

Contents

<i>List of figures</i>	page vi
<i>List of boxes</i>	viii
<i>List of tables</i>	x
<i>Foreword</i>	xi
<i>Claude Martin</i>	
<i>Preface</i>	xiii
<i>Acknowledgements</i>	xvii
Part I Integrating natural resource management	
1 The challenge: alleviating poverty and conserving the environment	3
2 Dealing with complexity	29
3 Getting into the system: multiple realities, social learning and adaptive management	55
4 Issues of scale	79
5 Models, knowledge and negotiation	98
Part II Realities on the ground	
6 Institutions for managing natural resources in African savannas	119
7 Forest margins in Indonesian Borneo	144
8 Learning by doing on tropical American hillsides	170
Part III The research–management continuum	
9 The spread of innovations	191
10 Measuring the performance of natural resource systems	211
11 Achieving research–based management	226
<i>Bibliography</i>	248
<i>Index</i>	263

Figures

2.1.	Some of the major components of social–ecological systems.	page 35
2.2.	The major features of integrated research and management.	37
2.3.	Adaptive capacity as the missing link between sustainability (persistence) and sustainable development at different levels of organization.	40
2.4.	The array of disciplines that is likely to be involved in research on social–ecological systems, overlaid on the major features of such research.	51
2.5.	Interdisciplinary science focusses on integration (synthesis) of components and processes functioning at lower levels of organisation.	53
3.1.	The transfer of technology view of the way innovations originate and are passed down to farmers.	61
3.2.	The learning cycle in integrated natural resource management research.	64
3.3.	Important components of farmer experimentation.	67
3.4.	Innovation as a social process where the influences of research on the users are highly complex and unpredictable.	68
4.1.	Overlapping learning cycles for processes with different temporal characteristics.	81
4.2.	Schematic land–use transformations from forests (‘more people, less forest’) via <i>Imperata</i> grasslands to rehabilitated lands with various agroforestry options (‘more people, more trees’).	96
5.1.	Spidergram of factors affecting the amount of graze and browse available to livestock in Mahuwe.	100
5.2.	Factors affecting the local acceptance of management plans developed through the research process.	104
5.3.	Implementation of the Bayesian network indicating the factors affecting the supply of adequate graze and browse to livestock in Mahuwe Ward.	105
5.4.	Example of the structure of a decision support model.	108

5.5.	A conceptual model of an integrated natural resources research and management site in Chivi, Zimbabwe.	115
6.1.	The ruling elite in Romwe.	122
6.2.	The integrated model and its relationship to more disciplinary approaches.	130
6.3.	Net income (cash and subsistence) sources for households of different wealth status in Chivi.	131
6.4.	Time allocation by different household members in Chivi: average allocation over a year.	132
6.5.	Rainfall and cattle cycles in Chivi District, Zimbabwe.	134
6.6.	Three decades of change in Chivi.	135
6.7.	The numerous user groups and committees active in Romwe catchment.	137
6.8.	The relationship between traditional village and administrative boundaries and woodland resource use in Romwe.	140
7.1.	Projection of the land cover classes in a 250 000 ha area along the Malinau river.	149
7.2.	The central part of the conceptual framework.	154
7.3.	Scales of interest in the Bulungan forest and plausible promises for interventions.	156
7.4.	Proposed components of the integrated model for Bulungan.	160
7.5.	The learning cycles and their characteristics.	167
9.1.	Site similarity analysis done for Nochixtlan farmers in Mexico to plan a study tour.	200
10.1.	The five capital assets.	216
10.2.	The dynamic nature of capital assets.	218
10.3.	An overview of the integrated model of a land-use and forestry system built at a two-week workshop and subsequently refined, using STELLA.	222
10.4.	Radar diagram showing the impact of micro-credit on the capital assets in a small catchment in southern Zimbabwe.	224
11.1.	Proposed characteristics of organisations undertaking integrated natural resource research and management.	229
11.2.	In search of integrated natural resource management through reconciling top-down and bottom-up approaches (applied to catchment management).	237

Boxes

1.1.	Integrated natural resources management and its various manifestations	<i>page</i> 4
1.2.	Examples of integrated research and management	21
1.3.	Empowering local communities to benefit from wildlife in Botswana	23
2.1.	Complexities of research on integrated social–ecological systems	30
2.2.	Generic features of research on complex systems	33
2.3.	Agroforestry initiatives: comprehending complexity	44
3.1.	An adaptive management lexicon	58
3.2.	Transferring technology	60
3.3.	Learning and adapting for innovative resource management in southern Zimbabwe: getting into the system	68
3.4.	Adoption of new forage crops in southeast Asia	71
3.5.	Learning cycles in technology innovation	74
4.1.	Rehabilitation of degraded lands in the Himalayas: issues of spatial and institutional scale	82
4.2.	The CAMPFIRE programme in Zimbabwe	84
4.3.	Reconciling local sustainability with global climate change mitigation	88
4.4.	A conceptual model of nested scales of investigation in integrated research	90
4.5.	Lessons from integrated conservation and development projects	94
5.1.	Decision support for water demand by agricultural households in Thailand	107
5.2.	Moving to negotiation support for catchment management in Sumatra	111
5.3.	Summary of steps in a modelling approach	113
6.1.	The integrated use of resources by a small-scale farmer	125
7.1.	The changing nature of forest households	147
7.2.	Developing a conceptual model of the key problems and issues in Bulungan	153

7.3.	Using systems modelling as a tool for communication amongst researchers	159
7.4.	Learning cycles in the Bulungan research forest	167
8.1.	The difficult early days of the Hillsides Programme in Central America	178
8.2.	Changing farming practices: the case of Mr Sanchez	182
9.1.	The Indo-German Watershed Development Programme in India	207
10.1.	Learning together for improved conservation tillage in Zimbabwe	213
10.2.	Criteria and indicators at the Chivi catchment area in Zimbabwe	219
11.1.	The Queensland Wet Tropical Management Authority	231
11.2.	Alternative science	243

Tables

1.1.	Characteristics of approaches that use integrative principles.	<i>page</i> 18
4.1.	Examples of studies at different scales.	90
10.1.	Key problems faced in impact assessment for natural resource management research.	212
10.2.	Some suggested principles for each of the capital assets, with examples of criteria for each of the principles.	217
10.3.	Different scales at the Chivi site and some potential criteria for those scales, with one criterion shown for each of five capital assets.	220
11.1.	Undertakings by government and non-governmental organisations (NGOs) to help to bridge the gap between top-down and bottom-up approaches to integrated natural resource management.	238