

The Dry Forests and Woodlands of Africa

Managing for Products and Services

Edited by

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London • Washington, DC

First published in 2010 by Earthscan

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Earthscan Ltd, Dunstan House, 14a St Cross Street, London EC1N 8XA, UK
Earthscan LLC, 1616 P Street, NW, Washington, DC 20036, USA

Earthscan publishes in association with the International Institute
for Environment and Development

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ISBN: 978-1-84971-131-9 hardback

Typeset by MapSet Ltd, Gateshead, UK
Cover design by Susanne Harris

A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data

The dry forests and woodlands of Africa: managing for products and services / edited
by Emmanuel N. Chidumayo and Davison J. Gumbo.

p. cm.

Includes bibliographical references and index.

ISBN 978-1-84971-131-9 (hardback)

1. Forest management—Africa, Sub-Saharan. 2. Forest products—Africa, Sub-Saharan.

3. Forests and forestry—Africa, Sub-Saharan. I. Chidumayo, E. N. II. Gumbo, D. J.

SD242.A357D79 2010

634.9'2096—dc22

2010003283

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Printed and bound in the UK by TJ International,
an ISO 14001 accredited company. The paper used
is FSC certified and the inks are vegetable-based.



Managing Dry Forests and Woodlands for Products and Services: A Prognostic Synthesis

Davison Gumbo and Emmanuel Chidumayo

MUSINGS OVER THE PAST AND THE FUTURE

Each of the preceding chapters has raised key issues and challenges concerning the importance and management of African dry forests and woodlands and the products and services that they provide. In planning for dry forest and woodland management for the future, it is crucial to learn from the past, including learning from anthropogenic effects (Bird and Cali, 1998). Hoffman (1997) claims that historic anthropogenic influences, through the demand for wood for iron smelting, have been a lot more extensive than previously accepted. In addition, Huffman (1982), Hall (1984) and Schmidt and Avery (1996), working on Iron Age archaeological sites, have confirmed that vast amounts of wood were used, most of which was extracted from surrounding forests and woodlands. Domestic livestock, in particular cattle and sheep, evidence of whose existence dates back to the 1st century AD, have also been mentioned as agents of dry forest and woodland change in Africa (Tlou and Campbell, 1997; Campbell and Ramsay, 1994; Denbow and Wilmsen, 1989; Garlake, 1978). Further, cycles of abandonment and settlement as well as slash and burn correspond to deforestation and reforestation in Africa (Schmidt and Avery, 1996; Goucher, 1981). These are a few but key examples that show how strongly African dry forests and woodlands were influenced by human activities over thousands of years

ago; and the intensity of which has increased many fold in the last century as human and livestock populations grew, mines and road infrastructure were developed and cities expanded through rapid urbanization.

The use of dry forest and woodland resources should also be seen with a broader focus especially as these resources also provided goods for local and international markets in the same periods. Some scholars show how charcoal fueled local trade (for blacksmiths) and later entered into the vast trade routes of western Africa (Haaland, 1980; Goucher, 1981). In eastern and southern Africa a similar picture emerges (Schmidt and Avery, 1996; van der Merwe and Killick, 1979). The trees most sought after were *Burkea africana*, *Combretum imberbe*, *Prosopis africana*, *Percopsis angolensis*, *Ziziphus mucronata* and a host of *Acacia* species, but the most preferred species across Africa was *Burkea africana* (van der Merwe and Killick, 1979; Goucher, 1981; Goucher and Herbert, 1996). In addition, and as noted in Chapter 7, trade in charcoal could also have been complemented by a thriving timber trade, and though not widely recorded, centred on mahogany and ebony (Taylor, 1960). The depletion of forests for charcoal to fuel the smelting and smithing processes, not only reduced the number of key species but also created a disturbance regime that allowed for the establishment of Africa's dry forests and woodlands. The disturbance regime was augmented by fire as well as low levels of slash-and-burn agriculture. Use of dry forests and woodlands has not changed that much but has gained in intensity as populations grow. As noted, vegetation formations have historically been transformed through charcoal making, slash and burn, livestock rearing and lately, mining and infrastructure development have been added to the fray and in combination present formidable challenges to the management of dry forests and woodlands in Africa. As the previous chapters have shown, these vegetation formations can significantly contribute not only to the maintenance and improvement of people's wellbeing and livelihood security, but also to the sustainable growth of national economies. Given the many products and services that African dry forests and woodlands provide, one major challenge that remains to be addressed is whether appropriate plans and strategies exist, or can be developed, for managing these vegetation types for multiple and sometimes competing products and services in a sustainable way. Yet it must be noted that sustainable use ideals are central to any planned management and conservation of African dry forests and woodlands.

Increasingly, there are calls for the application of sustainable-use management to bring socio-economic factors to the centre stage of issues pertaining to sustainable forests and woodland management (Hutton and Dickson, 2000; Child, 2004). Major threats to sustainable management of African dry forests and woodlands in the future exist at the intersection of local land use and global environmental changes. Solutions to the problems partially lie in the existence of strong local governance systems where such systems receive sufficient support from the state. This is critical as increasingly, the integration of social and ecological components are being used to analyse resource management, conservation and sustainability issues (Gunderson and Holling, 2002). The dependence of rural communities on the biodiversity, ecological processes and

ecosystem services provided by dry forests and woodlands is enormous, yet it is precisely these forests and woodland types that are fast disappearing. For the hundreds of millions of poor and rural inhabitants of forest and woodland ecosystems, the losses in forest cover have had particularly severe consequences. Forests are embedded within larger-level socio-economic and political settings, which also have the capacity to significantly influence outcomes (Chapin et al, 2006).

The range of challenges presented in the preceding chapters requires working partnerships and these should be established on two fronts. Firstly, at the country level, the involvement of all the major stakeholders (e.g. public agencies, the private sector, NGOs, local communities and informal local institutions) is essential for efficient management of dry forest and woodland resources. It is important that governments:

- provide an enabling environment for economically efficient and environmentally sound forest sector activity;
- ensure better pricing to reflect the full scarcity of forest resources;
- tax resource users accordingly to internalize externalities.

The scaling down of government involvement in production will release scarce resources for those areas in which its intervention is more pertinent, e.g. sustainable dry forest and woodland management (where the market often fails), research, human resources development and donor coordination. Secondly, the global community should develop a common agenda for internalizing the priorities and needs of dry forest and woodland countries. The world community must also provide the strong financial and technical assistance needed by African countries for improvements in forest resource management. Other issues to be considered include:

- Strategizing for carbon sequestration in dry forest and woodland countries where basic baseline information and data are not available, in particular methods to be adopted for this purpose.
- How, from a research perspective, should the mismatch between tenure (state) and capacity to regulate access to forestry resources be tackled?
- It is critical that the profile of the forestry sector be raised at national government level so that sufficient funds are made available at that level. How can this profile be raised? Is it a question of showing contribution to GDP or the inclusion of the non-financial benefits?
- Do we have the right skills and numbers to address dry forest and woodland research?

Dry forests and woodlands need to be viewed as economically viable, multiple use systems that are inseparable from people's welfare, livelihoods, culture and development. The importance of dry forest and woodland products in providing housing, health care, employment, food, etc. and in contributing to all eight Millennium Development Goals (Petheram et al, 2006) needs to be accepted

and mainstreamed by a much wider range of stakeholders and sectors than is presently the case. Important services and value are being lost on a daily basis through resource mismanagement and land transformation. This comes with considerable environmental and social costs and is jeopardizing the livelihoods of the poor as well as future economic streams from these systems. Forests and forest product use and management need to be seen as part of a holistic and integrated approach to rural development and poverty alleviation and be acknowledged in key development strategies (e.g. Poverty Reduction Strategies, Sustainable Development Strategies) and decentralized planning initiatives.

The use of products generated by forest resources needs to be integrated into national surveys for statistical documentation of volumes and values, including household income and expenditure surveys. This type of data could help to generate the policy responses required to address this sector.

Indigenous or traditional knowledge embedded in customary laws, norms, beliefs and practices relating to the use and management of specific dry forest species needs to be included in any efforts to improve forest and species management. Furthermore, the interaction, and potential synergies, between such informal controls and more formal mechanisms such as government imposed restrictions need to be understood. The links between culture and forest product conservation are particularly important in some contexts and should be more explicitly explored. There are indications that cultural value may be as, or more, important than economic value in providing an incentive for sustainable management (Sambou et al, 2002). Indeed, the latter is often controversial with a high market value sometimes resulting in precisely the opposite outcome to that desired, resulting in overexploitation rather than conservation.

The trade in lesser known forest products and services needs to be supported at all levels, from local to international, through the provision of appropriate business support services and a favourable policy environment. Local and regional trade should not be ignored in the pursuit of high value international markets, as all levels of trade have a vital role to play in the livelihoods of those involved, with support for the local level trade often being an important way to target some of the poorest people and women in particular.

Institutionalized support needs to be provided for the commercialization of forest products, including micro-credit provision, skills training, organizational capacity building and development of value added products to assist local producers to expand their trading activities. Some of this may require cross-departmental or cross-sectoral cooperation. Targeted subsidies and support programmes that can make the cash sale of forest products more viable need attention (Petheram et al, 2006). Work from Botswana has shown how investment in marketing and training substantially increased producers' incomes, providing a livelihood for people who would have otherwise been supported by more costly state welfare grants (Terry, 1999). Suitable models that involve partnerships between the private sector, NGOs and producer groups, with appropriate government oversight, need to be explored (Wynberg, 2006). Coordinated regional approaches and policies are required for important

products traded across borders (e.g. mopane worms, woodcraft, medicines), or where products produced in adjacent countries are competing for the same markets (e.g. baskets).

The objective of this chapter is to bring together issues raised in the preceding chapters and propose plans and strategies for managing dry forests and woodlands for increasing the benefits of these vegetation types in a sustainable manner. To achieve this, the chapter presents three areas for discussion. Firstly, it examines the social-political context of sustainable forest management and the cross-cutting issues of policy and legislation that underpin the implementation of plans and strategies concerning natural resources management. Secondly, this chapter discusses the dynamics of dry forests and woodlands in the face of global change. Thirdly, the chapter briefly suggests ways of managing African dry forests and woodlands for multiple products and services before ending with a section on the way forward.

POLICY AND LEGISLATIVE REFORM

Key issues that have been repeatedly raised in the preceding chapters with implications for the management of African dry forests and woodlands relate to the need for policy and legislative reform. In this regard, issues pertaining to land and resource tenure, the associated property and access rights, and the need for integrated land-use planning must be addressed. It is our contention that institutional and political processes interact with economic and environmental or bio-physical factors depending on the management or conservation objectives. Further, we believe that macro level policies are very important in influencing forest management. In some cases, however, policy reform adds a layer of insecurity and uncertainty concerning the attainment of management objectives. A good example is land reform and 'degazettement' of forest reserves driven by the encroachment of local communities. Furthermore, it has been noted that uncertainties linked to long cutting cycles coupled with slow growth rates have made planning difficult, leading to overharvesting. This has been exacerbated by the lack of data and information.

Some of the key policy processes that are central to dry forest and woodland management relate to decentralization and devolution in governance. We note that decentralization and devolution of management for key resources may confer responsibility and ownership for stakeholders. While many dry forest and woodland countries recognize the need to devolve resource management responsibility to the lowest structures of local level institutions of the affected communities, in practice this is often not the case. Policy is often not matched with practice and for dry forests and woodlands where centralized decision-making and management is at play, communities are already alienated and this has promoted resource overuse that often lead to degradation. Centralization of management also inhibits resource access rights and benefits for local level user-groups from protected areas. Devolution increases resource access rights and benefits particularly to those most dependent on them (Ribot, 1999).

Policy and legislative reform is necessary to provide an enabling environment for managing dry forests and woodlands for multiple products and services. The burden of policy reform in the forestry sector in Africa is presaged on an understanding of the existing macro-policy context. Current knowledge shows that in Africa's dry forest and woodland countries the most dominant player is the public sector. Questions can be raised as to how the sector addressees and is addressed in the various national development plans and programmes if dry forests and woodlands are to be sustainably managed. In Table 11.1 we present a summary of the status of the forestry sector in selected dry forest and woodland countries in Africa. In this table we look at national forest policies, taking cognizance of the fact that FAO has been supporting the development and implementation of such initiatives in a number of countries. In the table we also show the principal supporting legislation for the sector as well as the institutional housing of the sector.

The table not only shows that there has been a widespread adoption of national forest policies across sub-Saharan Africa but also signals a shift from forests and woodlands as sources of timber to a wider range of forest goods and services and stakeholder needs. Clearly, these countries have embraced the concept of sustainable forest management and have acknowledged that good policies are needed, and it is hoped that this is not just a case of conformity but a realization of the importance of the sector. Besides working on NWFPs, most governments already had various pieces of regulation addressing the sector varying from acts of parliament to statutory instruments. In almost all the countries, the legislative framework for forests and woodlands is also supported by other sector-based pieces of legislation, especially environment and mining, which goes a long way to show that forests and woodlands are recognized in some countries. However, recognition alone is not enough as it does not translate into direct support for the forest sector.

While the above picture looks rosy in most countries, the institutional frameworks do not necessarily give priority and support to the sector. The general tendency is to place forests and woodlands within a ministry dealing with environmental issues as in Cameroon, Zimbabwe and Kenya. While the idea of linking forests and woodlands with environment sounds good in some cases, only a part of the environment is considered, e.g. water, as is the case in Burkina Faso. There are major variations in terms of where the forest sector is placed. In Ghana the sector is aligned with science and technology, while in Mozambique and Tanzania it is with agriculture and tourism, respectively. In other countries it is combined with land, natural resources or fisheries. Table 11.1 also shows the broad range of supportive legislation to the forest sector but this can also result in fragmentation and duplication of authority and responsibilities. For example, in Zimbabwe ten different ministries administer an estimated 20 environment-related laws. The situation is further complicated in countries with federal systems of government where responsibilities are shared by central and provincial authorities.

While Table 11.1 does not comprehensively show how countries are addressing emerging issues such as co-management of forests, it is clear that

Table 11.1 Positioning and arrangements in the macro-policy context of the forest sector in selected African dry forest and woodland countries

Country	Status of NFP	Principal Act(s)	Support Legislation	Key Institutions
Angola (2007)	National Forest, Wildlife and Conservation under discussion	The Forest, Wildlife and Conservation Areas Law	Environmental Basis Law Land law Biodiversity National Strategy and Plan of Action	Ministry of Agriculture and Rural Development (MINADER) <ul style="list-style-type: none"> National Directorate of Agriculture, Livestock and Forest (DINAPP) The Forest Development Institute (IDF)
Burkina Faso (2007)	The National Forestry Action Plan 1989 and 1991		Forest Code, Mining Code Environmental Code for sustainable natural resources management	Ministry of Environment and Standard of Living <ul style="list-style-type: none"> National Council for the Environment and Sustainable Durable Development Department of Water and Forests Department of the Environment
Cameroun (2005)	The 1994 Forest Law	The 1994 Forest Law	The presidential decree 94/436 The frame law on Environmental Protection 1996	Ministry of Environment and Forestry (MINEF) <ul style="list-style-type: none"> The Sub Directorate of forest inventories and management The Wildlife Division The Wood Industry Division
Ghana (2008)	Forest and Wildlife Policy 1994	The Forestry Commission Act 1999 Timber Resource Management Act 1997	Timber Resources Management (Amendment) Regulations 2003 Trees and Timber Amendment Act, 1994 Forest Protection Amendment Act 2002	Ministry of Lands, Forestry and Mines <ul style="list-style-type: none"> The Forestry Commission Forestry Research Institute of Ghana (FORIG)
Kenya (2009)	Draft Paper no 1 of 2007 on Forest Policy was published in 2007	Forests Act 2005	The Environmental Management and Co-ordination Act (EMCA) 1999 The Wildlife (Conservation and Management) Act Environmental Management Act 1996	Ministry of Forestry and Wildlife <ul style="list-style-type: none"> Kenya Forest Service Kenya Forestry College Kenya Forestry Research Institute Forestry Extension Services
Malawi (2007)	National Forest Policy of 1996, Community Based Forest Management 2003	Forest Act 1997	Environmental Management Act 1996 Land use Management Act Parks and Wildlife Management Act	Ministry of Energy, Mines and Natural Resources <ul style="list-style-type: none"> Department of Forestry Forestry Research Institute of Malawi Forestry Extension Services

Table 11.1 continued

Country	Status of NFP	Principal Act(s)	Support Legislation	Key Institutions
Mozambique (2007)	The Forestry and Wildlife Policy	Forestry and Wildlife Law 1999	The Land Law, 1997 The Environmental Law, 1997 Mining legislation	Ministry of Agriculture • National Directorate of Land and Forests • Forestry Research Centre (CEF)
Namibia (2007)	Approved 2001; Draft New Forest and Veld Fire Policy (2007)	Forest Act 2001 Forest Amendment Act 2005	Namibia Forestry Strategic Plan 1996 Water Act 1969 Nature Conservation of 1975 Environmental Protection Bill (in pipeline)	Ministry of Agriculture, Water and Forestry • Department of Water Affairs and Forestry • Directorate of Forestry – Research – Extension
Nigeria (2008)	Approved National Forest Policy 2006	A draft National Forestry Act is still in process by relevant government agencies	The Forestry Law	Federal Ministry of Environment, Housing and Urban Development • Federal Department of Forestry • Forestry Research Institute of Nigeria, Ibadan, Oyo State • Forestry Extension Services
South Africa (2007)	White Paper on Sustainable Forest Development 1998 (currently being reviewed as part of the SA National Forest Programme)	National Forest Act 1998	National Veld and Forest Fire Act 2001 Forestry Laws Amendment Act 2005 National Environmental Management Act 1998 National Environment Management: Biodiversity Act 2003	Ministry of Water Affairs and Forestry (MWWAF) • Department of Water Affairs & Forestry (DWAF) • Council for Scientific & Industrial Research (CSIR) Natural Resources & Environment • Forestry Extension Service
Sudan (2007)	National Forestry policy statement 2006	The Forests and Renewable Natural Resources Act 2002	Environment Protection Act 2000 The Wildlife Conservation and National Parks Act 1986	Ministry of Agriculture and Forests • Forests National Corporation (FNC) • Forestry Research Centre • Forestry Extension Services
Tanzania (2007)	National Forest Policy 1998, (currently being reviewed)	Forest Act 2002	Wildlife Act Environment Act Fisheries Act Water Resources Act	Ministry of Natural Resources and Tourism (MNRT) • Forestry and Beekeeping Division (FBD) • Tanzania Forestry Research Institute (TAFORI) • Forestry Extension Services

Table 11.1 continued

Country	Status of NFP	Principal Act(s)	Support Legislation	Key Institutions
Uganda (2007)	National Forest Policy 2001	The National Forestry And Tree Planting Act 2003	National Environment Management Act 1995 Uganda Wildlife Act	Ministry of Water and Environment <ul style="list-style-type: none"> • Forest Inspection Division (FD) • National Forestry Resources Research Institute (Na FORRI) • District Forestry Services
Zambia (2007)	National Forest Policy 1998	Forests Act 1973	Environmental Protection and Pollution Control Act Zambia Wildlife Authority Act 1998 Forestry Act 1999 Land Act 1995	Ministry of Tourism, Environment and Natural Resources (MTENR) <ul style="list-style-type: none"> • Forest Department (FD) • Forestry Research Division • National Centre for Scientific and Industrial Research (NCSIR) • Forestry Extension Unit

Note: NFP = National Forest Policy, an agreed strategic framework of priorities and viable options for improving forestry management at national level.

Source: www.nfp-facility.org/45444/en/ago/

Table 11.2 *Policy and legislative reform objectives in improving management of African dry forests and woodlands for products and services*

<i>Threat and resource use issues</i>	<i>Policy and legislative reform objectives</i>	<i>Scale of institutional involvement</i>			
		1	2	3	4
Climate change and vulnerability	Enhancing adaptation to climate change	✓	✓		✓
Management of protected areas	Strengthening management of protected areas		✓		
Resource overharvesting	Reducing overharvesting and where possible promoting alternative products	✓			
Invasive species	Preventing and controlling invasive species		✓		
Conservation in modified landscapes	Encouraging tree conservation in cultural and modified landscapes		✓		
International agreements	Domesticating and enforcing international agreements and fostering cooperation with international NGOs		✓		
Community and private involvement	Promoting involvement of local communities and the private sector in the management and utilization of natural resources	✓			
Subsistence and cultural uses of products and services	Recognizing and promoting sustainable subsistence and cultural uses of natural resources	✓			
Product and service commercialization	Promoting commercialization of natural products, value addition and trade	✓			
International trade	Promoting international trade that is based on sustainable use of natural resources	✓			
Production and use technologies	Building capacity and promoting technologies that contribute to resources conservation and efficient use	✓			
Plantation and woodlots	Building capacity for and promoting investment in appropriate development of plantations and woodlots	✓			
Wildlife and livestock production	Promoting efficient use of rangelands for either wildlife or livestock or their integration, but having regard to animal health and climate change implications	✓			
Carbon sequestration and trade	Building capacity for monitoring carbon sequestration under UNFCCC mechanisms and ensuring fair trade in carbon				✓
Land-use integration	Promoting integrated land-use planning and conservation of forests and woodlands for multiple products and services	✓			
Local knowledge and practices	Safeguarding and promoting useful local knowledge and practices that contribute to sustainable natural resources management	✓			
Resource tenure	Empowering the poor and vulnerable to have secure tenure to natural capital and resources	✓			
Property and access rights	Securing property and access rights for the poor and vulnerable in society to natural capital and resources	✓			

Notes: 1 = Local and national; 2 = local, national, and regional; 3 = regional and international; and 4 = national, regional and international

Source: Authors

various forms of policy and legislative reforms are needed. Such reforms should focus on complementary laws and by-laws on land tenure, property and access rights that deliberately protect the rights of the poor and vulnerable in society, particularly in rural areas, where they are more dependent on dry forests and woodlands for livelihoods and income generation. Issues pertaining to legislative reform necessary for improving the management of African dry forests and woodlands are presented in Table 11.2.

Response to these critical aspects will take place at four levels: local, national, regional and international. Of the 18 threat and resource use issues identified in Table 11.2, 12 are focusing at the local level and these should be dealt with through participation, social differentiation, authority structures and legal statutes.

Stakeholder participation

One key element to resource management decentralization is stakeholder participation. Resource sharing arrangements and management are gaining currency. This started in the wildlife sector where the management of parks and wildlife resources has moved in this direction by the state entering into co-management and resource sharing arrangements with stakeholders around designated conservation areas. In this way, previously marginalized community groups, such as those found around wildlife estates in Botswana, Namibia, Zambia and Zimbabwe have developed these sharing arrangements to different degrees in the last two decades. Such 'partnership' models raised the conservation status of the protected areas and resources. In Zambia, attempts to try such partnership arrangements for forest resources carried out through joint forest management approaches have some promise but indications are that a lot could be achieved if the state were willing to allow issues of permits and licensing to be carried out by the communities concerned (Bwalya, 2007). What is central is to ensure that appropriate and pro-community policies are put in place so that the communities become part and parcel of the management and enjoy benefit streams that meaningfully contribute to their welfare.

To a great extent, stakeholders may be actively involved in policy interpretation and use, but less so in the formulation processes of these policies. Often key stakeholders in dry forest and woodland countries are not consulted in defining resource management strategies and this often alienates them from the resultant policies and legal instruments. We posit the view that local people tend to be the least involved in policy design but tend to be the most adversely affected by resource use policies. While consultations in the wildlife sector have been carried out in southern Africa, such consultative processes are as yet to take hold in the forestry sector. The level of participation in policy formulation by various stakeholders involved in dry forests and woodlands is a key process to ensure ownership. It should be noted that there are often conflicting objectives over land use between local communities who may view policy actions as

disenfranchising them from protected areas, forest reserves included, and these need to be addressed to the satisfaction of all stakeholders.

This is not just an issue for dry forests and woodlands in Africa, the involvement of communities has been tried successfully in India under the joint forest management (JFM) framework. It was driven by the need to shift from a top-down approach, which was underpinned by the state's desire to maximize commercial revenue from forests, to bottom-up participatory approaches through policy change that fostered the involvement of villagers in the management of local forests (Poffenberger and McGean, 1998). According to Khare (2000), the objective of JFM is to achieve better forest resources conservation by creating partnerships between the forest department and forest protection committees. As of 2006, close to 17.3 million hectares (27 per cent) of Indian forest lands were under the management of 85,000 JFMs (Saito-Jensen, 2008). This is not to suggest that there have been no problems. As with trials with JFM in Zambia, India has experienced problems related to benefit sharing, capacity issues in forest protection committees, failure of the state(s) 'to let go' in terms of management (Bwalya, 2007). These are some of the lessons that African dry forest and woodland countries must learn and incorporate in their planning.

The ability of local level institutions to play a part in the management of dry forests and woodlands is also limited by social differentiation. This means that each person brings individual characteristics of gender, religion, age, status and ethnicity into the dry forest and woodland arena. In order to effectively use differentiation for the benefit of resource managers, governments must manage the individual differences of each person or group. The social categories that flow from social differences are rarely neutral. These categories mark differences in status and power among groups and determine specific groups' relative access to resources and power within communities and the broader social systems. Status and power differences get reproduced in resource arenas and are embedded in authority structures, norms and management systems at local levels. In this way, they subtly confer privilege to some groups and disadvantage to others. As a result, different identity groups have very different perceptions and values of resources that tend to widen over time. Such differences among people based on these categories are grounded within structures of power, inequalities and unequal access to resources, which often result in conflicts over resources at various levels.

Resource governance

Governance structures constitute the organizations responsible for enforcing forestry and woodland management. The processes by which policies and institutions, both informal at local level and formal at national levels, often play out depend on such systems. In most cases local level systems of governance do not have a stipulated mandate to cover forests but often do so from a pragmatic point of view. Dominated in part by traditional institutions such as chiefs, gover-

nance issues are subject to the contradictions that come with such institutions. For example, the allocation of land may not be forest and woodland sensitive or gender sensitive. In some countries, e.g. Malawi, explicit local level structures, village natural resources management committees (encompassing forests), have been set up but have not received sufficient support to carry out their work. Interestingly enough, a focus on forests and woodlands for such institutions is unavoidable as these are the most visible resources requiring attention. In other countries, the functions of forest management have been placed into the hands of local government structures e.g. village development committees in Zimbabwe and area development committees in Zambia. Linking issues of forests and woodland management to local government administrations, most of which are weak, means that they cannot be sufficiently addressed.

Whether these are the formal legal instruments or the informal local level institutions, such structures are central to enforcement. Enforcement by institutions is enhanced or undermined by the effectiveness of authority structures. At the formal level, one important part has to do with the level of funding that such structures are given by the state. Budgets have to be in place to allow such structures to respond and operate in an effective way. Without adequate funding, enforcement to ensure compliance by institutions becomes compromised by the structures in place and in some cases can become a recipe for corruption.

One of the challenges facing policy-makers, local authorities, practitioners and groups working in natural resource management in the dry forests and woodlands is the need to recognize and understand how institutions, and changes in institutions, affect people's interaction with their environment. Often the values of the resources that are violated are much higher than the penalties imposed on offenders that may act as a disincentive for resource conservation. 'Institutional factors are arguably the most important factors determining the success or failure' of natural resource management or conservation (Kayambazinthu et al, 2002). The long history of change in resource management arrangements that has resulted in disempowerment of local institutions means that those that have persisted should be supported and strengthened. It is interesting to note that successes have also been tainted by the problems of power where local politicians and elites have taken over control of such initiatives for their own good. This can be a danger where local communities are not sufficiently empowered and unsure of their rights. Thus, while examples of persistent or resilient institutions are to be found in sacred practices of various forms (Kajembe et al, 2002; Kayambazintu et al, 2002) care must be taken of the threat of elite capture. Such institutions lead to the conservation of key biodiversity resources, which may be woodlands, wetlands or species of flora or fauna.

MANAGING FOR MULTIPLE PRODUCTS AND SERVICES

Managing dry forests and woodlands for multiple products and services requires a critical assessment of the outcomes of interactions between products and services and the extent to which they are compatible (Table 11.3). Pair-wise combinations of the different products and services considered in the previous chapters indicates that nearly 71 per cent of the combinations are incompatible from the current management perspective, 20 per cent are compatible and 9 per cent are conditionally compatible. This scenario means that managing dry forests and woodlands for a combination of products and services may present challenges for managers. Maximizing the positive compatibilities requires astute management, especially at the local level. Thus, the role of management is very critical in influencing the outcomes of managing for multiple products and/or services where compatibility depends on conditionalities (Table 11.3); under such conditionalities, the technique for harvesting a combination of products and services may be key to influencing the outcome of particular management approaches.

For example, the harvesting of edible caterpillars does not require that the host tree be cut down but only occurs where there is weak tenure and enforcement of local rules and regulations for resource use. In a situation where regulations are observed, biodiversity conservation and caterpillar collection are compatible but when tree cutting is involved then compatibility is reduced or replaced by incompatibility. Management guidelines are therefore required for situations where compatibility is linked to a particular condition, especially with regards to the type of resource harvesting technique. In some cases where the use of one product is incompatible with the use for another product, management guidelines may focus more on utilizing the resource base for more than one product. For example, if a medicinal tree is cut for charcoal or timber or firewood, it can be recommended that bark be removed from a cut tree for medicinal purposes and the rest of the wood used for the other wood products, such as poles, timber or charcoal. For products and services that are completely incompatible, land use planning is important in ensuring that sufficient land is made available for the different products. For example, areas can be designated for charcoal production while other areas are set aside for watershed and biodiversity management as in the case of national parks.

Although degradation of African dry forests and woodlands is acknowledged, these vegetation formations still contain much of at least their plant diversity, perhaps because they have not been totally cleared for large-scale commercial agriculture and/or forestry as in Europe and northern Africa. Sub-Saharan Africa is relatively unique in this context and therefore opportunities exist for managing dry forests and woodlands for multiple land uses, products and services. The challenge therefore is for an integrated management approach at landscape level to deal with seemingly competitive land uses, such as agriculture and forestry, and conservation as traditionally practised. Such innovative

Table 11.3 *Compatibility in the management of dry forests and woodlands for different product and/or service combinations*

Product and service	Biodiversity	Fruits	Vegetables	Mushrooms	Caterpillars	Honey	Exudates	Bark & fibre	Roots	Poles	Timber	Utensils	Firewood	Charcoal	Herbage	Browse	Carbon	Water	Spiritual		
Biodiversity	0	+	+	+	+	0	-	-	-	-	-	-	-	-	-	-	-	-	-	+	
Fruits	0	0	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
Vegetables			0	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+
Mushrooms				0	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+
Caterpillars					0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+/	+/
Honey						0	-	-	-	-	-	-	-	-	-	-	-	-	-	+/	+/
Exudates							0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bark & fibre								0	-	-	-	-	-	-	-	-	-	-	-	-	-
Roots									0	-	-	-	-	-	-	-	-	-	-	-	-
Poles										0	-	-	-	-	-	-	-	-	-	-	-
Timber											0	-	-	-	-	-	-	-	-	-	-
Utensils												0	+/	+/	-	-	-	-	-	-	-
Firewood													0	+/	+/	-	-	-	-	-	-
Charcoal														0	-	-	-	-	-	-	-
Herbage															0	-	-	-	-	-	-
Browse																0	-	-	-	-	-
Carbon																	0	-	-	-	-
Water																		0	-	-	-
Spiritual																				0	0

Note: + compatible; - incompatible; +/- conditional compatibility.
Source: After Chundama and Gumbo (2009)

approaches can achieve some level of commercial agriculture and forestry, and also conservation associated with the agriculture/forestry activities, as long as appropriate infrastructure exists. One key question is whether a combination of short-, medium- and long-term land management approaches can contribute to a phased production of multiple products and services from dry forests and woodlands. For example, the land could be cleared for crop cultivation in the short term. During clearing, the relevant timber component is harvested and the rest of the woody component is used for wood crafts, poles, firewood and/or charcoal. During cultivation the crop system is specifically managed to ensure recovery of the woody component with its associated NWFPs as often happens in the traditional shifting cultivation practices. The woody regeneration is then specifically managed towards a future crop of fruits, poles, timber and eventually firewood and/or charcoal over the longer term. The feasibility of such management systems needs to be investigated through modelling and long-term experimentation. Such management systems are a direct challenge to the status quo in which land management is dealt with either by the agriculture department or ministry which focuses on agricultural production, or by forestry that focuses on timber production, or by nature conservation/national parks that aim at preventing degradation with no integrated land management. However, with still enough land available in many African dry forest and woodland countries, it is possible to experiment with new innovative approaches that integrate different land use successions and objectives.

AFRICAN DRY FOREST AND WOODLAND DYNAMICS UNDER GLOBAL CHANGE

There will undoubtedly be some marked changes in distribution and extent of African vegetation types during the 21st century due to climate and land-use changes. However, climate change and land-use change are likely to be intertwined, and it is difficult to predict what the consequences will be in detail. Table 11.4, although simplistic, shows probable responses of African dry forests and woodlands to climate and land-use changes. Generally, because the majority of tropical trees have a C_3 photosynthesis, they are more likely to be negatively affected by global warming; in contrast, the majority of tropical grasses have a C_4 photosynthesis and therefore are likely to perform better under a warmer climate. However, although Table 11.4 presents possible responses of dry forest and woodland vegetation and plants to future environmental scenarios, these outcomes are by no means certain. For example, these predicted responses might be modified or even reversed when interactions with CO_2 enrichment and nutrient availability are considered. In addition the question of the long-term impact of repeated fires and herbivory on dry forest and woodland productivity remains to be answered. Furthermore although we have many scattered data, we still do not have a comprehensive idea of dry forest and woodland productivity levels in relation to source of regeneration,

Table 11.4 Probable responses of African dry forests and woodlands to climate and land-use changes

Factor	Regeneration		Productivity		Species richness		Carbon sequestration		Fire	Herbivory
	Trees	Grasses	Trees	Grasses	Trees	Grasses	Trees	Grasses		
Decreasing rainfall	-	-	-	-	-	-	-	-	-	-
Global warming	-	-	-	+	-	+	-	+	+	+
Frequent droughts	-	-	-	-	-	-	-	-	-	-
Land clearing	-	+	-	-	-	-	-	-	-	-
Fire	-	-	-	+	-	-	-	+	NA	-
Herbivory	-	-	-	-	-	-	-	-	-	NA

Note: + positive response; - negative response; NA not applicable

Source: Authors

stage of growth, moisture availability, nutrient status and dry forest or woodland type or their species composition (Küper et al, 2006).

It follows therefore that we need to understand what the main determinants of productivity are for each vegetation type, so that management practices can be more strategically applied. Investment in capacity building and research will play a key role in addressing these issues. Forest and biomass inventories, as well as monitoring plant growth and phenology need to be undertaken at representative sites and the data analysed in relation to climate and land-use data to better understand their interactions. This will feed into the development of more appropriate management guidelines that will ensure that African dry forests and woodlands continue to provide the products and services that are crucial to the maintenance of livelihoods of millions of people that live in these vegetation formations, and to sustainable economic development of sub-Saharan African countries.

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