

Gender and Biodiversity Management in the Greater Himalayas

Towards equitable
mountain development

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The International Centre for Integrated Mountain Development, ICIMOD, is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalayas – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and based in Kathmandu, Nepal. Globalization and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream-downstream issues. We support regional transboundary programmes through partnership with regional partner institutions, facilitate the exchange of experience, and serve as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop an economically and environmentally sound mountain ecosystem to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now, and for the future.



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Foreword

This study aims to enhance understanding of the dynamic relationship among biodiversity conservation and management, gender, and livelihoods in the greater Himalayan region. Based on a review of literature and field-based case studies on the ground, it provides important insights on the different ways in which women and men in the Himalayas conserve and restore biodiversity. In particular, it analyses the critical role of women in conserving and managing rangelands, forests, and agroecosystems. This knowledge has broad implications for mountain development in the region. Although gender and women's inclusion is sometimes mentioned in development policies and discourses, it generally remains at the margins. Furthermore, projects, programmes, work cultures, attitudes, and practices often neglect meaningful inclusion of gender analyses and equity issues; This study identifies critical research gaps, which if addressed may go a long way towards better appreciation and integration of gender-specific knowledge, priorities, and needs for transformative social and environmental outcomes.

One of the greatest hallmarks of the greater Himalayas is its rich biological, social, and cultural diversity. The region boasts a rich variety of genetic resources, species, and ecosystems of global importance. As an example, 4 of the world's 34 globally significant 'biodiversity hotspots' are in the region. Of the 213 million people in the region, 22 per cent are indigenous peoples who rely mostly on natural resources for their living and whose practices contribute to maintaining high levels of biological diversity across the landscape and within various ecosystems.

As this study demonstrates, there is little doubt that the different roles, social positions, experiences, knowledge, and needs of women and men affect the way biodiversity is conserved, maintained, and used. This gender differentiation also affects the ways that biodiversity benefits are shared.

As the case studies show, women in mountain communities directly depend on natural resources to meet their environmental, nutritional, and socio-cultural needs and those of their families and communities. Because of women's greater responsibility for securing water, food, seeds, medicinal plants, wild edibles, fuelwood, forage, and fodder, they have a greater interest and role in conserving biodiversity. Their knowledge, science, and skills are critical for the sustainable supply of biodiversity products. The study confirms the view that biodiversity conservation and management is not only about conserving species, genetic resources, and ecosystems, but also social-ecological processes that are highly gendered. Development efforts must therefore be aimed towards three interrelated goals: effective biodiversity protection, addressing multiple needs of natural resource dependent social groups, and achieving socially inclusive and equitable development outcomes for women, men, and children of the greater Himalayas.

This study contributes policy and research recommendations for promoting and improving gender-sensitive and inclusive biodiversity conservation and management practices in complex mountain contexts. It provides evidence that substantial gains in sustainable and equitable mountain development can be made through measures to promote and support:

- women's access to biological resources, including control and ownership;
- women's meaningful participation in and benefits from income-generating opportunities and decision-making related to natural resources;
- women's collective action and women's leadership; and
- women's autonomous adaptive strategies in the face of changes due to multiple drivers.

The study clearly indicates the need for a greater focus on gender and social analysis in biodiversity research concepts and methodology; better integration of gender analysis and equity in biodiversity related capacity strengthening, sensitization, and partnerships; rigorous gender analysis and generation of interdisciplinary knowledge for effective biodiversity related policies and impacts; recognition of women as important actors in

biodiversity conservation and sustainable use for more equitable benefit sharing at all levels; inclusion of women scientists and gender expertise in conservation, development, and policy-making processes and decisions; and a focus on political-economic, socio-cultural, and gender issues at all institutional levels – local, national, regional, and international.

We envision that the findings of this study will be useful for development practitioners, researchers, policy makers, development planners, and civil society organizations working on sustainable and equitable natural resource management in the greater Himalayan region. We also hope that ICIMOD, its partners, and development practitioners at large will use this study as the basis for more in-depth and grounded research and commitments to create more effective impact for those women, men, and children who are normally at the margins of development but are key to the future.



David Molden
Director General, ICIMOD

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Acronyms and Abbreviations

CBD	Convention on Biological Diversity
CFUG	community forestry user group
FAO	Food and Agriculture Organization of the United Nations
ICIMOD	International Centre for Integrated Mountain Development
IDRC	International Development Research Centre
masl	metres above sea level
REDD	Reducing Emissions from Deforestation and Forest Degradation
UNDP	United Nations Development Programme
WWF	World Wide Fund for Nature

Part 1

Gender-Biodiversity Nexus



1 Introduction

Biodiversity is essential to life on Earth; it provides resources such as food, medicine, fibres, fuel, and building materials, as well as intangible services, on which humankind relies. For people in developing countries, particularly in least developed contexts, biodiversity is vital for survival. Biodiversity also forms an important part of people's belief systems and their cultural and spiritual values (CBD 2010).

However, biodiversity everywhere is being affected by changing land use and land cover, economic growth, globalization, climate change, and other drivers of change (Zimmerer 2010; Chettri et al. 2012). In particular, changes in habitats, cropping patterns, and technology and the introduction of new crop varieties are contributing to a significant loss of biodiversity (Momsen 2007b; Chambers and Momsen 2007). This has profound implications on livelihoods and the environment. The impacts tend to be even greater on heavily resource-dependent social groups, notably economically poor and marginalized mountain women. For these mountain people, the cost of the loss of biodiversity in terms of food security and ecosystem protection is especially significant (Momsen 2007b, p 149; Abdelali-Martini et al. 2008). The losses can be acute in mountain contexts, where steep, fragile, inaccessible, and hazard-prone environments make biodiversity conservation and management challenging.

The greater Himalayan region, the working area of the International Centre for Integrated Mountain Development (ICIMOD), stretches over 4.3 million square kilometres and includes the entirety of Bhutan and Nepal and parts of six other countries: Afghanistan, Bangladesh, China, India, Myanmar, and Pakistan. It is a highly complex, evolving, and dynamic region, and a haven for bio- and socio-cultural diversity.

Agricultural land, forests, rangelands, and wetlands are among the major terrestrial environments in the region and contain high levels of wild and domesticated biodiversity. The region is rich in genetic resources, biological species, and ecosystems of global importance, and contains 4 of the world's 34 globally significant 'Biodiversity Hotspots': the Himalayan Hotspot, Indo-Burman Hotspot, Mountains of South-West China, and Mountains of Central Asia (Mittermeier et al. 2004 in Sharma et al. 2010, p 910; Chettri et al. 2012; Olson and Dinerstein 1998, 2002). The region also houses 488 protected areas, 29 Ramsar Sites, 13 United Nations Educational, Scientific and Cultural Organization (UNESCO) Heritage Sites, and 330 Important Bird Areas (Chettri et al. 2008). These biodiversity resources not only act as storehouses of genetic resources for the future, but together represent critical resources for mountain women's and men's livelihoods.

Mountain people in the greater Himalayan region depend on biodiversity resources for the raw materials to produce goods for their subsistence use, to sell for cash income, or to exchange or barter for other necessary commodities (ICIMOD 2010, p 23). The region's biodiversity also provides multiple goods and services to people living in upland and lowland regions, both within the greater Himalayan region and beyond. However, as a result of the loss and degradation of forests and lack of effective forest management in many parts of the region, many species of flora and fauna are threatened (Sheikh et al. 2002). Men and women in the greater Himalayas practise various strategies for the management, conservation, and sustainable use of biodiversity, practices that also have deep cultural, spiritual, and gendered meanings.

In these mountain ecosystems, women play a key role in managing, conserving, and using different plant and animal species (ICIMOD 1997; Gurung 1998; Dhakal and Leduc 2010) to sustain the environment, their livelihoods, and those of their communities. All of the eight countries in the greater Himalayas are characterized by complex socio-cultural and political-ecological settings. Biodiversity in the region is inextricably intertwined with the socio-cultural and political-ecological context. Thus, development interventions aimed at the management, conservation, and sustainable use of biodiversity resources need to be context specific, ecologically sound, socially and politically feasible, and just (Brechtin et al. 2002, p 44).

Bearing this in mind, in recent years ICIMOD has advocated for biodiversity conservation and sustainable development through its 'mountain perspective framework' (Sharma et al. 2010, p 918). This framework provides an approach for understanding the limitations and opportunities of mountain environments, which are often characterized by environmental fragility, inaccessibility, marginality, and diversity, as well as specific niche opportunities and local adaptation practices. The mountain perspective also highlights the important gender roles and needs of women, men, and children in the greater Himalayas, which have been documented by research. For example, studies have documented that the degradation of rangeland and forests increases women's workload and drudgery as it increases the time spent by women on collecting biological resources. In forest sites with high deforestation, the time spent by women to collect one load of fuelwood, which is normally carried on their heads, is 75 per cent higher than in areas of low deforestation (Kumar and Hotchkiss 1988 in Bajracharya et al. 1993, p 2).

For indigenous peoples, the loss of biodiversity can mean an increase in food insecurity and even famine. Hence, biodiversity is essential for their survival. Wild edible plants are used as dietary supplements and for survival during times of food scarcity (Teklehaymanot and Giday 2010). The loss of these plants can be exacerbated by changes in agricultural practices such as the excessive use of chemical pesticides that affect native agrobiodiversity (Partap 1998, p 9).

Biodiversity conservation and management are of particular concern to women because of the gendered division of agricultural work, household duties, animal husbandry, income generation, and other tasks (Krishna 1999). Studies carried out in various cultures around the world reveal that women play a critical role in maintaining and sustaining local-level biodiversity resources and hold extensive knowledge of domestic and wild plants, agricultural practices, local species, and the genetic manipulation of plants and animals (Byers and Sainju 1994; Howard 2001, 2003; Lambrou and Laub 2004; Chambers and Momsen 2007; Voeks 2007; Abdelali-Martini et al. 2008). However, analysis of the gender dimensions of biodiversity in mountain ecosystems is a relatively new area of research. Those studies that do attempt to understand the gender dynamics of biodiversity generally focus on gender roles and how they have changed over time (Gurung 1998; Krishna 1999), rather than on the power relations that shape women's and men's access to, and control over, resources.

Notably, although the Convention on Biological Diversity (CBD) clearly recognizes the role of women in the conservation and sustainable use of biodiversity (Desai et al. 2011), there is much work to be done on its implementation, particularly in terms of the meaningful participation of women in policy-making. At the same time, given the gap in evidence-based research, empirical studies on gender dimensions are needed to shed light on the linkages among biodiversity, gender, and policy practices in the region.

This publication analyses the gender dimensions of biodiversity conservation and management in the greater Himalayan region by examining various existing scenarios illustrating the relationships of biodiversity conservation and management, gender, and socio-cultural and political-economic development in the region. Based on a literature review and six field-based case studies, the publication focuses on the analysis of gender-specific roles, needs, resource use, knowledge, management strategies, and access to, and control over, resources. It examines the implications of these factors for livelihoods and biodiversity conservation and management in mountain communities. In doing so, the study reflects on several questions, such as: What does biodiversity conservation and management really mean for women and men in the greater Himalayan context? Why is it important to analyse biodiversity conservation and management from a gender perspective? What are the implications for mountain women and men if gender issues and opportunities are not adequately taken into account?

Part 1 includes an introduction to gender and biodiversity in mountain contexts (Chapter 1). It presents an overview of biodiversity practices in the greater Himalayas, and traces the interactions among biodiversity, women and men, and their livelihoods within the region (Chapter 2). It also sets out the conceptual and analytical framework for the study and the methodological approach (Chapter 3). Part 2 presents the case studies from the field. Part 3 presents a synthesis of the case studies, comparing and contrasting them using the analytical approaches outlined earlier, and gives conclusions and recommendations for enhanced, equitable, and gender-transformative biodiversity conservation and management in the greater Himalayan region.

Understanding Biodiversity Conservation and Management

The Convention on Biological Diversity defines ‘biodiversity’ (or biological diversity) as “variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexities of which they are part”. Biodiversity includes diversity within species, between species, and between ecosystems (Orlove and Brush 1996, p 330).

‘Biodiversity conservation and management’ can be defined as the processes involved in the promotion, conservation, and sustainable use of various biological resources to ensure the continued provision of ecosystem services. Fisher et al. (2009, p 645) define ecosystem services as the aspects of ecosystems used (actively or passively) to produce human wellbeing. In this sense they include the ecosystem organization or structure as well as processes and functions if they are consumed or utilized by humanity either directly or indirectly. The functions or processes become services if humans benefit from them. Ecosystem services are generally grouped into four categories: cultural (religious, spiritual, ritual, aesthetic), regulatory (protection from disasters, purification of water, climate regulation, pollination), provisioning (fuelwood, fodder, forage, food, water), and supporting (soil formation, nutrient cycling, habitat) (Fisher et al. 2009).

Hence, it can be seen that biodiversity has many values and meanings and provides resources for a wide range of purposes. Value is also placed on biodiversity simply because it exists; its ‘existence value’ derives from the fact that people appreciate knowing that certain ecosystem services exist, even if they have no intention of actually using them (Brown 1998, p 76; Rasul et al. 2011, p 6). Biodiversity also has ‘option value’, which refers to the value associated with maintaining the availability of certain ecosystem services to meet future needs, with the awareness that it is difficult to accurately anticipate future demand for such services (Brown 1998; Rasul et al. 2011).

However, biodiversity conservation and management is rarely considered from a broad socio-cultural, ecological, and political-economic point of view that recognizes relations of power and differences between and among men and women based on class, caste, ethnicity, age, and life-cycle positioning (Verma 2001; Mackenzie 1995a, 1995b; Rocheleau 1995). Unequal power relations in the use, perception, ownership, and control of resources in a particular context must be recognized. In light of this, biodiversity conservation and management practices in the greater Himalayas can be considered as political-ecological processes adopted by different men and women in order to conserve, use, and maintain biodiversity resources to meet their socio-cultural and livelihood needs while maintaining the health of the ecological system. This study adopts this view.

Indigenous knowledge in biodiversity conservation and management

People and societies in the greater Himalayan region are diverse and heterogeneous. The region is home to 213 million people from a diverse array of ethnic groups who speak a variety of languages. Of these, 22 per cent are indigenous peoples. Most indigenous peoples and mountain communities in the region depend on local biological resources for cultural, spiritual, medicinal, and food security purposes.

In Nepal, 59 ethnic groups, constituting 37 per cent of the total population, draw their livelihoods mainly from forest biodiversity (Sherpa et al. 2012). Similarly, 17 per cent of Nepal’s population, representing 21 ethnic groups, draw their livelihoods primarily from wetland biodiversity (SEN 2011). India has more than 84 million indigenous peoples, commonly known as ‘adivasi’, or scheduled tribes, who are highly dependent on forests, wetlands, pastures and rangelands, and mountain ecosystems for their livelihoods (Bhasin and Nag 2002; Bose 2011). In Bangladesh, although only 1 per cent of the total population are indigenous, they live primarily in the Chittagong Hill Tracts, one of the country’s biodiversity hotspots. Shifting cultivation is their main livelihood strategy. Around 15 per cent of people in Bhutan are indigenous or members of tribal groups (OHCHR and NZHRC 2010).

The role of indigenous peoples and communities in biodiversity conservation in the greater Himalayan region is both prominent and significant. For example, in the northeast Indian states of Meghalaya, Nagaland, Mizoram, and Arunachal Pradesh, where nearly 80 per cent of the population belong to indigenous communities, they have contributed to the conservation of genetic diversity within various species, such as coir, jute, sugar-cane,



The region's wetlands contain high levels of biodiversity of particular importance to indigenous people and women

cucurbits, rice, soybean, maize, citrus, buckwheat, and several beans. Indigenous peoples residing in the western Indian Himalayan belt contribute significantly to conserving and maintaining a large pool of buckwheat, amaranth, soybeans, lentils, cowpeas, pome, and stone fruits (UNDP and FAO 2001). The cultural and culinary practices of smallholder farmers play a significant role in preserving and maintaining the genetic diversity of plant species as a result of selection preferences based on food habits, food culture, taste, time taken for cooking, nutrition, and the health benefits of different species.

Since biodiversity is a vital livelihood resource for indigenous peoples, they are highly knowledgeable about the plants they use. For example, Gurung communities in Nepal have a significant body of knowledge related to medicinal plants, and are reported to use 127 species within 119 genera of medicinal plants belonging to 62 families (Aumeeruddy-Thomas and Pei 2003, p 23). Economically poor households, including those from indigenous groups, are disproportionate dependent on agricultural and forest biodiversity for subsistence and livelihoods. For example, medicinal and aromatic plants are an important livelihood resource for many poor households, who spend a significant part of their time in collection activities (UNDP 2007).

One important example of indigenous knowledge and practice in managing natural and biodiversity resources in the Himalayas is swidden cultivation, also known as 'shifting cultivation' or 'jhum', an ancient and distinct indigenous land use practice. Although some researchers have criticized shifting cultivation as a destructive land use practice impacting negatively on the environment, and particularly on biodiversity, field research reveals that it is a highly diversified and, in many cases, ecologically suitable set of farming practices in many parts of the Himalayas. As one of the prominent farming practices in the greater Himalayas, shifting cultivation contributes to the conservation of a large number of agro-forestry species (Kerkhoff and Sharma 2006). In addition to conserving as many as 35 varieties of crops and over 380 species of non-timber forest products, shifting cultivation also provides ecological benefits such as improved soil fertility, enhanced natural regeneration, and spatially heterogeneous vegetation, which provides wind breaks and microclimate differentiation. Shifting cultivation has helped to conserve plant species of local and commercial value, and in many cases maintains increased levels of diversity.

Socio-cultural dimensions

Indigenous mountain communities in the greater Himalayas have strong and diverse spiritual and cultural beliefs regarding biodiversity and its conservation. The role of these beliefs in biodiversity conservation is significant (Byers and Sainju 1994; Anderson et al. 2005; Chettri and Sharma 2006; Gurung et al. 2006; Luo et al. 2009). A blend of religious and animist beliefs regarding the natural environment have led to biodiversity rich areas being referred to in Buddhist dialect as 'beyuls' (hidden lands), 'ters' (hidden treasures), and 'demazong' (valleys of rice). Within the cultural rationale behind this valuation are embedded principles governing human-nature relations, an understanding of the interaction between natural spaces and biodiversity, and a conservation ethic reflecting the very real need to maintain the ecological balance in remote and fragile mountain ecosystems (Chettri and Sharma 2006; Gurung et al. 2006).

Many mountain people apply cultural and spiritual practices and conservation ethics to various landscapes (rangelands, forests, hills, and mountains) referred to as 'pilgrimage sites', 'areas of taboo', and 'sacred sites' (Anderson et al. 2005; Byers and Sainju 1994; Luo et al. 2009; Pei 1998). Informal institutions such as 'dratsangh' and 'yulgigothe' in Dolpa District of Nepal (Ghimire et al. 2004), 'shinginawa' in Sagarmatha National Park in Nepal, and 'dzumsa' (Gurung et al. 2006) and 'na zong nyo' in Sikkim, India (Chettri and Sharma 2006) regulate the use of biological resources in various sacred sites and pilgrimage areas, in which the collection and harvesting of plants is largely banned. Sacred groves in Meghalaya in the northeast Indian Himalayas act as biological refugia (Kerkhoff and Sharma 2006). Baima Tibetans residing in the hills of the southern tip of Gansu Province of China, many of whom are followers of the ancient Bön religion, the oldest spiritual tradition in Tibet, have a long history of worshipping nature (plants, animals, rivers, mountains, landscapes). They follow customary rules in the use of natural resources, violation of which results in penalties (Luo et al. 2009).

Various transboundary landscapes of high value in terms of sacredness, culture, spirituality, and biodiversity are spread across the greater Himalayan region. For example, the Kailash Sacred landscape, which contains the sacred Mount Kailash, is the source of four of Asia's most important rivers and contains at least 20 globally threatened or regionally protected plant species (Zomer and Oli 2011). This landscape covers remote portions of the Tibet Autonomous Region of China and contiguous areas of Nepal and India.

Likewise, indigenous healers are present throughout the greater Himalayas, with the Indian and Nepalese mountains particularly well described in the literature. Amchis (indigenous herbal doctors), dhamis (spiritual healers), jhankri (shaman or faith healer), boongthing (Lepcha medicine men), phedangma and bijuwa (spiritual healers), and lamas (Bhutia priests) are the most common types of healers found in the Himalayas. These indigenous healers possess a vast knowledge of medicinal plants and play a critical role in their conservation and management. They generally follow a set of sustainable harvesting practices, which are based on the customary rules governing sustainable use and knowledge transmission from generation to generation (Ghimire et al. 2004). Religious leaders and institutions also play a significant role in biodiversity and ecological landscape conservation in the Himalayas (Byers and Sainju 1994; Chettri and Sharma 2006; Ghimire et al. 2004; Gurung et al. 2006; Luo et al. 2009; Pei 1998).

2 Gender and Biodiversity: Overview of an Emerging Field of Research

Much has been written about biodiversity and its importance to rural livelihoods and environmental sustainability. Although mostly focused on biophysical perspectives, the literature indicates the instrumental role of local communities, and women in particular, in biodiversity conservation and management. However, relatively little work has been carried out to analyse the relationships among biodiversity, women and men, and processes of development in mountain areas, particularly in highly natural resource-dependent social groups such as women, economically poor households, and indigenous peoples. These gaps are understandable given that interest in gender issues in agrobiodiversity is relatively recent (Momsen 2007a).

The CBD (1992) recognizes the role of people, especially women and indigenous peoples, in the conservation and sustainable use of biological resources (UNDP 2007). It also affirms the need for the meaningful participation of women at all levels of policy-making for biodiversity conservation (UNDP and FAO 2001). However, critics point out that merely mentioning women in CBD documents is not enough to strengthen their access to biological diversity (Momsen 2007b, p 154).

As the case studies in this publication highlight, women are crucial actors in biodiversity conservation and management in their multiple roles as farmers, herders, forest gatherers, primary health care givers, collectors of water, food processors, herbalist, market vendors, collectors and cultivators of indigenous vegetables, selectors and preservers of seeds, soil conservationists, and sustainers of natural and human-made environments (Rocheleau 1995, p 9; IDRC 1997, p 2; Howard 2001, 2003; Momsen 2007a; Oakley and Momsen 2007; Abdelali-Martini et al. 2008). Their knowledge, needs, and problems associated with biodiversity conservation and management are often different from men's. This is not based on biological differences and needs, but socially constructed roles, responsibilities, and meanings attributed to what it means to be a woman, or man, in their particular contexts and culturally specific locales. Women have more varietal selection criteria than men because of the many ways they use plant materials (Momsen 2007a). Women's knowledge of the quality of landraces and of the multiple uses of medicinal, herbal, and aromatic plants is a crucial factor in sustaining these species on farms and fields, thereby contributing to on-farm/in situ conservation of agrobiodiversity (Abdelali-Martini et al. 2008).

As the primary users and managers of resources, women have tremendous knowledge of the medicinal and nutritional value of diverse plant species (Byers and Sainju 1994). In many contexts, women are more familiar than men with the medicinal value of local flora (Voeks 2007). Women's roles in seed management – including seed selection, processing, storage, and exchange – contribute to conserving biodiversity in farms and home gardens (Oakley and Momsen 2007). Understanding women's gender-specific knowledge and choices, and the extent to which they access resources and make decisions related to biodiversity is not only relevant, but central, to achieving sustainable development and biodiversity conservation (Momsen 2007a; Oakley and Momsen 2007; Abdelali-Martini et al. 2008). Despite this, women remain 'invisible' actors from the grassroots right up to the policy level (UNDP and FAO 2001, p 294) and their contribution to biodiversity conservation is largely overlooked (Dhakal and Leduc 2010).

Gender roles and relations influence how men and women value and use biological resources and their knowledge, skills, and preferences for different species. As women and men play different roles in biodiversity conservation and management in farms, home gardens, forests, rangelands, and pastures (see Voeks 2007; Momsen 2007a, Oakley and Momsen 2007; Abdelali-Martini et al. 2008), they experience different problems and opportunities related to the use and management of biodiversity resources. In comparison to men, women are often more vulnerable to biodiversity loss because they experience gender-based inequalities in accessing and making decisions over land, plants, biodiversity resources (Scurrah-Ehrhart 2007), and development



Women's roles in seed management contribute to conserving agrobiodiversity

resources (such as credit, information, technology, training, and outreach). They also participate less than men in farmers' organizations and other decision-making processes critical to livelihood security (Leduc 2011; Lambrou and Laub 2004; Verma 2001). Biodiversity loss, caused by the modernization of agriculture, globalization, land grabbing, and changes in land use practices, often reduces women's access to, and use of, biodiversity resources, increasing the time and energy spent by women to collect the resources they need for food and for cultural, social, and environmental purposes.

This tells us that women's and men's engagement in and knowledge of biodiversity conservation and management are not static. Socioeconomic and environmental changes and new policies, knowledge, and technologies, which are also influenced by global forces, can influence women's access to and use, control, and ownership of biodiversity resources and the benefits derived from such resources. Thus, gender is central to biodiversity conservation, use, and maintenance in the greater Himalayan region – and is strongly associated with socio-cultural, livelihood, and environmental factors, as well as new drivers of change.

Gender Division of Roles, Responsibilities, and Labour

Men and women have different roles and responsibilities in biodiversity conservation and management. Women play a critical role in maintaining and sustaining local-level biodiversity, including the domestication of wild plants, genetic manipulation of plants and animals, and seed management (Byers and Sainju 1994; Howard 2001, 2003; Lambrou and Laub 2004; Chambers and Momsen 2007; Voeks 2007; Abdelali-Martini et al. 2008). For instance, 45 per cent of women in Bhutan are medicinal plant collectors (FAO n.d. in UNDP 2007, p 10). In Nepal, women are the primary collectors of medicinal herbs, wild vegetables, and tubers. In Pakistan, 90 per cent of medical herb collection is carried out by women, and 71 per cent of collected herbs are sold by women at local markets (UNDP 2007). An analysis of indigenous knowledge of Wancho communities in Tirap

District of Arunachal Pradesh, India reports that, despite their lack of representation in local village committees and decision-making, women are more involved in natural resource management than men (Aumeeruddy-Thomas and Pei 2003).

Both women and children are involved in the collection of wild species, but more girls are involved than boys because they accompany their mothers while doing farm work (Abdelali-Martini et al. 2008, p 378). As all of the case studies in this publication reveal, women intensively engage with biodiversity conservation in indigenous farming and forest ecosystem practices.

Often, gendered tasks are defined by the different responsibilities men and women have within their households in the context of their particular society (Chambers and Momsen 2007). These tasks are further defined by culture, norms, beliefs, values, and gender roles, which are constantly changing. A study on the ethno-botany of fruit plants in the Drosh Valley of Chitral, Pakistan, revealed that while men are involved in agronomic work related to fruit cultivation, women are responsible for post-harvesting tasks such as fruit processing and preservation (Aumeeruddy-Thomas and Pei 2003). Studies conducted among mountain communities of the Himalayas show that 80 to 90 per cent of the seed requirements of all farm-household crops are met through indigenous seed management and exchange practices, in which the role of women is crucial (Shrestha 1998; Kerkhoff and Sharma 2006). Women's efforts to preserve, conserve, process, and manage high-quality agricultural seeds are significant (Howard 2001, 2003; UNDP and FAO 2001; Oakley and Momsen 2007). The greater involvement of women in tasks related to biodiversity conservation (such as seed management, the collection of wild edibles, fruit processing, and harvesting) is because of socially constructed gender roles in which women are primarily responsible for food production. In comparison, men are generally responsible for off-farm and cash-oriented activities such as contract work, daily wage labour, employment, and the marketing of high-value agriculture and forest products (Gurung 1999).

Gender roles may change over time in order to ensure the fair distribution of resources and opportunities (Röhr 2009). The increased out-migration of men from rural farming households to urban areas in some parts of the Himalayas has led to changes in gender roles, with women taking on an additional range of tasks (Chambers and Momsen 2007; Lama 2010; Jain 2010; Leduc and Choudhury 2012). Men's out-migration has also meant that many rural women are becoming increasingly involved in subsistence and commercial production, as well as taking on much of the community and environmental management work which was formerly shared by women and men (IDRC 1997).

The out-migration of men and other drivers of changes in the greater Himalayas, such as too much and too little water, have intensified women's workload in the use and management of natural resources (ICIMOD 2009; Jain 2010; Sherpa 2010; Verma et al. forthcoming). Case studies from the region reveal that, on average, women in the western Himalayan region work from 16 to 18 hours a day (Jain 2010; Lama 2010; Hoermann et al. 2010, p 16). In migrant households, women's working hours have increased, on average, by 2 to 4 hours a day (Hoermann et al. 2010, p 16). Because of acute labour shortages, women-headed households where men have migrated are adopting strategies such as leaving agricultural land fallow and reducing the number of livestock, which eventually has implications for food security (Leduc 2011; Jain 2010; Verma et al. forthcoming).

Gendered Differences in Knowledge and Views of Biodiversity

Knowledge, preferences, and valuing of biodiversity resources are often highly gendered. As women's and men's roles differ, so do their gender-specific needs, interests, and knowledge. In their role as food producers and protectors of the environment, women tend to prefer to conserve genetic and species diversity in agriculture, wetlands, rangelands, and forests. In contrast, men are often concerned with converting these resources into cash (UNDP and FAO 2001).

Women, as custodians of indigenous knowledge related to seed production, selection, processing, storage, and exchange, maintain a diverse pool of genetic resources and contribute to their in situ conservation (Shrestha 1998; Oakley and Momsen 2007). Women make critical decisions related to seed selection based on distinct preferences for specific crop traits (Baniya et al. 2005; Kerkhoff and Sharma 2006). Women have been

identified as major decision-makers in seed selection for finger millet and taro in Nepal (Shrestha 1998; Baniya et al. 2005) and in seed management in Bangladesh, including the selection of crops and varieties (Oakley and Momsen 2007). Their preferences are based on size, maturity, and resistance to disease and pests. A study in the Andes showed that women and men have different preferences for maize varieties: while women grow different varieties of maize for special dishes needed for the family, men focus on the production of maize for sale (Chambers and Momsen 2007). The maize varieties preferred by women are the most suited to local weather conditions and the most nutritious.

Distinct gender differences in preferences also exist in relation to useful forest biodiversity. Women's preferences for various forest species are based on their multipurpose household uses, whereas men's preferences are more focused on timber production for cash and construction purposes (Byers and Sainju 1994; UNDP and FAO 2001). Aumeeruddy-Thomas and Pei (2003) found that women were more likely to describe wood species based on specific fuelwood characteristics such as heat and light producing capacity and the time taken to burn, while men's knowledge of wood species tended to be structured around their suitability for furniture making, thatching, and making sheds and shelters. These differences demonstrate that women and men prefer to use rangeland and forest resources and agricultural crops for different purposes, and these purposes are often influenced by their gender roles.

Indigenous knowledge associated with plant resources is also gendered, with men and women having different knowledge about species and their uses (UNDP 2007). In some contexts, women are more knowledgeable about medicinal plants for maternal health care and common and minor illnesses (Rijal 2008). Momsen (2007b, p 157) found that men farmers in the Peruvian Andes were less accurate than women in identifying species of potato cultivars, with men's out-migration for paid labour recently contributing to the gap in knowledge about plants between men and women.

Knowledge related to biodiversity management and use also varies between, and among, differently positioned men and women according to caste, ethnicity, class, age, life-cycle positioning, and marital status. Older Apatani women of India opt to select seeds and identify diverse varieties of paddy suited to varied soil conditions, whereas men and younger women tend to lack this knowledge (UNDP and FAO 2001). In the northwest part of the Swat District in Pakistan, women have a rich indigenous knowledge of medicinal plants. This is because 90 per cent of the medicinal herbs are collected by indigenous women and children (Hamayun et al. 2005). Women and children are the main actors in marketing of these medicinal plants, selling 71 per cent (UNDP 2007). In a study in the central Indian Himalayas, 52 per cent of women, compared to 26 per cent of men, were found to have knowledge of at least 30 indigenous health care practices (Samal and Dhyan 2006).

As stated earlier, biodiversity is a vital livelihood resource for indigenous peoples, which leads them to be more knowledgeable about the plants they use. For example, the Chepang, one of the most marginalized ethnic groups in central Nepal, have a profound knowledge of plants and use more than 200 plant species in their subsistence activities (Bhuju 2006). However, recent changes in demographics and belief systems have resulted in lower levels of this indigenous knowledge of medicinal plants among Chepang men, specifically young men (Rijal 2008).

In general, elderly people are more experienced in using plants with medicinal or religious value compared to young people. Women, especially older women, who are able to diagnose illnesses and identify appropriate herbal remedies, function as primary health care providers for their families and communities. Elderly women healers receive considerable prestige as a result of their healing abilities (Voeks 2007, p 17).

Because of their critical role in caring for sick children, the elderly, and other family members, women have to rely on a diverse gene pool of wild and domesticated plants and thus acquire a broader and deeper knowledge of important plants. Similarly, women farmers play a critical role in maintaining culinary practices because of their primary role in the kitchen; these practices can help to maintain and conserve agrobiodiversity. The important link between culinary practice and agrobiodiversity conservation, with implications for the socioeconomic status of women, is being critically threatened. Howard (2001) remarks that when culinary practices are lost, biodiversity is lost simultaneously; this leads to changes in women's position and status,

because in many regions biodiversity resources constitute the most significant part of women's wealth, providing them with food, medicine, clothing, shelter, utensils, and income. Hence, continued access to biodiversity resources is vital to women's status and welfare. As shown later, gender roles, responsibilities, preferences, and knowledge related to biodiversity are also linked to the degree to which men and women have access to, and rights and control over, biodiversity resources and associated localities.

Gender Power Relations, Localities, and Access to Biodiversity Resources

Gender differences in power relations exist in terms of biodiversity resources, localities at which women and men access biodiversity resources, and access to, ownership of, and control over biodiversity resources. Women and men use different places, and the same places differently, for their resource management activities and roles (Rocheleau and Edmunds 1997). There is an historical gender division of space whereby, in some contexts, men work in old-growth forests that are distant from settlements or engage in fishing, hunting, livestock herding, and timber extraction, while women work in small plots and in the management of local resources such as home gardens, swiddens, and other habitats relatively near the home (Chambers and Momsen 2007; Voeks 2007). Through the management of home gardens, women play a crucial role in the conservation of indigenous crop varieties and the provision of family nutrition and food security (Shrestha 1998; Kerkhoff and Sharma 2006). Homestead gardens also serve as experimental plots for women to try out and adapt wild plants, vegetables, spices, and indigenous species (Howard 2001, 2003; Aumeeruddy-Thomas and Pei 2003; UNDP 2007; Oakley and Momsen 2007). This again illustrates the important role women play as experimenters with indigenous knowledge and biodiversity.

Social relations are often shaped by gender relations which are influenced by caste, ethnic group, age, and other social identities (Lama and Buchy 2002). They govern access to, use of, and control over natural resources and shape differences and inequities among social actors (Currie and Vernooy 2010, p 4). Social and power relations in South Asia, particularly in India and Nepal, generally advantage high-caste women and exclude low-caste, socially marginalized women from access to certain resources, such as non-timber forest products, forage, fodder, and fuelwood, and from participation in decision-making processes related to the use and management of natural resources (Lama and Buchy 2002).

Gender differences in relation to rights and power relations also influence whether men or women have access to, and control over, biodiversity resources. For example, women in patrilineal societies in other contexts such as sub-Saharan Africa are not permitted to plant trees, since tree planting grants ownership rights to land, exclusively a man's privilege in many areas. However, women are allowed to harvest from trees (Verma 2001; Pfeiffer and Butz 2005: 244).

According to the historical gender division of space, women work in small plots and in the management of local resources such as home gardens, where they play a crucial role in the conservation of indigenous crop varieties and the provision of family nutrition and food security



Gender power relations and identities embedded in formal and customary institutions, and in the cultural context of a particular society, shape the type of crops women and men produce and on what type of land. While men's involvement is higher in the production of crops of economic importance, such as fruits and cereals, women engage with agricultural activities that are mostly for family consumption (Abdelali-Martini et al. 2008).

Gender Rights, Ownership, and Control over Biodiversity Resources

Gender-sensitive biodiversity conservation, sustainable use, and benefit sharing are influenced by rights, institutional (formal and customary) practices, land ownership, and markets. In most countries in South and Southeast Asia, property rights to land and tenure rights are controlled by men, through either formal or customary laws (Currie and Vernooy 2010). This affects men's and women's access to, and rights and control over, biodiversity resources. A woman living in a biologically rich mountain area might have access to private farm land, and to use or sell the produce from such land, even if she does not have legal ownership. In cases where land becomes scarce because of external forces such as climate change or the commercialization of agriculture, women may lose these *de facto* rights, because customary and sometimes statutory laws often do not permit women to own land. While land is usually the main source of economic livelihood, it is also an important source of power and status in agrarian systems (Allendorf 2007, p 1976). Losing land not only means a loss of income and food security, but also a loss of autonomy and a feeling of disempowerment (Otzelberger 2011, p 6).

In the greater Himalayan region, institutional practices strongly shape women's and men's access to, and control over, natural resources. Studies on gender issues in relation to the management of common property resources draw attention to the process of gender and social exclusion in the formation and operation of community forest user groups. For example, although women are the main collectors of herbs and wild vegetables from common property resources with controlled access, the majority of community forest user groups in Nepal and India are led by men, who mostly make the decisions related to forest conservation, development, and use, including the distribution of benefits (Agarwal 2001; Rai-Paudyal 2008; Nandigama 2009). Women, although included in the executive bodies of such groups, continue to lack a voice and influence in these decision-making processes (Nightingale 2002).

In the case of community forestry, for example, in addition to socioeconomic heterogeneity, gendered differences in power and status among forest users influence species preferences and the selection of trees. While tree species preferred by men and local elites, such as cash earning timber species, are often conserved in community forests, species preferred by disadvantaged groups as sources of food or fodder may be destroyed to increase production of more economically valuable trees. This power dynamic eventually changes the composition of forests, which may cause a reduction in biodiversity and diminish access to resources by forest-dependent users with limited influence (Shrestha et al. 2010).

Men's dominance is also common in customary institutions dealing with indigenous medicinal practices. For instance, in the greater Himalayas, indigenous healers such as the *amchis* and the *dhamis* are mostly men (Ghimire et al. 2004). Yet, as Momsen (2007b) points out, women play a primary role in providing low-cost medical care to poor households.

Biodiversity conservation and management practices are social processes in which women and men across various classes, castes, ages, occupations, and power groups are important actors in helping to conserve, manage, and use biodiversity in a sustainable way. Therefore, diverse elements of gender analysis such as gender roles, responsibilities, division of labour, gender relations of power, and rights, ownership, access to, and control over, biodiversity are useful in analysing the gender dynamics embedded in biodiversity conservation and management practices.

3 Analytical Framework and Methodology

To analyse the nexus between gender and biodiversity, it is necessary to bring together different approaches to analysing biodiversity and gender issues in a common and integrated framework of analysis. This chapter discusses the convergences between the different approaches, outlines the analytical framework developed for this study, and explains the methodology used to carry out the case studies.

Approaches to Analysing Biodiversity Issues

Literature on natural resources and conservation broadly discusses biodiversity from three main analytical perspectives: pro-nature, pro-people, and social justice. While the pro-nature perspective endorses the conservation of biodiversity through protectionism and the exclusion of people, the pro-people perspective promotes the inclusion and participation of communities in conservation practices. The former reflects the view that development is at odds with the protection of species and their habitats (e.g., Brechin et al. 2002, p 49), while the latter recognizes the importance of community-based conservation or community-based natural resource management.

The pro-nature approach tends to be similar to the 'classic approach' (Momsen 2007a, p 1) or 'fortress model' (Neumann 2005, p 129), which focuses on bio-physical activities in tackling environmental problems. This approach is often disconnected from socio-cultural, political-economic, gender, climate, and governance realities. The classic approach is largely a top-down approach with colonial roots and approaches to conservation that involve ambivalent to outright condescending attitudes to local people (Momsen 2007a, p 1). The pro-nature approach is based on the idea that biodiversity conservation can best be achieved by creating protected areas where ecosystems are allowed to function undisturbed by human activity (Neumann 2005, p 129).

In contrast, the community-based conservation or community-based natural resource management approach emphasizes the roles of resource-dependent communities and their potentially positive contribution to the conservation of biodiversity and other natural resources such as rangelands, forests, and wildlife. This approach is also referred to as 'people-centred', 'participatory', and a 'nature-society hybrid' of biodiversity conservation; it emphasizes the sustainable management and use of biodiversity to serve both conservation and development goals (Neumann 2005, p 139).

However, critics point out that the people-centred approach is inadequate in its consideration of gender and social differences within communities and in natural resource management (Lama and Buchy 2002; Buchy and Subba 2003; Buchy and Rai-Paudyal 2008; Khadka 2009). It usually treats community-based natural resource management groups as homogenous units, underestimating the diversity within them and the impact of this diversity on decision-making, resource management, and benefit sharing (Buchy and Subba 2003; Buchy and Rai-Paudyal 2008); it also fails to discern differences in gender, class, age, caste, ethnicity, marital status, and profession (Verma 2001; Mackenzie 1995a, 1995b) in shaping biodiversity management norms, customary laws, practices, and resource access.

The social justice approach to conservation, on the other hand, gives equal importance to people and nature. This perspective emphasizes that nature protection, or biodiversity conservation and management, is a human process in which the goal of biodiversity protection depends on the strength and commitment of social actors. The social justice approach considers biodiversity conservation as a set of socio-political processes and recognizes that problems of biodiversity conservation are contextual and solutions should be ecologically sound and socio-politically feasible; this approach also recognizes the importance of heterogeneity and the need to

ensure the equitable sharing of the benefits of development between men and women, who have distinct and different experiences, needs, interests, and power relations (Brechin et al. 2002, p 44–51).

The concept of social justice is closely linked to the concept of equity or fairness, which involves receiving a fair, but not necessarily equal, share of resources (Mahanty et al. 2006, p 6). In natural resource management, the idea of equity is concerned with ensuring that marginalized and excluded groups participate in natural resource management and share in the benefits of their use (Verma 2001; Lama and Buchy 2002; Buchy and Subba 2003; Malla et al. 2003; Nightingale 2002, 2006; Rai-Paudyal 2008; Buchy and Rai-Paudyal 2008). Such an approach is necessary to make community-based natural resource management gender and socially inclusive. Equity in community-based natural resource management has different dimensions, including ownership and access to resources, economic incentives and benefits, inclusion and representation, and participation and influence in decision-making. Equity can be between social groups within a community or between stakeholders at different levels or locations or from different generations (Mahanty et al. 2006, p 6). Equity also embraces elements of security of tenure and access to resources; stakeholder participation in decision-making and management; definition and defence of intellectual property rights; gender roles and rewards; and the sharing of benefits, including considering intergenerational ethics (Colfer 2005a, p xi).

As Colfer (2005b, p 5) argues, “certain sections of populations do not have the straightforward access to either resources or voice that is easily accessible to other parties”. Equitable ecosystems and biodiversity management can support social groups who lack a voice and access to, and control over, resources. Adopting a social justice and equity approach to biodiversity conservation can help to focus much-needed attention on women and other socioeconomically vulnerable and excluded groups. Such an approach can support transformative change in their livelihoods, provide capacity and decision-making opportunities, and develop leadership potential in natural resource and biodiversity management in the greater Himalayas. This study takes the view that the gender analysis of biodiversity conservation and management is key to social justice and improving the wellbeing of women, men, and children in the greater Himalayas. Accordingly, this study, takes a gender transformative approach, which closely mirrors the social justice approach.

Gender Analysis of Biodiversity Conservation and Management

Studies on the socio-political dimensions of environmental and natural resource management are best investigated through a political-ecology approach that stresses the importance of understanding human-environment relations (Bryant and Bailey 1997) within natural resource management.

Many political ecologists have emphasized the importance of gender relations within households and communities as a central part of social and cultural relations (Nightingale 2003). Feminist political-ecology investigates the gender dimensions of environmental resource management (Rocheleau 1995; Rocheleau and Edmunds 1997; Schroeder 1999; Verma 2001, 2009; Nightingale 2003; Westermann et al. 2005), demonstrating that gender is an important element in influencing access to resources, knowledge, and control over resources. According to these scholars, there are differences in access, control, and rights over resources according to gender, which cut across other domains of difference such as class, caste, ethnicity, age, culture, and life-cycle positioning. Nightingale (2003, p 529) further argues that social relations, including gender, in natural resource management are reflected not only within households and communities, but also at national and international levels.

This study examines broader issues of gender and environment by placing them distinctly within a political-ecology framework, thereby allowing an analysis of the relation between power and knowledge and of the way that struggles over material resources are simultaneously struggles over cultural meanings (Verma, 2009; Moore, 1996, 1993; Carney, 1996; Carney and Watts, 1990; Schroeder, 1995; Berry, 1997, 1989).

This study thus adopts a gender-based post-structural, political-ecology approach (see for example, Leach 1991; Mackenzie 1995a, 1995b; Moore 1993, 1996; Carney and Watts 1996; Schroeder 1995, 1999; Verma 2001, 2009) in analysing biodiversity conservation and management issues. The analytical framework is grounded in everyday natural resource management and the political-economic and socio-cultural realities

that exist in mountain contexts. Such an analytical framework places importance on gender as one domain of difference, while recognizing that it overlaps with other domains such as class, age, life-cycle positioning, marital status, caste, and ethnicity. Multiple and co-existing domains of difference produce different positionalities, which influence women's access to, and control over, natural and biodiversity resources. Access to, control over, and ownership of natural resources such as biodiversity resources and land are negotiated within and between households, and therefore gender and household relations are a focal point through which the relations of production are studied. Most importantly, the gender relations of production are culturally specific and characterized by different relations of power between (and among) women and men across different mountain contexts (Mackenzie 1995a, 1995b; Verma 2001, 2007, 2009).

Women and men continually negotiate, contest, and resist power relations in various ways. Hence, one important focus is on the micro-politics of women and men's struggles over access to productive resources and the symbolic contests that constitute those struggles (Moore 1993, p 381, 1996, p 126). Such an approach explores how these struggles and contests are shaped by, and shape, broader political-economic, historical, and socio-cultural relations (such as entrepreneurship, governance, kinship relations, social networks, and collective action) (Verma 2007, 2009). Central to this approach is a focus on the ways that development, the market, the state, customary institutions, culture, global forces, and multiple regimes of property rights affect natural resource and biodiversity conservation management practices (Verma 2007, 2009; Carney 1996, p 165; Moore 1993, p 381, 1996, p 126).

Recognizing relations of power and how they are inseparable from knowledge production is critical to understanding the gender dimensions of biodiversity conservation and management. Who is included in research and knowledge production and who is excluded says a great deal about how the field of analysis has been constructed. While women may be marginalized from centres of knowledge production and in accessing, controlling, and using biodiversity and other productive resources, they are not powerless actors. Many bodies of literature, including the case studies in this publication, have documented the creative and powerful ways that women negotiate, contest, resist, and create room to manoeuvre in their struggles over biodiversity resources (Mackenzie 1995a, 1995b; Verma 2007, Nellemann et al. 2011). Women's agency, creativity, resistance, and activism must be recognized.

Some of the most important areas of gender analysis in this study focus on gender roles and responsibilities; the gender division of labour; gendered preferences, knowledge, power, and localities; and access to, and control over, resources. In terms of biodiversity conservation and management, women and men in the greater Himalayas interact with biodiversity in various ecosystems and landscapes differently in order to fulfil cultural, spiritual, environmental, and livelihood needs, as shown by the case studies in this publication. The focus on gender analysis in biodiversity enables development practitioners to implement local resource management practices and innovations that address women's and men's specific gender needs and constraints (Leach 1991; Rocheleau and Edmunds 1997; Verma 2001; Westermann et al. 2005). Although natural resource management researchers and policymakers are aware of the importance of gender issues, research is most often gender 'blind' (Fajber 1999; Currie and Vernooy 2010). Researchers mostly employ households or communities as units of analysis and seldom deconstruct changes in gender power relations among those units (Fajber 1999).

Post-structuralists argue that households are complex and variable and do not exist in isolation from other institutions and relations (Verma 2001). Evans points out that "households are often shifting, flexible structures in which boundaries are difficult to discern" (Evans 1991, p 54). Indeed, the sheer cross-cultural diversity of household forms almost defies definition, and this diversity extends to various aspects of households (Verma 2001). For instance, family and household composition, and the ways in which social relations are mediated through kinship, marriage, and other social institutions, all create a variety of conjugal and residential arrangements (Evans 1991, p 54). Berry (1984, cited in Carney and Watts 1990, p 217) argues that the household should be treated as a point of departure for gender analysis. It is a socially constructed concept, hence its activities may not have a single locus, and any one locus does not necessarily represent a single unit of labour or resources (Roberts 1991, p 62). Nonetheless, the household remains a valuable concept for exploring the effects of different gendered interests, options, and social relationships in the management of natural and biodiversity resources.

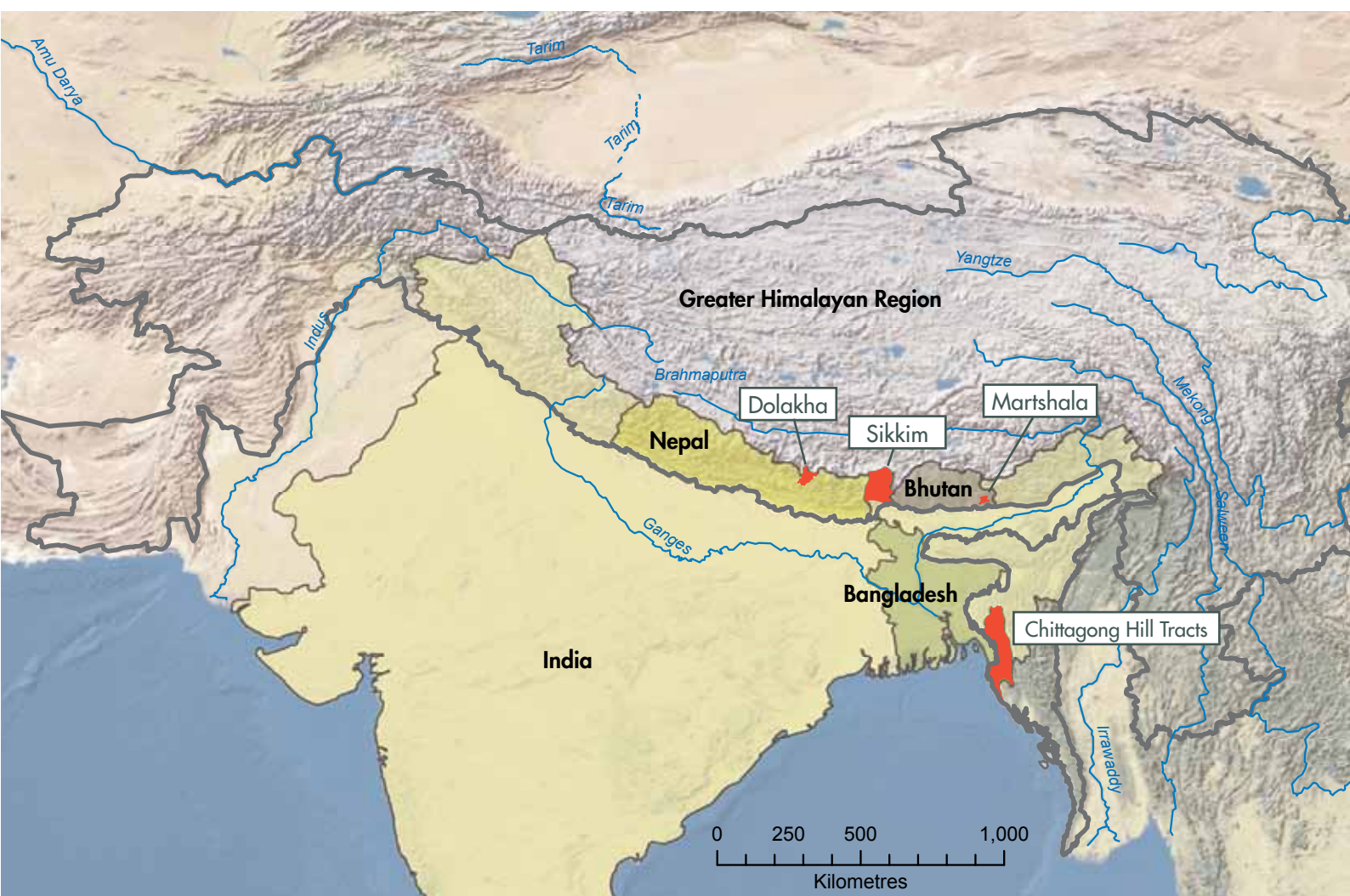
Case Study Methodology

The primary data for this study are drawn from six case studies on the gender dynamics of biodiversity conservation and management conducted in 2010 in Bangladesh, Bhutan, India, and Nepal (see Map). The case studies describe how men and women participate in various forms of land management and delineate their contributions to the conservation of various species, genetic resources, and ecosystems. The case studies outline gender issues and provide evidence of the importance of women's participation for effective and sustainable biodiversity conservation and management in the greater Himalayan region.

The case studies were selected to explain the socio-cultural and context-specific gender dimensions of biodiversity in diverse ecosystems with different land use arrangements, including those characterized by agriculture, community forestry, swidden cultivation, and state-managed forests. The case studies describe the indigenous knowledge and biodiversity conservation and management practices of several indigenous groups from the four countries involved, including communities from both the Tibeto-Burman and Indo-Aryan language groups.

The research is primarily qualitative to allow for a detailed understanding of the complex phenomena involved (Yin 1989). Survey data were collected in in-depth individual interviews and focus group discussions, to explore why and how men and women farmers and indigenous peoples engage in biodiversity conservation and management practices in diverse ecosystems in mountains. Such a predominantly qualitative approach provided a way to describe and analyse gendered experiences and everyday practices in biodiversity conservation and management. The narratives of respondents were documented and analysed to reveal patterns regarding gender roles, knowledge, interests, and strategies.

Case study areas



Five researchers (three women and two men) collected data for the case studies and interviewed men and women in various field sites. Engaging women in the fieldwork addressed limitations in previous research, which often failed to ascertain the perspectives and experiences of women because of lack of gender sensitivity in the research design and implementation. Male researchers can face difficulty in data collection because access to information on women's daily life and realities in most rural agricultural societies in the region is restricted by cultural norms (Oakley and Momsen 2007).

In addition, in the past, much data collection was based on information provided by male 'heads' of rural households, excluding the perspectives and experiences of women in those households (Chambers and Momsen 2007, p 42). To prevent such exclusion, each case study included in-depth interviews with both women and men in the case study areas.

With an overall focus on biodiversity conservation and management, the interviews with local men and women focused on gender interests, knowledge, strategies, and roles; changes in indigenous knowledge; gender roles and responsibilities in different ecosystems such as agricultural lands, forests, and rangelands; and benefit sharing for men and women. In addition, key informant interviews with government officials and project staff responsible for implementing biodiversity conservation programmes at the grassroots were undertaken.

The original names of all respondents have been changed in this publication to maintain confidentiality.

Part 2

Case Studies: Highlighting Gender Knowledge and Strategies



4 Women as Key Managers of Biodiversity in Shifting Cultivation in Bangladesh

Tuku Talukdar, Green Hill, Bangladesh

This case study describes the roles played by indigenous men and women in shifting cultivation in the Chittagong Hill Tracts, Bangladesh, and how these roles relate to biodiversity conservation and food security for household members. Shifting cultivation, alternately referred to as swidden agriculture, and locally known as 'jhum' cultivation, is an indigenous agricultural practice by which indigenous peoples in upland mountains derive their livelihoods while conserving a variety of agricultural and forest crops. Mertz et al. (2009, p 261) defines swidden cultivation "as a land use practice that employs a natural or improved fallow phase, which is longer than the cultivation phase of annual crops, sufficiently long to be dominated by woody vegetation, and cleared by means of fire". Upland rice and maize are the main staple crops grown in swidden agriculture in Bangladesh, followed by banana, cassava, and other annual or perennial crops.

Shifting cultivation is major factor in biodiversity management in the Chittagong Hill Tracts. For example, the domestication of wild crops through jhum has resulted in almost 12 species of *Dioscorea* being grown in the region and a wide pool of products being made from plants grown as per the ecological habitats and seasons of the area (Aumeeruddy-Thomas and Pei 2003). Shifting cultivation has allowed for the conservation, maintenance, and management of a huge pool of diverse genetic resources (Aumeeruddy-Thomas and Pei 2003; Kerkhoff and Sharma 2006), which is of great significance to local people, and globally, in adapting to climate change.

The Chittagong Hill Tracts lies in the southeast of Bangladesh and comprises three hill districts, Rangamati, Bandarban, and Khagrachari. With approximately 1.4 million people, the region is home to 11 indigenous peoples or ethnic groups: Chak, Bawm, Khumi, Khyang, Mro, Lushai, Pangkho, Tanchagya, Tripura, Marma, and Chakma. Each group has its own language, culture, and belief system. These indigenous peoples are agriculturists, primarily practising subsistence farming with limited cash crop production. They are among the poorest and most marginalized in Bangladesh, both socially and economically, and traditionally depend on jhum cultivation for their subsistence.

Although there are no reliable research findings or actual data available on the number of people and areas involved in jhum cultivation, a rough assessment by non-government organizations working on food security and livelihoods in the region estimates that 20 per cent of Chakma, 40 per cent of Marma and Tripura, and 80 per cent of other indigenous groups engage in jhum cultivation. The principal crop in jhum is rice. Vegetables are grown together with rice, supplementing the family diet as well as providing subsistence income. Women's roles in producing and marketing vegetables are comprehensive with primary responsibilities elaborated below.

Gender Roles

The shifting cultivation cycle includes a series of activities and processes. Both men and women perform these activities by playing multiple roles in different periods; however, women have more roles and a greater labour

burden than men (see Table 1). Men and women perform these activities collectively, in gendered groups, and individually, depending on the nature of the work.

Table 1: Activities, tasks, and gender roles in shifting cultivation

Activity	Period	Task	Gender roles	
			Men	Women
Preparing meals	December–January	Rise early in the morning and prepare a meal for the men, who will go far to select the plot for jhum cultivation. Pack cooked rice and curry in banana leaves and prepare water in a bamboo pot.		√
Selecting jhum cultivation plots	December–January	Select a potential jhum site and cut trees and grass to mark the site. Conduct a joint strategic consultative meeting among different families to decide which family will cultivate which (and what size) land.	√	
Cutting	January	Cut small trees and bushes using new knife ('da') and axe. Big trees are not cut. Women are involved only when there are no men in their household.	√	√
Drying	February	Leave jhum plots to dry in the sun.		
Burning	March	Burn dry weeds, small trees, and grasses carefully so that fire does not spread to neighbouring plots.	√	√
Cleaning weeds	March	After 1 day of firing, clean burnt weeds and cluster unburnt weeds and burn again.	√	√
Making jhum house	April	Construct jhum house using timber, bamboo, and flax.	√	√
Planting paddy with other crops	April–May	Mix cotton, cucumber, white pumpkin, and potato seeds with paddy seeds and plant in small holes dug by a piercing da.	√	√
Cleaning hay	June	Clean hay using malia practice in which men and women, boys and girls work together to finish the work quickly. The malia practice is also applied in other social activities when the task is too difficult for one person or household to handle.	√	√
Weeding and cultivating jhum	June–August	Weed jhum 3 times to ensure that planted seeds are properly grown.		√
Cutting jhum rice	September	Harvest jhum rice using sickle ('kachi'/'chari')	√	√
Making bung (to store rice) in jhum house	October–November	Make a 'bung' (container) out of a bamboo mat in which to store rice.	√	
Transporting and storing rice	November	Carry rice in 'thurung' (cane basket) and store at home.	√	√
Collecting cotton, potato, pumpkin, brinjal, chilli, cold potato, and arum	November onward	After harvesting rice, collect other produce including cash crops gradually, one by one. Carry produce in thurung and store at home.		√
Selling agro produce		Sell produce at local markets.		√
Planting fruit in fallow jhum		After harvesting rice and vegetables, plant different fruit saplings.	√	√

Seed Preservation and Agrobiodiversity Conservation

Women in particular play a critical role in seed production, seed storage, and the maintenance of genetic diversity. Their indigenous knowledge and techniques for seed preservation are transmitted through an intergenerational learning exchange process. They practise an underground seed-storage technique in which rice, ginger, and turmeric are stored for one year. To preserve the better quality seeds, women dry them in the sun using a 'kula' (round-shaped carrier made from cane used for winnowing rice and husking paddy) and 'talai' (a spacious mat made from cane, mainly used for drying paddy, ginger, turmeric, and arum) and put them in an airtight bottle sealed by pieces of cloth. In the past, women grew numerous varieties of rice and many species of different plants. Recently, the number of indigenous varieties of rice and plants grown has been reduced because of their lower productivity and limited availability. Women grow sesame, mustard, chilli, brinjal, cucumbers, sweet gourd, white gourd, beans, maize, ginger, turmeric, bananas, ladies fingers, and cotton.

In the village, women exchange seeds in order to have access to a variety of crop seeds. Before selecting the seeds for jhum cultivation, women collect information about the availability of seeds in the village. Seeds, seed tubers, rootstocks, and various other genetic materials are exchanged with other households, together with the knowledge for their proper storage and cultivation. Women also grow marigold flowers, which act as an insecticide, and leguminous plants, which help to improve soil fertility. In the past cotton was grown in jhum fields as a cash crop; however, changes in lifestyle, preferences, and a lack of sufficient labour and equipment to weave clothes mean that only a few women grow cotton now.

Access to Resources and Mobility

Shifting cultivation has had a significant influence on the ability of indigenous women to access resources and information, which has affected childcare, health, mobility, food security, and social recognition. In the past, women went to the jhum field early in the morning and left their children at home with other family members. More recently, women are spending more time caring for their children: they return from the fields earlier to care for their children and take them to a health service centre when sick. Increased women's awareness through greater access to information and markets is supporting childcare.

Likewise, women used to rely on herbal medicines to treat illness because of the inaccessibility of health services in the village. A local expert on indigenous medical practices, called a 'vaidya' or indigenous healer, could identify many medicinal plants, and women would prepare medicine for their children in consultation with this healer. Nowadays, most women, except for the inhabitants of very remote areas, have access to medical services and can afford to pay for such services with the income generated by jhum.

Women in the region are primarily responsible for household food security. As a result, they engage in shifting cultivation mainly to produce food for their households. Surplus produce is sold in local markets. In the past, indigenous communities made their own clothes on a back-strap loom using cotton grown in the jhum. Women collected cotton and spun it on a spinning wheel at home. They dyed the yarn using natural dyes from sap, leaves, and bark. Nowadays, only some households make their own clothes, preferring to buy readymade clothes from the markets.

Women feel that their increased mobility and access to local markets is an advantage of shifting cultivation. The sale of jhum products, which was traditionally a role played by men, is now undertaken by women. In the past, social barriers, long distances, remoteness, and very limited access to public transport constrained women from exposure beyond their household. This situation has changed, and women are now the main sellers of jhum produce at local markets. Men have supported the change in roles with a positive attitude and by sharing in household chores. As a result, indigenous women now have access to cash income from the sale of jhum products, which they spend on clothes, fuel, salt, and other commodities that are not available in their village. Women also think that their access to health services is increasing because of the income raised through shifting cultivation.

An indigenous woman explains the change she experienced because of jhum cultivation:

I came here with my parents after the construction of the Kapatai hydroelectric project. There was dense forest all round at that time, now this forest is decreasing. I learnt the method of jhum cultivation when I was 10 years old; not only me... all of the girls, as soon as they were capable of working with a 'tagol' (knife). I am still involved in jhum cultivation. I did not get an opportunity to go to school. Nowadays, our daughters are getting this opportunity. I do most of the work in the jhum field and sell jhum products at the local market, which was not possible in the past. My husband allows me to go to market and buy necessary things for the household. (Field Note, 10 July 2010)

Participation in Forest Management

Apart from jhum, women also participate in indigenous forest management practices in 'village common forests'. These practices are based on their indigenous knowledge of resource management in which they retain forest cover within the village for long-term use under the leadership of the 'mouza head' (customary village leader). There are an estimated 110 village common forests across the region, the size of which varies from 20 to 122 ha. The villagers, after taking permission from the village head, collect forest resources as required to meet their household needs. Commercial exploitation is banned in village common forests. The village forests generally have good forest stocks and are a valuable habitat for wild animals and birds. In accordance with local beliefs, wild animals are not hunted in these forests during breeding seasons. These forests also play an important role in maintaining watershed functioning. Indigenous peoples believe that littering in water is a sin from a religious point of view.

Gender Issues

Although women contribute substantially to biodiversity conservation, as well as household food security, through shifting cultivation, they experience some gender issues. First, men make all of the formal decisions over the use and management of jhum because of their social position as head of their households.

Second, the government's land use policy has led to the replacement of shifting cultivation with horticulture, plantation, and settled agriculture, which has facilitated opportunities for men to earn income. Extension practices for agricultural production is very top-down and not gender friendly. Women lack access to agricultural extension services, as most information on the use of chemical fertilizers and pesticides and technical training goes to men. The use of shifting cultivation land by the government (e.g., land grabbing by the army and for the settlements) has drastically reduced the land available for jhum (Dewan 2012). This is one of the reasons identified for the decreasing production of rice and other crops women are directly involved with. People have observed significant declines in rice production. Currently, only a few families have produced rice sufficient for 12 months. It is reported that 50–100 years ago production would have been sufficient for 18–24 months.

Third, the jhum cycle has also decreased from 5–10 years to 1–3 years. Jhum cultivators who used to grow many other varieties of produce and cash crops along with rice now have only a few products. This has reduced women's access to crops with nutritional and cultural value.

Soil improvement techniques used in jhum cultivation are changing drastically. Some decades ago, people did not use chemical fertilizers and production was sufficient for family needs. The use of chemical fertilizers to increase agriculture production from the increasingly limited land is widespread. However, women have reported that the soil is becoming very hard because of the use of chemical fertilizers, making cultivation more difficult. Women are aware of the use of organic fertilizers such as cow dung, which is environmentally friendly and results in more production than chemical fertilizers. They want to use more organic manure; however, supply is inadequate.

5 Women's Roles in Wild Yam Conservation, Management, and Use in Bhutan

Yeshey Dorji, Bhutan

The importance of wild plants as a food supplement and means of survival during times of drought and famine is generally underestimated. Consumption of wild food is common in biodiversity-rich rural areas of Bhutan – a country distinguished for its matrilineal society which grants women inheritance rights and privileges not found in most of South Asia. Rural people have significant indigenous knowledge concerning the conservation and sustainable use of wild plants. Women are the key sources, or reservoirs, of plant lore and knowledge.

This case study explains gender differential roles and needs in the conservation and use of wild yam, *Dioscorea* spp., locally known as 'borang jogtang' (literally 'wild potato'). Women gather it, providing food security at times of food scarcity caused by drought and other hardships. The study was conducted in the Monpa community, in central Bhutan, and Martshalla village in eastern Bhutan. These communities are indigenous users of wild yams and live and rely on it as supplementary food for 4–5 months, from May–June to September–October, depending on availability. During May–September, people experience a shortage of maize, their staple food. Two reasons are identified for the shortage of maize during these months. First, more than 40 per cent of the total maize produced is used to brew 'ara' (local wine). Brewing ara is a social obligation and is needed for socio-cultural activities carried out in households and communities. Second, post harvest, a large quantity of the maize stored at home is destroyed by insects, while maize kept in storage in the fields is attacked by monkeys and other wild animals.

The collection of wild yam as a source of food is decreasing in Martshalla village, which is modernizing and has access to many imported food items. Only a few people continue with the tradition of collecting the yam tubers. This is in contrast to the Monpa community, where wild yams continue to play an important role in food security.

Wild yam (*Dioscorea bulbifera*)



Securing Food Through Wild Yams

Women are the principal collectors and users of wild yams in the study areas. According to a 56-year-old woman in Martshalla village, who was responsible for collecting wild yams when she was young, there are socioeconomic, technological, and environmental reasons why Bhutanese women collect and use wild yams.

First, for rural women, wild yams constitute the main source of household food security. Ensuring food in the household is women's primary responsibility in rural Bhutan. Men often take part in off-farm activities such as working as wage labourers, mining stone quarries, and logging.

Women are not confident that this ensures the household's food security, and, therefore, they themselves search for food and conserve wild yams. Second, women's lack of income limits their potential to engage in small enterprise, such as buying threads for weaving clothing in their leisure time. As their leisure time coincides with the period when they have no food, during mid-March to mid-June, women collect wild yams. Third, though other work may earn more income – for example, timber harvesting – collecting wild yams is less labour intensive. Finally, the easy access to wild yams and herbs from forests adjacent to their villages allows women with children to return home to care for them. Therefore, women want to protect forest plants and wild yam creepers in nearby forests for sustainable use.

Indigenous women in the study villages use five species of wild yams. Four of the five species are widely consumed: *D. oppositifolia* and *D. bulbifera* are the most widely used, followed by *D. Hamiltonii* and *D. Wallichii*. The least used species is *D. hispida* which has an intoxicating effect similar to alcohol. They often avoid consuming this tuber. If they do use it, it is usually soaked in running water for a week before cooking in order to remove the intoxicant. Some species of *Dioscorea* also possess medicinal properties and are used by local indigenous health care practitioners as stimulants, tonics, carminatives, and expectorants. Women use *D. bulbifera* as a medicinal plant. The availability of the various species of wild yam varies from one to three months. For example, *D. oppositifolia* is available pre-monsoon in May and June, while *D. hispida* is available at the end of the monsoon in September and October. In between, other species are available intermittently. Staggered collecting provides food over a considerable period of time. Yams are locally named according to their taste, shape, and texture and are identified on the basis of their colour, size, shape, fibre content, and cooking properties.

Women prepare yams as a main course, or include it while preparing curries or sour dishes, generally after boiling. Sometimes women barter wild yams for other commodities with neighbouring villages. One kilogram of yam tubers may be bartered for 500–700 grams of rice or finger millet. Women also give tubers to friends and neighbours as gifts if there is a surplus. Women ritually offer the cooked yam tubers to their deities before serving them to family members. Wild yams are also used for social and cultural events. For instance, women and children collect yam tubers to serve as one of the main dishes for the New Year gathering.

Collective Action in Gathering and Sharing Wild Yams

Most of the time, family members decide to collect wild yams together. Normally the collecting group consists of men and women of different ages, varying from 15 to 60 years old with the majority between 20 and 40 years old. The quantity of tubers collected per expedition varies from 3 to 8 kg. Tubers are collected and stored in bamboo baskets. If women are in a group without family members, they employ a collective approach to collect and distribute the wild yams. Unlike in the Monpa community, women and girls in Martshalla village often form a group of two or three, leaving the village in the morning and returning by early evening.

Since there are risks to collecting wild yams, women choose to work collectively. These risks include wild animals, leeches, insect bites, snakes, sinkholes, and falling tree limbs. Women enter the forest in a group and then divide into pairs, sharing roles. Sometimes, some pairs cannot find wild yams and return empty-handed. In such cases, those who found tubers share them.

Women are aware that creepers younger than 3 years yield only about 3 to 4 kg of wild yams and don't find it worthwhile to dig out tubers. They therefore try to find creepers over 8 years old. After guessing the age of the creepers to be about 8 years, the process of digging and scooping soil begins, in which women, again, share roles. They clear vegetative ground cover about 0.3 m from the roots of the creepers. Using a 'chakku' (hoe), they dig a pit. A 'khesow' (small bamboo basket) is used to scoop soil from the pit. Usually a pit measures 1.2 by 1.5 m on the surface. Pit digging is carried out turn by turn to ensure that no one tires quickly and to ensure that one person is on guard for wild animals. Pit digging continues till the last piece of the tuber is retrieved. In a spot that has a thick soil profile, the depth of a pit could go down to 1.5 m. When the tuber is about 12 to 15 cm long, it is snapped and handed over to the partner on the ground. Digging is continued till the tail end of the tuber is retrieved. While her partner is digging, the woman on the ground cleans soil off the tuber making sure

that the skin is intact so that no air enters the cut ends. On average, the time required to dig a pit free of stones and tree roots is around one and a half hours. The collected wild yams are shared between the members of the group.

Indigenous Knowledge in Wild Yam Food Preparation

Women look after the entire process of yam preparation, both cooking them and distributing them among family members. After examining the quantity and palatability of the tuber, they decide which method of cooking to use. If the quantity is large and the taste is good, they boil the tubers for the main dish, to be eaten with finger-millet gruel. If the quantity is low and the taste is average, they prepare the yams as a curry to be eaten with cereals (maize, rice, or millet). On average, one family can consume about 2 kg of tubers in a meal.

Preparing *Dioscorea bulbifera* tubers requires a longer, more complex process to make them edible. First the tuber is washed and boiled along with its skin. The skin is then peeled and the tuber is cut into slices and kept overnight in a basket in running water. The next day the tubers are boiled again and eaten.

Gender Indigenous Knowledge and Strategies for Wild Yam Conservation

The indigenous knowledge held by women and men helps in conserving the wild yam's genetic resources in their natural habitats and helps in selecting the preferred wild yams depending upon their availability, taste, size, shape, and medicinal value. Men and women, both young and old, know a lot about wild yams, but women, because of their experience in field collection and in preparation, have a greater practical knowledge. Women can identify a yam species by looking at the leaf sheath colour and the presence or absence of thorns. They decide the best time for collecting tubers based on leaf characteristics: they collect tubers either before the leaves are formed or after the leaves become dry. The tubers apparently do not boil properly after the leaves have grown.

Most adult women can recognize various creepers of wild yams. According to one woman from Martshalla village, there are two types of creepers. One type has a darker stem and a darker shorter leaf. The internodes of the young shoot of this creeper are short. The tuber of this creeper is soft and sweet. The other type of creeper has an elongated, lighter coloured leaf, and longer internodes on the shoot with long prickly thorns. The tuber is yellowish and has more fibres and long thick hairs. This species is locally known as 'fhi-dang jogtang' and is collected only when there are no other species available for collection.

Although wild yam is a life-saving commodity, there are no real institutional or policy measures to protect or conserve it. Everyone is free to harvest tubers in the state forests. However, as they are responsible for collecting the tubers, women have adopted certain rules with regard to their collection on private land. As an example, women do not allow tubers to be harvested from their own land, and it would be a public issue if anyone dishonoured this agreement. While such a restriction ensures the availability of food at times of severe food shortage, it also avoids the digging of pits which are problematic when the land is brought under cultivation. Women restrict people from other villages from collecting the tubers in the forests that lie within the indigenous boundary of the village. Moreover, they restrict cattle grazing from other villages in the forests. To save the young vines, women inform cow herders to be careful not to cut them. Women collectively decide on fines for those who violate these customary rules.

Women avoid felling or wounding trees with yam vines. They consider it inhumane, and even dead trees with vines on them are not cut down. Men are also discouraged from cutting such trees for timber. Those vines in marginal areas that infest huge trees are left as 'mother vines', and most of the women in the village know that these vines are being nurtured as such. These conservation strategies, along with changes in people's lifestyle (e.g., access to more cereal crops and income), have contributed to regeneration and abundant populations of yam vines in the nearby forests. The proper management and harvesting of this resource offers women good potential for a sustainable source of cash income and food for subsistence needs.

6 Culture, Natural Resources, and Biodiversity: Women's Crucial Knowledge in Yeast Production in Bhutan

Yeshey Dorji, Bhutan

Rural life in Bhutan depends greatly on the bounties of the environment and its natural resources. The small farms, and natural resources around them, meet many of the daily needs of people in rural areas. There is a cultural association with nature and these natural resources, and thus social and cultural norms are intricately linked to age-old beliefs and indigenous practices regarding their use. This case study explores the close relationships between culture, natural resources, gender, and biodiversity, based on an analysis of the indigenous knowledge and practice of women in yeast making. Yeast, produced locally using a combination of plants and grains, is used in fermenting alcohol, which plays a central role in Bhutanese culture. It is of particular importance to women, who play critical roles in producing and using yeast for fulfilling social obligations.

Cultural Beliefs

Aum (honorific for elderly women) Sangey Dema lives in Mongar, a village in eastern Bhutan. Her son, Pema, 16, completed high school at Mongar Higher Secondary School and must attend a college in another district. Whether Pema will be admitted to the college and whether he will do well there depends not merely on the good academic scores he has achieved. The local astrologer has recommended a religious ceremony to appease the local deities, Pema's karmic stars, and the gods of four directions, in hopes of increasing the chances of his admission to and good performance at the college.

Ap (honorific for elderly men) Tshering, Pema's father, requested that the local monks perform the event, which would take two days. The family is busy preparing. Significant costs for the event include drinks to be offered to the gods, monks, and guests. Aum Sangey estimates that she has an adequate stock of home-brewed drinks to cover the whole event. She spent two days distilling the famous local ara (homemade wine) and bottling 'singchang' (beverage extracted before 'ara' distillation). Based on experience, it made sense for Aum Sangey to be well prepared.

Ara (Local Wine): Cultural and Social Values

Alcoholic beverages are an important aspect of any social and cultural event in the countryside. There is no stigma attached to alcohol use. The usual barriers and deterrents to using alcohol inherent in other societies are not as apparent in Bhutan. Alcohol is a part of almost all social occasions, including childbirth. Bhutanese babies are introduced to alcohol soon after birth. Starting with the celebration of a newborn, a special homemade rice-based fermented drink called 'chhangkhoy' is served to entertain well-wishers and to nourish and sedate the mother.

During social gatherings and celebrations, alcohol increases the sociability and enjoyment of guests. For different occasions alcohol is called different names such as 'tshogchang', 'zomchang', and 'phebchang' (welcome drink); 'lamchang' (parting drink); 'tochang' and 'shechang' (drink with meals and after, respectively);

'jhachang' (drink after tea); 'tashichang' and 'tendechang' (drink to celebrate joyous occasions); 'menchang' (drink for sick people as a medicine); 'zhengchang' and 'zimchang' (drink after getting up in the morning and to induce sleep just before going to bed, respectively); and so on.

Even during the game of archery, when people (mostly men) shoot arrows between targets that are 145 m away, alcohol is consumed. It is also traditionally served during archery competitions. Alcohol is also commonly a part of religious events, for example when offered to the deities by a spiritual practitioner in the practice known as 'serkem' or by a group of people in 'marchang', or used in the Buddhist empowerment ceremony called 'dhuetse'. Alcohol is also provided by friends and families during mourning to pay condolences to the bereaved as a mark of sharing grief. Hence alcohol has a significant place in the lives of Bhutanese from birth to death, morning to evening, and for almost all occasions. The Bhutan Living Standard Survey (2007) estimates that alcoholic beverages comprise 4.8 per cent of mean monthly per capita food consumption expenditure in rural Bhutan. However, most of such needs in rural areas are met from homemade ara and singchang.

Natural Resources and Women's Knowledge in Yeast Making

Their coexistence with the natural world over centuries has enabled the Bhutanese to learn and accumulate knowledge on the use of nature and natural resources for subsistence and cultural purposes. Yeast, produced from a combination of plants and grains, is used in fermenting alcohol from a substrate of maize or buckwheat, rice, millet, various fruits, and so on.

Indigenous homemade active dry yeast, called 'phab' (in central Bhutan), 'phow' (in western Bhutan), or 'pham' (in eastern Bhutan), is a dehydrated yeast formulation used as a catalyst in fermenting the substrate for homemade alcohol production. These formulations are mostly found in the form of dried cakes which contain dehydrated yeasts that are dormant but which become activated when added to a sugar- or starch-based substrate. They are also often available in local vegetable markets in the form of dried cakes. Yeast produces enzymes that break down sugar into alcohol and carbon dioxide. Women play an important role in alcohol making by ensuring the right temperature conditions, the quantity and quality of the substrate, and the proper introduction of active yeast.

Women are the primary producers of yeast in Bhutan. Their art and tradition of making yeast reflect the extent to which women use and manage non-timber forest products. They use many plant species to make the yeast. In Mongar, women mostly use the locally available plant called 'yangrem'. Various parts of the yangrem plant, a flowering bush, are minced, cleaned, and boiled. Once the minced plant materials are cooked, they are mixed thoroughly with maize flour, or another grain, and seed yeast to form a dough. In some places, for example Bumthang, buckwheat flour is used instead of maize. Hence, the process also depends on the local conditions and availability of materials.

The dough is then shaped into cakes of different shapes, mostly flat circular cakes, and kept warm overnight. By the next morning the yeast cakes are ready to be dried. They are kept in the open air and flipped several times until they are dry. In the entire process, no measuring instruments are used. Measurements are all taken through only observation and touch. This clearly takes a lot of practice and experience. Aum Sangey, for one, has never spoiled her yeast cakes. The indigenous knowledge necessary for assessing the moisture content in yeast is passed on to children, as has been done by Aum Sangey's mother to Aum Sangey. The only problem is that Aum Sangey has no one to pass the practice on to as she does not

Locally made dried yeast cakes



have a daughter, and her son, Pema, is not interested in farming. After completing his education, Pema aspires to work in a non-farming sector in an urban area. This raises issues of knowledge continuation for the next generation.

Conserving 'Yangrem'

Botanical publications use the local name of the principal material, 'yangrem', used by rural women, to represent several species such as *Leucosceptrum canum*, *Polygala arillata*, and *Eupatorium mairei*. They use yangrem in yeast making and harvest these materials only when needed, about once every two years. Knowing the value of the plants for yeast making as well as for fodder, women conserve the plant resources as common property. Yeast making, which is possible through the plant, may also provide a small additional income to rural women. Therefore, women emphasize the sustainable use and conservation of yangrem.

Aum Sangey explains that there are other plants used in yeast making as well. One is the dried bark from what she calls the 'rigay' (locally called 'sharchop'), a climber found in Karbi areas of Limithang locality at an altitude of 1,100–1,300 masl. The other is the use of the flowers and leaves of 'rutpa yangrim' (local name). It is a climber found in both high- and low-altitude areas.

Impacts of Modernization on Indigenous Knowledge

A long coexistence of humans and nature in this region has resulted in the vast amount of indigenous knowledge held by women about the use of plants for yeast production. While the indigenous yeast production processes are simple and adjustable, they have a scientific basis. Modern yeast production requires precise measurement of materials, pH, temperature, and moisture levels with modern equipment. With the indigenous methods, such rigid norms are rarely practiced.

However, this vast indigenous knowledge faces a challenge. Normally it is passed from parents to children; however, income opportunities, globalization, and modern development are influencing youth to migrate from rural to urban areas. As the younger generations tend to move in search of off-farm jobs and a different life, the older generation in rural areas find nobody to whom they can pass on their knowledge, practices, and cultural traditions.

7 Women's Practices of In Situ Agrobiodiversity Conservation in Sikkim, India

Tara Devi Dhakal, India

Women play a primary role in the conservation of in situ genetic resources and agrobiodiversity in Sikkim, India, although this is largely un-documented. In Sikkim, women are primarily responsible for homestead gardening and maintaining plots near their homes. They grow a diversity of plant species and contribute significantly to maintaining biodiversity in the agricultural ecosystem. As gatekeepers of seed management, they have sound indigenous knowledge of seed selection, processing, and preservation. They maintain a large and diverse repository of genetic resources of plant species in home gardens for various purposes. The following story of Rama Devi in Payong village in southern Sikkim reflects this and illustrates that women are the key actors in the promotion, maintenance, and conservation of agrobiodiversity.

Seed Gatekeepers: Gene Pool Conservation of Indigenous Species

Rama Devi Gautam is the primary person responsible for seed selection, processing, and storage in her household. As such, she plays a significant and decisive role in conserving and maintaining genetic biodiversity on-farm. Through in situ conservation of plant species in the homestead garden and in various plots in the vicinity of her house, she has maintained and conserved local varieties and landraces of 23 plant species adapted to locally specific climatic and pest conditions (see Table 2). She has conserved and maintained these indigenous species of vegetables, tubers, pulses, and cereals for many years and has rarely used exotic varieties of these species. As per the availability of land and depending on the season, diverse plant species used for various and multiple livelihood purposes are cultivated in the household vicinity. Her husband, Harihar, does not shy away from saying that he has a minimal role in and knowledge of seed selection, processing, and preservation, or in the home garden. He says that it is his wife who takes the lead in seed-related matters and home garden cultivation.

Knowledge of Agrobiodiversity

As mentioned earlier, it is Rama who makes important decisions related to seed selection based on distinct preferences or preferred crop traits. Her household grows two landraces of a local variety of paddy known as 'thulo attay' and 'sano attay'. Their preference for these two landraces is based on crop traits and socio-cultural reasons. Rama and her husband preferred these because they suit their local climatic and soil conditions, lodging characteristics, and because they are resistant to diseases and pests. These characteristics were ascertained over long periods of time through trial and error, observation, and comparisons with other varieties. Sano attay has a good yield. Rama attributed its desirableness to its taste and soft texture after cooking, and the preference shown by her children and older family members for it. Socio-culturally, both Rama and her husband want to conserve the paddy varieties to secure livelihoods for the next generation. They are not sure whether the introduction of new varieties of paddy would secure food for their families in the future.

Rama's knowledge of cultivation and preservation methods for each of the various plant species is both specific and practical. She is able to select the best seed in the garden or plot through regular monitoring and observation and keeps the plants aside to save seed for the next year. She preserves the seeds by putting

Table 2: In situ conservation of indigenous plants and their landraces in Rama's home gardens

Plant species (local/English name)	Scientific name	Type	Landraces (indigenous/local)
Dhan (paddy)	<i>Oryza sativa</i>	Cereal	Thulo attey, sano attey
Makkai (maize)	<i>Zea mays</i>	Cereal	Seti (white), paheli (yellow)
Bodi (cowpea)	<i>Vigna unguiculata</i> <i>sesquipedalis</i> <i>Vigna catjung</i>	Pulse	Kalo bodi, seto bodi
Sibi (moth bean)	<i>Vigna aconitifolia</i>	Pulse	Hiudey sibi, ghiu sibi, thangrey sibi
Rajma (common bean)	<i>Phaseolus vulgaris</i>	Pulse	
Kalo dal (black gram)	<i>Phaseolus mungo</i>	Pulse	
Pindalu (taro)	<i>Colocasia esculenta</i>	Tuber	
Simal tarul (cassava)	<i>Manihot esculenta</i>	Tuber	
Bethe saag (common lamb's quarters)	<i>Chenopodium album</i>	Green leafy vegetable	
Rayo saag (mustard)	<i>Brassica juncea</i>	Green leafy vegetable	
Tori saag (Indian rape)	<i>Brassica campestris</i>	Green leafy vegetable	
Bihi	<i>Solanum torvum</i>	Vegetable	Sano, thulo bihi
Karela (bitter gourd)	<i>Momordica charantia</i>	Vegetable	Seto (white), hariyo (green)
Ghiraula (smooth gourd)	<i>Luffa aegyptica</i>	Vegetable	Seto lamo (white and long), hariyo choto (green and short)
Pharsi (pumpkin)	<i>Cucurbita maxima</i>	Vegetable	Seto, hariyo
Kankra (cucumber)	<i>Cucumis sativus</i>	Vegetable	
Baigun (eggplant)	<i>Solanum melangena</i>	Vegetable	Dallo (round), white and black; lamcho (long), black
Iskus (chayote)	<i>Sechium edule</i>	Vegetable	Seto and green spiked
Mula (radish)	<i>Raphanus sativus</i>	Vegetable	Rato (red), seto
Tree tomato	<i>Cyphomandra betacea sendt</i>	Vegetable	
Dalle khorsani (chilli)	<i>Capsicum spp.</i>	Spice	
Khorsani (chilli)	<i>Capsicum frutescens</i>	Spice	
Haldi (turmeric)	<i>Curcuma longa</i>	Spice	

them on a 'nanglo' (bamboo winnowing plate), which is then placed above the fireplace. Except for tubers, rice, chayote, and turmeric, all seeds are preserved in this method. Rama claims that placing seeds above the fireplace helps in drying and the fumigation is helpful in preserving them from pests. She confirmed that she gained knowledge about seed selection, processing, preservation, and cultivation from women ancestors in her family, particularly her mother and grandmother.

Home Gardens and Access to Resources

Her home garden has enabled Rama to access both income and social networks. Customers go to her house to buy her produce, and sometimes her husband takes the produce to sell in a weekly market. Rama handles the cash and spends it on necessary food products such as rice, oil, salt, sugar, and spices, and stationery for her children who are in school. Rama and other women are able to build social capital and networks because of their access to the market. They are able to meet and interact with men and women from other communities and customers with whom they establish social networks. While in the market, people exchange knowledge about seeds and farm products and make loans, contributing to the maintenance of agrobiodiversity in this region.

8 Women's Conservation of Soybean Genetic Resources Through Kinema Making Practices in Sikkim, India

Tara Devi Dhakal, India

Culinary practices adopted by mountain women and men, often overlooked by agricultural researchers, are critical for biodiversity management in the Himalayas, and have associated social and economic benefits. Culinary practices and species preferences are significant in preserving and maintaining a diverse pool of genetic resources for a variety of plant species. Since rural women are primarily responsible for cooking, they have culinary skills and a generally high level of indigenous knowledge related to food preparation and storage and the maintenance of household food security. As a result of this important role, women have responsibility for, and maintain a close relationship with, plants. They conserve and use them sustainably. This case study provides an illustration of the indigenous knowledge and culinary practices women maintain, through which genetic diversity has been sustained and local varieties have been conserved in situ.

Culinary Practices in Making Kinema

The longstanding culinary practice of 'kinema' making, which includes conversion of protein-rich soybean (*Glycine max*) into a flavoured, sticky fermented food, uses a unique recipe of indigenous Kiranti women in Sikkim (Tamang et al. 2009). Initially made for household consumption as a food and nutrient supplement, in the current context it is widely used to earn household income. This culinary practice can also be observed in other parts of the eastern Himalayas, in Darjeeling District in India, eastern Nepal, and Bhutan. Historical detail of the origin of the recipe is unknown. However, Manamaya Subba, 53, a woman from the Limbu community, and Chandra Bahadur Rai, 60, a man from the Rai community, both from Aho village in east Sikkim, reported that in Sikkim, kinema making is an age old custom that has been practised for generations. Its knowledge has been passed down from ancestors. The Limbu community apparently developed the practice of kinema making. It is referred to as 'chymbi-kik' in the Limbu dialect. Other communities such as the Rai refer to it as 'hoki' and to soybean as 'kekpasi'.

Manamaya has been involved in kinema making for many years and has now become an entrepreneur along with 12 other women in the village. She utilizes around 800 kg of soybeans annually, as do the other women, which puts the demand for soybeans around 9,600 kg a year in Aho village alone. Manamaya and Chandra Bahadur report that since many households are run by marginal small farmers, owning from 0.5 to 3 ha of land, large-scale cultivation of soybeans is not possible. On average, around 20–30 kg of soybean are harvested a year by the households that have land to cultivate it. Soybean is cultivated, mixed, or intercropped along with other crops. It is grown on the edges of terraced paddy fields, or mixed with maize crops in higher altitudes where the maize matures only by September. Sometimes it is grown with other pulse varieties between June and November. Soybean is a nitrogen-fixing plant, thus intercropping enhances soil nutrients. As a result of the increased demand of soybean for kinema, many middle class women farmers in Sikkim are now increasingly producing soybean on their farms and selling it in the weekly market, thus generating additional income.

Kinema Making and Marketing

Manamaya and other women in the village buy soybeans from the nearest market, allowing them to choose the best quality and variety. After bringing home the required amount of soybean, they clean it carefully and boil it.

In a single batch, Manamaya boils around 8 kg of soybean. In Manamaya's family, boiling and stirring is the first stage of making kinema, and it includes the participation of male family members and the children. However, Manamaya must constantly monitor the soybeans, stirring them to ensure that the proper colour is not lost. In Chandra's family, Chandra takes up the boiling. Once the beans are completely boiled, they are crushed, so as to break them in half, with the help of a wooden bat called a 'mungro'. Boiled soy is called 'thym-naba-chyambi'. Half-crushed soy is called 'ha-gunglo-aa'. The final crushed product is called 'hak-ma sunmava'. Crushing is occasionally done by the father or children of the household, but mostly women carry out the work and supervise this task, as they know how much and how long to crush. Manamaya does the task of crushing in her house.

While the soy is boiling, Manamaya prepares the bamboo basket ('hapla') by putting a newspaper as a base. She then lines this with a layer of leaves of a local fern ('kate-va'), *Glaphylopteropsis erubescens*. The final crushed product is then carefully put into the basket. The basket is not filled, but is spread with about an 8 or 10 cm layer of crushed soy on the bottom and at the edges. Another layer of ferns is then layered on top. Manamaya then puts jute sacks carefully over each layer so that the soy won't stick when fermentation begins. Manamaya says that the basket is never to be fully filled because a large space is needed at the middle to avoid spoilage.

The final processed kinema is called 'chyambi-pogey'. It takes only three days during summer months for complete fermentation, while during winter it can take up to five days. Altogether, the process of boiling and putting it into the basket takes around five hours. Kinema with a sticky texture ('ryal') is always preferred. Limbus call that 'kodere-yaknen'. Sometimes, if the preparation technique is not followed precisely, the whole batch can spoil. This is a serious loss. The fully fermented kinema can last for three or four days in winter, but in summer it lasts only two days.

The kinema can also be dried to reduce wastage and expand its shelf life. When the kinema is ready, it is packed in green leaves of *Ficus* spp., *Macaranga* spp., *Cana edulis*, *Oestodus paniculata*, or banana leaves. Packaging is either done at home before transportation to the market, or when the product is sold to the customer.

Women are at the forefront in the marketing of kinema and travel long distances to the weekly market, on foot as well as motorized transport, to sell the product. Manamaya regularly goes to the weekly market to sell the kinema. If the basket is heavy, household men will assist in carrying it to the main road where Manamaya, along with other women from her village, share a taxi to the weekly market.

To sum up, the processing of kinema involves different stages where men, women, and children contribute as needed, but by and large women take the lead in all stages, from preparation to marketing to handling the cash income (see Table 3).

Table 3: Gender roles in kinema making

Major activities	Gender roles	
	Women	Men
Arranging soybeans	√	
Cleaning and soaking	√	
Boiling and draining excess water	√	√
Crushing	√	Sometimes
Preparing for fermentation	√	
Monitoring the fermentation	√	
Drying	√	
Packaging and selling	√	

Knowledge and Strategies for Knowledge Transfer

As shown earlier, Manamaya is involved in the entire process of kinema making. She knows all details of preparing the basket, layering the crushed soybeans, selecting and using the base material, determining how much to fill the basket, achieving the desired odour and texture, reducing spoilage, and determining how long to let the kinema ferment. Indigenous knowledge related to kinema making is transmitted through women, from grandmother and mother to daughter and daughters-in-law and sometimes to sons. Chandra Bahadur learnt the recipe from his mother.

Benefits of Kinema Culinary Practices

Conservation of agrobiodiversity: In situ conservation of genetic resources

Associated ecological benefits are a crucial aspect of the culinary practice of kinema. As soybean is the key ingredient of kinema and since it is grown locally, the diversity of this plant species is conserved in situ by women and farmers within their homestead agroecosystem. Two landraces of soybean ('bhatmas'), known as 'seto' (white) and 'kalo' (black), based on their appearance, are maintained in situ by ethnic communities and women farmers in Sikkim. However, as a result of species preference based on the local kinema culinary culture, visual appeal, and longer shelf life, the white soybean is preferred over the black.

The culinary practice of kinema making utilizes several other plant species for various reasons. These plants, important to the preparation process, are likewise produced, maintained, and collected by farmers in their extended agroecological and agroforestry practices. For example, Manamaya requires 25 kg of fuelwood for boiling 8 kg of soybeans. Likewise, she needs to use ferns (*Glaphylopteropsis erubescens*) as a layering material while fermenting. *Ficus* spp., *Macaranga* spp., *Cana* spp., *Oestodus paniculata*, or banana leaves are used as packaging materials for kinema. The utilization of these various plants in the culinary practices add value to the maintenance of these non-timber forest products species and provide incentives for in situ conservation by women farmers.

Health, food, and nutrition

Although women and ethnic communities may not be able to substantiate the properties of kinema through scientific data, they assert that it is nutritionally beneficial and has some medicinal properties. Chandra Bahadur responded that, apart from its high nutritive value, it is a good appetizer and provides energy. It is also beneficial in heart problems and relieves body ache. In addition, it is a nutritious food for pregnant women, and is given to women for one month after childbirth. Raw kinema, prepared with onion pieces, coriander leaves, salt, and ginger, is believed to be more nutritious. Kinema curry is prepared for home consumption; however the bulk of the produce is sold to support farmers' livelihoods. Dried kinema is also used at home as an alternative to vegetables during lean seasons, or mixed with other vegetables as a nutritional supplement.

Income and meeting livelihood needs

In the Himalayan region, particularly in northeast India, Bhutan, and the eastern part of Nepal, one can observe directly in the local market that women dominate when it comes to small-scale trade of agricultural and horticultural products. They sell diverse food and vegetable products that they grow in their home gardens, including prepared and processed items, and in the local weekly market. Manamaya goes to Gangtok every Saturday and Sunday to sell kinema and other seasonal vegetables in a local 'haat' (weekly market). She sells around 10 kg of kinema per day and earns a maximum of about INR 2,000 (USD 43) per day during peak seasons and INR 1,500 (USD 33) per day in lean seasons when she has little produce to sell.

At the end of the day, Manamaya and other women utilize the income they have earned from kinema and homestead vegetables to buy necessary food products at the market, such as rice, oil, salt, sugar, and spices, and school materials such as notebooks and pencils for their children. Manamaya reports that this income is also used to pay for clothing, social activities, labour, health care, and agricultural inputs such as seeds. Additionally, recently there has been a serious shortage of farm labour in the villages because of the out-migration of men for contractual jobs in companies. Farm labour wages have increased drastically from INR 50 (USD 1.08) person per day to around INR 150 (USD 2.82) person per day for normal farm work. Thus, labour requires money, and this requirement is met by the sale of kinema.

Empowerment, social capital, and resource sharing

In Sikkim, not only ethnic women, but women from other socioeconomic settings are equally engaged in the small-scale trade of agroforestry products. As a result of their role in marketing, women are more mobile

and can freely move out of the household. They travel long distances to sell their products. Women involved in marketing of homestead and culinary products receive acceptance from family members to travel and are valued because they bring home income. Interviews reveal that decision-making for any activity they do, such as spending income received from selling kinema, is based on the consensus of members of the family. In Manamaya's case, she alone keeps and manages the cash. Cash spending by women is considered 'pharu', meaning that they can save and always keep some money hidden to respond to difficult times ('jakati'). Thus, kinema making supports women's economic empowerment. As a result of their role in marketing, women are able to build and extend their social capital as well. In the weekly market, women meet and interact with other women from different communities and customers with whom social networking is established. In the weekly market, women representing caste groups (e.g., Brahmin and Chettri) and ethnic groups (e.g., Rai, Newar) sell vegetables, ginger, turmeric, medicinal plants, rice, seeds, and pulses. This results in the exchange of knowledge, seeds, farm products, and cash (lending loans).

9 Women's Leadership in Community Forestry in the Middle Hills of Nepal

Seema Karki and Min Gurung, Nepal

Rural women in Nepal have been participating in forest protection, development, and use for many years, as their agriculture- and livestock-based livelihoods rely on forests. Women's roles in community-based forest management practices have been widely documented. The ways in which they participate in forest decision-making and their important strategies for the conservation of biodiversity and ecologically sensitive areas in the community-managed forest ecosystems are little known. This case study, conducted in Dolakha District, a mid-hills district of the Central Development Region of Nepal, explores the roles, strategies, and knowledge of rural women in biodiversity conservation and management in community forests. The case study surveyed three community forest user groups (CFUGs) in this district, namely, Charthali, Napke Yanmara, and Bhitleri, which have been managing their community forests for more than a decade. All of them are led by a woman chairperson.

Increasing Women's Leadership in Community Forestry Decision-Making

Bishnu Dhakal, District Forest Officer of Dolakha, stated that women make up 35 per cent of the total membership in the executive committees of community forest user groups in Dolakha District, and that the trend has been increasing over the past 5 years. According to Dhakal, more than 50 per cent of total forest users in Dolakha district are women, and they are contributing to conserving 47 per cent of the total forest area in the district through community forestry. This is the second highest out of 74 districts of Nepal which implement community forestry programmes. According to Ratna Sharma, Forest Development Officer of the Nepal Swiss Community Forestry Project (NSCFP), women are taking more leadership roles in community forest user groups these days, and more than 20 per cent of chairpersons are women in groups facilitated directly by the project. He also mentioned that NSCFP has been encouraging the meaningful participation of women in various project activities, including community forest user group governance, pro-poor livelihoods, sustainable forest management, policy influence, and commercialization of forest products.

The Napke Yanmara Community Forest User Group in Dolakha District has an executive committee composed of only women and comprises 166 households, with 341 people managing 152 ha of forest as common property. The group has been an exemplary model for resolving conflicts and contributing to sustainable forest management and biodiversity conservation. According to Suntali Thapa, the chairperson of the group, there were numerous internal conflicts when she was appointed as the chairperson five years ago. She was selected as an alternative in an effort to resolve a conflict that emerged among forest users in the Napke Yanmara village in which two elites competed to make their daughters chairperson. The women's executive committee, with the support of the Dolakha District Federation of Community Forestry Users Nepal, negotiated with all members of the groups to resolve the conflict. When the elites did not see the situation resolving in their favour, they supported Suntali Thapa.

Kalpana Thami, chairperson of Charthali Community Forest User Group, Bhimeshwor municipality, Ward 4 of Dolakha District, explained women's contributions to biodiversity conservation:

Most of the community forests we have been managing were barren at the time of handing over 10 years ago. We women members of our community forest user group selected mother trees to protect for regeneration and prohibited men to cut big trees in our forest. As per our group's rules, each household is responsible to guard the forest at least three times in a month on a



Members of a women's community forest user group in Dolakha, Nepal

rotational basis. We have been successful in conserving wild edibles called kafal, guheli, kurilo, ban tarul, siltimur, and lapsi, which were rarely found in the forest 10 years ago. We also have seen a number of wildlife species, particularly rabbit, deer, tiger, wild chicken, and different birds, in our community forest. (Field note, 10 July 2010)

For women, working as the chairperson of a community forest user group within the context of Nepal's highly patriarchal and socially unequal culture is not an easy task. However, women's success in taking on responsibility for forest conservation and management in the Dolakha district provides an example of the significant benefits realized from their participation. Women play essential roles that allow them to use their knowledge and experience to develop effective strategies to conserve, manage, and use community forests. As a result of these examples, women are increasingly being recognized as important actors engaged in biodiversity

conservation in the Middle Hills of Nepal.

Struggles with and Strategies for Forest Management

As a woman chairperson, Suntali Thapa faced many problems in the early days of her leadership. Two of the most difficult problems were controlling illegal harvesting of forest products by outsiders and reducing uncontrolled harvesting of forest products by members of her community forest user group. For this, she had to work very hard to organize all users to resolve the problems collectively. Among the first things the group did was implement the formation of a small group that patrols the forest regularly. The collective patrolling approach proved to be successful, catching in the first six months 22 people who had entered the forest for illegal harvesting. According to Thapa, protecting forests against illegal and uncontrolled harvesting was the most difficult task to address in the beginning, but the group succeeded because of the sincere and collective efforts made by all the women involved. Technical and moral support provided by the Federation of Community Forestry Users Nepal and the District Forest Office encouraged the women in the group to actively engage in forest conservation.

Once the members of the group succeeded in controlling illegal harvesting, this women-only community forest user group started to work on forest management measures. They initiated new plantations in degraded forest lands. With technical support from the forest officials, the group divided the forest area into five different sectors in which harvesting of fuelwood and fodder takes place on a rotational basis annually. This practice allowed for the regeneration of plants and reduced harvesting pressure in the forest.

Women members of community forest user groups encourage forest users to plant trees on farms, and promote agroforestry approaches so that fuelwood and fodder can also be obtained from private lands. Because women are the primary users of these forests, women-led groups are more sensitive to the ecological fragility of the state of the forest, allowing them to identify and conserve ecologically sensitive areas. They have identified conservation areas within the community forests, such as springs, areas prone to landslides and soil erosion, wildlife habitats, and religious places, and have declared them community-protected areas. An area of 50 m radius around all water sources has been designated as a conservation zone. As a result, users are strictly

prohibited from collecting even dead wood or fallen trees from these protected areas. Guidelines have been issued that users must take care of seedlings and non-timber forest products while collecting fodder and grasses from the forest. Once a year the forest is opened for thinning and pruning activities. Forest products produced from these activities are then distributed among members of the community forest user group.

The group distributes fuelwood on the basis of users' demands or by equal shares. The group has adopted a 'social equity' approach, providing fuelwood free of cost for poor households and the victims of natural disasters. All user households are free to collect dead wood, fallen branches, and fodder on certain days of the year as decided by the executive committee.

The chairperson of the Charthali Community Forest User Group feels proud of doing something for the poorest of the poor members of her group. She reported that 16 out of 27 households are identified as economically poor, and they have been allocated two ropanis (0.1 ha) of forest land for undertaking income-generating activities like the cultivation of cash crops and fodder trees. These poor households have been trained in the cultivation of such cash crops as broom grass, napier, argeli, lapsi, and bamboo. The poorest user households have also produced raw materials, such as leaf litter and various weeds in their allocated forest lands to sell to a nearby briquette factory. They are able to earn about NPR 700–2,500 (USD 9–32) in one year from this activity.

Gender Differential Interests, Knowledge, and Responsibilities

While women are more knowledgeable about fuelwood, fodder, and wild edibles, men have more knowledge of the production and marketing of timber. Women forest users are interested in managing forests for firewood, fodder, and the conservation of water springs. In contrast, men are more interested in timber production and high-value products (e.g., essential oil) because of the economic value associated with them and the mobility needed for trading timber and essential oil.

Although men also are involved in forest resource management, women have the primary responsibility for the promotion and maintenance of forest resources that are critical to their livelihoods and subsistence needs. While women have managed forests for meeting their immediate requirements such as obtaining fuelwood, fodder, cut grass, leaf litter, medicinal plants, herbs, and wild edibles, they also recognize the importance of this role for gaining political benefits, such as participation in the executive committee of community forest user groups.

Fuelwood, a primary resource extracted from the forest upon which communities are dependent, is used for both cooking and heating purposes. In some cases, fuelwood is also used as a source of income. Women know about the species that are fast growing and that produce less smoke while burning. Women's direct experience in the forest and home make them more sensitive to decisions regarding the time and duration that the forest is open for collecting. They open community forests from October to December each year for fuelwood collection.

Fodder and grasses are important forest resources for rural communities, as their livelihoods also heavily depend on livestock. This is even more so in highland areas where livestock are the major component of local livelihoods. Traditionally, fodder plantation and protection, collection, and harvesting are the responsibilities of women.

Women community forest user group members encourage forest users to plant trees on farms for fuelwood and fodder, to conserve the forest



After the introduction of the community forestry programme, grazing practices in community forests have been reduced. Collecting forage and fodder is now an even more difficult task for women because of the prohibition of grazing in community forests. This situation led them to adopt community forest management measures that produce more fodder and forage and has led them to become more involved with forest-related decision-making than men.

Both men and women users in all the three community forest user groups are trained in fodder harvesting techniques to promote regeneration. They protect fodder seedlings and saplings while harvesting tree fodder and grasses. This practice helps to conserve and maintain biodiversity.

Women know when to collect forage and fodder and which tree species are good for fodder. They are aware of fodder species that are more nutritious for lactating animals, such as 'dudhilo'. They also know more than men about the fodder species available in community forests and the surrounding area. Some of the fodder species available in their forests are called khasru, silinge, lise, jhigani, chilaune, phalat, katus, painyu, dudhilo, and kaulo. The production, collection and utilization of fodder and grasses have two interlinked purposes: improving the livelihoods of rural households by increasing their access to forest products, and regulating ecosystem services by improving soil fertility. Sustainable management of fodder and grasses also helps improve livestock productivity, which eventually contributes to improved nutrition and income for rural farmers.

Gender-Specific Knowledge of Non-Timber Forest Products and Strategies for Biodiversity Conservation

After controlling the illegal harvesting of forest products and their continuous efforts to protect the forest against fire and overharvesting, women are now very happy not only to have access to fuelwood, fodder, and forage but now also have abundant non-timber forest products (chiraita, argeli, wintergreen, orchid, nagbeli, and wild edibles) in their community forests. Women are more familiar with the importance and use of wild edibles such as fruits, yams, and leaves than their male counterparts. Women have practical knowledge about the appropriate location, season, and time for harvesting. They know which fruits and vegetables are available in which part of the community forests. They also know the best time to harvest the various plants, for example, early in the morning, after sunset in the evening, after rain, and so on. Women's involvement in the collection and use of these wild edibles has provided them with a detailed knowledge about the various non-timber forest products. Women conserve wild edibles through applying local techniques for multiplication such as leaving a certain number of plants to protect mother plants, rhizomes, and stems. Women are stricter in applying protection rules because they prefer and generally work in groups and with more transparency.

More Contributions but Limited Access to Information: A Gender Issue

As a result of their implementation and contribution to sustainable forest management, women are now able to see significant changes in forest cover, including species abundance and introduction of new species, which allow for sufficient access of all forest user households to fuelwood, grass, and fodder. Suntali Thapa expressed confidently that "women are equally as good in managing forest resources and biodiversity conservation as our men fellows". However, women's lack of awareness on forest policies is apparent. Women were generally less aware of the legal provisions associated with community forestry and such provisions are usually explained to them by men. Consequently, there is still a need for a focus on the quality of women's participation in the people-centred forestry process, and whether the greater roles played by women in forest management without being familiar with the policy framework, is a solution to the challenge of improving women's social and economic opportunities in forestry.

Part 3

Synthesis and Conclusions



10 Analysis and Key Learning from the Case Studies

The case studies summarized in Part 2 demonstrate that biodiversity conservation and management dynamics in mountain contexts are highly gendered. A consistent pattern can be observed concerning women's extensive and diverse role in biodiversity conservation, management, and sustainable use in the greater Himalayas, although men also participate in important, but different, ways. In particular, women conserve and use biological resources to meet cultural and spiritual needs; manage natural resources in order to ensure access to water, food, fuelwood, fodder, forage, medicine, and other resources; and sustain the environment and support habitat for wildlife, which ensures the provision of regulating services such as protection against landslides, soil erosion, and loss of water springs, required to meet productive and household needs and maintain a healthy environment.

The need to access these services by mountain women is shaped by socially constructed gender roles and responsibilities, relations of power, and the cultural norms prevailing in the study areas. Because women are mainly responsible for securing natural resources, they tend to have a central interest in conserving indigenous varieties of agricultural seeds, forest plants, herbs, water springs, and ecologically sensitive lands in order to sustain livelihoods and ensure that future needs are met. Studies in other countries and regions focusing on the gender dimensions of agrobiodiversity have resulted in similar observations, including research carried out in West Asian dryland areas (Abdelali-Martini et al. 2008), Mexico (Chambers and Momsen 2007), Bangladesh (Oakley and Momsen 2007), and Brazil (Voeks 2007).

In addition, gender-specific strategies clearly demonstrate that biodiversity management is not gender neutral, but that landscapes and natural resources are shaped and managed in different yet complementary ways by women and men, who have differentiated (as well as often contested) roles, responsibilities, knowledge, and strategies. Emerging from this study (and others) are six important areas of investigation that indicate the gender dimensions of biodiversity management and conservation, which are discussed in detail here.

Gender Roles and Division of Labour

Biodiversity conservation and management in the greater Himalayas is highly gendered. Evident from the case studies is the fact that women and men have specific gender roles and division of labour in conserving and using biodiversity. As the case study on swidden cultivation in Bangladesh and the case study on agrobiodiversity conservation in India demonstrate, women are centrally involved in the conservation of herbs, plants, and indigenous seeds, the varietal selection of agricultural crops, and marketing of agro-products. In these cases, men support women in the selection of jhum cultivation plots, cutting small trees and bushes, burning dry weeds, constructing jhum housing, planting, harvesting, transporting and storing jhum rice, and preparing land for cropping. Women play a significant role in the management and maintenance of on-farm and home-garden agrobiodiversity to ensure household nutrition and food security.

Both rural men and women farmers participate in the protection of biodiversity resources, such as wild edible plants, agro-seeds, and medicinal plants, and in indigenous food and culinary practices, such as the making of kinema in Sikkim. However, evidence from the case studies indicates that women's roles and responsibilities tend to be greater and more intense in the protection and sustainable use of biodiversity resources. Women's responsibilities for agricultural production and home garden management to ensure household food security and subsistence livelihoods have resulted in a greater reliance on these resources. For example, the case study from Sikkim illustrates that women take the lead in all stages of kinema making, from its preparation to marketing, including the buying of basic goods from the income it generates, although men and children contribute as required.

As custodians of seeds and in their primary responsibility for home gardens, women maintain genetic resources for agricultural production and practice in situ conservation while producing food for household consumption and security. As Shrestha (1998) argues, through the management of home gardens, women play a crucial role in the conservation and management of indigenous crops varieties.

Women in many of the countries of the greater Himalayas spend significantly more time on agricultural, household, and animal husbandry activities than men (Tabassum 2006; ICIMOD 1989; Verma et al. forthcoming), but their mobility tends to be limited (Lama 2010; Jain 2010; Sherpa 2010; Leduc 2011). Although changes in gender roles are occurring in the case study areas, women still carry out most tasks associated with the care economy (caring for household members, including children and the elderly). They also carry out productive activities (collecting water, fuelwood, fodder, and medicinal herbs) and income-generating work (cultivating crops and vegetables, processing and storing food materials, preparing food).

The case study by Talukdar reveals that indigenous men in shifting cultivation households in the Chittagong Hill Tracts in Bangladesh are beginning to share some of the household and care economy work (e.g., cooking and caring for children) while women are engaging in selling jhum products. Women's increased access to income from jhum products supports their livelihoods. This shift in gender roles can be attributed to an increased awareness of gender issues among shifting cultivators, increased access to education by girls and boys in indigenous communities, and better market information and accessibility.

Likewise, the case study by Dhakal on Sikkim highlights that smallholder women farmers are participating in the production and selling of home garden products and kinema products, which increases their mobility and access to markets and income. The sharing of labour between women and men (i.e., preparing home garden plots for cropping) increases morale, support, and the confidence and freedom of movement of women through collective action and market access (i.e., the collective selling of agrobiodiversity products in markets). This is contributing to change towards egalitarian gender roles in the area.

The case study on Nepal by Karki and Gurung shows that women are taking up leadership roles in community forestry activities. Respect for women's knowledge of forest resource management by communities, technical and moral support to women forest users by non-state actors and forest officials (government, development projects), and women's agency in collective action are key factors in this. Such transformative changes are responsible for the increased recognition of women's roles from protectors of forest to managers and bearers of knowledge of forest.

Women's Collective Action

Evidence from swidden cultivation in the Chittagong Hill Tracts, Bangladesh; wild yam conservation and yeast making in Bhutan; community forestry in Nepal; and kinema making and genetic resources conservation in Sikkim, India demonstrates that collective action adopted by women has been effective in conserving biodiversity. It has also enabled them to access biodiversity resources to meet their multiple needs. Indigenous women in central and western Bhutan collectively harvest wild edible tubers from forests. However, institutional and policy measures in Bhutan are not always effective in engaging community men and women in forest management in general, or in protecting plants and herbs with high cultural and food value in particular. This has led Bhutanese rural women to organize themselves to conserve forests near their villages and protect them from outsiders collecting wild yam tubers. As a strong conservation measure, these women only harvest tubers from mature, wild yam creepers that are more than eight years old.

As shown in the case study on Nepal by Karki and Gurung, women's collective action allows them to organize forest users to patrol forests, for plantation, and in the conservation of wild edible plants and fruits, yams, nutritious fodder plants, water springs, and ecologically sensitive areas, including thinning and pruning (e.g., silviculture activities to improve forest growth and regeneration). In particular, women have adopted several forest management strategies such as controlling the illegal harvesting of forest products, reforestation in degraded areas, and the protection of ecologically sensitive areas. Such efforts allow economically poor households to harvest and generate income from non-timber forest products and plantations in community

forests (e.g., forage, fodder, timber, leaf litter, non-timber forest products) according to sustainable forest management principles guided by the government authorities. With increased confidence resulting from collective action, women are increasingly able to make decisions regarding forest resource use and distribution mechanisms.

Women's collective action has also been effective in increasing their mobility, establishing networks with other women, exchanging indigenous knowledge of cropping and seed preservation, lending cash, and increased incomes from small-scale, land-based businesses. Indigenous women in Sikkim, India who are involved in the making of kinema go to local markets collectively to sell their products. Afterwards, they share knowledge on sources of agro-seeds and try to ensure that other women also have access to indigenous seeds. Sometimes, to save transportation costs and increase profits, a group of women will collect kinema in bulk from households in the village at lower prices and sell it at market for higher prices. These examples highlight women's agency in improving their livelihoods, and also demonstrate their commitment to the conservation of biodiversity, agroecosystems, and forests to meet their present needs, while ensuring the availability of genetic resources for the future.

Socio-Cultural and Spiritual Practices

As the case studies from Bangladesh, Bhutan, Nepal, and India illustrate, biodiversity conservation not only relates to protecting or conserving species, genetic resources, and ecosystems, but is a process embedded in the socio-cultural context and livelihood concerns of mountain women and men, which are differentiated by multiple and overlapping positionalities (e.g., gender, ethnicity, caste, class, age, marital status, and locality).

In the case studies on Bhutan, Dorji argues that a belief in local deities positively influences conservation practices. For example, homemade wine is used to appease local deities and celebrate cultural events and rites of passage, including the birth of a child. Women make local wine using yeast, which requires plant materials gathered from rangelands, forests, and wetlands. Women's knowledge of plants and herbs within such processes is both nuanced and important. They view biodiversity resources as a way of fulfilling their cultural and social responsibilities, which is inseparable from the need for biodiversity conservation. For instance, they avoid felling or wounding trees that carry wild yam vines and consider such practices to be inhumane.

In Sikkim, India, indigenous women from smallholder farmer households are involved in home gardens, referred to by Howard (2003, p 4) as an "indigenous experiments station or gene bank", in which they produce and save varieties of indigenous plants including cereals, pulses, spices, and beans. These plants are nutritious, carry both medicinal and cultural value, and generate subsistence incomes. These women also protect landraces of soybean to prepare kinema, which has economic, social, cultural, and nutritional value. For instance, it is often given to mothers for a month after childbirth for nutritional purposes.

The indigenous and spiritual beliefs of shifting cultivator women in the Chittagong Hill Tracts of Bangladesh protect water springs, as littering in water is considered a sin. Similarly, Karki and Gurung's case suggests that women forest users in Nepal do not harvest plants or trees in places considered spiritual within community forests.

Age is another element that makes biodiversity conservation in the greater Himalayas gender and socially specific. Adult women farmers in all of the case study areas of Bangladesh, Bhutan, Nepal, and India maintain a variety of plants with high nutritional, food, medicinal, economic, and environmental value. In matrilineal societies, as in Bhutan, women and daughters are more active than men in the conservation of wild edible plants, which they use to meet their social, subsistence, and cultural needs.

Gender-Differentiated Knowledge

Gender-differentiated interests and knowledge play a key role in the conservation, management, and utilization of forest and agricultural resources. While studies beyond the greater Himalayan region remark on men's interest in the market value of biodiversity resources in contrast to women's interest in their cooking characteristics and

nutritional values (Chambers and Momsen 2007), research within the region shows a somewhat different trend. Women in the greater Himalayas are interested in the social, cultural, nutritional, food, and subsistence income value of biodiversity, while men seem more interested in the commercial value of biodiversity and, therefore, are more likely to engage in activities such as managing forests for high-value timber and non-timber forest products and managing land for high-value cash crop plantation (e.g., rubber, coffee, fruits) (Sarin 2008; Leduc and Choudhury 2012).

The case studies from Nepal and Sikkim show that women tend to be more interested than men in conserving water springs and ecologically sensitive areas, controlling illegal and unsustainable harvesting in forests, practising equitable forestry (i.e., supporting poor forest users), and protecting agricultural crops that have nutritional and economic value. In comparison, men in Nepal, for instance, tend to be interested in harvesting and marketing trees and plants that produce timber or high-value non-timber forest products (e.g., 'machino', 'nagbeli').

A consistent pattern can be observed in women's indigenous knowledge of biodiversity resource harvesting seasons, techniques, uses, and conservation. As bearers of indigenous knowledge of edible and medicinal plants, agro-seed production, seed storage, and plant breeding, indigenous women contribute to the conservation and sustainable use of varieties of genetic resources and crops. Evidence from Bangladesh, Bhutan, and Nepal suggests that women are more knowledgeable about the physical properties, habitats, strengths, collection, and sustainable use of forest and agricultural plants and seeds than men in the study contexts. Women decide the appropriate time to collect wild yam tubers based on leaf characteristics. Women forest users in Nepal are more accurate than men when naming fuelwood, forage, and fodder species in community forests. Women know which tree species are suitable for fodder and forage and the best time to harvest them. They are aware of fodder species that are more nutritious and better for lactating animals, and how to select mother trees for fodder. Women farmers in Bhutan have precise knowledge of indigenous yeast processing techniques. As yeast making is women's responsibility, women have significant knowledge and experience in plant identification, habitats, conservation practices, and the sustainable use of herbs in making yeast. The kinema making practices adopted by indigenous women in Sikkim have been supportive in in situ conservation of varieties of soybean species, a critical ingredient of kinema.

These gender-differentiated interests and knowledge have two major implications for the management of the environment. First, problems of deforestation, forest degradation, and loss of indigenous genetic resources can potentially be reversed when women engage in the conservation and management of biodiversity in various ecosystems, including agroecology. Second, the increased commercialization of agriculture and forests promoted by the interests of men often reduces access to biodiversity resources, especially indigenous plants, crops, animals, and other environmental resources (e.g., water and pastures) for women. This marginalizes women's conservation efforts, their indigenous knowledge, and the critical role of socio-cultural values associated with biodiversity management.

Most critically, women's knowledge of biodiversity conservation is related to skewed gender divisions of labour and responsibilities in which women, in their roles as households managers, plant gatherers, home gardeners, seed custodians, food producers, forest managers, income generators, and plant breeders, engage more intensively in the protection, management, and use of agricultural and forests resources than men. Such observations support similar research findings by Howard (2001, 2003), Momsen (2007a), Chambers and Momsen (2007), Voeks (2007), and Abdelali-Martini et al. (2008) beyond the greater Himalayan region.

Access, Control, and Ownership of Biodiversity and Natural Resources

Within the regional context, women have limited access to and control over land, labour, credit, information, and technology (see Gurung 1999; Leduc 2011). Nonetheless, they play a critical role in the conservation and management of plants and genetic resources in forests and on small farm plots, homestead land, and common property land. In the region, women increasingly spend more time than men in forest management activities (as evidenced by the case study on Nepal) but have a limited awareness of national forest policies. Nevertheless, government extension services mostly provide agricultural inputs to men farmers, as described in the Bangladesh

case study. As the case studies reveal, women's strategies for biodiversity conservation and use are oriented towards maintaining sustainable mountain production and supporting positive environmental change. However, limited development and policy support for ensuring women's tenure rights to biodiversity conservation and use is an impediment to their ability to conserve and protect biodiversity and to meet their livelihood needs in a sustainable way.

Despite such limitations, in the case areas, women's agency and income-generating opportunities play a key role in enabling their access to income and local markets. This in turn enables them to establish networks with other women to exchange knowledge and to lend or borrow cash. Such strategies improve their social, financial, and human capital. By engaging in the production and sale of kinema, women in Sikkim generate income for their families and play a significant role in fulfilling household livelihood needs. Women involved in the marketing of homestead, culinary, and jhum products have greater acceptance and status within their family members, and are allowed to travel to markets and earn income. Indigenous women see biodiversity conservation in swidden cultivation practices as a way of increasing their access to materials and resources, including markets (see case study on shifting cultivation in Bangladesh). In India, women's increased decision-making power is helping them to maintain and conserve local varieties and landraces of 23 plant species used for home consumption and sale (see case study on agrobiodiversity in Sikkim).

Women's Adaptive Strategies in the Face of Simultaneous Drivers of Change

Women's indigenous strategies for biodiversity management are often appropriate in adapting to the context-specific impacts of socio-cultural, political-economic, and climate change. When indigenous women collect wild yams during times of drought and famine in rural Bhutan, they know that a loss and decrease entails acute food insecurity. To ensure against this scenario, they use wild yams as a dietary supplements and means of survival when stored staple food such as maize runs out. Instead of harvesting and selling timber as a means of survival, indigenous women find non-timber forest products, such as wild yams, an important source of food that requires a relatively low level of investment in terms of labour during times of food scarcity, although timber may provide them with more income opportunities. Easy access to food with a low level of investment in labour is thus an incentive for indigenous women to conserve wild edible plants. They also use wild yams to be less dependent on their husbands for cash and food. Such findings are similar to those documented beyond the greater Himalayas by Teklehaymanot and Giday (2010) and Verma (2001).

This evidence from the ground demonstrates the significance of women's adaptation strategies in the face of change. It also supports the view that women are not always (and only) a vulnerable group stressed by climate change; they are also capable, knowledgeable agents who adapt to climate change and ensure sustainable livelihoods and environments. For instance, in swidden cultivation in Bangladesh, indigenous women grow flowers that act as an insecticide. Women in Sikkim, India promote plants that enhance soil nutrients, adapt to local climatic conditions, and resist diseases and pest attacks. Women in community forest user groups in Nepal have developed and implemented forest management strategies that make forest users responsible for protecting water springs and landslide-prone areas.

The case study by Dhakal on the making of kinema by indigenous women in Sikkim (which entails the conversion of protein-rich soybean into a flavoured sticky fermented food) illustrates a unique adaptation practice in response to changing socioeconomic circumstances. Kinema, which was used for household consumption in the past, is widely used to earn household income in the current context. Women involved in making kinema in Sikkim receive on average USD 38 per day from the sale of kinema, in addition to which they benefit by using it for household consumption. Women in the case study areas found kinema production and sale an appropriate small business because it requires relatively low amounts of investment and labour and can be made with locally available resources (e.g., cooking utensils, fuelwood, soybeans, water). In addition to this adaptation practice, the preservation of local varieties of seeds with highly adaptive capacities and the production of vegetables, spices, beans, chillies, tubers, pulses, and cereals in small agricultural plots and home gardens have been effective in their socioeconomic empowerment, by giving them access to income, increasing mobility, and improving household decision-making power.



In rangelands, the ability and indigenous knowledge of women pastoralists in conserving biodiversity resources is crucial for adaptation to environmental and socioeconomic change

The case study on Nepal by Karki and Gurung demonstrates that, through exposure to forest management training and interactions with forest officials and development practitioners, women forest users plan and implement sustainable forest management activities, enabling them to obtain fuelwood, nutritious fodder, forage, and leaf litter in ways that also help to reduce women's workload in collecting these resources. Increased involvement in the sustainable management of forests has also enabled women to claim their right to participate in, and benefit from, a wide range of forestry interventions. For example, women select trees for seed production and train forest users on forest harvesting and plantation. Although only a small percentage of women hold leadership positions in community forestry user groups in Nepal, they demonstrate a strong ability and interest in sustainably managing natural resources, including biodiversity. As shown in the case study on Sikkim, India by Dhakal, women maintain biodiversity resources with high socio-cultural and economic value in places that are near and easily accessible to their homes, thereby saving precious time.

Recent research indicates the importance of taking into account women's empowerment and agency in enhancing community resilience to adapting to climate change (Arora-Jonsson 2011; Nellemann et al. 2011). The ability and indigenous knowledge of women farmers, forest managers, and pastoralists in conserving biodiversity resources is crucial for adaptation to change. In particular, women's knowledge of biodiversity conservation and its role in local food security and climate change resilience is significant. Women's knowledge related to biodiversity conservation also has the potential to reduce emissions from deforestation and forest degradation and to improve forest and agricultural land management practices, as discussed in the next chapter.

11 Enhancing Gender-Sensitive Research and Action in Biodiversity Conservation and Management

This report provides insights into the dynamic relationships among biodiversity, livelihoods, culture, gender, and especially the roles, strategies, and knowledge that men and women in the greater Himalayan region use to maintain and restore biodiversity. These important relationships are just beginning to be explored and indicate a close relationship between gender and biodiversity in mountains, providing evidence that the processes of conservation are gendered and context specific. In the future they will require greater attention in research, development, governance, capacity enhancement, and policy implementation.

Although both men and women are involved in conservation and management practices in diverse ecosystems, the degree of their involvement varies. Women are mostly at the frontline of such efforts, as recent research on gender and adaptation to climate change demonstrates (Nellemann et al. 2011). For women, biodiversity conservation is a critical strategy in adapting to socio-cultural, political-economic, and environmental changes. It is important for securing essential livelihood resources (e.g., wild food, fodder, forage, fuelwood, herbs, indigenous crop seeds, and subsistence income), meeting socio-cultural needs, and expanding social networks. Socioeconomic, environmental, and technological hardships are shaped by cultural norms and unequal gender power relations (for example, in division of labour, roles, responsibilities and access, and control over resources) which further influence women's everyday experiences and livelihood activities. Such hardships also affect their proactive efforts in biodiversity management. As further argued below, women's roles, knowledge, and sustainable strategies are often undervalued and overlooked.

Empirical evidence demonstrates that gender-differentiated knowledge, roles, preferences, and experiences in using and managing environmental resources (e.g., forests, agroecosystems, rangelands) have implications for the way biodiversity resources are conserved. Compared to men, women are more engaged in conserving a broad range of agricultural crops, seeds, genetic resources, forests, rangelands, ecologically vulnerable landscapes, and water springs for social, financial, cultural, and environmental purposes. This is a result of their high workload and multiple responsibilities. For example, women's involvement in home gardens, swidden cultivation, wild yam collection, kinema making, and forest conservation is contributing to the increased biodiversity of a diverse set of plant species and wildlife.

These findings have important implications for policy, community empowerment, and research related to biodiversity, especially given the rapid socio-cultural, political-economic, and environmental changes occurring in the region. Mountain-specific constraints such as inaccessibility, fragility, marginality, and limited access to social and development resources, as well as opportunities such as environmental niches, diversity, and community-driven climate change adaptation also play a critical role in sustaining mountain environments in the greater Himalayas. However, some of these dynamics are rapidly changing.

Gender-Specific Biodiversity Management Strategies

Biodiversity provides livelihood incentives. Gender-specific biodiversity management strategies can provide men and women an opportunity for income generation, for instance. Men, women, communities, governments, and other institutions in the greater Himalayan region have pioneered and adopted innovative approaches for preserving, conserving, and sustainably using biodiversity. These include home gardens or homesteads, Beej Bachao Andolan (the Save the Seeds Movement), and community-based natural resource management

approaches. The following sections discuss the extent to which women are involved in livelihood options that involve biodiversity and the strategies of biodiversity management prevailing in the greater Himalayas.

Women's access to high-value biodiversity products

The case studies from Bangladesh, Bhutan, India, and Nepal show that increased women's engagement in biodiversity conservation in different land use practices (e.g., home gardens, swidden cultivation, and state-owned forest) can offer them access to material resources, increased mobility, and exposure to local markets and community leadership. It is apparent that women's collective action and leadership in community-based natural resource management have been effective in promoting biodiversity and sustainable use of natural resources. However, recognizing women's roles at the production level is not enough; they need to be included in the value chain related to high-value forest products and agricultural crops.

The case study research did not attempt to examine women's specific roles in collecting, growing, or marketing high-value products such as medicinal and aromatic plants, even though the literature highlights its significance for women's empowerment (see UNDP 2007). A rigorous gender analysis of economically high-value mountain non-timber forest products (e.g., yarcha gumba, bay leaf) and agricultural crops in the greater Himalayas is needed to fill this critical knowledge gap.

The commercialization of high-value mountain biological resources may shift access to, and control of, high-value biodiversity products in favour of local men or external agents (business middlemen, corporations, bioprospectors) as well as influence access to information, skills, knowledge, mobile technologies, and decision-making processes to their advantage. As stated in Chapter 1, the greater Himalayan region is rapidly changing in terms of climate, socioeconomic conditions, infrastructure, and markets. Mountain biodiversity offers the potential for mountain communities to derive economic incentives through linking of conservation with community-based enterprise promotion, such as mountain eco-tourism and non-timber forest products (Sharma et al. 2010). Recent initiatives on Reducing Emissions from Deforestation and Forest Degradation Plus (REDD+) in the greater Himalayan region present another opportunity for increasing socioeconomic and livelihood opportunities for mountain women by engaging them in non-land-based high-value products such as forest carbon. Exploration of approaches and practices for the inclusion of women in mountain enterprises and the implications of this for rural livelihoods and women's economic empowerment also need to be researched in the future. Of importance will be increases in the number of women involved in decision-making, control, and ownership of resources and benefits from these enterprise and learning opportunities.

Gender impacts of the commercialization of natural resources

Market forces and globalization have exerted pressure on mountain resources in the greater Himalayan region, and they are narrowing the pool of genetic resources by giving importance to a few exotic species of global value. This is adding to the devaluation of, and reduction in the cultivation of, local species and crop varieties and contributing to the loss of associated indigenous knowledge. This in turn is having impact on the food security of mountain women and men. At the same time it is devaluing women's contribution to maintaining a highly diverse pool of genetic resources of local value, thus undermining their role and knowledge.

Women continue to be excluded from decision-making over commercial resources. For example, in matrilineal societies in Meghalaya, India, men mostly make decisions related to new land use management practices such as the promotion of commercial cash crops and fruit plantations on swidden cultivation plots. This is an alternative to indigenous land use practices in which women had some degree of control over farming in the plots (Sarin 2008). The conversion of swidden cultivation plots for cash crop plantation and wetland rice cultivation has increased women's workload, as these new practices tend to be labour intensive. In addition, the out-migration of men for seasonal wage labour has shifted men's responsibility for farming onto women (Leduc and Choudhury 2012). The gender implications of these land use changes for long-term changes in access to and control over biodiversity resources, as well as household food security, need further research and analysis.

The long-term sustainable conservation of agrobiodiversity and future needs for genetic biodiversity within agriculture can, to a certain extent, be fulfilled through, and benefit from, resourceful women in their role as seed producers and cultivators. However, conservation perspectives, policies, practices, and research need to be gender sensitive in order to recognize the importance of women's knowledge about, and contributions to, biodiversity conservation, and to ensure that women's roles are given due weight and included in development programmes.

Women's biodiversity management in home gardens

Indigenous homestead farms or home gardens often contain an array of tree species, herbaceous perennials, annuals, and seasonal vegetables and serve as a major source of fuelwood, fodder, medicine, food, spices, flowers, green manure, pesticides, and nutrition for mountain farmers and communities across the region (Salam et al. 2000; Shrestha et al. 2001; Gautam et al. 2006; Galluzzi et al. 2010). For example, on average, rural households in Bangladesh meet 90 per cent of their energy requirements from homestead forests (Salam et al. 2000). A study done in 30 home gardens of the Marma indigenous group in the Rangamati Hill District of Bangladesh reveals that women are primarily responsible for maintaining home gardens, which contribute to the conservation of genetic diversity for 19 perennial species, with the largest number being food and fruit crop species (69 per cent), followed by timber (26 per cent), and ornamental species (Aumeeruddy-Thomas and Pei 2003). In Chandigre village in Meghalaya in the northeast Indian Himalayas, 37 seasonal crops and 30 perennial crops were found to be maintained in home gardens (Kerkhoff and Sharma 2006). Studies also found that an average of 14 species of vegetables, 5 species of fruit, and 5 species of fodder trees are maintained in home gardens (Shrestha et al. 2001, p 110). The crops grown in these home gardens are consumed by the household and women sell the surplus in nearby markets (HKI 2001).

Women and men farmers in seed saving movements

Realizing the importance of agrobiodiversity for future food security, social activists and farmers in Vijay Jardhari in the central Indian Himalayas initiated Beej Bachao Andolan (the Save the Seeds Movement). The movement began with the explicit aim of protecting local agrobiodiversity against the threat posed by the introduction of improved varieties associated with the green revolution, which was perceived as leading to an erosion of genetic diversity within the main and important agricultural species. Men and women farmers involved in Beej Bachao Andolan believe that the loss of diversity within this vital gene pool has the potential to threaten their livelihoods and the future coping resilience of farmers. The movement has been successful in diversifying the gene pool of various landraces with the establishment of living gene banks in the fields of local farmers who maintain 150 varieties of rajma (*Phaseolus mungo*), 130 of rice, and 40 of millet (Joyal 2001).

Women's roles in community-based natural resource management

The Himalayan foothills of Tehri Garhwal in India provide an example of a successful community-initiated forest conservation programme. The degradation of forests from overexploitation of resources led to collective action by concerned communities who formed a Van Suraksha Samiti (Forest Protection Committee), a community-based institution to develop rules regarding the use of natural resources (Joyal 2001). In the same village, the out-migration of men has provided women with an opportunity to increase their participation in the village economy. A Mahila Mangal Dal (Women's Welfare Committee) has been formed in the village, which has been successful in mobilizing women for natural resource protection and local forest governance. Women are active members of the Forest Protection Committee (Joyal 2001).

The Pokhari Samrakshan Samiti (Lake Conservation Committee) in the Sikkim Himalayas is another example of a successful community institution for biodiversity conservation. Recognizing threats to conservation and to maintenance of the sanitation of lakes posed by tourism, the Forest, Environment and Wildlife Management Department of Sikkim introduced the idea of involving men and women in biodiversity conservation through the Pokhari Samrakshan Samiti in 2006. Supported by The Mountain Institute (TMI) and the World Wide Fund for Nature (WWF), such committees have been formed and have operated since 2008. The Tsomgo Lake Pokhari

Samrakshan Samiti in the eastern district has been successful in financing its own conservation initiatives through funds generated from tourism. The Pokhari Samrakshan Samiti is authorized to levy and collect fees for lake conservation of 10 Indian rupees per tourist per day. More than USD 58,000 has been raised in one year, with the funds being used for lake conservation and awareness raising initiatives (Pers. comm. with government official, Sikkim 2010).

The greater Himalayan region has a long history of community-based natural resource management practices and vast experience in their application. Joint forest management in India; community forestry, buffer-zone forest management, collaborative forest management, and leasehold forestry in Nepal; social forestry in Bangladesh; and community forestry in Bhutan are some of the main examples of national community-based approaches to the conservation, management, and sustainable use of biodiversity in the region (Khatri 2010; Sharma et al. 2010).

Of the eight regional member countries of the greater Himalayas, Nepal has the most well established and nationally institutionalized community-based forest management approach. Emerging in the late 1970s, community forestry is often cited as a people-centred forest management regime that hands over usufruct rights in government-owned forests to local groups. It is based on the premise that local people will contribute to forest resource conservation, management, and sustainable use because it is in their self-interest. As of November 2011, 17,685 community forest user groups are managing about 28 per cent of the total forest area (5.83 million hectares) of the country, involving about 39 per cent of the total population of Nepal (DoF 2011).

Women hold around 31 per cent of membership in the executive committees of community forestry institutions at the grassroots in Nepal (DoF 2011), although their participation in leadership positions is very low. The significant contribution of women and girls in the conservation, management, and use of natural resources, including biodiversity, in different institutional arrangements such as community forestry (Agarwal 2010) is related to their presence at home, their role in agricultural production, and their dependence on natural resources for household food security (Khadka 2009). For example, in Nepal women collect 84 per cent of fuelwood resources (Bhatia 1995) and their participation in community forest management is associated with meeting their everyday needs for forage, fodder, leaf litter, fuelwood, and other biodiversity resources.

Men, women, communities, and national institutions across the greater Himalayan region are engaged in diverse approaches to natural resource management and biodiversity conservation. However, how men and women participate in biodiversity management in these people-led biodiversity conservation and management approaches, and how they benefit from it, needs further research.

Gender and Biodiversity Management in Rapidly Changing Contexts

Critical new issues are emerging globally, and these are sometimes felt acutely in the greater Himalayan region. For example, new drivers of change, such as climate change, globalization, geopolitical shifts, new market forces, migration, and changes in land use, are creating new challenges and dilemmas, as well as opportunities, for mountain women and men.

First, the Millennium Ecosystem Assessment identified climate change as a dominant driver of future biodiversity loss (CBD 2011). Climate change and biodiversity conservation and management are integrally linked, as climate change affects biodiversity and changes in biodiversity and associated ecosystem functioning can affect local environments, growing conditions, and, to a certain extent, climatic conditions, particularly micro-climatic differentiation (Midgely 2009). Local perceptions of the impact of climate change on biodiversity include early budburst and flowering and new agricultural pests and weeds (Chaudhary and Bawa 2011).

Mountain women and men can mitigate and adapt to the impacts of climate change through the continued engagement of indigenous practices and adoption of new techniques for conserving and sustainably managing biodiversity. Biodiversity, with its regulatory function, can be an important part of adaptation to climate change. Carbon and water cycles, two important large-scale processes for life on Earth, both depend on biodiversity at genetic, species, and ecosystem levels (Midgely 2009). Studies show that economically poor rural farmers often reduce and manage risk by growing a wide variety of locally adapted crops, some of which can be resistant

to drought or pests (Shrestha et al. 2001; SSMP 2010). Smallholder and economically poor farmers have developed and adopted crop varieties and cropping patterns to adapt to high variability in mountain farming practices and, consequently, to adverse impacts of climate change such as droughts, erratic rainfalls, and crop disease (SSMP 2010).

Women and men contribute to climate change differently. They are also affected by it differently and react to it differently (Nellemann et al. 2011; Röhr 2009; Terry 2009; Dankelman 2002, 2008), illustrating that responses to climate change are not gender neutral. Women in particular are important agents in sustainable adaptation efforts (Dankelman 2002, 2008). Gender inequalities “impact how people experience climate change, their abilities to cope with its impacts and their potential to influence decision-making at all local, national and global levels” (Sasvari 2010, p 15). These inequalities, combined with social, economic, and political factors, make women more vulnerable to the negative effects. The consequences are potentially severe. The United Nations Development Fund for Women, for example, reports “the proportion of women affected by climate-related crop changes in Africa could range from 73 per cent in the Congo to 48 per cent in Burkina Faso” (UN Women, 2011 in Arend and Lowman 2011, p 3). Yet, gender issues and analysis remain at the margins of important discussions, negotiations, policy-making, and institutions (Verma et al. 2011; Khadka 2009) regardless of the fact that neither the impacts of climate change on different women and men nor the ways in which they respond to climate change are gender neutral (Otzelberger 2011; Dankelman 2008, 2002).

Although women play a crucial role in natural resource management and biodiversity conservation (Byers and Sainju 1994; Howard 2001, 2003; Agarwal 2010), their systematic exclusion in policy-making from the community up to the national, regional, and international levels disadvantages them in critical negotiations of global processes such as climate financing (WEDO 2007; Arend and Lowman 2011). As Mitchell et al. (2007) point out, the voices of economically poor women from the ‘global South’ are seldom heard in negotiations on climate change adaptation. As elsewhere, women and girls make up a disproportionate number of the economically poor in the greater Himalayan region, although they are important forces in mountain farming and biodiversity conservation. For them, meeting nutritional, health, cultural, and social needs is already a great challenge (Leduc 2011). The remoteness, fragility, and steep terrain of rural mountain settings and the lack of basic services in the region disadvantage women from participating effectively in and benefiting from development processes. This hardship is likely to intensify with predicted increased climatic variability and changes in monsoon patterns induced by global climate change and other drivers of change.

Second, globalization, new market forces, and the high rate of men’s migration have resulted in several emerging gender issues. In the greater Himalayan region, many who migrate are men. As an example, in Nepal more than 80 per cent of international migrants are men (Sherpa 2010). Recent research reveals issues emerging from an exacerbation of the ‘feminization’ of agriculture and landscapes (Lama 2010; Jain 2010; Sherpa 2010; Leduc 2011). In the mountain areas of India and Nepal, out-migration of men to urban areas and foreign countries for employment has shifted their responsibilities and work in agricultural production and natural resource management on to the shoulders of women, intensifying women’s workloads (Nellemann et al. 2011; Leduc 2011; Hoermann et al. 2010; Jain 2010).

Third, the influence of globalization and market forces on areas under indigenous land use practices, such as shifting cultivation in northeast India, has resulted in several gendered impacts. The introduction of settled farming practices, such as wet rice cultivation and horticulture, in shifting cultivation areas demands more labour for crop management, often during times of the year when labour is required elsewhere. Again, since men increasingly migrate, their responsibilities have shifted to women. Shifting cultivation land, which is a common property regime, is de facto privatized once fallow lands are converted to cash-crop plantation. Men are more likely to own and control land in such a scenario (Leduc and Choudhury 2012). As Sarin (2008 p 48) argues, the conversion of jhum (shifting cultivation) fallows into commercial plantations seems to be replacing women’s control over their production, which is centred on household food security, with production for the market primarily controlled by men.

Many of the case studies in this publication reveal that women’s indigenous knowledge related to food preparation, kinema making, yeast making, wild yam collection and use, landrace varietal selection, seed preservation, and wild plant conservation and maintenance is transmitted from mothers to daughters and

daughters-in-law. Owing to modernization and globalization, however, women face a challenge in sustaining this indigenous knowledge, as rural youth are increasingly migrating to urban areas. As the case studies from Bhutan, Bangladesh, and India illustrate, women and men are involved in both agricultural and forest biodiversity conservation and management, while young women and men mostly spend their time in schooling and non-farm activities and show declining interest in agriculture. Younger women and men, especially those with the most formal education and travel experience, show little interest in learning the identities and uses of local wild plants (Voeks 2007). The extent to which shifts in livelihoods and cultural identities influenced by modernization and globalization have impacts on natural resource management in general, and biodiversity conservation in particular, requires further research and greater attention in the future.

Fourth, changes in land use and patterns of resource extraction are also leading to changes. For example, deforestation and forest degradation have been major issues within and beyond the greater Himalayan countries, intensifying women's workload for gathering basic forest products. In Nepal, forest cover decreased by 24 per cent between 1979 and 1994 (Ojha et al. 2008, p 18). Women struggle to find basic livelihood resources from rangelands and forests that are steep, degraded, and relatively far from home. In Lorpa village in Jumla district of Nepal, for example, women are aware that the time it takes them to collect fuelwood, forage, and leaf litter, which they are now forced to search for at higher altitudes, has doubled over the past two decades (Khadka 2012). Deforestation and forest degradation rates have increased during the past ten years mainly because of encroachment, conversion of forest lands, and the felling of trees (Kotru 2008), as people try to survive in rapidly changing circumstances. Habitat degradation, mostly caused by deforestation, contributes to species loss and extinction (Sheikh et al. 2002; Pandit et al. 2007) and further reduces the availability of biodiversity resources (e.g., leaves, fibres, fuel, wild edible, medicine) that women rely on.

Towards Gender Transformative Research and Action: Recommendations for the Way Forward

Gender inclusive and responsive decision-making, policy, and action

This study demonstrates that women's meaningful participation in interventions related to mountain biodiversity not only is essential, but provides an effective and sustainable development approach appropriate to the greater Himalayan region. However, women's contributions require increased recognition in policy-making and implementation in order to ensure substantial gender, social, economic, and political gains. Women's contribution to biodiversity is often undermined by lack of participation in local, sub-national, national, and global policy-making bodies (Momsen 2007b) as well as by weak political commitments. A lack of effective participation of women and gender experts in policy-making and negotiations leads to gender-blind policy outcomes (Hemmati and Röhr 2009; Khadka 2009).

Focus on and inclusion of gender and social issues and perspectives in conservation policy, strategies, and programme implementation in the greater Himalayas are important to broaden attention to biodiversity conservation and management beyond the biophysical dimension.

In the future, policy sensitization will be important to increase benefit sharing for both women and men on an equal basis, while recognizing women in particular as important stakeholders. Policy and programme innovations need to be gender responsive in order to have greater and equitable impacts on those who manage natural resources on a daily basis. Innovations need to analyse and take into account women's specific issues, needs, knowledge, and strategic responses to ensure equitable access to resources. For instance, taking gender issues into account in biodiversity policies and programmes requires careful attention in the organization of policy-making events, competencies, and sensitization at all levels. Diversifying participants in policy-making forums based on gender, diversity, and analytical expertise (ensuring that gender issues are integral) will help to deepen understanding of gender issues in conservation and development. Similarly, the inclusion of women and other marginalized groups in decision-

making positions in natural resource management institutions (statutory and customary), sensitization of staff, and their capacity building on gender and social analysis are essential for effective policy implementation.

The exclusion of women from development processes has compounded women's marginalization in land tenure and land use institutions. Women's inclusion in decision-making in local institutions, with the exception of women-led community forest user groups in Nepal, is very limited. Encouraging women to take the lead in common property resource management strengthens their confidence to participate in decision-making in formal natural resource management institutions at the local level. However, most societies in the greater Himalayan region have deep-rooted social norms and ideologies that constrain the acceptance of women's leadership in customary village institutions (Sarin 2008; Khadka 2011). Research and analysis is needed for deeper understanding of the gender dynamics embedded in planning, monitoring, and implementing biodiversity management programmes and policies, and their implications regarding women's and men's livelihoods.

The inclusion of social and gender analysts and gender-balanced participation in conservation policy processes are important to ensure attention to socio-cultural perspectives in addition to economic and environmental dimensions.

Women's continued exclusion from access to knowledge resources, such as information on policies and agricultural extension services, has serious implications for their ability to sustain their environment and livelihoods. Further exploration and analysis of the extent to which women and men have control and ownership of information, incentives, institutions, and institutional processes related to biodiversity management is required. For instance, women's meaningful participation in climate change mitigation and adaptation programmes such as REDD+ has great potential if their efforts, access to resources, and inclusion in decision-making can be better supported.

It is worth keeping in mind that mere inclusion and representation of women in biodiversity conservation may not lead to gender-positive outcomes. This is because simply 'adding' women may not change underlying gender power relations that shape research, development, and policy-making. The idea of inclusion thus needs to link to outcomes as a result of which biodiversity stakeholders become aware that 'change happened to people'. Outcome mapping is one useful approach that focuses on people; in this monitoring and evaluation methodology results are measured in terms of "changes in the behaviour, relationship, activities, or actions of men and women, groups, and organizations with whom a programme works directly" (www.idrc.ca), rather than just the development impact of a programme (e.g., changes in state-policy relevance, increased income, or reduced park – people conflict). Gender outcome mapping in the greater Himalayan region can help to showcase how change is possible when it comes to gender equality and promoting women's decision-making and control over biodiversity resources. When such efforts are carried out in addition to an action-research framework aimed at reflexive learning from research for development efforts and gender-positive policy change, great strides can be made.

Addressing gaps in research and knowledge

As this study shows, biodiversity conservation and management depends on socio-cultural, political, and economic contexts that must be integrally considered. Research, training, and other capacity building approaches are also essential. This study shows that much research remains to be done in order to understand the gender and social dimensions of biodiversity in the greater Himalayan region. The following describes some research issues that need to be addressed to better inform and support the design of conservation programmes and policies and to help reconcile socioeconomic needs with conservation efforts.

Focus on and integration of gender and social perspectives in research related to biodiversity is vital for holistic natural resource management and mountain development.

This study focuses on four countries, namely Nepal, India, Bangladesh, and Bhutan, and should be geographically expanded in the future to the other countries of the greater Himalayas – China, Myanmar, Pakistan, and Afghanistan. As the problems to do with the effective management of biological resources require analysis on several scales (Brown 1998), it would be useful to expand and compare gender analysis of biodiversity for national and regional levels, transboundary landscapes, and a range of ecosystems such as rangelands, wetlands, forests, and farm lands. Cross-comparative analyses at different scales will further nuance research and draw out relations between them.

Social aspects of biodiversity mainly tend to be limited in analyses of women's roles in conservation. While the case studies in this paper have focused on women's roles, responsibilities, knowledge, strategies, and participation in biodiversity conservation, there has been limited analysis of the gender power relations, negotiations, contestations, and resistance involved in access to, and ownership and control of, biodiversity resources. Similarly, the role of gender in development policy initiatives (in particular, National Adaptation Programmes of Action, REDD+, payment for ecosystem services, and transboundary landscape based conservation) has been inadequately studied in the greater Himalayas. There has also been limited analysis of the implications for rural food security and gender inequality within biodiversity conservation. Research and ethnographic analysis on the gendered political ecology of access to, ownership of, and influence over land use and biodiversity resources and its impact on sustainable mountain environments is urgently needed.

The case studies illustrate women's agency in adapting to new socioeconomic and environmental changes such as climate change and the out-migration of men and young people. Adaptation efforts can be an important avenue for mountain women and men to benefit from conservation of mountain environments and the commoditization of ecosystem services such as carbon trading from rangelands or community forestry. However, the extent to which women participate in and benefit from new initiatives requires further research. Similarly, increased interests to modernize indigenous farming practices such as shifting cultivation in the greater Himalayas (Sarin 2008; Leduc and Choudhury 2012) might have negative impacts on indigenous men and women, land, and biodiversity.

There is growing research interest on indigenous knowledge and practices such as the role of culture, spiritual beliefs, and indigenous healers in mountain communities in relation to the conservation of mountain biodiversity. Although the case studies presented in this study do not focus extensively on these dimensions, they illustrate a range of socio-cultural, ecological, and economic diversity within and between countries. Some societies are polygamous, while others are polyandrous; some are matrilineal, and others patrilineal; and some have village governance institutions headed by men elders. A gender analysis of biodiversity conservation and use in these societies, focusing on cultural aspects of biodiversity (Cocks et al. 2006) and the capacity and influence of men and women in species identification, monitoring, and use can help to draw evidence on the gender-based cultural importance of mountain biodiversity and its role in rural livelihoods. It can also help in the conceptualization of best practices that can make a difference to women and men within specific cultural contexts.

As the case studies from Bangladesh, Bhutan, India, and Nepal indicate, women's involvement in biodiversity conservation and management is not only focused on securing subsistence livelihood needs, but is also associated with culture and spirituality whereby women prioritize the conservation of cultivated and non-cultivated plants, water springs, and other natural resources of cultural importance. The strong interconnection among gender, socio-cultural and spiritual practices, and biodiversity conservation is underresearched but nonetheless drives many management decisions made by women and men on the ground.

Although women's indigenous knowledge is critical for biodiversity management, women often have limited access to extension services, including information related to national policies and agricultural inputs. However, networking among women in their villages and those neighbouring them is strong. Social networks and institutions can assist them in times of stress (Pouliotte et al. 2009) and facilitate the exchange of knowledge and resource management practices. Experience from the ground reveals that networks play a crucial role in balancing power through advocacy and in giving local women and men a voice, serving as an important space for information exchange and dissemination and a source of capacity building for men and women (Buchy 2012). National and global networking is vital to increase the visibility of grassroots work and knowledge and

to link global experiences to the national and local levels and vice-versa. Social institutions play a key role in women's and men's strategies. However, it is useful to keep in mind that societies do not respond en bloc to exogenous shocks and changes (Verma 2001; Berry 1997). In many parts of the world:

[C]hanges in climate, population density, economic conditions or patterns of conquest and domination have often led people to question established practices, experiment with new ideas, and contest or renegotiate rules and boundaries which they find inadequate or unacceptable in new circumstances. In the process, social identities and institutions have multiplied and/or been reshaped so often that they appear to take on permanent qualities of fluidity, ambiguity and creativity. (Berry 1997, p 1228)

In the greater Himalayan region, women's knowledge and experience are crucial in adapting to climate and other environmental changes (Leduc 2011) and in shaping biodiversity management. However, there is a paucity of platforms to share, exchange, and scale up knowledge and experience about gender, biodiversity, natural resources, and mountain development. There is limited space for grassroots women and professionals to discuss and learn about gender issues. In particular, there are limited platforms for networking among professionals and scientists working on gender and biodiversity in the region and beyond. Such networks are essential in informing policymakers, development practitioners, and communities about biodiversity and mountain development issues. ICIMOD is currently working on ways of creating such networks.

Capacity and institutional strengthening

Increased awareness, sensitization, and analysis of the close linkages of gender, development, and biodiversity are essential for capacity building of conservation actors and stakeholders at various levels. It is equally important to link research with capacity strengthening measures in order to enable biodiversity stakeholders, including grassroots women and men, in the design, implementation, and monitoring of biodiversity programmes and policies that address the needs and concerns of those who depend on biodiversity for subsistence and who play an important role in tackling global issues such as climate change and environmental degradation.

Among the main findings of this study is the scarcity of gender literature and research capacity in the greater Himalayan region with the potential to make mountain knowledge more gender sensitive, transdisciplinary, and influential. Many natural resource-based research institutions in the region recognize gender balance as an issue, with expertise on biophysical and economic fields outweighing that of social sciences and gender analysis. Few women researchers are in decision-making positions in their respective institutions. Research partnerships in the greater Himalayas should consider diversity criteria in regard to

research team members, expertise, research questions, and outreach mechanisms. The provision of funding for more students to undertake graduate research fieldwork on gender issues of biodiversity and climate change adaptation would enhance support for making biodiversity research and knowledge products more gender inclusive.

Capacity and institutional strengthening on gender and social concepts, approaches, and analysis for conservation actors, including researchers, communities, and policy-makers, is needed to ensure effective conservation policy and programmes and equitable and sustainable use of biodiversity.

Momsen (2007a) argues that biodiversity and gender analysis is incomplete without understanding the complex relationships between development and environmental conservation. This argument highlights the importance of understanding the dynamic relationships between people and the environment in a context as highly complex as the greater Himalayas. Strengthening of gender analytical capacity at organizational levels would go far in furthering understanding and building research capacity in gender issues of biodiversity at the local level (UNFP and FAO 2001). Some research institutions have already begun to include in their analytical perspective

the gender and political ecology of resource management, use, and distribution, and the role of the state and communities. This is useful, as it moves away from the analysis of communities as homogenous units as well as the limited focus on intra-household gender power relations.

In addition, limited conceptual, methodological, analytical, and writing/documentation skills hold back the implementation of robust social analysis/gender analysis of sustainable biodiversity management programmes and projects (Adamo 2002). Tailor-made training on gender and social analysis would prove useful to conservation actors, including researchers, communities, and policy-makers. Gender balanced training is an important strategy to promote gender equality in skills and knowledge sharing. As the Nepal case study shows, women hold important leadership positions in community forestry. However, they are sometimes disproportionately represented in these positions when compared to men. Skewed leadership in natural resource related institutions sometimes leads to a situation where women are invisible in policy-making forums and have limited opportunities to have their voice heard and to influence policy-making and implementation. This has serious implications for gender-equitable access to, and control over, natural resources as well as the technological and political-economic benefits derived from these resources in the greater Himalayas. Therefore, capacity strengthening programmes should focus on building women's leadership skills to enable state and non-state actors (including those working in statutory and customary institutions) to deal with conservation issues and programmes in socially just ways.

Women's leadership is critical in the face of rapid changes in the greater Himalayan region. If women are frontline agents of adaptation (Nellemann et al. 2011), then biodiversity management and conservation efforts need to recognize and value this

agency. Lessons from gender integrative work at ICIMOD suggest that meaningful participation and gender balanced leadership is possible. It requires, however, that women have access to information; that they are active, respected members of discussions; that they are able to influence decision-making; and finally, that the decisions addressing gender issues are implemented (Gurung et al. 2009) in ways that positively impact the wellbeing of all women, men, and children living in the greater Himalayas.

Strengthening women's leadership
is key to equitable and sustainable
mountain development.



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