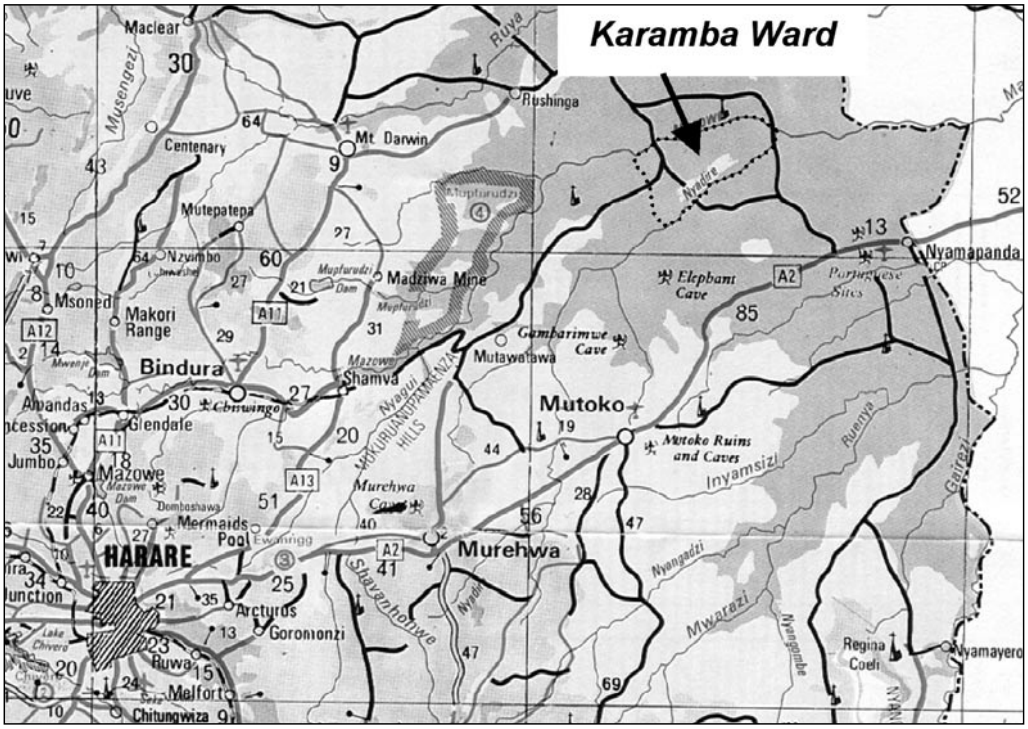


Figure 3. The locality of Karamba Ward, UMP District, NE Zimbabwe (extracted from the AA Map of Zimbabwe, 1992)

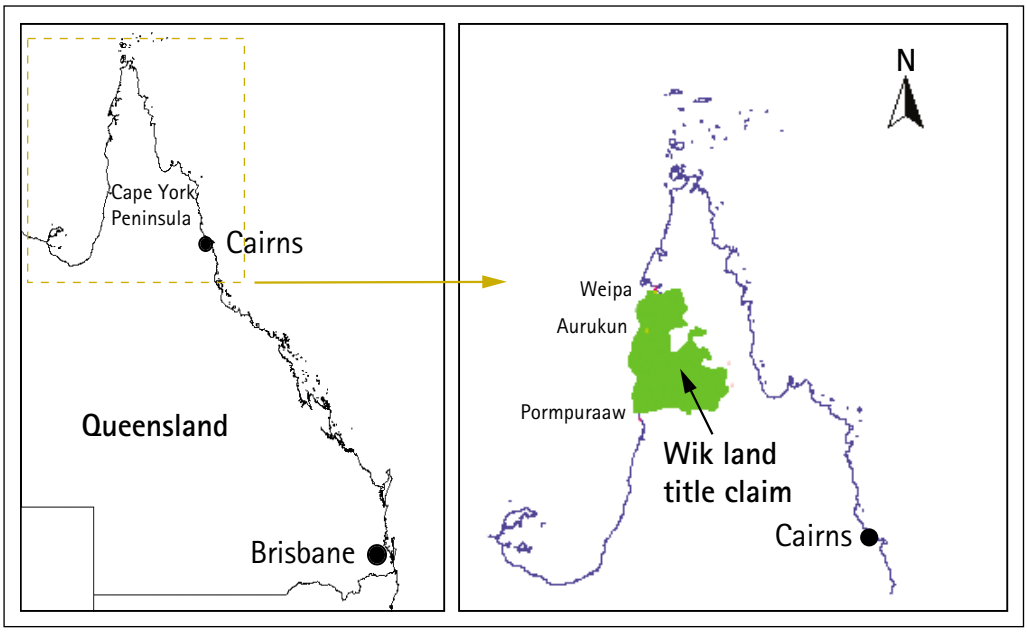


lacking, for example in the development and application of decision support systems. Zimbabwe community participants in the project come from farming communities located in Karamba Ward in the Murehwa/Mtoko region of northeastern Zimbabwe. This area contains three communal lands, Uzumba, Maramba and Phungwe (known collectively as the UMP district), located along the south bank of the Mazoe River (Figure 3).

Northern Australian collaborators

In northern Australia the project was implemented through the existing natural resource management and planning programs of local and state government agencies in collaboration with universities and NGOs. Participating partners are the Queensland Department of Natural Resources and Mines (QDNRM), the Environment Protection Agency, and the University of Queensland and Cape York Development Corporation ('Balkanu'). Balkanu is an organisation established by traditional owners of Cape York Peninsula to advocate their interests to government and other institutions. The project focuses on traditional owner groups residing in Aurukun Shire on the west coast of Cape York Peninsula who lodged a native title claim over their traditional lands (Figure 4). This area contains communities with a mix of traditional indigenous and contemporary resource management knowledge and shares many resource management issues with Zimbabwe.

Figure 4. The location of the Wik native title claim on Cape York Peninsula



Project development phase

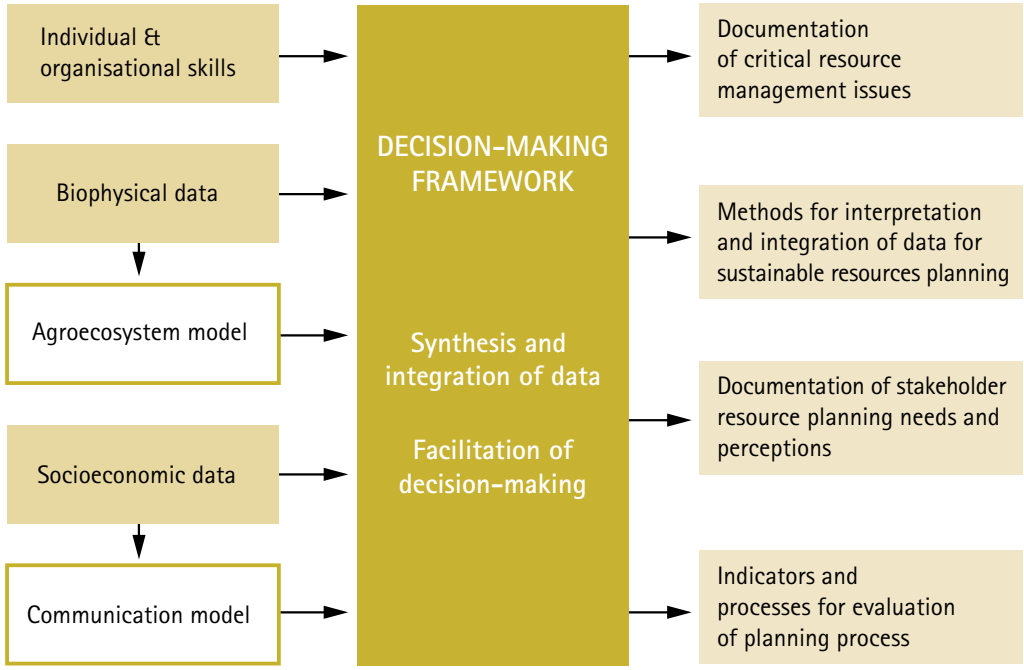
Discussions and correspondence during project development visits with fellow researchers and co-investigators in southern Africa and northern Australia showed a shared concern for wise management of tropical woodlands. It was also evident that the effectiveness of sensitive management could be substantially improved by enhancing the existing planning and decision-making processes, and by using information and communication tools that ensure greater community involvement in planning outcomes. Such improvements would include new approaches to gathering, presenting, integrating and communicating information, and to community-based decision-making, in order to optimise the choice between competing resource use options. Therefore, the main aim of this project was

to develop and trial a framework of processes and tools for decision-making to bring about effective community-based planning for sustainable resource management in tropical woodlands.

These processes and tools were to assist tropical woodland communities in making resource use decisions, and enhance the capacity of woodland managers to identify, plan and implement sustainable natural resource management options. Discussions identified key issues as:

- stakeholder ownership and joint decision-making within planning frameworks
- effective, multi-directional communication and information flows
- recognition and interpretation of biophysical information and resource limitations

Figure 5. Conceptual framework for resource use planning



- input of community values that are balanced with political values
- outcomes which meet the needs of resource users
- a process that is transparent, equitable and holistic.

The research for this project integrates these elements in a framework for resource use planning, conceptualised in Figure 5. The framework requires an interdisciplinary array of tools, data and modelling approaches that inform planning and decision-making, including: individual and organisational skills, biophysical data, agroecosystem models, socioeconomic data and communication models. For simplicity this diagram depicts the process as being linear when it is actually iterative and cyclic. These inputs were grouped within various subprojects (Figure 6) in the research and were trialled, implemented and evaluated in the test sites in Zimbabwe and northern Australia. The subprojects are described below.

Subproject 1: Data integration and interpretation: background information, collection of biophysical and social sciences data, and construction of an agroecosystem model.

Subproject 2: Communication and decision-making: transfer of information, interpretation and knowledge, construction of a model of communication flows, development of a decision-making model and tools, and facilitation of decision-making.

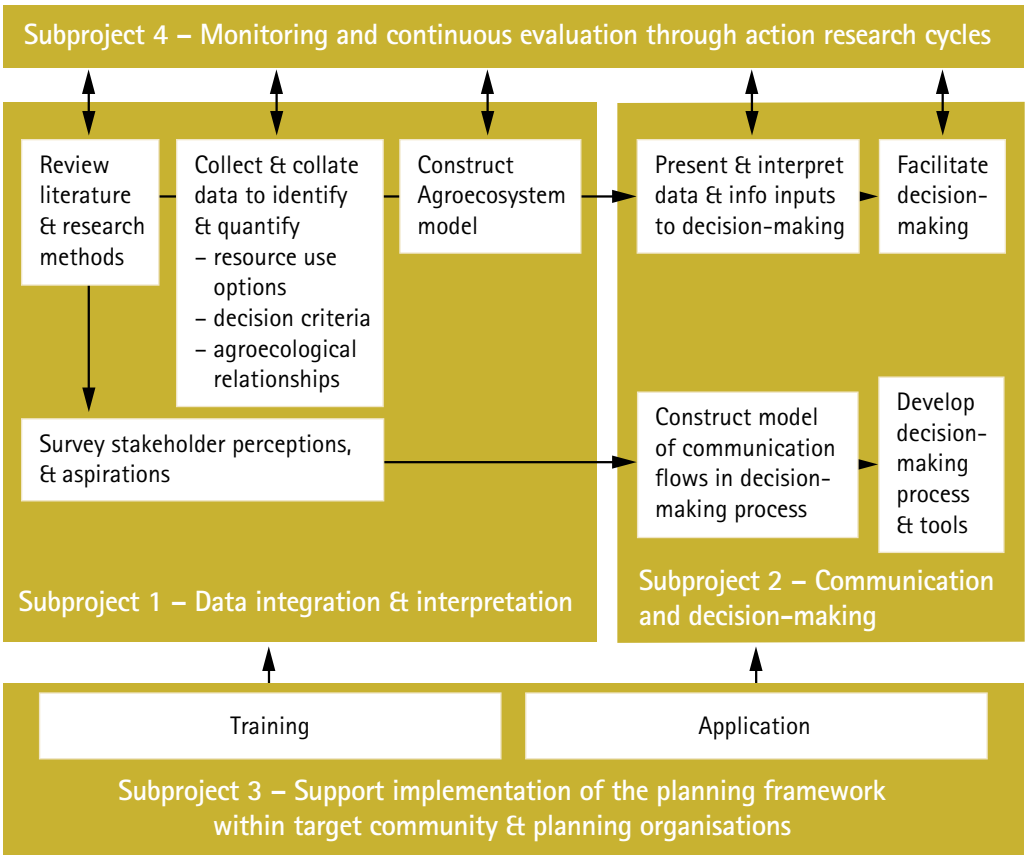
Subproject 3: Support implementation of the planning framework: a participatory process and needs-based training and application.

Subproject 4: Evaluation and monitoring: establishment of community performance criteria and review workshops for inter-country exchange.

This project was directed at providing a framework for resource use planning at national, regional and local levels. This aim is premised on the belief that enhancing the capacity of communities to plan effectively will lead to more sustainable use of natural resources, and that planning is primarily a process by which stakeholders reach a common understanding of the consequences of various courses of action, and make decisions.

The objectives of the study are outlined below. Outcomes include effective plans for the study site communities, a set of tools and processes for enhanced community-based planning, and increased capacity and motivation of planning agencies to transfer the lessons learnt from this project to other areas. This process does not finish once a technical document (or plan) is produced. In this sense the project is about the process of planning rather than the production of a plan per se.

Figure 6. Diagrammatic representation of the research design



Objectives of each subproject used in the research design

These objectives informed the development of a framework of processes and tools for effective resource use planning.

Objectives of subproject 1: data integration and interpretation

- complete a review of existing literature and research methodologies for community-based planning in indigenous communities
- identify critical resource management issues for tropical woodlands of Zimbabwe and northern Australia
- adapt methodologies that are culturally relevant for the collation, presentation and integration of a range of data types
- develop dynamic agroecosystems models for multi-objective management of tropical woodlands

Objectives of subproject 2: communication and decision-making

- complete a review of resource planning needs and perceptions of identified key stakeholder groups
- develop a framework for multi-objective natural resource planning in tropical woodlands based on an improved understanding of community and land manager decision-making processes and their information requirements
- complete resource use plans for the study site communities

Objectives of subproject 3: support implementation of the planning framework

- identify training and resource needs to support application of research outcomes in collaborating agencies
- increase the skills and knowledge of staff from collaborating agencies in the use of multi-objective decision-support processes and tools
- increase awareness and knowledge of research outcomes in identified related agencies/countries

Objectives of subproject 4: evaluation and monitoring

- establish indicators to evaluate the performance of the planning process throughout the project and, through negotiation with communities and agencies, beyond the project life.
- evaluate the success of the resource use plans

CHAPTER 2

Reviewing resource use planning in Zimbabwe and northern Australia

J. Carter, D. Mpofu, R. Thwaites, W. Mutinhima

Planning defined

Planning is the use of information and knowledge to provide options for decision-making. It uses a process that encourages public involvement for considering and reaching decisions on a range of options (Steiner 1992 in Low Choy 2002). As such, planning is primarily a social process. It is a common misconception that it is an output-driven, content-based production focused on the end result, a plan. The process of planning centres on facilitating individual or collective decisions and determining actions necessary to implement them.

Whilst the production and implementation of a plan are components of planning, they are clearly inadequate alone. When the planning process is neglected in favour of outputs (i.e. producing a plan), planning becomes dominated by bureaucratic solutions to problems and opportunities, and remains static.

These solutions are often not representative of local stakeholders, and are commonly unworkable because outsiders lack an understanding of the contextual setting.

The evolution of planning

The history of planning reflects changes in academic thought in the profession. Planning paradigms change because societal thinking and values evolve. Initially, the planning paradigm used the 'institutional' planning model based on rational, centralised and technocratic solutions, sometimes known as 'top-down' approaches. These approaches were dominant from the 1940s, largely in response to post-war reconstruction and resource development, and the belief that only government held the legitimate authority for planning decisions. Planners that emerged from this school were termed technocrats or rationalists, because they organised and managed resources by applying laws of spatial behaviour that were deemed to be free of political influence.

From the 1960s a school of planners known as the pluralists called for all stakeholders to be represented in the planning process. This change was a response to growing recognition of the very different groups who wished to steer planning decisions. The pluralists were critical of the rationalists' claims to objectivity, arguing that planning outcomes were not always predictable and therefore 'plannable', but were often the result of political decision-making. They called for a community-initiated or 'advocacy' model in planning processes, so that the spectrum of stakeholder views could be represented. This model was problematic because stakeholders' inputs were not always, or were inadequately, communicated to institutional decision-makers (Moote & McClaren 1997), and sometimes additional information, not mentioned by stakeholders, was included in the planning process.

New ways to combine elements from all approaches emerged with 'participatory planning'. Mechanisms were developed to facilitate stakeholder input, evaluate their options, bargain and resolve conflict, and develop local on-ground action plans. The institutional role in the process was that of providing participant funding and/or technical advice as required (Dale & Bellamy 1998, Dale & Lane 1994). In this way all stakeholders were represented in the planning process according to their roles and strengths.

Recently, a further school, the elite theorists, developed their own critiques, arguing that government can not adequately represent key social issues because social and economic 'elites' exercise control over public policy, and thus over planning decisions. They criticised earlier models as simply a token attempt to alter top-down approaches, and suggested there was need to emphasise social and other non-human (e.g. environmental) values in planning because economic values are well incorporated within existing approaches.

Planning in Zimbabwe

In pre-colonial Zimbabwe a traditional land tenure system prevailed. In the Ndebele and Shona societies the king and the chief, respectively, owned the land on behalf of the community. The headmen and kraal-heads, under the directive of the king or the chief, allocated to households heritable rights to arable land and allowed them to graze their livestock on unallocated communal land. Residential and arable land use was held under traditional freehold, while grazing land, forests and other natural resources were held under communal tenure (Land Tenure Commission 1995).

Agriculture was based on shifting (rotational) cultivation owing to an abundance of arable land during that time. Farmers grew different crops based on their knowledge of the environment and culturally adapted cultivation methods. For instance, a system of ridges and furrows was constructed to improve drainage, control soil movement and promote crop growth (Whitlow 1983). Agricultural production was generally above basic subsistence requirements.

Ancestral spirit worship was also intimately linked with agricultural activities (Alvord undated). Ceremonies, rituals, spiritual worship and religion were manifest in natural resource control through respect for sacred areas. Traditional regulations and taboos controlled resource use, and traditional leaders were key figures in determining allocation of cropping and grazing land.

From 1898 indigenous people were largely dispossessed of their land by European settlers, and were moved to reserves located in marginal and less accessible environments. Land in commercial farming areas was mostly owned by Europeans, while land in native reserves was state land held under communal tenure with usufruct rights (Land Tenure Commission 1995). Roth and Bruce (1994) argue that communal tenure is a colonial construct, a result of distorted understanding of the traditional land use systems that provided secure land ownership, not simply the use-rights of communal tenure of land that belongs to the state (Land Tenure Commission 1995).

Local systems of governance were incapacitated when the colonial regime introduced systems of centralised governance through alliances with local leaders. Colonisation also brought radical changes in land ownership patterns. Early settlers viewed traditional shifting cultivation methods as a manifestation of lack of interest in permanent ownership of land and a general shiftlessness that was not conducive to successful arable agriculture (Alvord 1929). When the Rhodesian government attained self-rule in 1923, all land in the native reserves came under the authority of the British High Commissioner. All land that had not been settled, being remote, tsetse-infested and therefore unattractive for white settlement, became the property of the state. Land use planning in native reserves became the responsibility of Native Commissioners (Roth & Bruce 1994).

This divergence of perceptions on land tenure gave settlers the leverage to introduce a foreign concept of ownership and sedentary agricultural resource allocation and utilisation. The *Land Apportionment Act 1930* formalised European domination in matters of land ownership, and resulted in the creation of a dual agrarian system (Rukuni 1990): the lawful segregation of land through racially based differences in land planning and allocation. Colonial land policies and agricultural development were biased toward white farming areas (Rukuni 1990), denying the indigenous population large areas of fertile land, excluding them from mainstream economic development, and forcing them to work as cheap labour in mines and on commercial farms. Efforts were also made to incapacitate the flourishing indigenous agricultural industry in order to stifle potential competition in marketing of agricultural produce (Alvord undated).

Not long after the creation of native reserves, it became evident that they were becoming overpopulated and degraded. Training in tillage and crop husbandry was introduced by the government in the hope that local demonstrators would pass on these methods to others. However, these new initiatives largely failed owing to opposition from the commercial farmers.

Following the failure of extension by persuasion, the colonial government turned to legal mechanisms for the compulsory enforcement of

resource use plans, enacting the *Natural Resources Act 1942,* the *Native Land Husbandry Act 1951* and the *Water Act 1976*. These Acts avoided local consultation by assuming ignorance on the part of the natives, but underestimated the resistance that indigenes offered to forced innovations.

The Natural Resources Act aimed to redress resource degradation and overexploitation through the creation of a Natural Resources Board which held the natural resources in trust for the people. The Board administered the Act, was autonomous and had widespread regulatory powers in the utilisation of natural resources in the country. The main responsibilities of the Natural Resources Board were to raise public awareness in natural resource management and conservation, monitor utilisation of resources, and advise the government on appropriate legislation. Thus the Board had powers to produce plans for natural resources conservation.

The Act also provided for community participation in natural resource management and conservation through the creation of grassroots conservation committees. However, these committees were generally confined to commercial farming areas where farmers were provided with economic incentives for investment in conservation works. Natural Resource Officers were the planners and decision-makers. These conservation committees were ineffective in some communal areas because failure to fulfil prescribed conservation practices often resulted in prosecution or enforced cessation of land use practices by the officers empowered to do so under the Act.

Local practices such as streambank and dambo (localised wetlands) cultivation were banned under the Act despite the role they played in household food security (Bell & Hotchkiss 1989). According to Scoones and Cousins (1994), the legislation was enacted under the guise of arresting degradation and reducing stream flow, but was intended to disable peasant agriculture and reduce competition with existing and emerging agricultural markets (Bell & Hotchkiss 1989). However, although dambo cultivation was illegal, it persisted in many communal areas, signifying its paramount importance in the survival of local communities (Whitlow 1983).

The Native Land Husbandry Act sought to introduce private land ownership in native reserves, thus replacing traditional land tenure. Private land ownership was expected to increase agricultural production, raise rural incomes and reverse urban migration. The Act also provided for mandatory enforcement of cropping and conservation practices, seeking to prevent land being fragmented beyond viable production unit limits. In native reserves where the land could not accommodate the people, forced relocation was effected. Again, imposed conservation works, usually in the form of contour ridges and storm drains, were often harshly enforced yet resisted by indigenes, and eventually the Act was abandoned (Land Tenure Commission 1995). The Act has been criticised for failing to acknowledge local, traditional knowledge systems regarding land and natural resource management (Rukuni 1990).

The lack of local consultation and the assumptions that local people are incapable of managing the natural resource base were exacerbated by the establishment of the Department of Conservation and Extension, which strengthened European agriculture through technical advice given to commercial farmers. The department later extended its activities to small-scale commercial farmers. Communal farmers were catered for when the Department of Agricultural Development was established in 1969, but commercial farmers continued to receive preferential treatment through greater resource allocation to the Department of Conservation and Extension.

The Water Act aimed to control the use of public water in both surface and underground water sources, prevent and control water pollution, and establish combined irrigation schemes and dam safety. It was criticised for its benefit to European commercial farmers and for stringent measures which impeded communal farmers' access and utilisation of water for agricultural purposes.

After independence in 1980, the Government of Zimbabwe embarked on a land resettlement program to redress equity in land redistribution and avert political instability. The Communal Land Re-organization program was designed to develop communal agriculture, improve rural livelihoods, and devolve authority for resource management to local communities. However, the program failed to have an impact in many communal areas due to lack of funds.

Several ministries and government departments have been created since independence to formulate and implement rural development policies. These institutions were particularly geared towards uplifting the rural sector and the communal areas that had always lagged behind the commercial farming sector under colonial rule. AGRITEX had the task of providing agricultural extension services to both communal and commercial farming subsectors, and developing agricultural land use and village development plans.

The Ministry of Local Government, Rural and Urban Development plays a central role in land use planning, deriving its legal mandate from the *Regional, Town and Country Planning Act 1976*. Under the Act the ministry is empowered to plan and coordinate land use in both rural and urban areas, and to administer communal land through the Rural District Councils (RDCs) under the *Communal Lands Act 1982*. Under the Act, RDCs are required to take cognisance of customary law while discharging their duties, particularly those involving land use and allocation. The RDCs are empowered by the *Rural District Councils Act 1988* to administer communal land and to make by-laws about any development plans that can override customary claims. The RDCs also coordinate the implementation of plans through local councillors. It is the responsibility of the councillors to mobilise local communities to abide by plan requirements. However, RDCs are too far removed from local realities to adequately address the concerns of local communities (Cliffe 1986 in Fortmann & Bruce 1993).

Following independence, there was a concerted effort by the state to erode the powers of traditional leadership. Traditional leaders were pressured to make way for new village development committees (Vidcos) and ward development committees (Wardcos), which were intended to be democratically elected local-level institutions through which development planning would be formulated and implemented in tandem with RDCs. However, traditional leadership structures proved to be resilient by continuing to exist in parallel with the new institutions. The government was finally forced to recognise traditional leadership under the *Customary Law and Local Courts Act 1992*. Despite their lack of legal status, kraal-heads continued to be involved in land allocation and command a big following among the rural populace (Land Tenure Commission 1995). Generally, traditional leaders also command respect in communal areas. Spirit mediums have remained powerful and control access to local resources. They have had to be consulted by government institutions seeking permission for development projects. Since independence, conflict over land allocation has occurred between Vidcos and kraal-heads, and many land use plans have not been implemented.

Recent participatory approaches in Zimbabwe

The recent proliferation of participatory approaches in land use planning has assisted planners to develop relevant and acceptable plans for rural development. The participation of villagers has led to the plans being viewed as locally designed and owned. Four approaches to land use planning in Zimbabwe with varying levels of participation are discussed below. Table 1 presents these planning examples, showing the range of scales, planning modes and implementation mechanisms against which the examples are evaluated.

The International Cooperation Centre in Agronomic Research for Development (CIRAD)

Land use planning under the CIRAD project in Lower Guruve researched local community interests and integrated local practices in resource use to determine potential land use options. Local knowledge systems were significant determinants of future land use options, as were community-based criteria in assessing potential future land use options. Local leadership was also acknowledged as playing a key role in local land management issues, and local leaders were consulted under this project. As a result the traditional leaders supported the CIRAD project.

Coordinated Agricultural and Rural Development (CARD)

The CARD programme is geared towards reaching the majority of rural people through networking with different institutions. Understanding local knowledge systems is key in the CARD program, as are development without upsetting the ecological balance and land use plans that are sustainable and compatible with the needs and aspirations of local communities. The program has already scored considerable success in those communal areas of Zimbabwe where it has been implemented. However, its major setback is its reliance on the commitment of other institutions in rural development. Other obstacles faced by the program are the lack of planning capacity at various levels, a failure to harmonise sectoral priorities and poor communication links between different institutions.

The Mid-Zambezi Development Project (MZDP)

The MZDP is among several efforts by the Government of Zimbabwe, with donor funding, to improve agricultural activities in the valley, reorganise the settlement pattern for valley residents, and ease population pressure in some communal areas in the project region. Infrastructural developments (e.g. roads, boreholes, school and clinics) were also planned as part of the resettlement program for the valley residents. The Mid-Zambezi Programme preceded this project and was funded by the European Economic Community, whose main objective was to eradicate tsetse fly to enable human and livestock habitation in the Zambezi valley.

The MZDP exhibited a stance reminiscent of the colonial era, where locals were not consulted about developments in their areas. The project was described as top-down, attempting to impose externally derived land use plans in the valley as well as refusing to incorporate local knowledge and practices in the implementation of the project. Serious conflicts erupted between locals and project personnel, especially with regards to designation of arable land. Because the project area experiences low and erratic rainfall, the local people had settled and cultivated fields along rivers and streams. However, land indicated as being arable under the MZDP did not coincide with land under cultivation by valley residents,

resulting in enforced relocation of families into the planned villages. The riverine fields were designated as part of the grazing land.

The MZDP also downplayed the role of the chiefs, headmen and kraal-heads in land allocation. Demarcation of land for different uses proceeded along technical and scientific criteria, disregarding local knowledge and needs. Concerns of local villagers were inevitably interpreted as rebellion against development of the valley. Valley residents were effectively excluded from the planning and decision-making processes of the project and were only persuaded to participate in the implementation phase. In short, the MZDP subordinated local traditional institutions to state control, overhauled local land use systems and dismissed meaningful contributions towards the project by valley residents.

The resettlement program

The resettlement program is the major land reform strategy in Zimbabwe, and was broadly embarked upon to correct the colonial legacy of inequitable access to land. Through the program, the government intends to alleviate population pressure in communal areas, improve the lives of the rural poor, and ensure efficient and productive use of land in both the communal areas and resettlement schemes (Land Tenure Commission 1995).

The resettlement program has met with only partial success. It has generally been narrowly focused (being concerned almost exclusively with the transfer of land from commercial to communal farmers), has been centrally driven without adequate local consultation, and has lacked appropriate and effective institutions for its implementation (Goebel 1996, Land Tenure Commission 1995). Lack of transparency on the part of government and its failure to balance the political and economic objectives of the program are also contributory factors to its limited success. The government enacted *the Land Acquisition Act 1992* to expedite the process of acquiring land for resettlement. Settler selection criteria shifted from social to economic and productive considerations in order to increase agricultural production in the resettlement areas. Equitable land distribution was compromised as only a minority of farmers in the communal areas could meet the new criteria.

Table 1. Evaluative framework for community planning examples in Zimbabwe

Example	Spatial scale	Planner role	Implementation method	Distribution of control	Stakeholders	Predominant planning orientation
CIRAD	local	facilitator	local knowledge and practices	dispersed	local leadership	community success criteria
CARD	local	facilitator	local knowledge and practices	dispersed	local leadership	central plan based on consultation
MZDP	local	technocrat	technical regulations	centralised	farmers	central plan
Resettlement	national	technocrat	technical	centralised	farmers	central plan regulations

The resettlement program as a land use planning project failed to solicit the views of the public regarding the program during the first decade after independence. It is only recently that the government has started consulting civic society, holding stakeholder meetings which have been considered useful in guiding the program.

Recurrent themes in Zimbabwe

Colonial land use planning strategies generally favoured the European minority and failed to incorporate the perceptions of local people in plan formulation and implementation. The fundamental flaw was the assumption or belief that indigenes were incapable of managing the land resources under the European concept of resource use. Although, initially, strategies were based on persuasion, they eventually shifted to compulsion. Colonial planning authorities also believed in technical and scientifically proven methods of conservation, and disregarded indigenous knowledge. They did not consult with local communities and traditional institutions, a situation that led to marked resistance by local groups to rural development.

In post-independence Zimbabwe planning authorities continued to view locals as incapable of managing their natural resource base. The dominant criteria for external intervention have remained rooted in technical considerations such as carrying capacity and land capability. These criteria have tended to emphasise the productive aspects of land while ignoring non-productive uses and functions of the land important to the local people. For instance, planning authorities may disregard the concept of sacredness of certain areas in violation to community norms, generating conflicts in land use priorities between government institutions and the beliefs of the local communities (Sithole 1997).

At the local level it has been observed that power conflicts between introduced and traditional institutions abound. Elected leaders find themselves not obligated to consult traditional leaders before making decisions about local issues. In retaliation, traditional leaders resist development plans. Kavalo and Nehanda (1993) note that in many instances government and non-government institutions that purport to consult local communities in fact persuade villagers to participate in external development of projects. Sithole (1997) also noted that local consultation was in some cases hindered by local institutions that tend to operate as individuals rather than as committees. For instance, ward councillors would represent their constituencies at the RDC but fail to pass on information to the villagers through their committee. Consequently, councillors would make decisions on behalf of the community, and plans would be approved on their account, only to be rejected by the community at the implementation stage. It is therefore evident that planning authorities should ensure that local consultation does not end at the level of institutions, but is in fact extended to reach households.

The transition from colonial rule to independence did not see much change in the manner in which land use planning in communal areas continued to be conducted. The government adopted centralised systems of governance and continued to impose rural development plans on local communities. However, it appears as though views about local communities are changing, particularly among researchers. The proliferation of participatory approaches has so far scored considerable success in the different communal areas where they have been implemented. These approaches, in addition to the consideration of technical and scientifically proven parameters, point to the importance of local practices, knowledge and interests in land use planning.

Clearly there is a need to harmonise political and traditional institutions in order to reduce conflicts and facilitate actions that lead to the implementation of plans, and therefore foster local sustainable use of natural resources.

Planning in Australia

Aboriginal and Torres Strait Islander peoples lived in Australia for tens of thousands of years with strict societal laws and customs for managing their land. They planned aspects of their life by creating and revising rules, or implementing other shorter-term controls as necessary (ATSIC 1993).

Australia was first colonised by the British in 1788. Under the formal assumption of 'terra nullius' during the 1800s and 1900s, land previously occupied by indigenous groups was allocated through the introduced British legal system to 'free' settlers and war veterans in the form of pastoral and development leases. In much the same way as in colonial Rhodesia, this land redistribution was underpinned by European cultural beliefs about the need to open up the vast expanses of land to development and create employment. The majority of development occurred in prime locations close to the sea, fresh water, good rainfall and arable land.

As elsewhere, legislative history shows that planning in Australia provides the framework for most land use decisions, frequently reducing it to administrative tasks for state and local authorities. Town planning legislation, introduced around the late 1930s, decentralised the regulation of land use decisions to local authorities, particularly for their central business districts. Rates and taxes were introduced to help local authorities generate revenue for infrastructure.

Planning in Australia began as a profession around the end of World War II, with concerted efforts by government to reconstruct society following the effects of war. Planning in Queensland was conducted under the *Local Government Act 1936-1989*. Zoning schemes organised land use activities into appropriate areas, and the right to build on or subdivide land or change its use was also controlled.

In 1980 the Queensland Government amended the Act so that local councils were required to produce strategic plans. Then in 1990 Queensland proclaimed the *Local Government (Planning and Environment) Act 1990*, which repealed some previous land use planning provisions. The Act, guided by a broad definition of the environment, instituted codes to facilitate environmental protection and detailed a framework for assessing development proposals. Environmental impact statements could be produced at the discretion of local councils where environmental impacts were a possible negative consequence of development.

This Act was replaced by the *Integrated Planning Act 1997,* which sought to redress criticisms of the need for biophysical inventories, regional plans and ecologically sustainable development principles to guide land use decisions. The Act also reflected changing attitudes about the need for public participation in decision-making, and made provisions for public consultation mechanisms in planning schemes and policy formulation. The Act contains statutory requirements for advertising proposed development schemes, public notices about development and public rights of appeal and so forth. However, the Act has limited capacity to effectively engage the public, and there are current calls for funding to resource community representatives to avoid, manage and resolve disputes in a framework of participation that makes planning more efficient, cost-effective and accountable. In addition, the Act can only be initiated by new development applications, and can not be used as a planning instrument for existing land use. In this regard, other land-

and water-based legislation must be used, for example the *Water Act 2000*, the Environmental Planning Policy (Water), the *Land Act 1994* and the (draft) Coastal Management Policy.

In Australia constitutional responsibility for resource use planning and management lies largely with state governments. Federal government involvement in resource use planning is concerned with international obligations (such as national security, international treaties and international trade), regional social and economic development, resource security for industry and environmental protection. The involvement of local government (the third tier) is largely restricted to local and regional statutory planning. Inter-institutional conflict between levels of government (and between individual agencies) due to unclear or overlapping mandates is common.

At the federal government level, recent Australia-wide resource use planning initiatives include the National Strategy for Ecologically Sustainable Development, the Intergovernmental Agreement on the Environment in 1992, the National Strategy for the Conservation of Australia's Biological Diversity and the National Strategy for Rangelands Management. All these initiatives involve partnerships between various levels of government. They promote regional approaches, the precautionary principle, intergenerational equity, intergovernmental cooperation and community participation in planning the use of natural resources. A summary of several initiatives and points of relevance is given below.

Alongside this history of European planning runs the history of European coexistence with Australian indigenous people, who have not had their needs and aspirations adequately articulated through European statutory provisions. In many instances in remote communities, Aboriginal law and customs remain paramount and are practised by residents. In 1992 a landmark case overturned the doctrine of 'terra nullius' and showed that the land was in fact inhabited by indigenous people at the time of settlement. The *Native Title Act 1993* was introduced, which instituted mechanisms for indigenous groups to claim native title over their lands. In 1996, after another court case showed that native title and pastoral lease could coexist, the Act was amended. However, very little progress has been made for indigenous groups, and many are still engaged in complex processes for demonstrating native title.

Indigenous cultural management practices for land and sea are highly developed, and include resource access control, flora and fauna management, fire regimes, site protection, spiritual maintenance of country, continuing ceremonial practices, and public education through knowledge transfer to younger generations and non-indigenous people (Djordilla et al. 1999). A wealth of development projects in Aboriginal communities have been implemented, many of which have failed because community members were inadequately or inappropriately involved (ATSIC 1998). Considerable distrust and frustration within Aboriginal communities about past or recent land use policies has been recorded (Cordell 1995).

Simply gaining access or consent of traditional owners is different to genuine collaboration, which requires active support and objectives that deliver real benefits. It is important to negotiate roles of all partners to ensure equity in the process. There has also been a general failure of planners to allocate sufficient time to properly engage, and to design and implement projects, with indigenous people. Meaningful participation requires appropriate contact with traditional owners, a process which can be very time consuming and does not lend itself to rapid appraisal methods and timeframe-driven surveys.

Some principles for working collaboratively with indigenous Australians (summarised from ATSIC 1993, 1998)

Involve Aboriginal people from the start: In this way needs are identified directly and the project has greater effectiveness and relevance for, and acceptance by, the people.

Invest time establishing credibility and rapport: Impacts from past government policies remain in the living memory of many people, and a new representative may be viewed in that light. However, people will relate mostly to a newcomer's actions rather than their words or position.

Understand the community: Arbitrarily defined communities are frequently comprised of groups of people with non-uniform economic, social and political relationships. In the past outsiders have not understood local complexities and politics (including priorities and power brokers), resulting in project failure.

Contacts: Identify appropriate people, how to contact them, their position in the group, whether they are a formal elected representative, and the nature of their relationship to others; and check that all major leadership groups are represented.

Negotiation: Negotiation is preferred to consultation, which, in the past, has been seen as tokenism to foregone government decisions. Negotiation increases the power and ability of the community to effect desired changes. Negotiations in an Aboriginal manner take longer than in a non-Aboriginal manner, and sufficient time is necessary for the process to take place.

Meetings: The community will have ways of organising discussions and formal meetings, which should only be held if the researcher is known to the community. Use contacts for guidance about organising the meeting and agenda. Clarify roles of the facilitator, chairperson, experts, absent parties and sponsors; the presence and speaking rights of observers; who has the right to negotiate; what is negotiable; and whether discussions are confidential. Meetings are not the usual way communities reach agreement, but occur to confirm that agreement has been reached – decisions occur outside meetings. Therefore meetings should be used to share information and not extract information or make decisions on issues. Aboriginal people place importance on the idea of independence and privacy, which may be compromised by too many questions at a public meeting.

Project/plan evaluation: Community feedback on the process, resources (e.g. financial, human, time) used and communication is necessary. Considerations include: how and by whom success should be defined and measured; the degree to which outcomes correspond with objectives; successes and blockages; and benefits to the people.

Use of information: Negotiate the manner of recording and storing information so that only appropriate people have access. Media releases require the agreement of the community.

Language: Attempts to understand local language, even just a few words, are usually welcomed as language is a form of identification. Language should only be used in the home community – external usage could be misinterpreted or may be inappropriate.

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Some principles for working collaboratively with indigenous Australians (summarised from ATSIC 1993, 1998) continued

Verbal communication: Aboriginal communication patterns are not usually of a direct manner. Open discussion is preferable to confrontation – people may gauge others' views before expressing their own, or may understate their views when at odds with others'. Leading questions may not be useful because many people may not express or hold a firm opinion. Powerful people will not generally give an opinion until they know the position of others – they will usually make a final speech stating what they will accept and remain silent if they think their views are unlikely to be accepted, their silence being noted by others. They may also remain silent if they don't like an idea. Needs identified by community leaders should be respected, and group solutions are preferable to grander individual solutions. During conversation, matters of importance may not be discussed immediately – follow the pace set by the client. Clarify communication because of inherent biases in enquiry and interpretation. Aboriginal people relate best to practical realities.

Non-verbal communication: Aboriginal people do not usually ask 'why' but use non-verbal actions such as observation for understanding. A listener may need to infer links between statements. Silence often means that people are non-committal, waiting for consensus or support, or are listening. Time delays (even several days) may elapse between initiating and imparting information. Indirect eye contact implies respect but will vary in its usage between communities or non-Aboriginal people. Sometimes an intermediary is necessary to discuss issues to avoid embarrassment, disagreement or refusal, or because the client cannot discuss the issue.

Instead, community-based planning initiatives should capitalise on existing planning processes and understand the aspects of community life that are planned. They need to consider the types of information used, persons responsible and priorities, and the way in which roles are defined, actions are taken and decisions are made. It should be unnecessary to introduce new structures that conflict with traditional authority and structures.

Several agencies in Australia have developed comprehensive guidelines and protocols for working with indigenous groups (ATSIC 1998, Batchelor College Research Program 1995, Centre for Aboriginal and Torres Strait Islander Participation, Research and Development 1995, CINCRM 1999, CYLC 1995, NARU undated) that aim to ensure the customs and traditional authority of the people or communities are followed. Although specifics will vary with each community, there is common ground, some of which is summarised in Table 3 (see chapter 3).

Recent participatory approaches in Australia

In Australia many attempts have also been made to introduce participatory approaches to various scales of planning at national, regional and local levels. Some of these initiatives are discussed and evaluated below. Table 2 presents these planning examples, showing the range of scales, planning modes and implementation mechanisms against which the examples are evaluated.

Table 2. Evaluative framework for community planning examples in Australia

Example	Spatial scale	Planner role	Implementation method	Distribution of control	Stakeholders	Predominant planning orientation
PMP	local	facilitator/ technocrats	workshops structured learning	dispersed active participation	farmers	each stakeholder develops own plan
CYPLUS	regional	technocrat	technical passive participation	centralised	pastoralists indigenous NGOs	central plan based on consultation
MDBC	subregional	facilitator	meetings	partly centralised	miners/tourists irrigators	central plan based on consultation
Landcare	local	facilitator	forums	dispersed	several	community group develops
ICM			coordination			unique plan
Coastcare	local regional	facilitator coordination	forums	weakly centralised	community groups	advisory to central authority
Wet Tropics	regional	mediator	negotiation forum	dispersed	indigenous groups	community sets negotiation process & content; implement
CHRRUP	regional	coordinator	negotiation	dispersed	several	community sets indicators & process; technical support
NAP	regional	facilitator	informal delegations	diverse	several	whole catchment

Property Management Planning (PMP)

The national PMP campaign aims to provide a framework for planning of agricultural lands. The organisational structure for PMP varies between states, some having regional and state steering committees to guide program implementation. In Queensland the Department of Primary Industries is responsible for implementing the initiative, known as Future*Profit* (QDPI 1999). The process involves primary producers attending an integrated workshop series to enhance farmer skills in whole systems management strategies at the property scale.

A review of the PMP initiative (van Beek et al. 1998) found that most participants gained skills and knowledge during the workshops, wanted follow-up activities and further learning, had improved their institutional and industry links, and had altered management activities for greater economic, social and ecological benefit. Van Beek et al. (1998) also recommended that PMP continue to be enhanced. Suggested

improvements to the process included redefining PMP functions, products, processes and relationships, which are achievable aims because of the flexible and dynamic nature of the program.

The PMP initiative has also undertaken management planning activities with Aboriginal communities and traditional owners (CDPI&E 1995), assisting access to direct seeding and revegetation techniques, pest management and control, and business planning. Particular needs acknowledged by the initiative in relation to indigenous resource managers included skills identification; training needs analyses; resource mapping; and planning, identifying and reclaiming degraded sites.

Aboriginal groups also recommended specific improvements to the PMP process such as incorporating the cultural and heritage values of communities and the relationships to native flora and fauna in the planning. Indigenous resource managers were critical that the process did not adequately recognise the existing values and skills of local people, instead appearing to work with predetermined content and an imposed resource use planning agenda. Although the iterative and cyclical nature of the process identified their concerns after the initiative had been trialled, a better process would have been to negotiate the partnership from the start. In this way each party would have the opportunity to articulate their requirements, roles and contributions, rather than becoming involved in an initiative designed to co-opt participants into an existing framework.

Cape York Peninsula Land Use Strategy (CYPLUS)

CYPLUS covered an area of 13 million hectares of comparatively unpopulated and largely undisturbed natural environments in far north Queensland. The process was jointly funded by Commonwealth and state agencies and involved three stages conducted throughout the 1990s. Stage I identified issues and gathered data, Stage II defined strategies for resource use (including relevant principles, policies and mechanisms), and Stage III was designed to implement strategies.

Stage I comprised two data collection and analysis programs – the Natural Resources Analysis Program and the Land Use Program. The Natural Resources Analysis Program involved collecting data about resources and displaying these data in a GIS. The Land Use Program involved collecting data around themes relating to land use, covering economic, environmental, social and cultural issues. It was overseen by working groups established through a public participation program designed to enhance community involvement. No mechanisms for negotiating policies and strategies were detailed in the process at the outset, so the Cape York Regional Advisory Group (CYRAG) was formed as a forum for multi-party negotiations.

CYPLUS Phase I retained a predominant focus on technical data collection and presentation. Funding priority was given to the Natural Resources Analysis Program, which commenced prior to the public participation program. Delays in funding for projects in the public participation program made it difficult to implement the initiative; consequently, insufficient attention was given to collecting data about a broad range of stakeholder needs. Despite CYRAG, accountability to constituents and government support and guidance during negotiations were lacking, and community acceptance of the initiative was poor (Dale & Bellamy 1998). Stakeholders ultimately had little say in the resource planning and implementation of strategies.

During Stage II CYRAG formed smaller working groups to address specific issues, and focused on integrated and equitable frameworks for

decision-making. However, differences in priorities between government and the community were evident, and to many participants it appeared that government was simply seeking recommendations for its preferred land uses.

Cordell (1995) suggested that indigenous people in particular found it difficult to identify with, contribute to and feel ownership for the CYPLUS project, and to understand planning objectives. He postulated that this was because research concepts and priorities were incompatible with the laws and principles regulating sociocultural information and traditional knowledge of local communities. The process appeared to 'steam-roll' the local people, and agencies failed to acknowledge the wealth of knowledge and skills-base existing in the region. Nor did they demonstrate any understanding of the traditional resource use planning structures and mechanisms already existing in the region that were grounded in culturally based natural resource management rules.

The Murray–Darling Basin Commission (MDBC)

The MDBC, initiated in the late 1980s, was one of the first large-scale catchment planning processes in Australia. It arose from recognition of the need to coordinate natural resource planning and management across the multiple jurisdictions influencing the health of Australia's major water catchment. The MDBC was intended to plan for the competing issues related to mining, tourism, irrigation, and biodiversity and environmental concerns of the catchment. Lack of coordination between sectoral interests throughout a plethora of jurisdictions had resulted in divergent and at times conflicting approaches to subregional resource use planning adopted by different states.

Dale and Bellamy (1998) concluded that, despite goodwill amongst stakeholders and prior resolution of differences, centralised planning dominated community input to the MDBC. Community groups required continuous support with resources and strategic guidance, and needed to be linked to policy implementation and strategies. Community capacity to identify, develop and implement solutions and works programs was not resourced by government; government responses lacked uniformity; and aspirations articulated by the community were not delivered on the ground. All the while existing resource management practices continued and the state of the environment showed little improvement.

Landcare and integrated catchment management

The National Landcare Program is administered by the Commonwealth and implemented through State–Commonwealth partnerships (CDPI&E 1995, Claridge & Claridge 1997), with regional and state facilitators employed throughout the country. The Landcare movement has mobilised community groups and initiated activities. This can be attributed to its inbuilt appeal to local stewardship and the self-help ethic; financial incentives; public awareness of environmental degradation; social benefits from the program; and information, skills, status, responsibility and education in the program.

Integrated catchment management (ICM) or total catchment management (TCM) initiatives have been implemented by various state governments to deal with natural resource issues on a whole-of-catchment basis. Various forums exist including catchment and statewide coordinating committees to develop and implement strategies. Queensland implemented the Integrated Catchment Strategy in 1991 (QDPI 1993).

Both Landcare and ICM use similar planning frameworks (QDNR 1997, QDNR undated). In Queensland the Department of Natural Resources and Mines (QDNRM) relies on several participatory techniques to engage the community in local-scale resource use planning. For example, the ICM movement involves forming a catchment coordination committee at the local level, and a catchment management coordinating committee at the state level. The role of the catchment coordination committee is as a forum for discussion: fostering communication and liaison between stakeholders; identifying problems; initiating and coordinating actions; promoting community understanding through educational programs, activities and information; advising government; obtaining resources and community support; and producing progress reports to the community and linked organisations.

Claridge and Claridge (1997) reported that, despite these efforts, the impact of Landcare and ICM had been limited. Whilst a strong stewardship attitude had been fostered amongst local stakeholders, evidence showed that this had translated into only modest behavioural changes, and the number of trees Australia-wide (a major focus of the Landcare initiative) continued to decrease. However, they suggest that valuable lessons learnt from the initiative included:the need for small rather than larger groups to maintain representativeness, early involvement of stakeholders to increase ownership and decrease suspicion of government motives, and appropriate training in group management skills. Limitations on community participation in Landcare and ICM include bureaucratic impediments and frustrations when preparing funding submissions, and downplaying of local environmental degradation by comparing local area impacts with environmental degradation elsewhere.

Coastcare

The Coastcare program, operative at national, state and local levels, is designed to collaboratively manage coastal resources with all stakeholders. The focus of the program is on cooperation between community groups and local government, development of local or regional management plans, and community participation. Facilitators are employed to provide technical, scientific and organisational advice, establish links, and disseminate information.

Claridge and Claridge (1997) found that the Coastcare program could be more successful if more emphasis was placed on fostering stewardship attitudes and creating social norms to support sustainable resource use practices. Management advisory committees have been established to assist the Australian Fisheries Management Authority to communicate with industry and researchers; however, they are expertise-based and advisory rather than representative and influential in decision-making and process ownership. The process does not appear to encourage local knowledge, expertise and evaluation.

Wet Tropics Management Plan

The Wet Tropics Management Authority (WTMA) reviewed the planning process used during formation of the draft management plan for the Wet Tropics World Heritage Area (a region of tropical rainforest in northeastern Australia) (WTMA 1998). The management of the Wet Tropics operates across both state and federal government levels. They concluded that Aboriginal participation in the co-management of the area focused primarily on their involvement as an information resource in resource management projects rather than as partners in decision-making and management. WTMA (1998) also found that the planning and

management process for the area was overly concentrated on natural resource issues rather than on integrating necessary cultural, social and economic considerations.

A two-year review of Aboriginal involvement in management of the Wet Tropics was overseen by an Aboriginal steering committee and resulted in recommendations for a two-stage negotiation process for a regional agreement. The first stage in this process was to develop agreed processes and the second stage to focus on matters for negotiation with the WTMA. Some of the recommendations made by the review to the Wet Tropics Board were implemented. Others were given to an interim negotiating forum, with a facilitator employed to ensure equitable participation.

This process demonstrates the need for prolonged attention to negotiating and planning the conduct of an initiative in an equitable manner.

Central Highlands Regional Resource Use Planning Project (CHRRUP)

CHRRUP was established in a region of five local government jurisdictions in Central Queensland to pilot an alternative approach to community participation in natural resource planning and management (Dale et al. 1998). Participants in CHRRUP include a catchment management community group, conservationists, pastoralists, grain growers, irrigators, economic development organisations, human services, the mining industry, Aboriginal organisations, and government and university representatives. The planning process involved three concurrent interrelated functions: planning, support, and research and development. The project was implemented in stages, in which the three functions were concurrent.

Stakeholders were represented and participated through a regional coordinating committee. A range of facilitatory, coordinative and technical support services were provided to equip stakeholders to develop and support their own planning processes. These included a natural resource information system, user-defined decision support tools, a reporting system, structures for interacting with other stakeholders and some financial support. Stakeholder-set performance criteria were used to assess institutional, administrative and legislative arrangements; to assess tools, methods and data use; and to negotiate procedures. CHRRUP represents a considerable attempt to make resource use planning fully participatory, yet further mechanisms to decentralise activities and responsibilities may be possible.

National Action Plan for Salinity and Water Quality

In 2001 the federal government and the governments of all states and territories reached agreement on a National Action Plan (NAP) for Salinity and Water Quality. A fundamental basis of the NAP is the decentralisation of responsibility for natural resource decisions to catchment level representative groups. These groups will have responsibility for planning natural resource management, allocating resources and monitoring progress against agreed targets. A selection of catchments has been identified throughout Australia (including some in the north) in which this new approach is being trialled. It is too early to comment on the success of the approach but planning is already well advanced in several of these catchments.

Recurrent themes in Australia

In Dale and Bellamy's (1998) review of regional resource use planning in Australia they suggested that participatory approaches used to date have largely co-opted stakeholders rather than seeking genuine negotiation of resource use issues. This finding is at odds with many of the government reports on the Landcare process and similar initiatives, including regional forest agreements. The claim by Dale and Bellamy (1998) is that the processes used continue to co-opt community participants into outsider-designed collection and analysis programs rather than providing opportunities for local people to design their own processes and data collection.

They also found that stakeholders are commonly inadequately resourced to participate effectively, and even where stakeholder groups are funded to participate, tensions between government agencies and local stakeholders are common. In other cases participant funding is seen as tokenism to centralised planning. However, it appears that these issues are more effectively addressed through the more recent NAP in Queensland, particularly through the establishment of local boards or committees from within the communities and under their own management processes.

Linkages between biophysical, cultural, social, economic, political and other driving processes within the ecosystem have still been largely ignored, or understated, in most planning processes. This may be due to misperceptions that resource use planning involves a spatial and not a strategic plan. It may also be a result of the dearth of available tools and frameworks that effectively integrate across these disciplines.

Resource planning processes continue to emphasise outputs, with much less attention to, and critical analysis of, the processes behind the initiatives. All too often the successes of the initiative in terms of the end-product are reported, and difficulties and failures with the process are ignored. Only by a critical understanding of the constraints within existing processes can this field of research develop. For instance, it is commonly assumed that consensus decision-making is desired by all stakeholders. Maintaining a diversity of solutions that are uniquely applicable to, and owned by, individuals may in fact be a desired outcome.

The comparative success of programs such as Landcare and ICM highlights the value of using local facilitators as a mechanism for involving local communities in decision-making. Facilitators are commonly not from within the community and their contribution is obviously enhanced by the length of time they have been in contact with the community. The time required for appropriate participatory action research is well documented in this field (e.g. Birckhead et al. 1996, Buhat 1994, Carter 2001). Continuous and close engagement with community members is widely acknowledged as essential, many practitioners describing cases where between one and five years was required simply to build relationships of trust.

As the examples demonstrate, there is clearly room for improvement and innovation in implementing participatory approaches. Despite the diversity of opinion about what constitutes effective, sustainable and equitable resource use planning, many factors and changes need to be incorporated within the work.

CHAPTER 3

Multi-disciplinary resource planning: participation, agroecology and decision support

J. Carter, R. Thwaites, P. Lawrence, P. Norman



Until publication of the Brundtland Report '*Our Common Future*' (UNCED 1987) and the 1992 UNCED 'Earth Summit' in Rio de Janeiro, resource use planning procedures were still largely based on agricultural development and maximising productivity, whilst integrating other resource uses. To be effective, modern resource use planning must be multi-objective, address ecological sustainability and include valuable community and other stakeholder inputs.

The framework for resource use planning conceptualised in Figure 5 required an interdisciplinary array of approaches, tools and data to inform decision-making. Individual and organisational skills, biophysical data, agroecosystems models, socioeconomic data and communication models were envisaged as necessary inputs for a decision-making framework. These inputs were grouped within various research subprojects (Figure 6) that collectively

come under the banners of participatory research, agroecology and decision support. This chapter reviews the theoretical basis for the inputs and approaches that are applied within the study areas in Zimbabwe and northern Australia described later in this monograph.

Participatory research

Participatory research, sometimes known as 'community-based research', 'action research', 'participatory action research' or 'collaborative research', is a well-documented and rapidly expanding topic in a range of disciplines, including those of agriculture and resource use planning (CDS 1999, Okali et al. 1994). Participatory research in resource planning is based on the premise that increased participation by end users in research programs increases effectiveness of the work through greater community ownership of the process and an increased probability that outcomes will be implemented. This results in a win–win situation for all stakeholders. Local resource managers gain employment and management opportunities not otherwise available. Costs to government are decreased because resources are managed on-site and because compensatory payments related to loss of income or social or cultural factors are reduced (Okali et al. 1994, WTMA 1998).

The ideal behind participatory approaches is that acknowledging and incorporating the values and contributions of local people redresses the power dynamics and social inequities that arise under the institutional planning paradigm. Local contributions must be incorporated from the inception of the process to its completion, with the aim of progressively increasing community involvement over time. As community participation becomes more active, ownership of plans is thought to increase, as does the likelihood of successfully implementing and continuing the outcomes of the planning process over the long term. These processes and tools require long-term commitment and flexibility (Defoer et al. 1998), ideally being iteratively evaluated as part of the process. However, true participation is a complex and demanding process, and rarely is the rhetoric of full and active participation by all stakeholders matched by a corresponding reality (Wiggins 1996).

Both ideological debate and practical experience have expanded the field of participatory research. Ideological debates surround the nature of knowledge and its form through various dichotomies such as local and non-local knowledge systems, and in 'formal' and 'informal' approaches, better described as objectivist or constructivist approaches. Experiences gained from implementing participatory initiatives often point to the need to seek a more productive interface between local and non-local knowledge systems.

Participatory programs do not require abandonment of all previously used methods, but rather that a partnership be developed through dialogue and shared understanding among all stakeholders. A number of participatory tools and techniques (summarised in Table 3) can be used at various stages, and no single tool will achieve an answer either at one point in the process or over a longer timeframe. However, many researchers enter participatory research with little or no training and with limited appreciation of critical issues such as how to resolve theory and practice, select appropriate tools, negotiate responsibilities and accountabilities, ensure community ownership after project withdrawal, and adapt the research process as necessary (CDS 1999).

The key to success is that local community members control the design and process. Outside researchers must communicate ideas within a shared dialogue using joint learning processes and interfacing tools. This is a radical change from positions researchers commonly held in the past, as originators of ideas and observers of local community members. Participatory approaches require that attention be given to recognising the validity of local culture, knowledge and values, and to using processes that facilitate local contributions to planning. The greater emphasis in the process must be on indigenous cultural contributions, rather than exotic (or western-based) approaches, so that the culturally based imbalances, legacy of mistrust and negative impacts from past approaches are redressed.

Community-based or participatory research is advocated by many researchers and planners because the technique has the potential to span the gap between theory and practice of community participation. Detailed outlines for action are not devised at the outset because problem-solving is based on partnerships and cooperation rather than on a need to achieve an externally identified goal.

However, many participatory projects continue to make little difference on the ground. To date, farmer participation in formal research programs has been minimal, limited to testing improved technologies with little or no farmer input elsewhere in the process (Tesfaye et al. 1998). Project failure is also attributed to inadequate investment of time and understanding of participatory processes by the research and committee teams, and inappropriate structures to sustain the project. Ultimately, the needs of farmers must override those of the researcher, but in reality the reverse generally occurs.

Pinheiro et al. (1998) suggest failure is probably because there has merely been a change in methods and models, and not a change from the dominant positivist paradigm to paradigms which guide the integration of alternative philosophies and practices. Speculation over the lack of change in paradigms and guiding philosophies raises concerns about the motives of outsiders. Participatory techniques can be abused to achieve predetermined outcomes that foster interest in a particular project or to gain local acceptance of an already existing technology; or sometimes the set of techniques becomes the framework of the activity rather than participation itself.

In recent years there has been a paradigm shift amongst many development practitioners towards true participatory development, and donors are beginning to follow suit with the necessary support, but it is not a speedy process. Donors are faced not only with the constraints of participatory development such as time, money and dynamic processes, outputs and outcomes, but also with constraints imposed by recipient governments that want quicker and more tangible results and benefits.

Because of the fundamental differences existing between the bureaucratic culture and that of the community, there is need for agencies to support and effect the necessary changes through a commitment to capacity building at all levels. It is easy to fall back on known approaches in the absence of better alternatives, but it is clear there is need for western institutions to understand cultural prerequisites for equitable participatory partnerships. All participants can then better coordinate approaches and effect the changes necessary for genuine participatory resource use planning.

Table 3. Participatory techniques	
Technique	**Description and purpose**
Rich pictures	Pictorial representation of important elements in a situation (e.g. people, organisations, landscape). Assists with understanding interactions between stakeholders and issues; ensures list is comprehensive; assists with shared understanding. Best in a small group.
Brainstorming	Ideas are listed quickly without discussion or judgement; analysis occurs at a later stage, although some combination may occur. Mind mapping or card techniques can be used. Small or large groups.
Visioning	Articulates a shared long-term vision; ignores immediate issues. Participants think creatively and imagine a point in the future and desired outcomes/successes.
Questionnaires and survey	Gathers structured information from specific questions. Professional assistance for wording and analysis is usually required. Questions are less concerned with people's perceptions and concerns.
Mind mapping	Ideas are clustered and links between them shown. The process usually starts with a central issue or question and a dendrogram (tree) of ideas is constructed. Priority issues should be placed first.
Cause and effect mapping	Causal reasons for a situation are explored, not symptoms. A fishbone is constructed with the outcome or effect at the head and causes on the bones. Symptoms are sub-branches. Information is analysed and organised and covers all possibilities. Useful in problem identification or situation analysis.
Historical analysis	History and background are explored to understand changes and perceptions. Information is recorded in two columns: one showing the date and the other with key local/external events; influences by people/groups; changes (social, environmental, economic) and trends. Best in groups.
Locality mapping	Participants draw a map of the local area: local conservation activities, land degradation, improvements etc. are shown. Process is to first draw the town, boundaries, infrastructure etc., followed by participants' information or ideas.
Focus groups	Broad topic questions are posed to a small group. The group discussion is then recorded and summarised. Focus groups provide a greater depth of information than one-on-one questioning, because the members bounce off and respond to other members' comments. Care needs to be taken in group composition.
Semi-structured interviewing	Collects information from individuals or small groups about an issue. The context of interview is presented and some broad open-ended questions are asked which do not constrain conversation; focusing or probing questions then arise as a result of the conversation in a cyclic manner. Questions should first be tested.

Table 3. Participatory techniques	
Technique	**Description and purpose**
Flow diagrams	Diagrams which illustrate and analyse the consequences of issues and actions (positive and negative). The action is drawn, followed by the necessary steps and factors to be considered.
SWOT analysis	Strengths, weaknesses, opportunities and threats are recorded in separate columns. These can be brainstormed or analysed/synthesised from other information.
Institutional linkage/ Venn diagrams	Illustrates the overlap between individuals, services, groups, the project and other components, and the importance of each to the issue. Each entity is represented by a circle (size depicts the importance) and the distance between circles represents the degree of interaction. A small circle inside another is a component of an organisation. Differences obtained within or between groups can be discussed.
Information tabulating and graphing	Information is presented in tables or graphs for ease of analysis and comprehension.
Matrix analysis	The value of an activity is ranked according to certain criteria, e.g. an activity is rated against attendance, cost or value to members. Rows show items and columns show criteria. Scores are summed to show the most beneficial item.
Issue analysis	Issues are identified from other activities (notes and common ground), and grouped according to a theme which links them. Quantitative scores such as the number of times an issue arises can be given.
Card technique/ Delphi technique	Each issue/idea/piece of information is written on sticky paper, and information is clustered, organised and ranked. These are grouped and the groups are named, and can be ranked again.
Interrelationship diagrams	Important causes and relationships are identified by recording causal factors. Each is discussed and examined to determine if one is causal. One-way arrows are drawn (no arrow if no relationship) to show causes and eventually the driving cause is identified and priorities determined.
Nominal group technique	Ideas are listed (written, verbal) and voted on. Group members rank proposals and the group decides most important ideas by totalling scores. Scores from each group (for each proposal) fed back to plenary. May need to vote again on top three or four issues. Seen as promoting equality of opinion within the group.
Action planning	Tasks, resources, timetables and responsibilities are identified in columns in a table.
Problem census	Question asked and problems listed without discussion. Individuals report to small groups and group discusses and devises group list. Final lists reported to plenary and small groups then place in order of priority. Generates several priority lists which may need further discussion or actions, or another meeting.

Table 3. Participatory techniques	
Technique	**Description and purpose**
Situation analysis	Breaks situation into component parts: one or many things; how many actions needed, is there consensus on the issue, definitions, improvements etc. The emphasis is shifted from opinion to verifiable information.
Setting priorities	Considers each concern in three dimensions: how serious is the concern, what is the time urgency and what is best estimate of its probable growth. Concerns are judged in order of importance, available resources and solutions at the time and public support for the concern.
Force field analysis	Based on the view that present system is in equilibrium and forces acting to change the situation (driving forces) are equally balanced by forces opposing change (restraining forces). Aims to reduce restraining forces not driving forces. Identify problem/situation. List driving factors and rate these by order of importance, impact and ease of change. Repeat for restraining forces. It is most often performed as part of a situation analysis with the prioritised forces providing vital information for action planning. Can also be used for evaluation.
Social and technical analysis	A wide group of stakeholders meets, from which a subgroup is selected, representative of the social system. A small task is elected to devise programs and decide on alternatives to be implemented. A matrix is used to score each program against three criteria (social values, political values and technical analysis), and criteria are then scored on order of importance.
Decision analysis	Decide on decision statement and alternatives that must be satisfied (e.g. maximum cost). Decide on conditions preferred (e.g. length of time). Group evaluates alternatives against criteria (musts and wants) and can rank wants by importance.

Source: Carter (2001)

Participatory action research (PAR) methodology applied in this study

PAR is a form of collective self-enquiry where all participants in the process are involved in a structured process of 'learning by doing'. It is a research style appropriate to community development where individuals and groups are involved in research (Claridge 1997). In this way participation is maximised and needs-based training incorporated through adult learning techniques based on 'trial and error'.

Experiments are progressively conducted and at the same time changes in the process are effected (Argyris & Schon 1991). PAR frequently cannot predict its endpoint because it is not a linear process, commencing with a hypothesis, collecting data, analysing and interpreting the data, and making predictions. The process is iterative and cyclical, and emphasises differences in situation and context.

It involves continued cyclic effort at reflection, based on an analysis of action (Checkland 1991, Dick 1993, Gianotten & de Wit 1991). Rigorous data analysis and interpretation occurs through

formal tests of verification, falsification and distribution checks from multiple data sources and collection methods (Whyte et al. 1991). Continuous emergence and revision of knowledge as it is gained informs results and conclusions.

PAR is especially appropriate for collaborating across differing knowledge systems and cultures because the research requires reporting on personal involvement as a variable in the system, and on an ability to learn from mistakes (e.g. Agar 1996). PAR breaks down distinctions between 'outsider' and 'insider' or 'researcher' and 'researched' or other dichotomies between subject and object, because all participants are variables in the situations analysed. In this way participants can interact more closely, and together own and implement the research project.

Subprojects 3 and 4 in this study required support implementation of the planning framework, guided by a participatory process that comprised several stages including evaluation and monitoring according to community performance criteria and review workshops. A PAR methodology was chosen to align subprojects 3 and 4 with many of the issues of optimising participation during the process, discussed above.

Resource evaluation using agroecosystems modelling

Resource evaluation is an objective assessment of land resource 'performance' in the context of land use. Planning that is based on understanding both the biophysical and socioeconomic capability of resources contained within agroecosystems, and which includes resource evaluation as a central component of decision-making, will contribute substantially to intergenerational ecological and socioeconomic sustainability.

In resource evaluation data are required for:

- establishing and understanding the *planning need*
- identifying *resource use options* (e.g. to clear trees and extend cropping, or to retain trees and harvest timber and non-timber forest products)
- identifying *decision criteria* (or goals) by which resource use options are to be evaluated (e.g. commercial returns to farmers, downstream environmental effects)
- quantifying *relationships* between resource use options and decision criteria to enable the relative scoring or comparison between options (e.g. models of the effect of intensifying cultivation on soil erosion) in the decision-making process
- *monitoring* and evaluating the success of the plan.

Many resource evaluation techniques have followed prescriptions or guidelines devised or adopted by central authorities, e.g. the FAO Framework for Land Evaluation in Africa (FAO 1976), the USDA procedure for Land Capability (Klingebeil & Montgomery 1961), and the Queensland guidelines for agricultural land evaluation (Land Resources Branch Staff 1990). These technical procedures have often been imposed on private land managers by central authorities who have governmental responsibility for land use planning. For national and large regional planning projects, this is still the case in Australia and is certainly so with many developing nations, including Zimbabwe. The procedures in these projects stem from the desire to standardise the process of matching land qualities (defined from the status of individual land attributes) with resource use requirements (defined by a clear understanding of 'land utilisation types'). Such biophysically based procedures were advocated by the FAO

(FAO 1976) and others (e.g. Dent & Young 1981) from their experience with agricultural expansion and development during the 1960s and 1970s. Subsequent development of these procedures has led to more sophisticated computerised means both in Australia (e.g. Ive et al. 1985) and southern Africa (e.g. Hammond & Walker 1984), which further centralise the operation of planning procedures but alienate community opinion, aspiration and self-determination.

Resource use planning has, likewise, sought to take the decision-making away from separate individuals and from the grassroots level. However, more recent approaches, seeking sustainable options for the allocation of land resources, have refocused on the individual and community, recognising that land resource users possess valuable knowledge and understanding of resource limitations and potentials. This paradigmatic shift also recognises the individual's role in formulating culturally appropriate aspects that aid adoption of any plan. An example of such an approach is integrated resource management, which actively seeks to integrate the perceptions of planners, interest groups, communities and individuals (the 'stakeholders') with regards to resource values. It also seeks to assess and plan resource use on multiple scales, thus addressing a problem often confronting resource use planning processes (Yin & Pierce 1993) and which applies in both the Zimbabwean and northern Australian contexts.

Increasingly, planning authorities have come to realise that this prescriptive, institutional imposition of resource use plans is not only unacceptable to the affected communities but is also extremely difficult to implement in any efficient and democratic way. The introduction of more community involvement in decision-making and for decision control, particularly in Australia, is changing the perception of resource use planning for rural areas.

A desirable aspect of all resource evaluation and planning projects is to improve our understanding of the biophysical and sociological aspects of the relevant agroecosystems. Modelling can be used as a tool to inform decision-making that captures the predominant, driving components and processes that influence the agroecosystem, as well as the other influences that can have significant effects.

The study of agroecology was born out of concern for the lack of interaction between ecologists and agronomists and sociologists/economists, and an identified need to develop a research approach that would ensure the achievement of ecologically sustainable, as well as agriculturally applicable, production. Gleissman (1990) and others (e.g. Altieri 1987, Conway 1985, Lawrance et al. 1984) suggest that the emergence of agroecology and the notion of the agroecosystem provide an opportunity to integrate the multiple biophysical and socioeconomic factors affecting agricultural systems.

Decisions concerning the management of any agroecosystem are part of the agroecology of the system because, in this theoretical framework, social systems are part of the agroecosystem. Therefore, decision-making is part of a systems process, which can be analysed and modified using systems analyses that simplify the complex decision-making processes within agroecosystems.

Agroecosystems modelling applied in this study

Subproject 1 of this project required data integration and interpretation, comprising background information, biophysical and social sciences data, and agroecosystems model construction.

Agroecosystems analysis offers a theoretical framework for resource use planning because it assesses the structure and function of various

resource uses and related human activities as components of the agroecosystems model. The modelling is sensitive to variation in resource capability across the landscape because functional agroecological zones are modelled spatially and conceptually.

The spatial components of agroecosystems analyses were expressed through GIS (geographic information systems) and remote sensing (RS) technologies. GIS is a powerful tool for storage, analysis and presentation of spatial data. The recent rapid expansion in availability of computer technology has seen increasing recognition of the utility of GIS in community-based planning and natural resources management.

The comparatively recent availability of inexpensive satellite remote-sensing imagery has likewise proved a boon to natural resource planning. Combined with GIS, it allows, for the first time, rapid and relatively cost-effective capture of comprehensive data on terrain and vegetation features. The use of such imagery as a backdrop to inform planning discussions with stakeholders is now a common occurrence in regional planning throughout the world. The utility of this data in finer-scale community-based planning has been constrained to some extent by the scale at which the data is captured. With increasing availability of high resolution imagery (pixel sizes of 10 m or less), the use of satellite remote sensing in community-based planning will undoubtedly increase.

The concept of 'resource management domains' (RMDs) incorporates human intervention in the management of natural resources, particularly in rural landscapes. RMDs are a multi-scale expression of spatial resource data that define the environmental and socioeconomic conditions for a given area (Dumanski & Craswell, 1998). They are conceptual expressions of the natural and human ecosystems and, in the context of this project, a way of expressing the dynamics of the agroecosystems under investigation, which complement the spatial modelling described above. They are a more dynamic, more detailed, versatile and scale-independent version of the standardised agro-ecological zones (AEZs) of the FAO (1976).

RMDs were considered of relevance to the current land use decision-making project as they can assist with research design, structuring and organisation of natural resources information. They are also expected to accommodate the complexity of land resource management issues of local through regional to national significance, and thus assist with the progressive resolution of policy-related issues and local interest issues important to all levels of decision-making.

Socioeconomic information has an equally important role in this context to that of the biophysical environment, as expressed through the principles of an FESLM (framework for evaluating sustainable land management), which are also adopted as a conceptual basis for this project. Within an FESLM, land management is assessed by evaluating its performance against five major indicators of sustainability, viz. productivity (maintenance and enhancement), security (reduction of risk), protection (of natural resources), viability (economic) and acceptability (in a social context) (Smyth & Dumanski 1993). Decision procedures that incorporate the biophysical evaluation methodology in an FESLM with stakeholder knowledge and experience have been formulated for Australian tropical savanna lands, e.g. the decision support system ASSESS (Shaw & Bellamy 1996).

Decision support and decision theory

Decision support tools or decision support systems (DSS) are commonly promoted as a means to improve the ability of individuals or groups to make appropriate decisions (Shaw & Bellamy 1996). Decision theory is increasingly being applied in many spheres including industry and business. More recently it is being considered in relation to natural resource management, and in agricultural and other production systems.

In its broadest sense, a DSS is defined as an integrated and reproducible approach to the age-old problem of helping people make better decisions. A DSS integrates information in a structured way, with objectivity and increased efficiency in the decision-making process (Shaw & Bellamy 1996). It does not necessarily attempt to model details of human interaction, but rather to model inputs, outputs and parameters likely to affect the selection of a preferred option from a range of alternatives (Gillard & Moneypenny 1988). In summary, there are three key factors in the use of a DSS in decision-making (Stuth & Stafford Smith 1993), namely to:

- integrate a wide range of information
- make decisions that are unique and applicable to the site or issue to be resolved
- ensure people are the most important part of the planning process.

There are a range of terms to define decision support tools, including multi(ple) objective decision-support systems, multi(ple) criteria decision-support systems, multi(ple) criteria decision models, multi(ple) criteria decision analysis and multi(ple) criteria analysis. Typically, these systems each involve a method for combining quantifiable impacts with an allocation of weights that reflect a preference or degree of importance. The underlying intent of these systems is to support decision-making processes through the synthesis of information, provide a structured approach for quantifying trade-offs, and include functionality for communicating outcomes.

Multiple objective, as opposed to single objective, decision-making recognises that within the community there are many values and objectives related to a particular decision and that an individual decision-maker can also hold multiple objectives. Single objective decision-making focuses on optimising a single criterion (e.g. net present value in cost-benefit analysis or environmental quality in environmental impact assessment). In contrast, multi-objective DSSs recognise that an optimal solution that satisfies all the objectives and considerations is rare and requires some degree of trade-off.

There is an increasing awareness among decision-makers and society of the need to simultaneously consider and identify several objectives for natural resource management, because of the limitations of single objective resource criteria to judge ecosystem-based management practices (Sanderson et al. 1990, Renard 1984). Broad-based indicator data need to reflect environmental factors and management objectives, with due consideration given to the sampling procedure and representativeness of the site. Furthermore, misconceptions regarding the ecosystem health and quality of the resource can develop if the assessment is based on one criterion, because many indicators of health have different rates of change in time and space. As suggested by Renard (1984), to ignore erosion is as serious as using erosion as the only measure of rangeland condition.

Improved accessibility to data storage and retrieval tools, and to the development of computer technologies that provide graphic user interfaces, are further increasing the use

of multi-criteria decision support tools in natural resources management. Stuth et al. 1992, RangePack (Stafford Smith & Foran 1990), BeefMan (Clewett et al. 1991), GrazPlan (Moore et al. 1991) and Stockpol (McCall et al. 1991) apply simulation models to test various suitably structured temporal scenarios.

The USDA Agricultural Research Service in Tucson, Arizona (Lane et al. 1991, Yakowitz et al. 1992), has developed a broader approach to multi-objective DSSs. Their method overcomes the requirement to assign individual weights to decision criteria through the use of an importance order of the criteria and the calculation of best and worst composite scores (Yakowitz et al. 1993). Criteria chosen to evaluate current and alternative resource management systems can be quite diverse, considering soil, water, plants and animals. New developments in the decision model are designed according to a hierarchical multiple attribute decision problem (Yakowitz & Weltz 1997). A range of management systems that require evaluation using a number of decision criteria is constructed using a matrix. This matrix can be populated using information sources of measured data, systems modelling and expert opinion from scientists, farmers and community leaders (Lawrence et al. 1996).

Methods to resolve conflicts in resource management must also recognise the spatial distribution of resource use. For example, the preferred management practice in an upper part of the catchment may be in conflict with that in the lower part of the catchment. For this reason, multi-user, multi-objective (MUMO) DSSs that accommodate the spatial relationship between management systems are being considered (Shaw & Bellamy 1996). Ecosystem modelling, in conjunction with MUMO-DSS, can therefore be effective in identifying preferred management systems provided the decision criteria are sufficiently broad-based. To this end, there are considerable efforts being made towards the development of indicators of sustainability that embrace physical, biological, chemical, agronomic, economic and social factors, for field, catchment and regional suitability.

Important considerations in the development of a DSS include institutional and organisational changes, as well as an evolutionary development of the DSS through iterative prototyping following practical experience (Eason 1988). It should not be assumed that end-users will automatically adopt new technology or fully embrace its outcomes. Ison (1993) suggests that one of the reasons for failures in DSS adoption is development of the DSS in isolation of the users, which can often result in addressing the wrong problem. However, Stuth et al. (1992) and McGrann (1993) believe that adopting new technology is not successful when the following issues are not addressed:

- assessment of the technical skills of the user against key concepts of DSS models
- follow-up training within 30 days of initial delivery
- interrelationships between DSS components and algorithms
- interrelationships between DSS and objectives of the organisation
- training and education that is linked with job performance appraisal
- adequacy and timing of training
- user-friendly presentation of results that avoids the black-box syndrome
- training manuals for users.

For less structured problem-solving or where input data are limited, there is a shift from algorithmic methods towards knowledge-based systems. Knowledge-based systems may be broadly defined as compiled knowledge or human expertise that is structured and retrieved

according to a set of rules assisting the user to think about his/her problem. Methods for building and applying knowledge-based systems are given by Schmoldt and Rauscher (1996) with particular emphasis on natural resource management. The catchment management support system produced by Australia's CSIRO (Cuddy et al. 1993, Davis et al. 1991) is an example of a DSS that integrates simple, steady-state modelling with a database of expert knowledge to predict nutrient loads in watersheds.

Communication and decision support used in this research

Subproject 2 required communication and decision support to assist with information, interpretation and knowledge transfer. Both technical and non-technical tools were chosen, including the Facilitator decision support software developed at QDNRM and a communications model.

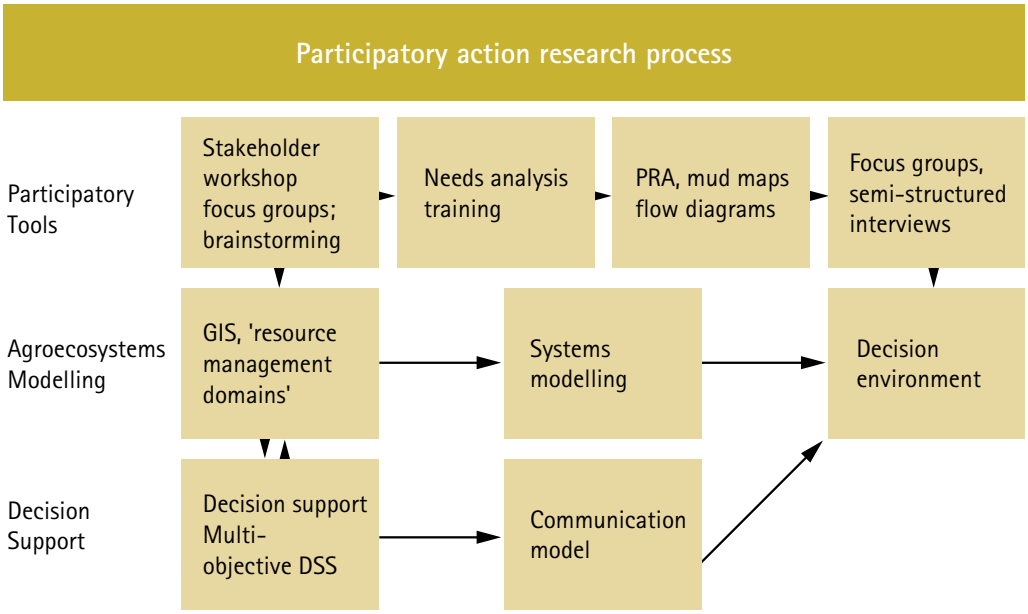
The scientific and planning literature indicates there is an increasing use of decision support tools in natural resource planning and resource allocation, ranging in scale from farm and property planning through to catchment and regional applications. However, there is considerably less certainty about the appropriateness and fundamental benefits of these DSSs when applying them in cross-cultural settings. Recognising that these systems are not limited to computer-based systems was also critical in this research. Many inhabitants of remote areas neither have access to computers nor know or understand them, let alone believe in the outcomes of technological bases to decision-making.

Smyth (1999) stressed that decision-making in indigenous networks occurs in various organisations that offer support to communities, including clan group organisations (usually incorporated bodies), community councils, native title statutory representative bodies and regional representative organisations. Within the community and cultural context, some knowledge is shared by all members and some restricted to appropriate people (elders, men, women). Therefore, appropriate people with authority are the filter through which planning options and aspirations should be approved in decision-making.

Smyth (1999) suggested the primary tool for initiating and conducting planning was likely to be free-flowing, well-facilitated discussions, held on-country in an atmosphere of trust, among people who have developed mutually respectful relationships (i.e. using participatory approaches). The senior traditional owner has the right to speak for their estate and to make decisions, although that person has usually conducted extensive consultation with his/her clan members and considered all issues (Williams 1985).

For this reason the process required trialling both technical and non-technical decision tools. It used Facilitator for technical application and developed a communications model for the non-technical decision support. An effective framework for decision-making can use a 'communication model' as a basis for identifying the strength and direction of knowledge and information exchange, so that the foci of decision-making, both current and desirable, can be pinpointed. This understanding can then be linked to those social and economic factors that have greatest input in determining how an agroecosystem operates and is managed (Gleissman 1990).

Figure 7. Participatory planning process developed in Zimbabwe (tools used at each stage of the process are described in the text)



Building the framework of processes and tools for Zimbabwe

A framework was needed for the development and application of participatory, agroecological and decision support processes and tools. A participatory action research methodology was chosen for both study areas and the framework built accordingly.

Some three years were spent scoping the project with relevant stakeholders to integrate community driven needs and aspirations with technical land use management techniques. The framework that eventually emerged included a suite of participatory, agroecological and decision support tools chosen to suit the various subprojects, as conceptualised in Figure 7 and described below.

Participatory processes and tools

The participatory processes and tools deemed most relevant to the Zimbabwe test site included:

- *Brainstorming and focus group stakeholder workshops*: stakeholder workshops that bring together institutional stakeholders were a vehicle for introducing the project concepts and initiating project momentum. During the workshop, focus groups were formed to brainstorm and record relevant perceptions, constraints and resource issues.
- *Needs analysis and training*: training in relevant participatory, agrocecological and decision support tools was undertaken via country exchange visits and by university staff. A need for community entry was identified, and an activity linking with a concurrent maize/sorghum trial in another externally-funded project was used.

- *Field-based participatory rural appraisal (PRA)*: PRA is a rapid, structured approach used to elicit community needs, and to gather their maps, ranked priorities and other relevant information.
- *Flow diagrams*: Flow diagrams produced by institutional and community stakeholders were useful for constructing agroecological and decision support models (refer below).
- *Focus groups and semi-structured interviews for monitoring and evaluation*: Interim progress needed to be measured by using data from focus groups and semi-structured interviews held with all stakeholders involved in the project. Data was grouped into themes and issues.

Agroecological processes and tools

System properties that combine large numbers of agroecosystem processes into simple, highly-aggregated measures of performance needed to be identified both conceptually and spatially, to evaluate whether the agroecosystem was meeting human objectives. Integration of biophysical and social sciences data, and their interpretation, occurred through various resource evaluation and resource use planning techniques:

- *GIS and RS:* Resource use mapping using GIS and RS was deemed an important tool for input of spatial data into agroecosystems analyses.
- *Resource management domains:* RMDs were considered the complementary conceptual input into agroecosystems analyses. 'Mud maps' constructed during PRA were deemed to be inappropriate for integration within the GIS used in institutional planning. However, they are useful for deriving spatial RMDs in a modified and simplified form, and for facilitating communication with institutional planners. Thus the RMD concept could be adapted to a participatory approach, although it may not suit all community-based planning circumstances.
- *Systems modelling:* Conceptual agroecosystems modelling for Karamba Ward trialled a STELLA modelling shell (iThink 1994), which is a visual, dynamic, object-oriented computer modelling framework for characterising the connectivity and fluxes within ecological and social systems. In a way it is a modelling system of the spidergram concept, which can be produced by institutional and community stakeholders.

Decision support tools

- *Facilitator:* This software is applied to a hierarchical, multiple-attribute decision problem using a number of decision criteria. A matrix is constructed and populated with information from measured data and expert opinion.
- *Communication model:* A communication model was used to facilitate the DSS – it identifies inputs, such as people, positions, information and flows, so that strategic nodes and networks can be mapped.

Building the framework of processes and tools for northern Australia

Within the PAR methodology, a planning framework constructed for the Australian test site, comprising several participatory, agroecological and decision support tools, was developed (Figure 8) and is described below.

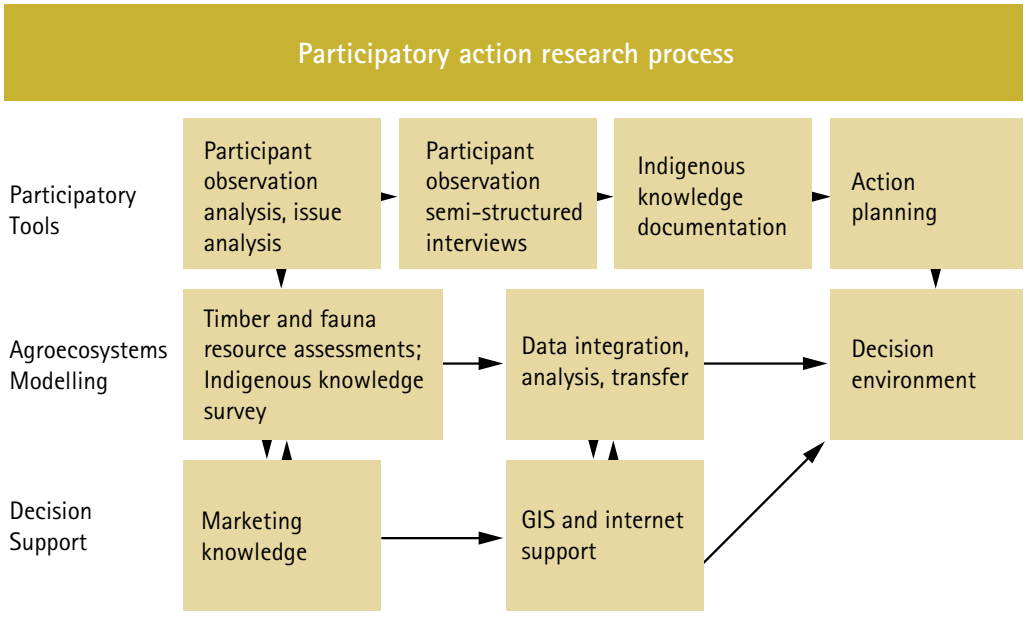
Participatory processes and tools

- *Participant observation:* These techniques have been found useful in other collaborative environmental management projects with

indigenous Australians (Carter 2001) and were deemed to be useful during surveys and other situations (refer below). Participant observation involves collecting data about everyday situations, conversations, events and observations whilst participating in the local system as a variable in the situation. Data collected in this way are of integrity, because the data are not elicited for externally identified questions or unanswerable hypothetical situations, but gathered in the appropriate context.

- *Issue analysis*: Data that recorded community members' aspirations was gathered during participant observation, and emerging themes developed using issue analysis.
- *Participant observation and semi-structured interviews for monitoring and evaluation*: Interim progress was measured by analysing data from participant observation and semi-structured interviews with different stakeholders. Data was grouped into themes that articulated community-based indicators of success.
- *Indigenous knowledge documentation:* Use of local knowledge was considered necessary in promoting participation and also for integrating between western and indigenous knowledge systems.
- *Action planning*: Data from participant observation was also organised into an action plan to inform decision-making.

Figure 8. Participatory planning process developed in northern Australia (tools used at each stage of the process are described in the text)



Agroecology processes and tools

- *Timber and fauna resource assessment surveys:* To target timber and non-timber resource uses related to the forest and woodland, a limited timber survey exercise was conducted in conjunction with local rangers to gain a more detailed and scientific inventory of the timber resource than currently existed. This information was necessary for assessment of the economic productivity purposes (refer marketing assessment below) of the resource. Community members had also been commissioned to undertake a fauna survey, and institutional linkages were made with this initiative for cross-fertilisation of information.

Decision support processes and tools

- *Data integration and analyses using GIS and website links*: A regional GIS was constructed and used to integrate data from traditional knowledge documentation and the timber and fauna resource assessment surveys. Photographs and data recorded in indigenous languages were linked to the GIS using databases and URL address links.
- *Marketing assessment*: A marketing assessment was outsourced to a forest economist to help provide indications of the economic potential of the timber resources and possible options for decision-making.

PART 2

Trialling the processes and tools

CHAPTER 4

Participatory resource use planning in Zimbabwe

P. Lawrence, J. Carter, P. Frost, R. Thwaites, P. Norman



Resource use issues

Frost & Mandondo (1999) describe the relevant biophysical and socioeconomic background to resource use planning in semi-arid areas of Zimbabwe. After independence in 1980, the Zimbabwe government commenced resettling families onto commercial farming land to help redress inequitable access to good quality agricultural land. In 1992 the *Land Acquisition Act* was passed, approving the purchase of five million hectares of mostly European-owned commercial farmland for the resettlement of one million subsistence farmers. Former landowners were to be compensated in government bonds, which was later amended to their fair cash compensation and right to judicial appeal. The process has been long and complicated, and continues to this date to be a priority issue for Zimbabwe.

Miombo woodland in Karamba Ward of the UMP District, NE Zimbabwe, 1) Mr Crispen Marunda of the Zimbabwe Forestry Service stands in a natural stand of 'wet miombo' of the uplands, 2) partly cleared 'dry miombo' of the lowlands with burning for agricultural development evident. (Photos: P. Norman).

Low and erratic rainfall, poor soils, unreliable and poor quality surface water, underdeveloped groundwater and frequent drought combine to generate fragile environmental conditions.

Agriculture is limited to rain-fed cropping and livestock production. Chronic food shortages and dependence on food aid is the outcome of recurrent drought and widespread crop failure, despite the use of relatively drought resistant crops. Deforestation, soil erosion and water deficiencies, inextricably linked with poverty, result in a deteriorating spiral of environmental management in many communal lands. There are international concerns over the loss of a high proportion of Zimbabwe export income, resulting from land redistribution and associated political unrest. Lack of foreign currency produces chronic fuel shortages and a general economic decline.

The remoteness of the particular study area in Karamba Ward, UMP District, aggravates the lack of infrastructure, with high transportation costs for marketing natural resource products and profits that may not adequately compensate the backloading of locally harvested produce. Complexities of social networks are present through colonial and traditional community structures, and there is need to work with personnel from all these structures, including elected representatives. Governance and decision-making authority is a complex situation. The *Customary Law and Local Courts Act 1992* endorses traditional authority and social institutions. Such structures will replace ward and village-based authority and redress the existing power dynamic – currently, a young person with university qualifications may call a meeting, which is not in keeping with the traditionally based authority to direct such forums.

Six villages in Karamba Ward were selected by personnel from the national resource use planning agency (AGRITEX) and University of Zimbabwe in 1999 as the eventual test sites for this planning framework.

Cultivation of cleared miombo woodland in a dambo of the UMP District of NE Zimbabwe (Photo: P. Norman)

Participatory processes and tools

Brainstorming and focus group stakeholder workshops: In July 1999 a stakeholder workshop was held to introduce the project concepts, initiate project momentum, and brainstorm perceptions, constraints and resource issues. Data gathered during these exercises were used to populate a matrix. A final stakeholder workshop held in Harare in September 2001 provided an opportunity to develop and interpret the outcomes of a communication map (Figure 11). Attendees at the final workshop, including the chief of Karamba Ward, representatives of the Rural District Council and CAMPFIRE, extension officers and planners within AGRITEX, and staff of the University of Zimbabwe provided a cross-section of interests and knowledge.

Needs analysis and training: During the stakeholder workshop a training needs analysis was undertaken which showed that training in participatory approaches and techniques within the lead institution was necessary to progress institutional understanding of participatory initiatives. Training was undertaken in PRA techniques by CASS representatives in 2000, and in the use of agroecological and decision support tools during country exchange visits in 1999.

Field-based PRA: Two AGRITEX extension officers undertook PRA in the six villages between January and March 2001. Community sketch maps (from the training exercise and subsequent PRA) showed cropping fields, good soils, forests, surface water sources, cattle watering points, kraals, homesteads, non-timber woodland resources, draught-power sources, transport sources and other social data at the farm level. These data were transferred onto topographic maps and digitised into the GIS (Figure 9). Other PRA data relating to community members' knowledge of resources and planning values and priorities were analysed and summarised from the data. These data were considered to be not useful input to a GIS for producing RMDs.

Flow diagrams: Flow diagrams were constructed to aid the eventual use of spidergrams and a communications model for agroecological analyses and decision support (Figure 10).

Focus groups and semi-structured interviews for monitoring and evaluation: Interim progress in the project was assessed in early 2001, using focus groups and semi-structured interviews with all stakeholders. Analysis of data identified that, although several small steps had emerged in the process, the institutional planning culture had remained largely unchanged from top-down planning approaches. Fuel shortages, national priorities for land resettlement schemes and high staff turnover in the lead institution, together with the introduction of inexperienced personnel unfamiliar with participatory approaches, were identified as obstacles to progress.

Institutional linkages to CIMMYT (International Maize and Wheat Improvement Centre) were developed during the process to help provide short-term benefits and quell community apprehensions. AGRITEX extension officers were briefed and trained on how to conduct maize trials, and in the use of CIMMYT data collection

Case study

The need for an on-site facilitator

Farmers in Karamba Ward initially associated the woodlands agroecosystems project with another community wildlife management project. A rural district councillor had told some villagers that they needed to relocate to establish the wildlife area. Stakeholder conflict was clearly evident, and there was need to invest time and resources to quell fears and hostilities and restore trust for this project.

AGRITEX officers undertook training in participatory rural appraisal techniques as part of this project, after which Philip Mhlanga was appointed as an on-site extension officer. Karamba is the most isolated and underdeveloped ward in the UMP District. Whilst resident extension officers had been appointed to other wards, no one had ever before been appointed to Karamba. Having Philip based in the area meant he could spend more time with local residents, a week at a time in each village.

Philip built relationships with local farmers and soon became aware that most of them had little interest in wildlife use. They were more interested in the possible cost-savings and easier farming that new open-pollinated maize varieties offered through a sorghum and maize trial initiative, and in the future farm food security that this project had to offer by involving them in planning. His on-site presence established a stable communication node and farmers began telling him the various agricultural practices that had worked for them, such as appropriate moisture and soil conservation techniques. Others liked to inform him of their solutions for the next season, such as ways to improve food security. Philip would then explore further land use planning opportunities that built on these initiatives. For example, he asked village leaders to include '*when* is water a problem?' in discussion about community residents' needs and constraints with water resources.

Philip's extensive network of local contacts allowed him to facilitate two-way communication between the community and national- or regional-level AGRITEX staff. Some farmers raised concerns that they could not re-use seed the following year because the new open-pollinated variety was not certified. Others were concerned that only farmers selected to participate in the trials would benefit from the outcomes. Philip organised a meeting with about 50 villagers, where AGRITEX staff explained that the seed did not

Maize trial: a farmer participating in a 'baby' trial near Nyanzhou discusses his thoughts with members from CASS.

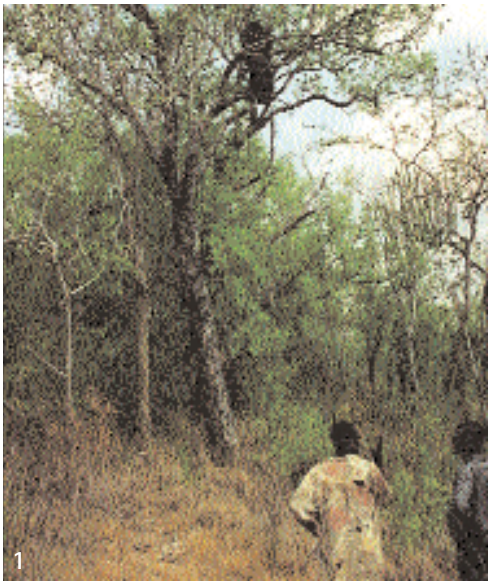
require certification, although it would have to be kept away from weevils. They also explored options for allowing the trials with as many participants as possible throughout the majority of village development committees in the ward, realising that this would generate additional benefits because of the ability to compare AGRITEX differences in study results.

The secondary school teacher and students at Nyanzhou School in Karamba Ward also attended the meeting and one student gave an oral presentation about the project and the school's role in keeping records of information from the maize trials. One farmer was proud of his exercise book and the observations he had recorded, and showed this book to a regional AGRITEX officer. A lively discussion ensued about the best varieties and reasons behind their choice. Another farmer expressed his satisfaction about the opportunity to have two-way dialogue, explaining that questions and concerns were being raised, but also mentioning the benefit of 'listening to teachers'. Some farmers then asked for future discussions and trials about other concerns, such as introducing new conservation measures they felt would best suit their needs and farms.

At a subsequent community gathering, which was also attended by the AGRITEX planning officer Nicholas Ncube and the ACIAR project liaison officer Wilson Mutinhima, as well as the local chief and his headmen, the schoolchildren presented a message about good farm practice and planning for the future by means of play-acting and song. This was well received by both community members and the planning staff. Wilson Mutinhima reinforced this message with praise for the community's involvement and the efforts of Philip Mhlanga, who had become part of the community. The farmers and some children, having become more relaxed about the proceedings and enjoying the occasion, then volunteered some of their feelings about the food and farming problems they were suffering and even offered some solutions themselves. They did this with reverence to the chief but with a sense of equality with the AGRITEX and RDC members.

Farmers meet at Nyanzhou to discuss their feelings and concerns with national and regional AGRITEX staff before the schoolchildren's play.

Daphne Mpofu (a social scientist from CASS) reported her observations that both AGRITEX staff and farmers had slowly changed their behaviours during the course of the project. She noticed farmers were asking questions, requesting information and discussing issues, whereas AGRITEX staff no longer used direct questioning but were happy to use indirect questions and allow issues to arise from conversations. Farmers were also taking the initiative to suggest ideas to AGRITEX staff, such as having their soils tested. She believed that some of this was due to residents selecting their local leader to ask questions and report back to larger groups, but also because farmers had gained confidence to make suggestions and were not told what to do. They also felt encouraged by their chief's involvement in these issues in their community.



Industries in Miombo woodland 1) a bee-keeper and one of his hives in the woodland, 2) sacks of charcoal for sale on a village roadside. (Photos: P. Norman)

and monitoring sheets. AGRITEX also initiated sorghum SV2 observation and demonstration trials alongside the maize trials (excepting at the 'mother' site) to observe the advantages of small grains. Farmers selected the sites and managed the satellite, or 'baby', trials, and also provided feedback to AGRITEX on the usefulness of the crops. A farmer demonstration field day was arranged to show the findings and benefits of the joint AGRITEX–CIMMYT trials to local farmers.

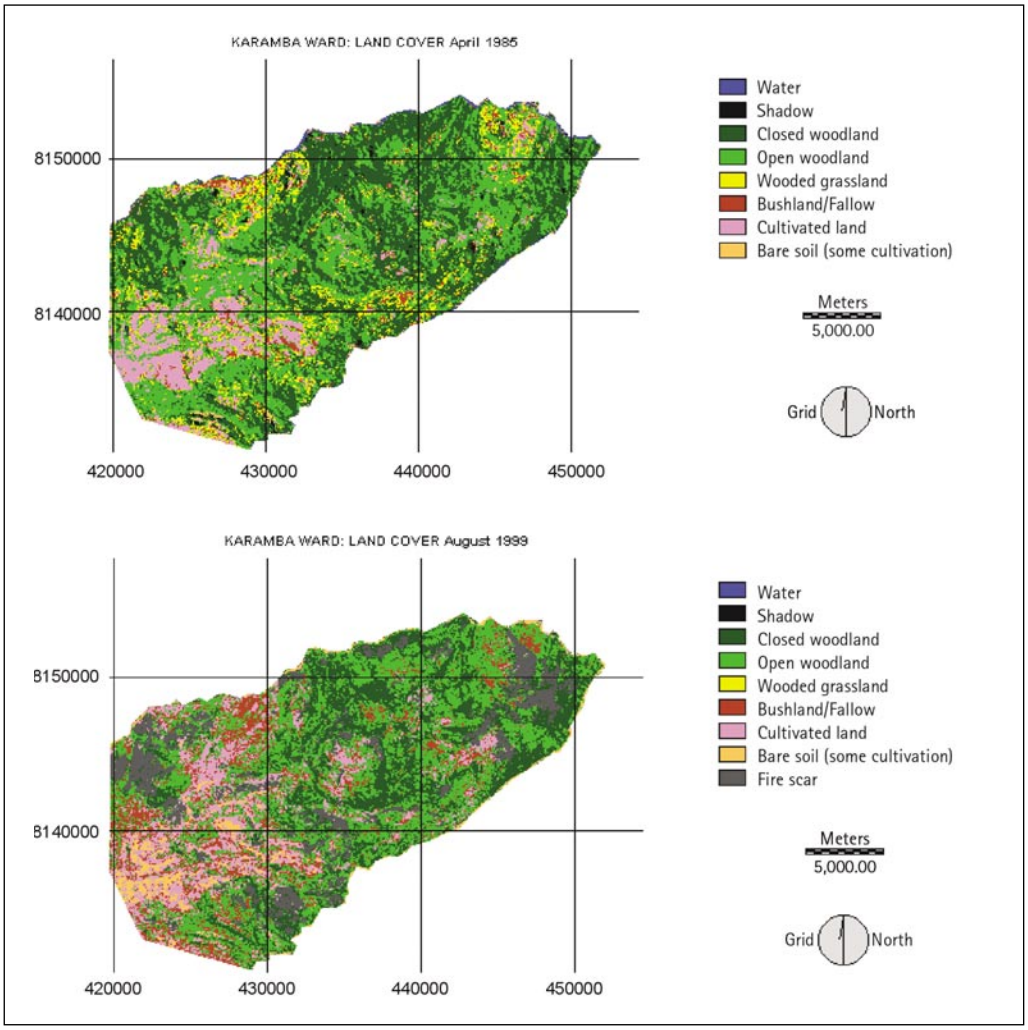
Agroecological processes and tools

Incorporating agroecosystem properties into resource use planning requires their spatial expression at appropriate scales. Zimbabwe is divided into five 'agro-ecological zones' (AEZs), primarily based on climate, which reflect the government's emphasis on agricultural production and potential resource use (Warner 1993). This zonation is a comparatively crude and broadscale (1:1,000,000) categorisation of the environment defined by rainfall amount and temporal pattern, and by altitude range (giving a 'veld class'). Subsequently, only very broad statements of land use capability can be made from this classification of 'resource use systems'. Socioeconomic information is 'retro-fitted' into this classification rather than being part of the classification criteria. However, much socioeconomic data in Zimbabwe (e.g. tenure type, demographic relationships, employment levels, land use systems) is analysed according to these AEZ divisions, as though they form boundaries of an administrative system.

This research enhanced existing land use zones by analysing finer-scale information and more complex systems within Karamba Ward, to gain an understanding of agroecosystem dynamics on the local scale. Both spatial and conceptual modelling were used. The AEZ zonation formed the simplest of baselines for the more intensive agroecosystem analysis.

GIS and RS: Very little land use and natural resource data was available for Karamba Ward although a land use plan had been developed. A GIS was developed that relied largely on compilation of existing public domain datasets that were only available at relatively coarse grids, and not suitable for local-scale decision-making or for a finer-scale RMD analysis. Limited analysis was conducted to develop a digital elevation model, which contained errors needing statistical restoration before any derivative analysis could

Figure 9a. Sample datasets from the Karamba GIS created by project partners in Zimbabwe showing land cover change between 1985 and 1999



be undertaken. Simple expert models were used to derive maps of agroecosystem potential (a combination of annual precipitation and soil productivity), resource use intensity (a combination of cattle density, human population density and cropping) and resource use sustainability (a comparison of agroecosystem potential with resource use intensity). A sample of the original datasets is shown in Figure 9.

The AGRITEX district office interpreted land use types and administrative boundaries from aerial photography, and mapped these in draft form but from a subjective and implicit analytical and interpretation basis. Soil maps, like the geology maps, exist at 1:250,000 scale only and vegetation mapping is patchy for the area in general. Some agroclimatic modelling, as well as Landsat remote

Figure 9b. Digital elevation model of Karamba region from digitised contour data (source: Bwerinofa 2001)

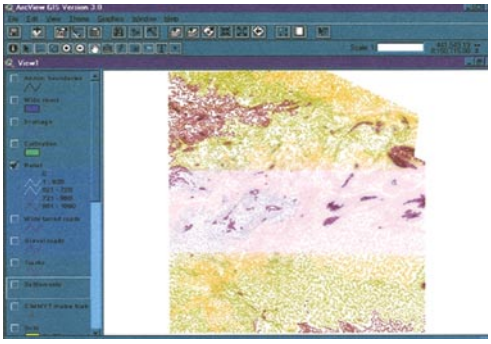
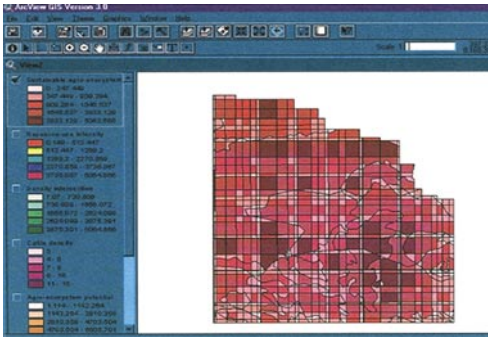


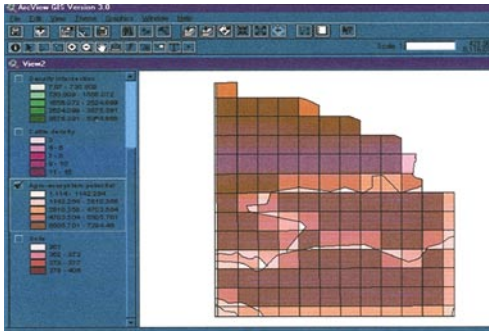
Figure 9c. Digital map of sustainable resource use within Karamba Ward. Multi-cell overlays (source: Bwerinofa 2001)



sensing data interpretation at a broadscale level, were undertaken for the UMP District.

Land use change information was produced through the use of SPOT and Landsat satellite imagery. Change detection techniques were used to map vegetation clearing and to track general population movements. The analyses showed migration of people over a number of years from

Figure 9d. Digital map of agroecosystem potential within Karamba Ward. Grid-based version of resource management domains with vector overlay (Source: Bwerinofa 2001)

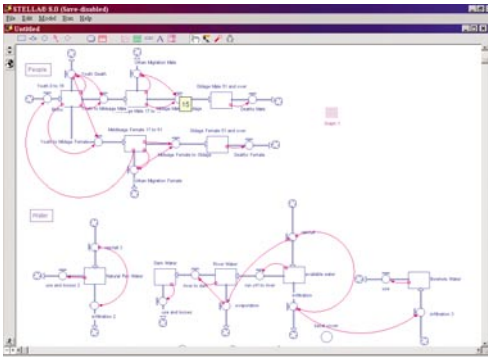


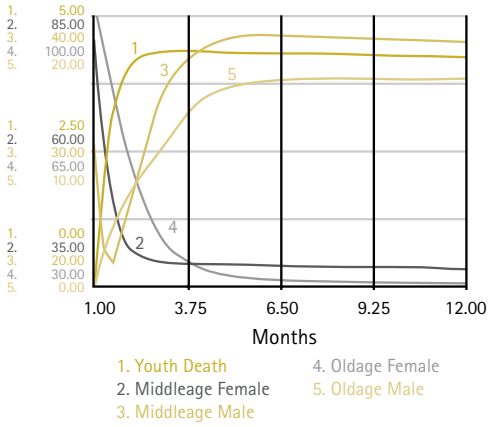
the Mazoe valley in the eastern part of the ward to Dewe and along the central corridor. This migration may have been due to the establishment of the Nyatana wilderness area (a CAMPFIRE and RDC initiative) and the pressure to relocate residents.

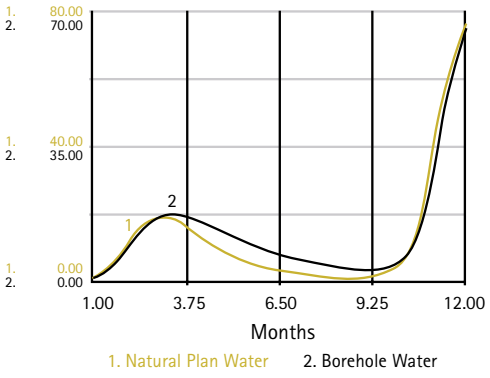
RMDs for spatial modelling: Land assessment data was acquired in traditional technological ways by AGRITEX. It was very restrictive in its use because of scale, and of low worth to dynamic land use planning and delineation of RMDs. The spatial land use component of the model was not pursued further at this stage, and research effort changed to concentrate on conceptual modelling (below). Improvements in RMDs could and should be easily effected with training workshops and courses and use of more appropriate scales of data.

STELLA for conceptual modelling: On a country exchange visit an AGRITEX staff member was trained in the use of STELLA to apply his understanding of the agroecosystem context in which his institution conducted planning.

Figure 10. A systems model for Karamba,
a) spidergram,
b) demographic trends over time,
c) water use over time







Spidergrams developed by participatory techniques were included as inputs to STELLA software using a visioning activity. The model was built around community water use, exemplifying the relationship between population dynamics and natural resources. Key elements of the model are shown in Figure 10a–c and include the birth and death rates of respective genders, emigration of young people to the city in search of paid employment, and return to the community of aged people following retirement. The model also identified how environmental variables such as climate and hydrology influenced the availability of surface and bore water.

Community discussions during model development raised issues such as the interaction between different land uses (particularly tree clearing and conversion from grazing to cropping), although these were not quantified in the early iteration of the model. The final spidergram representation of the systems model, using STELLA, was discussed with the community and revised and updated according to their directions.

Decision support processes and tools

Facilitator: The AGRITEX staff member was also trained in the use of Facilitator during a country exchange visit. On return to Zimbabwe, he found he needed further expertise in the technical skills of the program, and use of this tool was eventually discontinued.

Communication model: A communication model was constructed to identify the interactions between participants and the flow of information in the decision-making process. This activity models people and their positions in the network, and the origins, influences, flows and significance of information in the research. Understanding the source and significance of information helped identify critical paths and strategic nodes for efficient and timely exchange, as well as

AGRITEX district extension officer, John Matsikure, inspects one of the more successful of the 34 varieties of open-pollen maize at the maize/sorghum trial ('Mother') plot in Karamba Ward. Students from the Nyandzhou School manage the plot under the direction of their teacher. (Photo: R.Thwaites)

ineffective flows and blockages, of information. Identifying these key points was useful to implementation and conflict resolution.

The approach used in constructing the communications map involved a three-stage, open-ended, facilitated process. In the first stage the facilitator enquired about which individuals, people or organisations made decisions that influenced the landholder. To initiate the process, three questions were raised:

- Who makes decisions that influence natural resource use in Karamba Ward?
- Who else provides information that assists in these decisions?
- How does information flow in making decisions about natural resource management in Karamba Ward?

Critical participants with whom the farmer directly consulted or accessed relevant advice or information were listed. The second question identified the people or groups who indirectly influenced or provided information relevant for their decision-making, and their names were listed with different colour cards. While these two issues may seem somewhat similar (direct and indirect information sources), defining the extent and strength of the participants that influenced the farmer is a critical part of the process because farmers have greater confidence in both the information and, presumably, any actions that are sourced directly. The final step involved defining the webbing of information between the various providers and the farmer. Discussions at this stage often identified additional linkages and dependencies between the participants in the supply and transfer of information. The process was guided entirely by group consensus of the stakeholders listed in Table 4.

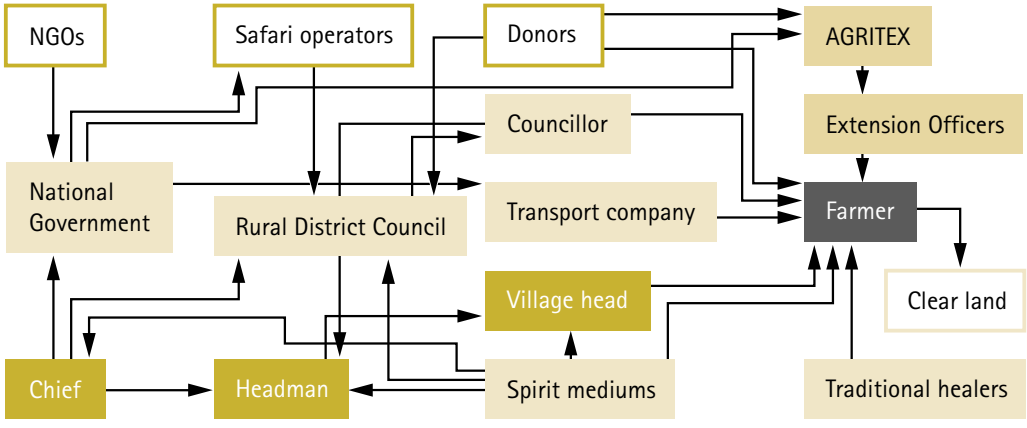
Table 4. Information sources that influence farmer-level decisions

Source of Information	
Direct influence	**Indirect influence**
Councillors	NGOs
Rural District Council	AGRITEX
Extension officers	Traditional healers
Village head	
Headman	
Chief	
National Government	
Donors	
Safari operators	
Spirit mediums	
Transport company	

New agricultural land settlement, Karamba Ward, UMP, on the southern boundary of the Nyatana Wildlife Management Areas. Note the shallow, rocky nature of the soils. (Photo: P. Frost)

The communication model was applied to the issue of timber clearing in the Karamba Ward, and to the sources and interactions of information that would influence the farmer in reaching a timber clearing decision. The model helped to exchange knowledge from all data sources about cultural, environmental and socioeconomic costs and benefits of timber resource management. It also served as an interface that assisted with community-based decision-making and outside influences about timber resources. The eventual model is shown in Figure 11 and decision criteria and options for clearing are listed in Figure 12.

Figure 11. Graphical communications model of influences on farmer decision-making in Karamba Ward

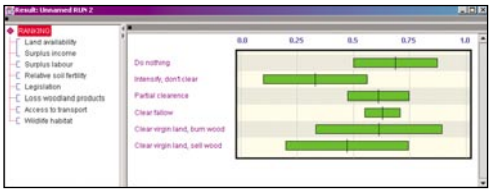


The model identified traditional leaders, and kinship and community relationships within a dynamic setting, with the following specific observations:

- the predominance of traditional leadership authority (chief, village head *Sabhuku*, and headman *Sadunju*) in influencing land use decisions
- the relative integration of traditional leadership and political leadership (e.g. through the chief being represented on the National Council and on the RDC)

Figure 12. Decision criteria and options for tree clearing in Karamba Ward using the facilitator model

Decision Criteria	Tree Clearing Options
Availability of land	Clear fallow
Surplus income	Clear virgin land, burn wood
Loss of woodland products	Clear virgin land, sell wood
Relative soil fertility	Intensify but don't clear
Surplus labour	Partial clearance
Wildlife habitat	Do nothing
Access to transport	
Legislation	



The project Extension Officer, Mr Philip Mhlanga, at the table addresses a community meeting of farmers and families at Nyanzhou School in Karamba Ward to discuss ideas and concerns about the CIMMYT maize trials. (Photo: J. Siamichira)

- the prominent role of the spirit medium to guide and influence decisions at all levels
- the role of the rural district councillor to directly and indirectly influence the farmer
- the broadscale direct influence of donors on the RDC and the farmer
- the relatively peripheral position of the external technical experts (including AGRITEX) in influencing the decision
- the diversity of influences on farmer's' decisions.

Outcomes suggest that the farmer has access to a range of information sources to support his decision-making processes. However, it is not possible to determine whether farmers use all these sources and if in fact all were of equal value to their decision-making process. It is presumed that the chief would draw upon personal networks with other chiefs for gathering and exchange of information, and on interactions he has with government officials.

Perhaps the most enlightening outcome from the activity is the relatively limited influential role played by AGRITEX, who adopt a linear model of information provision through extension officers. Although the extension officer and councillor interact, it was not possible within the scope of the workshop to determine the relative emphasis of effort used by the extension officers to advise the farmer directly or channel their information through RDC councillors.

In communication that occurred during the research, the use of conventional extension tools (such as photography, community newsletters and oral text recording) was suggested during country exchange visits. Zimbabwe collaborators responded by using singing and drama as communication and decision support tools as these were deemed appropriate communication forums with local culture. These tools were useful when they were implemented toward the end of the process.

CHAPTER 5

Participatory resource use planning in northern Australia

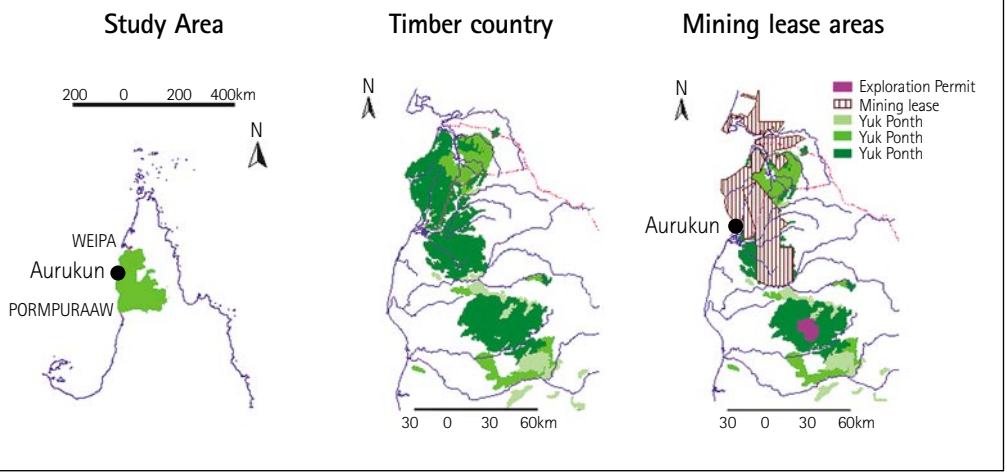
J. Carter, J. Ngallametta, P. Norman



Resource use issues

The Wik native title claim area comprises the collective traditional estates of several Aboriginal language groups on the western side of Cape York Peninsula, as shown in Figure 13. The term 'Wik' is largely used by non-Aboriginal people to refer to a heterogeneous group of people who form larger macro-linguistic groupings of various Wik, Wik-way and Kugu languages. The Wik region covers some 27,430 km^2 extending from the Edward River to Weipa, and includes the inland territory drained by the Archer, Kendall and Holroyd rivers. Around 1300 Wik and Kugu people live in this area, mostly at Aurukun, and the population is increasing (Martin 1997). The Aurukun Shire Council services a portion of the area.

Figure 13. GIS coverage showing study area; timber country and Aurukun shire boundary; and mining lease overlain with timber country



A range of issues important to resource planning are relevant. In recent decades reduced employment opportunities in the cattle industry, imposition of bauxite mining, and establishment of local government administrations have occurred. There has also been substantial effort from bureaucrats and researchers to initiate western-based projects in natural resources management. A legacy of inappropriate approaches and unsuccessful research outcomes has resulted, reviewed by Dale (1993).

Aurukun township on the banks of the Archer River estuary. Note the single road access and airstrip. (Photo: R. Thwaites)

A smaller region within the Wik claim area, to the north of Aurukun, was chosen by a representative of Balkanu for this study because of the need to plan future activities with Comalco, a mining group with a lease in this area. The majority of the area is owned by the Wik-way people, a particular language group that unites several clans, and Wik-way estates fall largely in areas covered by the Comalco and Pechiney mining leases. The area is treed with forests of varying species mixes, heights, densities, productivity and, hence, timber potential. Wik-way estates include areas that correspond to an extensive stand of largely overmature timber resources. The species mix is predominately *Eucalyptus tetradonta* (Darwin stringybark) with some *E. nesophila* (Melville Island bloodwood) and *Erythrophleum chlorostachys* (Cooktown ironwood).

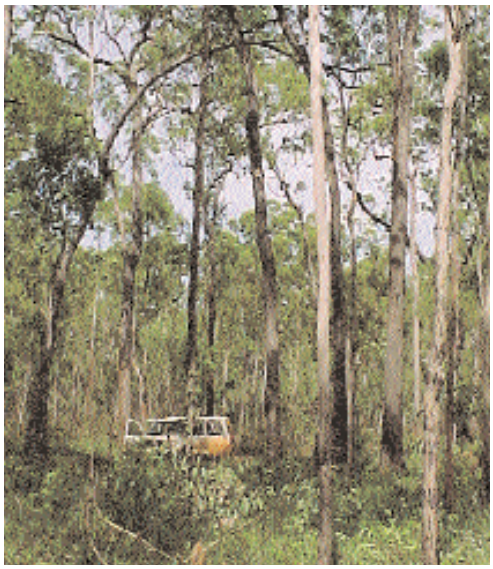
The timber resource under mining lease is designated to be clear-felled, with removal of topsoil and bauxite, followed by replacement of topsoil in its initial horizons. Comalco have done much to ensure the optimal rehabilitation of mined land; however, lowering of the surface soil and subsequent contact with groundwater is inevitable. Loss of the bauxite layer from the already nutrient-deprived soils renders the rehabilitated land uninhabitable for the timber species that previously thrived there.

Extensive research by Comalco over the last 30 years has shown there to be limited land use options for post-mined land. The most suitable options to date are simply to replace native vegetation; however, none of the species suitable to the rehabilitated sites have, as yet, any potential for economic return. The environmental repercussions are high and irreversible. Other threats to the timber resources include termites, pests and fire.

Economic benefits from clear-felled timber in the mining lease area will produce a one-off payment only, as each section is cleared on a rotation basis over time. Other sections can probably be managed over time and yield a small-scale sustainable harvest. Loss of cultural values and impacts on water quality and biodiversity remain unable to be quantified in terms of their economic value. Remoteness of the area, being some 11 hours drive from the nearest city, increases the transport costs.

Another issue is the lack of infrastructure in some regions, particulary in the south, and the seasonal inaccessibility and political difficulties with obtaining access to these areas.

The timber resource also holds cultural value for traditional owners. A large amount of information has been documented during the field visits with community members during this research but, clearly, many more resources are used than this project has had time to record. Predominant among the resources currently used from *E. tetradonta* forest are *Parinari nonda* and other traditional food plants and animals. There is an unquantified value of these resources to subsistence livelihood strategies (e.g. food, shelter materials) and cultural preservation (including knowledge transmission opportunities and artwork materials). Potential losses of revenue that could have been generated from forestry or ecotourism are also issues related to the forestry resource.



Tropical woodland of northern Australia. Darwin stringybark (*Eucalyptus tetradonta*) forest near Aurukun (Photo: J. Carter)

From the gathering of information on these resource issues, three separate scenarios have emerged:

Planning strategies for salvage timbers on mined land: The main, and probably a priority, issue on areas scheduled for mining is to consider the options for the material which can be salvaged prior to mining.

Planning strategies for mined land rehabilitation: Professional feasibility and marketing advice is a priority issue for long-term use of rehabilitated land. It may be that the best use of the land is in socially beneficial programs like education, gymnasiums or health centres; or new industries that have never been considered such as rain-farming; or even industries not based on natural resources. Risk-averse strategies such as mixed economies, coupled with education, are probably optimal. The advice will probably need to be scoped in a manner that considers alternative ways of implementing actions, and new products that might be developed and marketed.

Planning strategies for native forest management: Those areas of native forest not under mining lease may or may not be managed differently. Changes to these areas will need further decisions by traditional owners and may be based on their culturally-derived knowledge, coupled with outside advice.

The Aurukun Shire Council, the local government administration which services a portion of this area, commenced a community-based ranger program, known as the Wik and Kugu ranger program, in 1989 to implement contemporary natural resources management. It involves a combination of both traditional and western intellectual traditions, and aims to promote Wik, Wik-way and Kugu autonomy. Representatives from the council have recently appointed a ranger coordinator to initiate and facilitate these aspirations, incorporating collaborative styles of research with western scientists as necessary, and promoting existing management strategies where possible.

Participatory processes and tools

Paramount in the process was the need to work to the protocols for outside researchers collaborating with indigenous people in Australia, summarised in Table 3. These protocols guide outsiders to work according to several cultural protocols, including maximum community engagement.

Participant observation: During October and November 1999 relationship-building activities were undertaken through on-country field trips and workshops. These field trips were used to explore the resource and economic issues in context and discuss research needs. Between June and November 2000, five visits were held to conduct the modified collaborative resource assessments. During initial visits, and during the revised resource assessment surveys, participant observation was used to collect and group data about community members' aspirations for resource use planning.

Case study

Kinship structures and clan-based systems

Forest surveys were taken across a range of sites that spanned the traditional estates of different social groupings. A community leader or elder needed to oversee how the project was conducted within the community and take the leadership role in the survey work, requiring negotiation with the various social groupings.

One old man, Joe, was considered the most knowledgeable about natural resources because he had spent years as a child living 'in the bush' with his parents prior to being brought into the mission to experience a European lifestyle. Since living in Aurukun, he had experienced working in a (now defunct) sawmill during the mission era of the 1960s and 1970s, and had worked on a bauxite mining survey. Because of his local knowledge and experience, representatives from all clan-based groupings felt he was the most appropriate person to be assigned to work on this project. Elders and community rangers told the researchers to work with Joe on the project.

Joe was present every day, and guided the project along cultural protocols. For example, when visiting each clan estate, he would nominate the most appropriate person to visit that area. This would usually be the most senior traditional owner of the area, who had authority to speak and answer questions about resources on his traditional estate. That person also has obligations to inspect and monitor resources, look after visitors and have a project role as provider of traditional knowledge about the timber resources in the area. At times, the senior person was unavailable and Joe would systematically work through social relationships, prioritising the next most appropriate person. Sometimes he would base his decisions on gender and age considerations, so that females and children also had opportunities to visit their clan estates.

Many community members expressed a wish for children to accompany senior people because of their 'need to learn from their elders', which is an important communication process for many indigenous cultural groups in northern Australia. An entire carload of people would always travel to each sample point. Participants often expressed satisfaction at the chance 'to visit our country' and to familiarise themselves with initiatives occurring on their estates, because they had not been aware of many of the initiatives or projects funded in past years by other donors.

Participants usually represented social groupings and clan systems and, in doing so, provided a base from which information about the project was disseminated to wider members of those social groupings. Sometimes people who had not participated in a visit to a timber sampling site would ask whether there might be another opportunity to be involved.

Aspirations, grouped from participant observation data by issue analysis. The number of instances that an aspiration was recorded is not necessarily indicative of its importance.

Knowledge transmission and language maintenance
Instruct outside researchers and children with knowledge.
Maintain language use.
Use existing learning mechanisms of small clan-based groups, on-country.
Acknowledge elders as instructors and knowledge owners.
Use tools such as photographs to help these processes.
Programs restructured to facilitate autonomy
Encourage direction of management activities and outside researchers by elders.
Promote cultural management activities unable to be fulfilled through current work requirements, such as burning regimes, guardianship of outsiders, food collection and knowledge documentation.
Incorporate respect for ceremony and closures.
Encourage links between ranger activities and arts and craft activities.
Encourage input from outside researchers for decision-making by elders.
Devolve local supervision, personnel coordination, resource organisation, daily timetable and general agenda setting to designated persons.
Outstation development
Work on-country and manage resources in situ.
Teach in groups on-country.
Progress outstation development in the south, which is necessary to manage country in largely inaccessible areas.
Employment and training (related to timber)
Install more carpentry training, with a supervisor, to make boats and furniture.
Employ a trainer for portable sawmill and dressing timbers.
Employ local people to sell timber, nursery plants or otherwise.
Organise a training tour to discuss successes and difficulties found in other initiatives.
Participant resourcing and funding
Procure a second vehicle to meet resource management demand.
Produce more resources, to involve a greater number of people.
Continue progress reports, newsletters, visual extension tools.
Implement female ranger program to encourage gender equity in participation.

Issue analysis: Issue analysis was applied to all the participant observation data gathered about people's aspirations. From these aspirations, community-based indicators for monitoring and evaluating the forestry resource use planning process were grouped and developed (Table 5). The aspirations were expressed according to indigenous community forestry indicators developed by Smyth (2000), who summarised international and national indicators of the Centre for International Forestry Research, the International Tropical Timber Organisation, the Forest Stewardship Council, the Australian Montreal Process Implementation Working Group and the Commonwealth State of the Environment Reporting system. As he also found, the interwoven nature of natural and cultural indicators was of paramount community importance, in particular through indicators such as environmental and language maintenance. The final indicators developed in this research were verified in semi-structured interviews with senior traditional owners and clan groups on their estates, and are articulated within the action plan (refer below).

Participant observation and semi-structured interviews for monitoring and evaluation: Two trial timber surveys were conducted to gauge how the resource survey might occur, and were modified after evaluation. During the trials an elder, nominated as the local project coordinator by community rangers, identified species, provided ecological knowledge, discussed cultural values of the trees, assessed tree merchantability, and supplied information about processing requirements. He was eager that this knowledge be used in the research. Thus, a refinement of the research process was to incorporate indigenous knowledge with western knowledge, and to expand the sampling techniques to include methods for recording information from both knowledge systems.

Indigenous knowledge

Indigenous knowledge was included in the research during the process of the collaborative forest resource survey. The local project coordinator used his culturally based authority to direct outside collaborator learning, using knowledge transmission processes from elder to younger generations and outsiders. He also contributed knowledge through applied demonstration of resource practices. The outside collaborator's role was simply to record this knowledge, in text and through the visual format of digital photography.

Local knowledge recorded included local language names of trees, fauna species and placenames; descriptions of habitats and ecological relationships between timber trees and key fauna species; and the cultural importance and useful qualities of timber trees and fauna. To protect intellectual property in indigenous knowledge, only an example of the work is given in Tables 6 and 7.

In addition to recording local knowledge, Wik, Wik-way and Kugu elders and rangers continued their role in culturally based environmental management activities, conducting site protection and burning, and providing directed learning for other family members during these surveys. The collaborative resource assessment sampling requirements were fitted to other priorities for managing country, occurring concurrently with the necessary land management activities of local participants. Thus the sampling was not the focus of work but part of a larger environmental management agenda that complemented existing daily activities, for example ethnobotanical work already being undertaken with community members, and thus did not place a drain on limited community resources and capacity to take on new projects.

Table 5. Community-based native forestry indicators

Salvage timbers

Criterion	Indicator
Impact assessment and advice	1. Level of funding for producing a management plan and impact assessment 2. Presence of a plan detailing acceptable level of impact with: • objectives • maps/resource inventory • land use and ownership • cultural impacts • environmental impacts (biodiversity, soil, water quality and flow, off-site impacts) • evaluation mechanisms • grievance and dispute mechanisms 3. Estimate of equity returns from damages • assess and value lost commercial opportunities (based on the sustainable industry of timbers and non-timber products which could have been generated over time, impacts on potential future tourism industry etc.) • assess and value impacts on subsistence resource use and livelihood strategies and non-consumptive-use forest values • social impact assessment (positive and negative, e.g. reduced crime)
Salvage timbers maximise social and economic profit	1. A flow of benefits attributable to forest resource products and services 2. Successful employment for: • portable sawmill, trainer & apprenticeships, full-time positions • carpentry shop fittings, trainer & apprenticeships, full-time positions • marketing mentor & full-time position to progress regional marketing

Rehabilitation areas

Criterion	Indicator
Economic assessment of resource options	1. Completed consultancy 2. Level of successful funding for: • collaboration with government and industry on growth trails of alternative species for non-wood products (e.g. oils from *Melaleuca spp.*, *Eucalyptus brassiana*) and for timber industry (arts & crafts timbers, biofuels, furniture) • new marketing strategies and market development for wood and non-wood products
Resource monitoring	1. Presence of recurrent funding for land and sea management 2. Collaborative arrangements with outside institutions brokered

Table 5. Community-based native forestry indicators

Native forest management	
Criterion	**Indicator**
Forest management knowledge transfer	1. Presence of recurrent funding for employment in education programs for school, land and sea management program and cross-cultural awareness training for outside researchers 2. Recurrent funding for: • local cultural environmental managers and officers • sufficient resources to conduct environmental management, including gender equity in resource management 3. Social and economic benefits from harvesting forest resources in a local and regional economy 4. Intergenerational equity in access to cultural identity and knowledge, or acceptable rate of cultural change
Recognition of relationship between forest management, culture and health	1. Decrease in cultural disintegration 2. Increase in nutritional status
Recognition of customary rights and law	1. Extent to which institutions recognise customary rights to own, use and manage resources 2. Existence of clear resource use rights
Collaborative processes	
Criterion	**Indicator**
Effective role recognition	1. Local leadership, management and coordination roles specified 2. Extent of traditional management activity in future arrangements
Effective two-way communication mechanisms	1. Direct and indirect employment in language maintenance 2. Long-term outside residents speak local language 3. Expansion of institutional extension capacity and activities in resource management 4. Reciprocal learning programs 5. Mutual respect for contributions from all stakeholders at an institutional level through: • ldirect and indirect employment • lpolicy re-orientation to allow recognition of alternative learning traditions • lacceptable payment for collaborators in initiatives and research programs

Table 5. Community-based native forestry indicators	
Environmental management performance	
Criterion	**Indicator**
Condition of indigenous languages	1. Number of people who identify as knowing a language 2. Intergenerational recognition of language 3. Number of languages documented 4. Wider use of indigenous languages in media, signage, map sheets 5. Number, type and funding for indigenous language programs undertaken in language centres, schools and other institutions
Effective functional reach	1. Appropriate technical components including extension materials and mentoring roles 2. Appropriate negotiation components through efficient communication and dispute resolute mechanisms
Capacity for strategic and operational change	1. Restructuring of organisational requirements 2. Alteration of rigidity in timesheets and work roles. 3. Continued progressing or amendment of objectives
Effective decision power	1. Presence and extent of traditional authority structures
Capacity building	1. Local employment and training 2. Long-term commitment from donors, facilitators and mentors

Action planning

A complete forestry management plan that used the community-based indicators depended on more informed economic information about harvesting, processing and marketing advice, and could not be developed in the timeframe available. However, an action plan to scope future needs in native forestry was substituted, and forms a basis for further timber and forestry planning and management beyond this project.

For this component of the work, additional elders were needed to direct small clan-group discussions on their country and to help develop the action plan. The local project coordinator, rangers and the land and sea management coordinator instigated appropriate social networking with other traditional owners to expand the functional reach of the project beyond the existing collaborators. The action plan was scoped via traditional owners speaking on their estates in field workshops, facilitated by semi-structured interviewing techniques. Workshops were conducted on clan estates in a manner similar to on-farm or transect walks described elsewhere in participatory research. However, these on-country workshops frequently require greater input of time and resources than on-farm walks, often occurring over days. The final action plan was delivered as a photo report, with actions recommended.

Table 6. Examples of local knowledge about various timber species*

Species		Cultural value	Ecology		Market opportunities		Post-mining potential
Wik Mungkan Wik Ngathan Kugu uwinh Local English	Botanical name Standard trade name	Cultural uses	Biodiversity impacts: food nesting habitat	Habitat	Market opportunities	Local and outside merchants' comments	Post-mining rehabilitation value
Yuk Ponth Yuk Moethen Yuk Ponthay Messmate	*Eucalyptus tetradonta* Darwin stringybark	housing, woomeras, spears, fencing, flooring, furniture	fruits and flowers are possum food; hollows are nesting habitat for possums, birds, goannas, sapling stems for butcherbirds and others	large amounts, lots of soils, more on the ridges	most building uses, needs some protection, posts and round poles	strong timber	not good, slow growing

*The species name is recorded in four languages (column 1) and is also given a botanical name and standard trade name (column 2). Similar knowledge about a range of other timber tree species occurring in the region was recorded.

Table 7: Fauna survey examples

Date	Method	English name	Latin name	Local name	Wik-Mungkan	Location	East.	North.	Habitats	Uses	Food
many times	visual song	blue-winged kookaburra	*Dacelo leachii*			Aurukun					

Future actions centre around enhancing local capacity through use of indigenous knowledge, continuing culturally based environmental management, documenting and using customary enforcement, and decentralising management to the clan estate level through direct resourcing. Other actions relate to collaboration with western scientists for obtaining outside advice on natural resource enterprise development and mine-site rehabilitation. All traditional owners indicated a clear need for individual traditional owners to make decisions affecting their estates.

Agroecosystems processes and tools

Timber and fauna resource surveys

Because there was need to provide quantitative data for the outsourced commercial market analysis (described below), 47 native forest samples were taken. A basal area sweep technique was trialled through applied demonstration. The local project coordinator had previous experience with western science survey

The beach at Amban, north of Aurukun township, an ecotourism site for permit fishing. Note outcrops of bauxite under the vegetation. (Photo: R. Thwaites)

techniques and guided the sampling strategy (e.g. 'the country is more open here'; 'this forest has occasional bloodwood and ironwood' or 'go on the other side of the road this time'), representing informal systematic and stratified sampling procedures. He also organised daily logistics such as appropriate kin-based working groups. A clear capacity for emergence of local leadership in research was demonstrated. A fauna survey was added to the timber assessment so that baseline information about biodiversity impacts from forestry was commenced.

Differing roles emerged for different collaborators. The local project coordinator sited each timber sample, based on his knowledge of forest variability (described above) and on culturally based access restrictions. The outside collaborator's role was to conduct a basal area sweep and determine the trees that comprised each sample. Local collaborators identified the tree species in their language and English, while the outside researcher recorded data. Local participants advised on the merchantability of individual trees by estimating the presence and size of termite hollows from the sound made when they used a tomahawk to strike the tree. Average tree heights, stem heights and 'diameter at breast height' (dbh) measurements of each species were taken by the outside collaborator, as well as 'global positioning system' (GPS) readings. Results of the survey are shown in Table 8.

As the process progressed, different roles were increasingly shared. For example, the outside collaborator, after learning how to gauge merchantability and with increased knowledge of local language and taxonomy, at times took on those roles, while local collaborators sometimes took measurements and GPS readings. The evolution of shared roles was unsolicited and unfacilitated, being a natural progression of joint learning of the others'' roles based on mutual intellectual respect.

A report on biodiversity issues was also prepared in the form of a community newsletter, using plain English statements and several digital photographs of rare and threatened animals. Another review of other relevant post-mining issues was summarised from Lawrie (1985) and presented in a community extension report using plain English statements and several

Project field work in the tropical woodlands of north Queensland, Australia, L–R: Dr Jenny Carter (Univ. Queensland) and Ranger Sharon Ngallametta of Aurukun.

Table 8. Timber survey results, representing the basal area of timber species in the forest stand of different types of timber country

Average basal area										
Forest type	No.	Height	Forest	Ironwood	Bloodwood	Messmate	Black	White	Broad	Narrow
Mixed	9	20	9.4	1.1	2.8	0.6				
Messmate mixed	18	21	8.9	0.1	2.2	4.0				
Messmate	23	23	8.9	0.1	0.6	7.4				
Mangrove	4	15.8	18.8				7.3	11.5		
Paperbark	2	21	17						7	9.5

Other timber species documented occurred in small proportions only.

graphics to demonstrate the process of mining and environmental impacts. A list of vegetation species already trialled on post-mine sites was gathered (Table 9).

A digital elevation model was constructed for the region but the source data is at such a broad scale and the region is of such subtle topography that the model was of little use for the project purposes. The major intent for the digital elevation model was to define resource regions (for RMDs) from topography and land surface process modelling in combination with other spatial biophysical and social data. Satellite imagery and spectral data (Landsat ETM+) was useful to confirm vegetation association patterns but was too limited for other more detailed interpretation of forest resource quality and density. Spectral patterns were too subtle in this area for any detailed interpretation without the opportunity for appropriate ground-truthing. Spectral analysis also needed extensive ground-truthing and training set data, which was not possible to establish or maintain. The major use for the imagery was for updating and supplementation of detail to extant topographical maps of the area after ortho-rectification.

Selective logging and clearing of the tropical woodland. 1) Workers from Aurukun load selectively harvested logs of stringybark for the sawmill near Aurukun, (Photo: J. Carter) 2) Clearing of native woodland, mining of bauxite, and rehabilitation with native and introduced species at Weipa, CYP. This is the intention for much of northern Aurukun Shire (Photo: R. Thwaites)

Table 9. List of additional revegetation species trialled by Comalco		
Acacia auriculiformis	*Casuarina littoralis*	*Leptospermum longifolium*
Acacia brassii	*Cochlospermum gillivraei*	*Lophostemon sauveolens*
**Acacia dimidiata*	*Deplanchea tetraphylla*	*Melaleuca arcana*
**Acacia dunnii*	*Dodonaea platyptera*	*Melaleuca brassii*
Acacia legnota	*Dodonaea triquestra*	*Melaleuca dealbata*
Acacia leptocarpa	*Eucalyptus alba*	*Melaleuca saligna*
Acacia mangium	**Eucalyptus camaldulensis*	*Melaleuca stenostachya*
Acacia platycarpa	*Eucalyptus cullenii*	*Melaleuca symphiocarpa*
Acacia sp. aff. Rothii	*Eucaylptus dichromophloia*	*Neofabricia myrtifolia*
Acacia simsii	*Eucalyptus miniata*	*Pandanus sp.*
Acacia torulosa	*Eucalyptus polycarpa*	*Parinari nonda*
Adenanthera abrosperma	**Eucalyptus ptychocarpa*	*Sophora tomentosa*
Alphitonia excelsa	*Gmelina dalrympleana*	*Sterculia quadrifida*
Alstonia spectabilis	**Grevillea banksii*	*Xanthostemon crenulatus*
Atalaya variifolila	*Grevillea glauca*	
Callitris intratropica	**Grevillea heliosperma*	
Casuarina equisetifolia	*Grevillea pteridifolia Hakea persiehana*	* = non-local native

Summarised from Foster (1985)

Decision support processes and tools

Data integration and analyses using GIS and website links

A spatial database and analysis was established using ArcView 3.1, to scale-up the forest resource survey results into spatial zones that could be used to determine resource quantities for a marketing analysis. Several publicly available digital data layers were used as a backdrop in the GIS. Timber and fauna species from surveys and secondary sources were entered into the database.

Quantitative and qualitative data from the collaborative resource surveys were integrated in simple Microsoft Excel and dbase files. Since forest and fauna resource surveys were spatially referenced, these files were incorporated as layers in the GIS for data presentation and analysis. Through the labelling capabilities of ArcView, qualitative information such as species names were displayed in local language and mapped to their location on the estates of traditional owners.

GIS layers were imported into MapInfo, and the localities, placenames and species names were then linked with photographs and text through web-based links, displayed against various backdrops such as mining tenure. This decision environment reflects probable future trends of subsuming GIS within information technology, and future GIS trends of web links to text, photographs, sound recordings and GIS layers that can be displayed and interrogated for management questions. For example, strategies in the action plan are to optimise cultural environmental management and return the same species to post-mining land. These strategies could be addressed in this constructed decision environment by searching on indigenous knowledge of species which grow in wetter areas, combined with western knowledge of the species that have not yet been tried as a rehabilitation species. Once trees matching those criteria are found, the results are displayed in language, with photographs and possible localities as a discussion and decision tool. Results of queries can also be output in oral recordings or as text linked to photographs, video, stories, and places on maps or complexes of places through the decision environment.

The GIS was presented to local collaborators through various forums. A community newsletter was used to facilitate discussion about the GIS information with some elders. An applied demonstration of the GIS was presented to some traditional owners individually and through a local council meeting. Displaying placenames and species names in language, and the locality of timber and fauna species visually, was useful. Mostly people wanted to know whether the mining lease was located on their estate, and some elders were unaware of the extent of mining lease tenure on their estate. Other people checked that placenames of physical features such as rivers were accurately recorded.

After demonstrating the GIS through a local council meeting, some elders wanted more visits to their estates to include additional features on the map, in particular, culturally important sites. Their active participation in this component of the work indicates that at least part of this objective had moved beyond the use of GIS as a purely consultative tool. Their interest probably extended from previous decades of experience with outside cultural mapping experts, and with their recognition of the capability of the GIS as a tool for management and decision-making.

Marketing assessment

Semi-structured interviews were held with local timber cutters harvesting timber for domestic use. They indicated that apparently merchantable trees that were felled returned only around 10–15% timber recovery. Forest regrowth stands of around 30–35 years remained immature, showing slow regrowth. Few individuals of *E. chlorostachys* had a bole length greater than 2 metres, which would probably limit products to furniture or small items rather than structural materials. Local hardwoods are hard on tools, and past treatments such as tar are no longer eco-friendly, while creosote is not well absorbed because of wood hardness.

The limited product potential, slow regrowth and lack of marketing and post-harvesting advice clearly needed to be addressed in the forestry planning process. A forestry economist was engaged to advise on commercial product potential and options. Future planning remains dependent on this work, which continues beyond the life of this project and cannot be described in this research. Future feedback mechanisms are necessary to include this part of the work within a longer-term planning framework.

However, preliminary indications of potential prices offered and collection costs of many native forest products indicate that enterprises are financially marginal or markets difficult to enter because of intense competition. Many existing and potential local markets are volatile, and informed market testing and investment capital is probably required. Value-adding or using Aboriginal labelling may improve the position of a product in a particular market niche or as tourism and education products.

PART 3

Outcomes of the research

CHAPTER 6

Lessons for community-based resource use planning in Zimbabwe and northern Australia

J. Carter, P. Norman, R. Thwaites, P. Frost



Participatory research is a developing field. It has arisen as a response to the repeated failure of earlier linear research-extension approaches to achieve broadscale or long-term adoption of improved practices by communities. Participatory approaches are increasingly becoming accepted as essential to reduce social inequities in externally funded initiatives such as this project. However, matching the reality of community participation with the rhetoric espoused is difficult. As a newly emerging field of science we still have much to learn about participatory research, and success in its application seems at times to be as much 'hit-and-miss' as based on sound science. Only by critically examining the deficiencies in the process as well as the successes, and attempting to understand the causal factors behind them, can true advances in this approach occur.

This chapter documents insights, issues, constraints and lessons from this research that provide useful findings and advance the field. It also contains lessons in project management gained from experiences in both the Zimbabwe and Australian test sites.

Application of participatory processes and tools

Inadequate or inappropriate community involvement has been acknowledged as a common cause of failure of development projects throughout the world, including with Aboriginal communities in Northern Australia (ATSIC 1998). It results in a lack of ownership by project beneficiaries, limited positive or net negative community impact, and continued waste of scarce community resources. Even when community-based or participatory natural resource planning approaches have been attempted, they have often failed as a consequence of application of inappropriate techniques based on incorrect assumptions. Such assumptions are generally based on presumed relevance of western democratic concepts (reflecting the culture from which the researchers usually come) in other cultures. They include presumptions that:

- Rapid and comprehensive information exchange is desirable.
- Direct questioning and information extraction is appropriate.
- One-way knowledge exchange and information flow is acceptable.
- Workshops and meetings are suitable forums for facilitating a process in any setting.
- Committees and consensus decision-making are appropriate authority structures.
- Participation requires a representative sample of community members.
- Building the capacity of local participants alone will increase active participation.

Experience in this project has confirmed that such assumptions are more often incorrect than not.

Rapid and comprehensive information exchange is probably inappropriate

Communication strategies used by many Australian Aboriginal peoples are founded on time, silence, indirect information, reciprocity in communication, reciprocity in learning, non-consensus decision-making and appropriate contexts for knowledge transmission. Several of these are anathema to accepted western thinking of communication and participatory decision-making. An understanding and acceptance of them is, however, of paramount importance to working in this field. In working with Australian Aboriginal peoples, the outside collaborator is rarely from the culture of local participants (i.e. Aboriginal), compared with Zimbabwe, where facilitators are often from the culture in which they are encouraging local participation. This observation points to a greater need for attention to appropriate communication in Australia and to the need to encourage more young Aboriginal people into resource use management and planning professions.

Eades (1992) advises that information be frequently exchanged only at a stage when trust has been built between interacting parties. Relationship-building activities designed and controlled by the local participants must also be part of the schedule of any participatory project in order to build that trust. These activities need to be embedded in the methodology and neither

hurried nor expedited for data gathering. Relationship-building activities could include Aboriginal-directed field trips, which can also serve the secondary purpose of exploring the issue in context (see below). Such trips commonly involve the senior traditional owner and clan groups on clan estates.

Direct questioning and information extraction may not be appropriate

Direct questioning does not respect privacy, may put people 'on the spot' and is disrespectful of the importance of two-way information exchange. Silence and waiting until people are ready to give or hear information are central to Aboriginal ways of interacting. Researchers attempting to elicit information from Aboriginal people using one-sided questions are usually unsuccessful. Another feature of Aboriginal communication is that information is volunteered. Speakers hint at what they are trying to find out about, prompting two-way information exchange.

Direct questioning is also considered inappropriate because of the phenomenon of gratuitous concurrence, that is the speaker agrees with whatever is asked as a peacemaking gesture rather than indicating agreement. This occurs because of cultural priorities of agreement over conflict. Researchers in Zimbabwe also encountered this. Sometimes agreement is given simply because the question has not been understood. Participant observation techniques and open-ended discussions are considered more useful in generating data of integrity in such situations. However, these techniques are intensive and time-consuming and are rarely used (Carter 2001).

Knowledge exchange and information flow requires joint learning processes

Reciprocity in learning is a desired feature of many indigenous cultures. For example, researchers at the Centre for Biodiversity and Indigenous Knowledge (CBIK 2000), an applied research centre established in Kunming in southwestern China in 1995, claim that the priority issues in participatory natural resource initiatives with indigenous cultures include intercultural dialogue and joint learning processes.

Many so-called 'participatory techniques' do not facilitate joint learning processes, but rather appear to serve to extract information required by a donor or outside agent. The outside researcher may learn much from local participants but these learning experiences are frequently not adequately incorporated into the methodologies and analyses of the research and planning processes. True participation requires equitable opportunities for input from all partners, including the knowledge of all partners. This cannot be achieved with one-sided designs in resource use planning. Recognition of reciprocity in communication and learning, including the roles of language, knowledge and customs, must be part of the process.

Local knowledge, too, is frequently ignored or downplayed in these processes. Even with increasing worldwide awareness and respect for indigenous or local knowledge, attempts to use it are frequently limited and token. In some cases the agenda focuses only on the added benefits to western society rather than an intrinsic valuing of culturally based expertise. Valuing traditional knowledge is more than just documenting and using knowledge. As Alpert (1995) suggests, the demands of investigating

and evaluating traditional ecological knowledge should not be underestimated because, like any complicated time-intensive scientific task, collecting the knowledge, talking to people and verifying data must be valued for the amount of labour invested in the task. Working with local knowledge systems also requires appropriate communication and interfacing tools including the use of local language.

Workshops and meetings may not be appropriate forums for facilitating a process

Local land managers have a wealth of knowledge and expertise about management strategies that suit local conditions. Wise decision-making depends on the quality and availability of relevant knowledge, which must be understood 'in context' (Bosch et al. 1997, MWLR 1999). Because of the discrepancies in communication strategies discussed above, data generated through workshops and rapid information extraction is probably of limited integrity. In reality, most novice and even experienced outsider initiatives are generally not aware of appropriate contexts for knowledge exchange with many indigenous groups. Workshops need to occur in context, and include useful techniques such as meetings on clan estates led by traditional owners.

Exploring issues in a clan setting and not in broad community meetings are also important forums. Smaller, clan-based working groups and other methods such as farm transects (broadly similar to walks or workshops on clan estates) and participant observation are valuable, but are rarely mentioned as a means of communication. This is probably because they require time and are often at odds with donor objectives, which commonly prioritise expedient data collection and costs at the expense of negative project impacts and perceived cultural destruction.

Working within local governance structures and clan-based social groupings rather than setting up new committees and consensus-based processes is important

Substitution of western-based work structures, such as elected representatives of governing committees, for traditional authority structures has been a major consequence of European colonisation in many countries including Zimbabwe and Australia. Administrative governance structures set up since colonisation, and until recently in Zimbabwe, were attempts to undermine traditional authority and hence conflict with local norms. Traditional authority structures are frequently overlooked and yet may retain considerable influence (e.g. the communication mapping exercise conducted in Zimbabwe demonstrated that traditional healers were still the major influence over land use activities in villages within the study area). Reconciling contemporary and traditional authority structures, which can be based on very divergent views of equality and democracy, represents a major challenge for community-based participatory planning.

Working within traditional authority structures will also help address issues of knowledge transmission, relevant contexts and so on, as previously discussed. Through such a process, outsiders in Australian Aboriginal communities are usually placed in kinship networks (Pacific and Aboriginal Ecosystem Design Conference 1994), with implications for future work strategies. Within the clan-based system, project managers are identified and the traditional authority of elders and leaders is exercised. 'Clan Project Manager' or similar label is used to validate their employment and acknowledge their direction of the program. Such positions also encourage local leadership, another goal of participatory programs.

Some may argue that working within the clan system compromises the breadth of community representation; however, there may be little choice, and the trade-off is greater in-depth and on-site understanding by the outside researcher. The social reach of the project can be supplemented through the normal network of information dissemination, so that information is neither enforced nor imposed; rather, relevant information is communicated at the discretion of the clan project manager. Work programs and future potential enterprises build on and work with these social groupings.

Participation does not necessarily require a representative sample of community members

The concept of representative democracy as practised in western cultures can be quite alien to traditional cultures. Working at the clan level has implications for initiatives that aim for participation based on a 'representative sample' of the community. Communities, in a western sense, commonly work across traditional social groupings. Researchers in this project found, however, that there may be no need to involve anyone other than a particular clan on most occasions – just those on estate country where the researchers are working.

Maintaining traditional cultural capital (such as language) is essential

Working with local language helps to demonstrate the existing social capital that various partners bring to the project. Even in western circles, language maintenance is now a desired goal and indicator of the state of the environment because of the links between cultural and biological diversity (Smyth 2000). Using local language is not just a means of data transmission but demonstrates to local groups the outsiders' interest in that culture, their respect and their interest in engaging in reciprocity interactions.

Application of agroecosystems processes and tools

Agroecosystems modelling was intended in this project as a means to capture and present information to develop a common understanding of how the systems worked, where resource use pressures or conflicts could be expected to emerge, and how to address them. It was proposed as a method to link such cause and effect relationships between different scales.

The concept of scale in the study of community resource management has often confounded resource assessment processes when the findings at one level of organisation have been transferred to a management process at a different scale, usually a finer, more detailed scale. Questions are often raised as to whether regionally devised resource use plans are appropriate to individual villages or how applicable household surveys are to national planning and planning policy. The methodological approaches chosen for this study specifically sought to address these issues of scale in integrated resource assessment and land evaluation by linking across scales and allowing for action and interaction between ecological and socioeconomic hierarchies of scale as far as possible. The basis to the project, though, was to establish the land use planning process at the local (village) fine scale and develop it 'upwards' to regional and national scale frameworks.

While it was not possible to thoroughly test the use of agroecosystems (for reasons explained previously), it was possible to draw some conclusions from project experiences on the potential for broader application of the method. These conclusions include:

Modelling shells such as Stella are useful for expressing complex relationships simply

The agroecosystems and communication models are important in the overall framework because they provide useful insights into how the systems functioned, and a dynamic context for implementing a planning process.

Modelling using STELLA required a comparatively high level of facilitation to be effective in the planning process. It was necessary to train the AGRITEX planner in the concept of the modelling before effective factors and data could be included. This was undertaken over a period of several days. The planner had only a very limited knowledge at the outset, but following completion of the training was able to construct a working model of complex relationships between village population structure and water supplies.

Agroecosystem models are only useful as a communication tool if all stakeholders are involved in their development

The intention was for the trained AGRITEX planning personnel to undertake a participatory exercise with the Karamba community to populate the initial STELLA model and create a broader resource base to it while being community specific. However, the community was not effectively included in the process. AGRITEX planning personnel lacked confidence in this process, and entry to the community was limited. This was doomed to fail because, as illustrated by the communication model, AGRITEX is effectively isolated from social change processes. Community workshops and casual communication with key community personnel, particularly the chief and headmen, would be necessary to create a useful agroecosystems and resource use model in the future.

Where community members were engaged in a genuine partnership, as in the community mapping exercise conducted early in the project by CASS, the results showed considerable promise. For instance, during this process discussions with farmers on-site revealed a sophisticated traditional appreciation of the suitability of various soil and vegetation types and landscape zones for different land uses. The existence of such systems, often supported by laws and cultural mores, is well documented in Zimbabwe (refer chapter 2). While such beliefs serve a useful purpose in mitigating resource over-exploitation, they may inhibit communities from taking advantage of previously unavailable but perfectly sustainable alternatives (e.g. the introduction of a new but better suited crop such as sorghum in dry areas where maize is a marginal proposition).

Agroecosystem modelling is compatible with adaptive research and planning

Adaptive models are often used in community-based research to establish and monitor trial harvests based on local conditions (Berkes 1999). Such trials could be implemented and supported by delegation of relevant regulatory authorities to allow 'the experiment' to continue. Adult learning techniques based on application, reflection and evaluation are used in these experiments to assess successes and failures of the trial in an iterative way. Thus the trial harvest is refined over time, and is based on applied demonstration and practical implementation.

Future adaptive research designs can be coupled with cautious enterprise development based on low-risk, low-cost technologies and with adequate support staff. Local economy contributions in all facets of environmentally sustainable development (ESD) can be concurrently assessed, including contributions to reduced health, employment and environmental bills. Institutionally coordinated

projects requiring a whole-of-government approach and commitment for the long term are required for community-based ESD because answers to complex ESD situations are largely unknown. Integrated research and development packages may also need to deliver necessary infrastructure development at the outset and substantial investment in high-level market development advice, offset by community in-kind contributions.

During this time data on growth rates and other important industry-specific parameters can be collected, so the research design serves a range of simultaneous objectives. For example, best-performing species and their subsequent rehabilitation and management on altered post-mined sites can be progressed to optimise cultural and environmental sustainability in recognition of the reality of impending change in the area. New market opportunities for forest products not yet present in mainstream society need to be combined with creative marketing analyses and strategies.

Application of decision support processes and tools

Decision support targets the process of decision-making, and usually has technological systems and software developments as simple tools that may assist the process. However, the generally accepted contextual definition for decision support systems (DSSs) can be expanded to include support for:

- structured or semi-structured computer-based analysis tools that incorporate criteria weighting algorithms and optimisation techniques to evaluate discrete, non-exclusive options
- the mechanisms, processes, protocols and strategic discussions that assist or guide an individual or group to be better informed when making a decision
- the generation, interpretation and exchange of written or spoken information, knowledge, diagram photographs, digital images and GIS that accompany decisions.

A number of key lessons were learnt from this project about the development and application of decision tools and processes.

Decision tools do not necessarily have to be highly technical or computer-based

A major hurdle encountered by the project in introducing decision support tools was the common preconception that they were complex and computer-based, and hence not applicable or inappropriate to people of limited formal education or familiarity with computer technologies. This preconception was first encountered with the funding agency and then at virtually every step in the process, despite repeated assurances that it was not true. It is important to remember that decision support is not necessarily a technological fix, but can be used in communication and knowledge exchange and in structural relationships support. DSSs are not necessarily computer-based, and this research aimed to demonstrate a method for non-computer-based aids that improve decision-making by using the communication mapping exercise. Clearly there is still a way to go.

Decision support in northern Queensland relates to supporting cultural knowledge protocols, for example the correct person for exchanging information in the correct place. Decision-making is not consensual, but rather involves working within the clan-based system and local decision-making structures. These lessons have implications for programs that seek consensus decision-making because decisions may not reflect consensus across social groupings.

Visual media such as photographs and applied demonstration have long been considered useful community-based resource management

communication tools. Decision support in future would ideally look at ways of amalgamating and interrogating text, photographs, sound recordings and so forth to answer important management questions. Various multimedia products could be adapted to answer questions about forest management which are linked to decision-making. For example, because local people have expressed their desire for the same trees to be returned to mined land, an important land management decision might be 'which local species could grow in swampy habitat left after mining that Comalco have not yet tried as a rehabilitation species?' Although the original species may not be returned, species that grow in swampy areas may be able to thrive there. Results of this query would then be output through an appropriate tool as text linked to photographs, video, stories and places on maps or complexes of places.

Communications modelling is an extremely useful tool but needs to be applied early in the project

DSSs are useful tools because they can help outside researchers to understand the dynamics of decision-making at the community level, the quality of the information and its flow, and the points of intervention. It is necessary to identify all known groups and stakeholders at both the local and representative levels, and, in particular, the key players that offer more specific aspects of communication flow when constructing the model. Questions need to be open-ended or else risk leading responses by participants.

An important lesson from the research includes the need for drawing up a communications model early in the participatory planning framework. When a decision model was developed (near the end of the project) in Zimbabwe, it became clear that a number of the assumptions inherent in the project methodology about power and influence of respective project partners were incorrect. Further, it identified a number of highly influential groups that had been overlooked in putting the project team together, and helped explain some of the difficulties encountered in implementing the project. For instance, the model identified that AGRITEX is not the sole or lead player in the delivery of information. Indeed, the process of developing the communication model encouraged AGRITEX staff to admit some level of disempowerment by demonstrating that they were a less significant input to decision-making and source of information than originally envisaged. The communications model at the outset would have helped identify the drivers and blockers in the system.

Decision power and processes vary with differing governance structures

For now, this process has simply illustrated the type of decision support that could be beneficial in future. An important next step is how to scope such a decision support tool appropriately, including the conceptualisation of the tool needed, the questions and different issues specific to different language groups, any necessary outsider contracted advice, and opportunities for collaborative learning.

In indigenous Australia most enterprise initiatives remain unsuccessful in terms of financial indicators (Ivory 1999). Existing labour is community oriented and supports the profitability of community incorporated bodies established to attract funding. These artificially imposed structures detract from individually productive activity and development. While this research reflected active participation in the research, there was little mechanism for roles for the elders in decision-making. The existing bureaucratic council structure is accountable to European ideologies, mechanisms and rationale through its legislative powers. Although the shire

remains under the dominant influence of western administrative systems and structures that fulfil government policy functions, local decision-making continues informally, often counter to the European ideology and not immediately observable to the outsider. Lack of formal recognition of existing decision power will probably continue to limit active participation and, ultimately, demoralise local capacities, creating a significant impediment to effective community-based ESD.

Because passive or active resistance to globalisation and assimilation continues, professionals now generally understand that cultural values and systems will not be abandoned (Altman 2001, Ivory 1999). The preference is to promote partnerships between the private sector and individuals or clan-based groups rather than communally oriented systems; and to interface existing knowledge transfer mechanisms with appropriate technical advice. Clan groups may need mentors to work alongside them for some time, and success may need to be captured firstly by social profit indicators, followed by economic profitability only over the longer term as the business grows. Local leadership capacities exist and need to demonstrate their worth in mentored clan-estate-based enterprises founded on adaptive management trials.

A concerted effort in building capacities of local decision power based on alternative systems of governance may be a solution, as is currently being canvassed elsewhere in indigenous Australia. The nature, structure and function of these systems requires considerable thought and time so that indigenous capacities to exercise decisions can be maximised. These may need to be balanced by institutional personnel capacity building and devolution exercises, so that existing personnel and structures are strengthened to actively collaborate in more workable solutions for community-based ESD, and in turn the sustainable management of forests, over the long-term.

Project management

A number of general project management elements emerged during the course of the research which would have contributed to greater success. While there are differences between the study areas, there are also similarities and lessons that can be transferred. Key lessons in relation to project management, in particular to management of resource planning projects, common to both countries are presented below:

Understand the people and their roles

Clearly define personnel roles

It became clear during the course of the project that some personnel misunderstood the degree of their involvement. Members of the Zimbabwean project team expected greater assistance from Australian team members. The Australian team thought that the Zimbabwean team would be much more independent and that cross-transfer of knowledge would occur through country exchange visits, where capacity of both country teams would be enhanced. A more explicit statement of roles (including renegotiation during project development) may have overcome these misconceptions. Earlier evaluation of the project may also have identified these problems and the need for greater commitment from overseas personnel and/or establishment of a dedicated coordinator position for the Zimbabwean team, as well as recognising the need for increased supervision of the data collection conducted in villages by staff newly trained in participatory techniques.

Recognise the importance of dedicated country coordinators

By its nature, participatory research requires the input of a number of stakeholders. Coordinating these inputs is a major task in itself (magnified in this project by the geographic separation between components). All Zimbabwean stakeholders agreed that progress in the project would have been enhanced by better coordination. Although there were multiple dimensions to the project, it was not onerous; rather, an overt role of coordination was missing, probably because many people were involved to varying degrees on the project but none with time commitments greater than 30%. This made it easier for personnel to become diverted to other work priorities such as the government 'fast-track' land reform, a situation which was amplified during times of staff shortages.

Appointment of a dedicated officer within AGRITEX toward the end of the project helped overcome the coordination problem in Zimbabwe but by then the project funds were almost exhausted and there was too much ground to recover.

The employment of a dedicated and on-ground project manager engaged with community members assisted the project in northern Australia. This role facilitated interaction with a wider range of people at the outset and provided continuity throughout the project. It was also necessary for the project officer to have a role in the regional representative organisation, thus leaving a legacy of joint learning and collaboration through involvement in other partner initiatives. Cross-learnings occurred which would otherwise not have been possible. The role with the regional representative body also gave the project officer credibility at the initial stages with community members and those of other communities on Cape York Peninsula, as illustrated by frequent reference to her as 'Balkanu worker'.

Recognise the importance of the facilitator role and the particular set of specialist skills required to fill it

Facilitating participatory action research requires specialised skills and knowledge and extensive experience and training, which are often overlooked and undervalued. Too frequently, newcomers are thrown into the field and the position is devalued by inattention to this role as a profession in its own right. The right personality and demeanour of the researcher are also important. Some outside workers, especially those trained in standard 'western biophysical science' techniques, may find it difficult to adjust to new approaches, particularly those that devolve power. Some personalities may not be suited to community-based processes, nor to certain positions such as facilitators of change.

Stakeholders need to understand this expert role so that other key personnel do not feel a loss of professionalism when they are involved in PAR. They need to value the differing knowledge systems and their roles as facilitators of exchange of knowledge between both sides.

Establish and maintain stakeholder relationships

Ensure communication

Lack of communication with local elected representatives exacerbated negative perceptions of the project by some stakeholders (particularly in Zimbabwe). A greater attention to communication and explaining the intentions of the project at the village level should have occurred from the outset. More work on promoting the project within the community may also have assisted – common extension techniques such as radio broadcasts or newsletter dissemination may have helped. Methods such as this were used with success throughout the project

in northern Australia and in the latter stages in Zimbabwe. Follow-up information exchange after the PRA data collection activity in Zimbabwe using such tools would also have helped, because villagers were not informed about the results of their input to the activity. That this did not happen is in part a reflection of the lack of a dedicated coordinator as referred to above.

Build on successful accomplishments

Farmers in Zimbabwe were satisfied with maize and sorghum trials and their role in the activity, as well as with the impact that an on-site extension officer made to their farming, although they expressed some concerns about the farmer selection process in the maize trials.

In northern Australia the project was identified and brokered by one regional representative only, and it was simply an aspiration of one group of people within the community. As the process unfolded and relationships were established in the community, other local residents articulated their own aspirations, which did not prioritise the timber resources. However, these aspirations only became clear after the community engagement process had for some time invested resources in relationship-building activities, communication mechanisms, resource surveys and facilitating an on-ground leadership role in the community with whom local people could make contact about the project. Toward the end of the project a ranger facilitator from outside the community was appointed by the local council, but this appointment simply quashed the local leadership role that had been emerging. There was insufficient time to build in aspirations articulated by other community members later in the process, for example linking the timber planning research to school, education and ecotourism activities. However, these were noted for future research.

Ensure equity in allocation of project resources and ownership of outputs

Negotiation needs to include budgetary equity, in terms of inputs and outputs, so that salary components and resources are shared across all stakeholders participating in the process, as are ownership of the benefits. Agreements relating to this need to be clearly stated and confirmed among participants.

Budget allocation was perceived by northern Australian stakeholders as being biased toward international and outside participants, providing little motivation for either the regional representative or local community members to be involved. In Zimbabwe concern was expressed about the concentration of resources within a central agency. Ownership of the project vehicle was, for instance, a point of contention between the study site community and AGRITEX.

Intellectual property rights including knowledge ownership is now a burgeoning field and many of the complexities have yet to be worked out. However, it is necessary that provisions relating to the protection of knowledge ownership in indigenous cultures are explicit. It appears this refers as much to the Zimbabwean communities as it does, more obviously, to the Aboriginal community of Queensland. Respecting the ownership of knowledge and the cultural rights of the Aboriginal community was explicitly stated in a research agreement. Although recognised in Zimbabwe, especially during the conduct of this project, the awareness and capacity of knowledge ownership still needs to be built within the relevant organisations (primarily in AGRITEX, least of all in CAMPFIRE). The apparent loss of power and control over the planning process by respecting indigenous intellectual property can be a threat to government organisations, although some attitudinal change is evident.

Look for opportunities to increase ownership at the community level and with local representatives

In Zimbabwe lack of community ownership of the project was illustrated by the hostility exhibited at times by villagers towards some institutional stakeholders. For some time, community members either knew little of the project or associated it with another ecotourism project that threatened people with relocation for wildlife conservation and failed to pay them their due dividends. Substantial mediation and communication was necessary to overcome local fears and misconceptions, probably because villagers were unaware of, and not involved in, the project planning from the outset. They were not informed about project goals and objectives, nor were they involved in stating their own goals and objectives during the process.

Even some time after the project commenced, representatives of local government structures, including the UMP District Chief Executive Officer, Chairman and District Administrator, were unaware that the project was operating in their district and did not know of the roles of stakeholders other than AGRITEX. These local structures and councillors have over 20 years' experience in contributing ideas to development projects and in cascading ideas through communities as appropriate. Their role and involvement would have increased community ownership and thus participation in the project.

Lack of community ownership resulted in people seeking a one-way flow of resources from donor to recipient, rather than negotiating an agreed matching in-kind commitment from community. Some short-term benefits were offered as a mechanism to quell hostilities, but were only preliminary steps in a long-term approach to sustainable resource use, which required negotiation. Relationship-building activities need to be part of the methodology and neither hurried nor expedited for data gathering.

Allow sufficient time

The length of time required for success in participatory action research is well documented. The need for continuous and close engagement with community members is widely acknowledged, many NGO's describing cases of between one and five years to simply build relationships of trust. Long-term funding commitment is necessary because short-term trial projects risk simply using people, their time and data in a trial situation. This may jeopardise further partnerships because, after input of time and money, the groundwork has been completed and relationships of acceptance and trust established, only to be abandoned. Accepting the status quo of short-term engagement without a corresponding commitment to work for and implement solutions can, in fact, have more negative than positive long-term benefits by feeding cynicism.

Insufficient time was a key constraint in this project. Time was needed for the lead agencies to undertake adequate training, adequately scope issues and be involved with community relationship building at the start. Insufficient time in the northern Australian component could be related to the renegotiation of the project as primarily a timber survey for data gathering to inform planning, rather than a planning project. The need to create links to technical advice was detailed in the community action plan, so that there is a mechanism for continued exploration of timber resource use options when these adjunct studies are completed.

Pre-plan: community entry and project negotiation are paramount

In this project several objectives were identified by the institutions in advance of brokering a partnership with the communities and regional representative body. This is an example of top-down planning, exactly the opposite of the philosophy espoused by the project. Northern

Australian stakeholders perceived it as their co-option onto a pre-determined project. Pre-appointed staff operating on the existing project objectives negotiated for Zimbabwe needed to redesign their input and roles, and there was need to bring in additional expertise at minimal cost to answer the expressed needs of these stakeholders. The key issue is that more attention to adequate negotiation mechanisms at the project's inception may have produced greater successes.

It is important to negotiate roles of all partners including those of local government representatives. In Zimbabwe these included the ward and village representatives as well as local people, whose responsibilities are negotiated in a partnership that shows all contributions to the project. Contributions from local people may sway the decisions of donor institutions about funding more basic needs such as infrastructure. Continuous review of roles and responsibilities occurs. It is also important to establish the unwritten institutions that might guide negotiation and expected outcomes, such as cultural norms and beliefs.

In Australia a 'chaperone', known and trusted by the communities, was used to help overcome initial community hostilities, introduce the project to communities and gain their input (to the extent possible) in its design. The role of timber survey as part of the project was valuable in informing marketing options, but more so because it served as a strong communication activity. In Zimbabwe maize trials were used as an alternative 'entry point' to the community to engender relationships that led to a focus for the land use planning process. There is a risk, however, that these 'entry points' may be perceived as disguises to gaining endorsement for pre-planned initiatives.

Work within existing governance structures

In Zimbabwe the lead agency (AGRITEX) was not well coordinated with regional or local representative bodies, for example the RDC. They also operated at a village level and did not include a household scale of analysis. The village level is probably the least appropriate in situations such as encountered by the project, where social structures are based on families and 'chiefdoms', and villages and wards are artificial social groupings.

In Australia the operation of the project according to clan-based systems most closely equates with operating at the household level. Natural resource management activities are maximised by the clan group responsible for a particular area and who has the authority to speak for that country. When traditional authority is exercised in the clan groupings, projects are far more successful. Within the clan-based system, project managers are identified who organise workers, the sampling strategy and other logistics. After appropriate kinship structures have been identified, the project can expand in new directions beyond the household level, according to extension of the social networking by the clan project manager. Thus the project frequently operated above the household level, but as directed by local clan leaders according to various local tenure and access arrangements.

Despite attempts to work across social groupings and increase the social reach of the project, community members often raised the importance of working within one particular clan group. This issue has implications for many community-based structures and work practices. For example, working with a group of rangers that represent a variety of clans is probably less than optimal compared with working in clan-based groups. Ranger programs may have representatives of various groups but frequently the outsider might

work in only a subsample of these groups. While the breadth of community representation may be compromised, the trade-off is greater in-depth, site-specific understanding, good social networks, well-organised daily logistics and outstanding participation of both local representatives and outsiders in what becomes more truly a collaborative work.

Respect indigenous knowledge

Traditional knowledge is more than a tool; it is a process that needs to be conducted appropriately. Years of learning through observation, practice and rational thinking have produced local knowledge systems which are useful in countries where humans from other areas have recently colonised a new landscape and are trying to gather knowledge about its ecological components and processes.

Secure long-term change

Increase exchange between countries and stakeholder groups

Most stakeholders expressed a need for greater exchange between country projects. While attempts were made to facilitate such exchange, they were clearly inadequate, with visits too infrequent and the personnel varying between visits. This made things difficult because information exchange (e.g. techniques demonstrated) on one visit often raised doubts that required further clarification and follow-up through subsequent visits. Often the visits simply resulted in a repeat exchange of information conveyed to different visiting staff, or visiting the same initiatives without discussion of changes implemented since the previous visit. Periodic visits were insufficient to come to grips with the complex long-term issues of the project.

Understand that the planning process, not the content, is important

There seemed to be a perception from some stakeholders that resource use planning is just about production of a plan. Training in agroecosystems modelling was meant to address this but probably only reinforced the technical dimension to planning. Greater attention to strategic planning with community members would have helped. Despite attempts to the contrary, there was still a dominance of content over process at both study areas through attention to GIS-related data collection and the timber survey. The participatory process is ongoing and not an isolated exercise that is ticked off when complete. Thus the content (in this case the timber resource survey project) needs to be downplayed in favour of a successful process.

A strategic and dynamic, rather than spatial and static, land use plan is probably more appropriate to community needs. A process facilitating community members to identify constraints, options and contacts, and a staged plan for resources with community contributions to the funded project, are probably more important than the location and status of resources and their potential for development. It would be necessary to identify a facilitator or person undertaking the community planning.

Balance short-term benefits with community ownership

In order to maintain commitment and motivation and to demonstrate progress, it is necessary to show short-term benefits during the process. These need to be specific but realistic, and not simply a list of tasks or substituting tasks. In Zimbabwe community members gained some short-term benefits through a linkage between

AGRITEX and CIMMYT, and on-farm trials of drought-tolerant maize varieties. Short-term benefits at Aurukun included easily incorporated local aspirations, such as visits by the traditional owner to inspect their estate.

The process of short-term successes needs to be carefully managed lest it perpetuate a one-way flow of resources from donor to recipient and reinforce 'colonial' attitudes, which disempower communities rather than strengthen their independence. Thus short-term benefits may be a mechanism to quell hostilities rather than steps in a long-term approach to sustainable resource use.

Capacity building is two-way

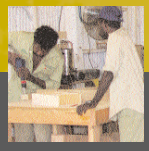
Capacity building needs to occur at all levels, both community and institutional. It is required at institutional levels because institutional capacity to work with community members needs to be built. In Zimbabwe a full-time position committed to participatory, on-ground work was required. This person would have required experience in participatory processes, and would spend at least half their time in the field with the extension officers to assist them in their information collection techniques, check data quality, give direction, write reports and so forth. The limited training for extension officers was insufficient for them to take control of the new directions in their research without an experienced full-time officer supervising their work. More leadership and capacity building for local people was also necessary, for example team-building processes to give them confidence to manage their own planning processes.

Institutional structures and policy also need reshaping

In addition to personnel capacity and devolution exercises, institutional structures and the environmental policy and statutory barriers may need to be rebuilt to advance the aspirations of community-based ESD. In northern Australia the project was fortunate, in part, by overlapping with significant new policy moves in government–Aboriginal –community relationships. In Zimbabwe it was the reverse, where the emerging government hard-line policy on land redistribution overtook, and at least temporarily subsumed, the project's intention to develop a 'partnership' approach to planning.

CHAPTER 7

‘Planning space’ – A conceptual framework of community-based resource use planning


P. Norman, R. Thwaites, J. Carter, P. Lawrence, C. Claridge, P. Frost, W. Mutinhima, W. Magaya, D. Mpofu

Introduction

According to the collective experience from this and other research, there is no standard recipe of processes and tools suitable for all settings that guarantees success in community-based planning. Despite the outward similarities of the two study sites, the appropriate processes and tools in each proved to be quite different, and determining which was appropriate in which site involved an unexpectedly lengthy and expensive process of trial and error, something that clearly cannot be afforded to be repeated for every setting where community-based resource use planning is demanded. So, how can the most appropriate tools and processes for any particular setting be determined with relative rapidity and efficiency at the outset?

The answer (at least in part) lies in understanding the relative strengths of each setting in terms of some fundamental community characteristics. In this chapter a conceptual framework is proposed that encompasses these characteristics in a three-dimensional 'planning space'. The dimensions that define a planning space are three fundamental characteristics that are indicators of likelihood of success in community-based resource use planning. The framework has at its heart the notion that understanding the positioning of communities within an optimum zone of the planning space, is a pre-condition for success in community-based resource use planning. Processes and tools (such as those trialled in this project) are proposed as the means by which communities may become strengthened in these characteristics and hence conditioned for success.

Components of 'planning space'

A 'planning space' might represent a more holistic conceptualisation of planning, which shows how components of the planning process and associated tools are linked. Such a conceptual approach can also be described as representing planning in terms of the multi-dimensional reality of temporal and spatial components, and the multi-stakeholder, multi-situational context of community-based planning. Figure 14 conceptualises 'planning space' as comprising three principal component axes describing the relative strength of a community's':

- institutional and organisational relationships, trust and cooperation
- technical capacity to plan
- participation in planning.

Figure 14. Community-based planning as 'planning space'

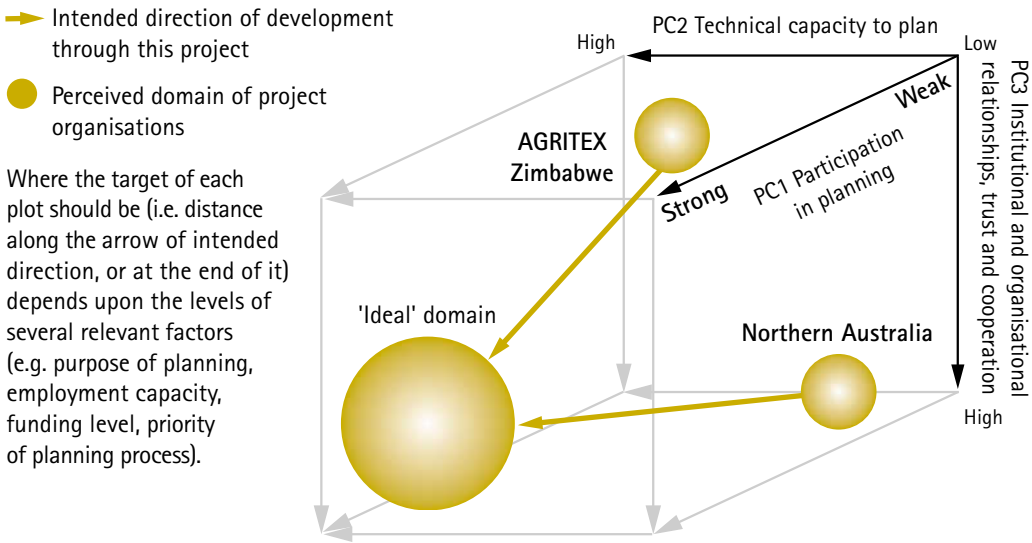


Table 10 summarises how the two study sites were ranked in their relative strengths in these characteristics. The rationale for this ranking is discussed below.

Institutional and organisational relationships, trust and cooperation.

This concept is analogous to that of *social capital* at a systems level, a developing topic in social science literature. Social capital is variously defined as: 'networks, together with shared norms, values and understandings that facilitate cooperation within and between groups' (OECD 2001). In other words it is the glue that binds communities, reflected in people's trust of each other, communication and cooperation, and willingness to participate in community activities that contribute to the greater good but do not necessarily bring immediate personal gains (i.e. a sense of altruism) (ABS 2002a). The relevance of social capital as a concept is gaining acceptance in areas such as health, crime and urban infrastructure planning. It has been applied to a limited extent in natural resource management (NRM), for example Pretty (2003) proposes a link between social capital and participation in community NRM groups.

Gaining commitment from individuals and organisations to the planning process required that, to some extent, they be prepared to defer immediate individual consumption for the promise of greater individual and collective future benefit. This requires a high level of trust and confidence between individuals and institutions and confidence in the steadying influence of social behavioural norms. It became very apparent in both study sites that a major impediment to collective commitment to a fully inclusive planning process was mistrust of certain individuals and organisations. In both cases this could to some extent be attributed to a history of external (e.g. government organisation) misleading and manipulation. It could also be attributed to some extent to decline in fundamental social fabric under the influence of external factors such as these.

Based on the project team's interaction with individuals at various levels in both study sites, the Zimbabwe site was ranked as moderate and the northern Queensland site as low in this respect. There was evidence of the community at the northern Queensland site having endured a greater level of destruction of social fabric and being at an earlier point in recovery from the influences of western colonisation. Had time permitted, it would have been desirable to test that appraisal with an independent assessment. While debate continues about the exact definition and interpretation of social capital, it has been quantified in a number of studies throughout the world, and measuring it would not seem to be conceptually that difficult (e.g. ABS 2002b).

Technical capacity to plan

Developing technical capacity as a key component of successful community-based planning is a common theme in the literature. Lack of technical capacity was recognised by Dale (1993) as an important contributing factor to the failure of government-funded land use development projects in Australian Aboriginal communities.

The team recognised at the outset that participants at both study sites lacked a range of skills required for successful community-based resource use planning. Training in the use of technical tools was built in as a major component of the project in Zimbabwe. Progress was achieved in the transfer of skills in timber resource assessment, ecological modelling, use of participatory rural appraisal and decision support systems. The team assessed that, by completion of the project, participants at the Zimbabwean site had adequate skills in the use of the technical tools necessary to successfully undertake planning.

Table 10. Relative strengths of the two study sites in characteristics related to 'planning space' and compensatory processes and tools

Axis	Processes	Tools	Zim	Aus
1	Building trust Facilitation	communication model community facilitator relationship building activities	M	L
2	Institutional strength Tech infrastructure development	training GIS/DSS/RMD etc.	H	L
3	Engagement/participation	focus groups semi structured interviews negotiated local roles PRA	L	M/H

Axes 1–3 respectively represent: strength of organisational relationships, collective capacity to plan and degree of community participation. The components and their key processes and tools are ranked according to whether they showed high (H), medium (M) or low (L) success within this research.

The participant communities in the northern Queensland site came from a lower base of skills at the outset, there was less training of participants, and the project team assessed that participants' skills remained at a relatively low level at the completion of the project.

Participation in planning

Community participation or engagement in planning requires shared recognition of a problem and the need for action. The project team came to the view that the desire to genuinely contribute to planning for improved resource use was limited amongst participants at the Zimbabwe site. Central and regional government players appeared to be more strongly motivated by the desire to control and cement their power-base, while community members appeared to be strongly influenced by 'donor mentality', where motivation was really to obtain short-term financial or physical benefit. This contrasted with the northern Queensland site where there was evidence, once the project had overcome initial misunderstanding and suspicions, of genuine commitment amongst community members and organisations to explore options for a better way forward.

Applying the concept of 'planning space'

The target or 'ideal' domain in this planning space is the intersection of high rankings on all three components, that is strong relationships, high collective technical capacity to plan, and high community engagement. Each of these components are essential building-blocks of the framework, encompassing a series of processes, participatory methods and practical tools that contribute towards enhanced information sharing and decision-making. When combined, the framework recognises a dependency between components.

The various processes and tools that are applied, and their success or modification, collectively shift the place-specific planning that occurs within this planning space. Table 11 compares and contrasts the strategies developed and applied within Zimbabwe and northern Australia and their relative success in repositioning study sites for successful community-based resource use planning.

Strengthening institutional and organisational relationships, trust and cooperation

Relationships can be classified as:

bonding – connections between like people (i.e. of the same social or cultural group or within the same organisation)

bridging – connections between unlike people or disparate organisations

linking – connections with people in positions of power to provide leverage (ABS 2002a).

Successful community-based planning requires a balance of all three.

In Zimbabwe bonding relationships seemed to be well developed throughout the community but bridging relationships were poorly developed with government bureaucracies. Similarly, in northern Queensland bonding was strongly developed (at least within clan groupings) and bridging poorly developed. In Zimbabwe PRA workshops and field visits were incorporated into the project to encourage development of bridging relationships between the study site community and the project team. In northern Queensland use was made of facilitators (in both the development and implementation phases) to encourage the development of bridging and linking relationships. Greater progress was achieved in northern Queensland (although from a lower base) due to the continuity of interaction through the facilitator. As discussed previously, the Zimbabwean component of the project was dogged with frequent turnover of staff and the lack of a full-time project officer.

Strengthening technical capacity to plan

Considerable effort was put into technical training of project participants in both Zimbabwe and northern Queensland. In Zimbabwe officers from AGRITEX and CAMPFIRE were trained in PRA, GIS and ecological modelling tools. In northern Queensland skills in conduct of forest resource inventory were developed through community members accompanying the project officer in field assessments. The impact of investment in strengthening technical capacity in Zimbabwe was limited by the failure of the trained officers to implement cascade training to transfer skills to other participants (which in itself could be attributed to lack of bridging relationships). In northern Queensland progress was positive if modest.

Strengthening motivation to plan

Both study site communities expressed a level of concern about the future state of their environments. However, in general, motivation to plan was low. This could in part be attributed to their past history of unsatisfactory experiences with top-down planning (or centralist social engineering in the case of Zimbabwe). Efforts were made in both northern Queensland and Zimbabwe to increase awareness and hence understanding of natural resource management issues and to convey ownership. Our experience suggests that, while motivation may be reasonably readily destroyed through disempowerment, it is not easily rebuilt.

Table 11. Components that comprise the principal axes of 'planning space'

PC 1 Participation in planning

Players	Roles	Zim	Aus
Community	resource custodians	weak	strong
Government	public services	strong	weak
Scientists	technical info resource	strong	weak
Facilitator	foster relationships	weak	strong

PC 2 Technical capacity to plan

Resources	Strategies	Zim	Aus
Infrastructure	Negotiated arrangements	low	low
Funding	Negotiated arrangements	high	high
Skills	Adaptive learning strategies	low	high
People	Coordination	low	high
Time	Adequate and long-term allocation	low	low
Certainty about responsibilities and rights	Effective legal and policy instruments	high	low
Linked agendas and structures between relevant organisations	Communication/structural relations mapping	low	low

PC 3 Institutional and organisational relationships, trust and cooperation

Issues	Strategies	Zim	Aus
Decision authority	Work with local governance structures	low	high
Perceived benefits	Community entry strategies /agenda-free introductions	high	low
Accessible non-indigenous information	Effective extension process/ targeted communication	low	low

Issues	Strategies	Zim	Aus
Valued indigenous information	Cultural awareness training	low	high
	Two-way knowledge exchange	low	high
	Documentation	low	high
Communication	Effective pathways	low	low
	Visual and action tools (photographs, stories, drama, song)		
Mechanisms	Appropriate language	low	high
	Applied demonstration	high	low
Equitable process and outcomes	Negotiated process/scope	low	low
	Stakeholder analysis	low	low
	Maximised local roles	low	high
	Local capacity used	low	high
	Maximised local roles in decision-making	low	low
	Local leadership roles	low	high

Linking space to time: planning space for adaptive management

'Planning space' is a useful model for characterising the likelihood of success in community-based resource use planning at any particular time. However, it is a static model; natural resource systems are dynamic and uncertain. Consequently, a dynamic, adaptive planning framework is needed that links space and time and can accommodate uncertainty. To guide planning that scores highly on the principal components of planning space, a framework based on adaptive management to link time and space is advocated. The key advantage of a cyclical adaptive management framework is a defined process for proceeding, evaluating and responding to considerable gaps in knowledge that emerge as the process unfolds, managing for uncertainty rather than predicted outcomes. An action-centred approach to monitoring and adjusting visions, targets and associated management practices is applied.

Adaptive management aims to increase participant learning about the interactions between natural and social systems, using feedback loops of trial, observation, reflection and adaptation. These deliver the applied context for active participation and learning, evolving experimentation, and reviewing and responding to the impacts of changed management practices.

Adaptive management is the preferred choice of change management and policy development when the risk of trial and error methods is unacceptable and decisions cannot be postponed while further data are collected, given the long timeframes for ecosystem responses. In addition, the adaptive management approach assumes that systems are resilient and flexible, yet undertaken as a place-based operation. In addition, it recognises that planning needs to be flexible yet dynamic to ensure all factors are considered in a systematic, participatory, trans-disciplinary process.

A schematic representation of the adaptive planning framework is shown in Figure 15.

Key elements in constructing an adaptive planning framework based on principal components in a planning space include:

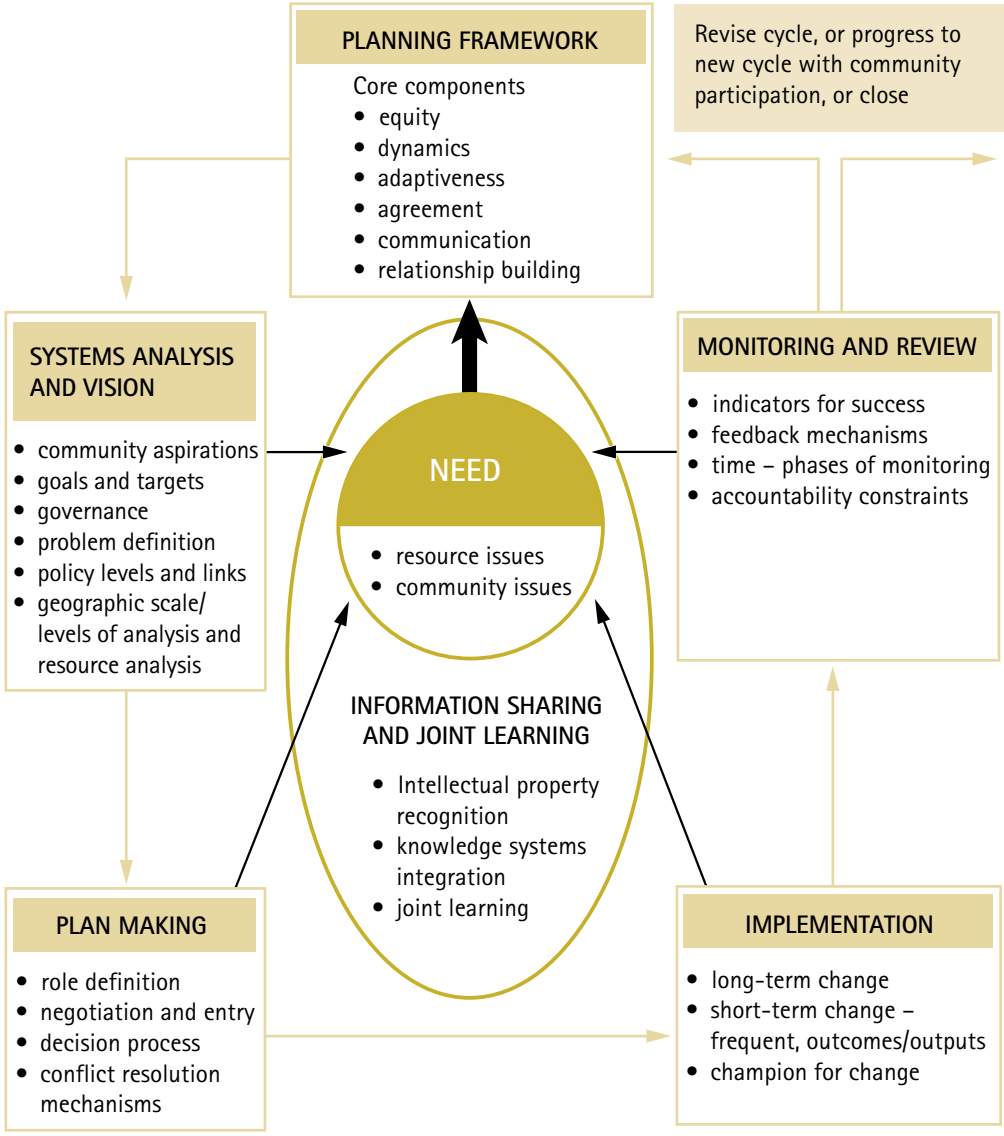
- a set of core principles to guide the framework
- systems analysis and vision
- plan making
- implementation
- monitoring and review.

To initiate the planning space within an adaptive management cycle, the external factor of need serves as an entry point to the cycle. For example, entry points could be a stakeholder who initiates a need that requires resolution, an issue of unsustainable resource use, or some other planning opportunity. Stakeholders involved at this point of entry should be open, non-judgmental and without a preconceived notion of what is to be resolved and how it will be undertaken. It is important that the stakeholders agree on the issue to be resolved and the process that should be used to progress and facilitate the resolution.

A set of core principles to guide the framework

The planning framework is premised on the basis that a set of core principles is present throughout the planning process. Consequently, the framework should contain an element of 'operation and engagement maintenance' in which resources and intellect are directed towards operational facilitation and implementation of the planning framework. Irrespective of who initiates the process, there are six principles that must be observed at the outset, and which will have a cascading impact on all subsequent actions and interactions among the stakeholders.

Figure 15: The planning framework as linked stages.



These essential principles are:

- Equity: all stakeholders are recognised as contributors to the process and are treated on an equal basis with respect to their value and contributions.
- Dynamics: a systems approach needs to incorporate mechanisms for dealing with change in the system and impacts of that change.
- Adaptiveness: planning should be established on the basis of an evolving knowledge base and ensure that there are processes in place which trigger an informed decision or management action. It also recognises the methodology of experimentation and learning by doing.
- Agreement: every step in the process of the framework should only proceed when there is agreement between all stakeholders. The processes for gaining agreement need to be consistent and at a level of formality that is both appropriate and effective for the purpose.
- Communication: a key finding from the project is that information needs to be communicated in a way that is informative and effective. This may involve the use of alternative mediums, and recognises that communication must be two-way and appropriate.
- Relationship building: perhaps one of the most important ingredients in the success of long-term partnerships is the development of trust among the individual and institutional stakeholders.

Systems analysis and vision

In natural resource management it is imperative that issues related to biophysical and resource assessment be considered. Furthermore, it is important to integrate these issues with economic, social, cultural and legislative factors. It is also necessary to strive to establish an agreement for a new paradigm of continual learning and embracing of adaptive management principles that is institutionalised within a partnership between community, industry and government. This process leads to an evolving system for knowledge growth and joint learning.

Techniques used would be influenced by the planning issue; however, they should include holistic approaches, for example participatory techniques, resource inventory, GIS, causal systems and simulation modelling, multi-objective decision support systems, visualisation of scenarios, and social and economic impact assessment analyses.

Many planning processes make the mistake of overinvesting in sophisticated data collection, analysis and presentation. Options for data collection are almost unlimited. Overuse of sophisticated technologies is not only wasteful of scarce resources but can also intimidate and inhibit the participation of stakeholders. Decisions about which data to collect, and which methods to use for collection, analysis and presentation, must reflect the needs of the situation and be negotiated from the outset.

Plan making

The plan making component of the adaptive planning framework establishes and consolidates management goals and targets, identifies feasible solutions to pressures on the system, and evaluates social, cultural, economic and ecological impacts of the various resource use options. A range of impact assessment techniques are put in place during this phase of the framework so that data and information are transformed into usable knowledge that leads to strategic positioning and feasible solutions.

Within the plan making component, a preferred strategy for implementation is identified. This involves the use of decision support methods and tools to evaluate the feasible options in conjunction with discussions involving all stakeholders. Preferably, this should be largely iterative and adaptive to the requirements of the community. It is essential that stakeholders actively participate, state their aspirations, and are informed of the possible direct and indirect implications of the strategies. Adaptive management processes can be complex; within this component of the planning framework, the importance of having an agreed mechanism for conflict resolution is paramount. This may take a number of forms but should consider the following factors:

- the method must be culturally acceptable
- a timeframe for resolution is included
- representation for all stakeholders is guaranteed
- respect for the outcome is given and agreement to proceed with the planning process reached.

Implementation

In planning for sustainable resource use, a long-term shift in behaviour toward community management of natural resources is sought. Such a shift requires durable attitudinal change that is often dependent on motivation or values.

Community members are not always strongly motivated to change. The long-term consequences of resource use are not always recognised by many community representatives, and often the path to long-term sustainability requires deferring present day resource use opportunities. It can be difficult to convince the present members of a community to make sacrifices to benefit future generations where the connection is unclear. This quickly became apparent in Zimbabwe where, for many communities, everyday existence is a matter of survival with little or no optional capacity.

It is of concern that in each situation the project was truncated at a point where community confidence and trust had been gained, but before a level of management competence in the absence of external resources had been reached. A likely consequence of this short-term planning is the perpetuation of feelings that community members were used and abandoned, and the reinforcement of prior skepticism about planning processes and implementation phases.

Monitoring and review

Frequent monitoring of the process is needed to progress the work in an adaptive manner. Indicators for success need to be articulated from the outset, negotiated to the benefit of all parties, and evaluated in a structured and staged way. These phases of monitoring may also require input from the donor agency, so any necessary changes to objectives should be agreeable and, in fact, desirable to all parties.

Table 12. A framework for future implementation of community-based native forestry initiatives by Wik peoples

Central-level implementation	Regional-level implementation	Local-level implementation
Provide relevant technical advice	Negotiate equitable collaborative arrangements	Use and document knowledge
Train personnel in devolution exercises	Broker creative public/private market opportunities	Continue extant management practices
Provide support staff and mentors	Maximise elder decision power and management	Initiate trial harvest experiments
Estimate cost-effectiveness of extant practices	Maximise employment	Apply local governance arrangements
Redistribute environmental funds	Integrate research and development packages	
Link environmental and indigenous policies		
Provide low risk, low cost technologies		

Often the need to produce reports and publications for institutional accountability drives the process, especially towards the project conclusion phase. This can sometimes have repercussions in that the process is less than satisfactory or that outcomes do not result, being overshadowed by outputs. Outputs need to be realistic, but outcomes should also be encouraged in reporting requirements.

Implications for government and policy

Village-level planning (as implemented in this project) is just one of a cascading series of plans/policies ranging through global, national, regional and local. A successful community-based resource use planning process will take account of all of these levels. Within the context of governance are the issues associated with levels of policies instituted by government and non-government agencies, as well as by local representatives. The process of land use planning may well include the implementation of central government policies but the process also involves policy modification. Likewise, informal policies may be developed and formalised through successive planning and continual monitoring and evaluation processes. The different levels of policies, their interrelatedness, and their different levels of formality must all be recognised and expressed in making the individual 'plan'.

Current partnership policy approaches that coordinate cross-agency service delivery with regional and local-level planning and implementation are generally acknowledged to be necessary. While the rhetoric is regularly espoused, a repeated criticism is that there are no

operational details for implementation. A table that summarises the mutual roles, negotiation and responsibilities in resource use planning outlined in the above chapters is proposed for the north Queensland study area example (Table 12). This scheme may help to coordinate future community-based ESD implementation at the central, regional and local levels. It is generic only but provides the basis by which further work can be guided, monitored and reconstructed. The onus is, however, on government agencies to commit to the framework by resourcing regional and community structures to implement the necessary actions, and devolving power as needed. This will require institutional personnel who are well skilled in the philosophies and approaches of community-based ESD, and who acknowledge the unwritten community policies such as traditional authority and decision-making. Personnel need a rare combination of the capacity to influence institutions yet the ability to facilitate on-ground activity without recourse to controlling or regulatory behaviour.

PART 4

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APPENDIX

Report on Timber Project June 2000

Research partners: Wik & Kugu Land & Sea Management Rangers, Aurukun Shire Council, Balkanu Cape York Development Corporation, Australian Centre for International Agricultural Research (ACIAR)

Wik and Kugu Land and Sea Management Rangers

People who helped with the timber survey:

Professor Joe Ngallametta, Sharon Ngallametta, Ron Yunkaporta, Leslie Walmbeng, Lionel Ngakyunkwokka, Hedley Karyuka, Sidney Wolmby, Pamela Ngallametta, Rotana Ngallametta, Hersey Yunkaporta, Tyron Venn, Jenny Carter.

People from the school who planned and attended the workshop:

Gladys Tybingoompa, Jasper Kowearpta, Shirley Wolmby, Melinda Koongotema, Jasmin Woolla, Daniela Sheppard, Stan Sheppard.

People who helped with the report:

Benny Yunkaporta, Miriam Quinkan, Desley Koowarta.

Rangers, school children and teachers show the inside stem of May Koyngkan (*Livistonia sp.*) collected in the timber country near Beagle Camp. May Koynkgan is an important food that contains water if you are thirsty.

Survey trip to Amban

On the way to Amban we looked at timber country beside the road. We looked at the different timber trees that could be harvested and sold to people outside Aurukun. The main trees for timber harvesting would be Yuk Ponth (*Eucalyptus tetradontra*), Yuk Yongk (*Erythrophleum chlorostachys*), and Yuk Put (*Eucalyptus nesophila*).

Yuk Ponth

Yuk Yongk

Yuk Put

Tyron showed how western scientists do a timber survey. They take a sample of the timber country by swinging around in a circle and looking through a measuring tool. They write down all the timber trees they see in that circle. They also measure some tree heights and widths (diameters).

Tyron works out which trees are in the sample and Joe identifies the species.

Survey trip to Wabub

We went to Wabub to survey some more country. At Wabub most of the trees were Yuk Ponth.

Joe and Leslie test trees for their timber properties.

Joe, Ron and Leslie look for other important species because the country was clean from fire.

Joe showed how to tell whether the timber trees are solid on the inside or whether they have hollows from termites. He hit the tree with a tomahawk. If the sound is dull there is lots of wood inside, but if the sound is high there is a hollow or pipe. This way we can work out how much timber could be made from trees. Sometimes large trees have a small hollow and the timber around the hollow can still be used.

Yuk Wayk

There had been a fire recently at Wabub, which made the country clean. If people want to harvest timber in future to sell, we need to think about keeping some of the good timber free from fire for a while so it can grow strong.

Wallaby track

The rangers showed Yuk Wayk (*Pogonolobus reticulatus*) which is an important tree that lives in timber country. Yellow dye is made from the roots and used to make colour in craftwork. If timber harvesting occurs we need to be careful to keep other important plants.

Grass eaten by wallaby

The rangers showed some wallaby tracks in the timber country. The wallaby had come out to eat the new shoots of the grass after the fire. If a timber harvesting project starts we will also have to think about how the harvesting might affect animals like wallabies.

Trip to Iith Kaang'an

We also went to Iith Kaang'an to survey this country.

Mixed timber country sampled at Iith Kaang'an.

The timber country here was a bit different from Wabub because there were more Yuk Yongk and more Yuk Put than there was at Wabub.

Rotana, Hersey and Sharon point out Yuk Po'al.

There was plenty of Yuk Po'al (Parinari nunda) at Iith Kaang'an. This is an important food tree that grows in a lot of timber country. If people cut more trees for timber they will need to be careful not to damage Yuk Po'al. They can cut the tree so it falls away from important food species. They will also have to be careful when they drive the tractor and drag the logs away because that might also damage Yuk Po'al. Rangers could mark a track for harvesters to take the cut log out of the bush to the tractor.

Visit to sawmill

Sawmill, Yuk Yongk and Yuk Ponth, cut for rafters and floorboards.

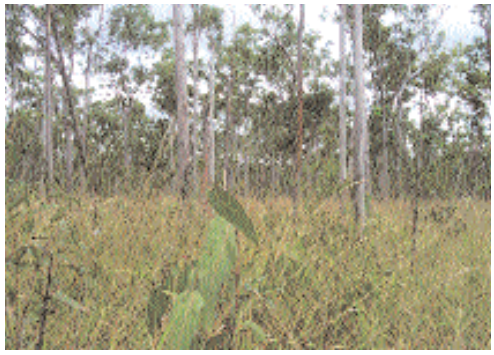
Rangers visited the sawmill to show us the sawmill and some of the different timber products which are currently made at Aurukun from Yuk Yongk and Yuk Ponth. The trees are cut through the middle and then products like floorboards, large planks and rafters are made.

Trip to Pach'aw

Rangers had another trip to Pach'aw to survey timber country in that area. It took a while to drive there because lots of timber had fallen on the tracks and we had to clear the track.

Swamp and foreshore at Pach'aw

At Pach'aw we noted the Kich Thuumpiy (*Melaleuca viridiflora*) swamp. Timber harvesting inland from here would need to think about water that drains into this swamp. If we harvest too close to the water it might make the water murky.



Timber country sampled near Pach'aw

Some of the country on the way was nearly all Yuk Ponth timber country. We took a sample in another part and the country there was a mixture of Yuk Ponth, Yuk Yongk and Yuk Put.

Yuk Minchak

We also found Yuk Kamp and Yuk Minchak which are different kinds of bloodwood that can also be used for timber. The bark on Yuk Kamp has less blood than Yuk Put. The bark on Yuk Minchak has much more red. There is not so much Yuk Kamp and Yuk Minchak as Yuk Put but it is probably still good for timber harvesting.

Education trip to Amban to teach the school children

We had a field trip with the school children at Amban who were studying biology.

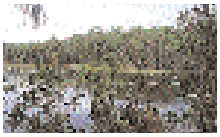
Joe, Gladys, and Sharon teach biology lessons to the school children.

Rangers and teachers taught the school children about different species and habitats around Amban. The children will make up a report about their excursion and what they learnt when they go back to school.

Timber country with May Koyngkan

On the way back we did some timber survey in timber country which contained a lot of May Koyngkan. Joe cut the outer leaves away and showed the inside stem which provides food. In this area May Koyngkan is an important part of timber country.

Survey trip to Oyingtan, Boydy's Camp and Paydan (Possum Creek)



Swamp at Oyingtan

Oyingtan is an important area for many animals. There were many birds and also a good supply of water lillies.

Freshwater turtle eggs

We saw the turtle eggs showing that turtles nest around the banks of the swamp.

Hedley shows the pig bones near the swamp.

Hedley also showed us that pigs use this area as well. Timber harvesting will have to occur a little away from the swamp so that there is not too much damage to this important water source.

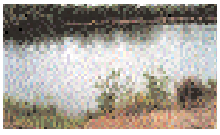
Yuk Thipan

We took a some timber sample here and also a little higher up the ridge. We also surveyed at Boydy's Camp and Paydan (Possum Creek). Close to the swamp we noticed another tree that grew around the swamp, Yuk Thipan. This tree was fruiting so we collected the fruits to take back to Cairns. That way we can find out the western science name for this tree.

Looking for flowers or fruits of Yuk Waak.

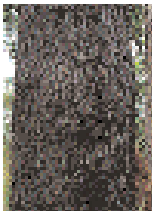
We also found Yuk Waak (probably *Eucalyptus clavigera*) growing in the swamp country. This is another important timber tree suitable for flooring. It also is slow burning which makes it good firewood. Sidney pointed out some flowers were growing on some branches. We looked for flowers and fruits on the ground but could not collect any this time. We hope to get some on the next visit.

Survey trip to Kap'



Watson River

We did some more sampling around Kap'. We heard Minh Kor' (*Grus rubicundus*) calling from across the river and also close by in another swamp near Moiy Moiy. This is also another important area where we should make sure timber harvesting does not damage the water and swamp.

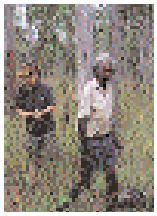


Yuk Athalkang

We took another timber sample here and found another tree, Yuk Athalkang (probably *Xylomelum scottianum*). This is a very good timber tree, with the timber being as strong as Yuk Yongk.

Survey trip to Moiy Moiy

We went to Moiy Moiy and took another timber sample there.



Tyron and Joe measure the tree height and tree width for the timber sample.

On the way back in the timber country rangers pointed out that some of the Yuk Ponth had been cut for May At (sugarbag). This is an important part of timber country which is of value to local people. If we harvest timber country we need to think about how much May At people would like to keep.

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