Values of Protected Landscapes and Seascapes

A series published by
the Protected Landscapes Task Force of IUCN´s World Commission on Protected Areas

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Protected Landscapes and Agrobiodiversity Values

Edited by
Thora Amend, Jessica Brown, Ashish Kothari, Adrian Phillips and Sue Stolton

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Preface: Introducing a new series

Some lived-in landscapes are so important for conservation and sustainable development that they deserve special protection. Where effective national or local conservation measures are in place, many of these lived-in landscapes have been recognised by IUCN as Category V protected areas – Protected Landscape and Seascapes. As protected areas based on the interactions of people and nature over time, they play an important role in sustaining biological and cultural diversity.

The many different kinds of values that such places can provide need to be better understood so that the full potential of the Protected Landscape approach can be realised around the world. The Protected Landscapes Task Force of IUCN's World Commission on Protected Areas (WCPA) has begun to document these values through Category V Management Guidelines (Phillips 2002), a special number of PARKS on Category V Protected Areas (Beresford 2003), and a book, The Protected Landscape Approach (Brown et al 2005). This work has been undertaken in concert with WCPA's broader effort to encourage the wider adoption of all six protected area management categories.

But there is a need for more detailed examination, explanation and advocacy to promote a wider understanding of the range of benefits that Category V protected areas can offer, especially as some of these cover matters that are not always familiar territory for IUCN.

This is why we are launching a new series of publications, in partnership with other organisations, on the values of Protected Landscapes and Seascapes. The series as a whole is intended to document and spell out the various environmental, economic, social and cultural values that this category can provide. Individually each publication will illustrate the respective value by use of a number of case studies, preceded by a synthesis section that will draw out the lessons learnt.

The first volume addresses the topic of agrobiodiversity. We believe that Category V protected areas should provide a way of conserving agrobiodiversity *in situ*, supported by the efforts of local communities and, at the same time, contributing to the protection of landscape and wild biodiversity. We intend soon to follow this with two further volumes on the significance of Category V: the conservation of 'wild' biodiversity values; and the conservation of cultural and spiritual values. Further volumes will follow, at a pace largely dictated by the availability of resources.

This publication would not have appeared without the sustained support and interest provided by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. We are indeed indebted to them and to a consortium of statutory conservation agencies in the United Kingdom: The Countryside Council for Wales, Natural England and Scottish Natural Heritage. Together with GTZ these agencies have provided the funding to launch this series with the present volume.

We also wish to thank Tejaswini Apte for her continuous support in editing this publication.

Thora Amend, Jessica Brown, Ashish Kothari, Adrian Phillips and Sue Stolton
(the Editorial Team)

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Protected landscapes and biodiversity values: an overview

Adrian Phillips and Sue Stolton

Category V protected areas – Protected Landscapes and Seascapes – are defined by IUCN as areas "of land, with coasts and seas as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such areas" (IUCN 1994).

Since they are lived-in, working landscapes, this category of protected areas would appear to provide a potential mechanism for conserving agrobiodiversity. This is the thesis that this volume sets out to test through the use of case studies. In particular, this volume seeks to determine the value of Category V protected areas in the conservation of agrobiodiversity, and what lessons can be learnt from experience in this regard.

This introductory chapter is in three parts:

- We ask, and try to answer, three basic questions about agrobiodiversity and protected areas.
- We discuss the wider context for the conservation of agrobiodiversity.
- We present an overview of our findings based on an analysis of the case studies that follow.

Some basic questions

What is agrobiodiversity?[1]

The Food and Agriculture Organization of the United Nations (FAO) defines 'agrobiodiversity' as the variety and variability of animals, plants and micro-organisms that are important to food and agriculture, and which result from the interaction between the environment, genetic resources and the management systems and practices used by people (FAO 1999). It includes, therefore, two groups in particular: (1) the wild relatives of domesticated species (for example crop wild relatives from which cultivated crops originated, or which are closely enough related to provide useful breeding material); and (2) individual breeds of domesticated species of livestock and crops[2] (in the case of crops, known as landraces).

Does biodiversity include agrobiodiversity?

The Convention on Biological Diversity (CBD) is explicit that biodiversity includes varieties of livestock and crops as well as wild biodiversity,[3] and thus conservation action under the convention includes the conservation of agrobiodiversity. Moreover, it defines *in situ* conservation in these terms: "the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings *and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties"* (United Nations 1992, Article 2, with emphasis added).

IUCN has so far focused mainly on the conservation of wild biodiversity. But it has nonetheless recognised the importance of conserving agricultural genetic resources for at least 25 years, since the publication of the World Conservation Strategy in 1980. So when IUCN uses the term 'biodiversity', it is to be presumed that it uses it with the normal scientific meaning attached to it by the CBD, and that it does not mean only wild biodiversity. While there are differing views among IUCN members about the inclusion of agrobiodiversity within the Union's aims, it appears that in practice IUCN has not challenged the CBD definition of biodiversity and therefore that it recognises agrobiodiversity as a constituent part of biodiversity.

Is agrobiodiversity conservation a legitimate purpose of protected areas?

While the conservation of agrobiodiversity is important, its place among the purposes of protected areas has been questioned (Locke and Dearden 2005). However, since the CBD's concept of biodiversity includes agrobiodiversity, it would seem logical that the reference to the protection and maintenance of biological diversity in the IUCN definition of a protected area[4] should be interpreted as including agrobiodiversity, just as it clearly is in the CBD's definition of a protected area[5].

There remains a question about what *types* or *proportion* of agrobiodiversity might be included within a protected area. If protection of *all* agrobiodiversity were included as a legitimate purpose for protected areas, then in theory the world's entire agricultural estate could be classified as a protected area, which is clearly not the intention. So we assume that protection of agrobiodiversity is a legitimate

objective for a protected area where it is intended to conserve:

- Important crop wild relatives[6];
- Traditional and threatened landraces, particularly those reliant on traditional cultural practices; and/or
- Traditional and threatened livestock races, especially if they are reliant on traditional cultural management systems and if such systems are compatible with 'wild biodiversity'.

The wider context for agrobiodiversity

Cultural landscapes and agrobiodiversity

Landscapes rich in agrobiodiversity are often the product of complex farming systems that have developed in response to the unique physical conditions of a given location, such as altitude, slopes, soils, climates and latitude, as well as cultural and social influences. Some systems long managed by indigenous and other traditional people, such as home and spice gardens, may not look like conventional farmland at all, resembling 'wilderness' to outsiders. The loss of these diverse systems and related agrobiodiversity has important impacts on human society and on other species (Altieri 1999).

The traditional cultural systems that have often developed over millennia can be closely linked to social stability and food security. For farmers across the world, agrobiodiversity is an insurance against disease and extreme climatic fluctuations, as a coping mechanism in times of scarcity, as a means to enhance overall productivity of their farms, pastures and wetlands, as a source of critical nutrition and medicine, and as a culturally important resource. For example, in Kenya, indigenous seeds have been shown to perform better in harsh drought conditions and thus increase food security (Wairegi 2000). Crop-breeders rely on traditional varieties and wild relatives to adapt crops to changing climatic conditions, new diseases and environmental stresses. The loss of traditional systems and their associated species can therefore have a wide range of impacts, including reducing the ability of human communities to survive extreme weather conditions or crop disease, lowering breeding potential, and generally eroding the resilience of agricultural systems.

Trends in agrobiodiversity

Traditional land-use patterns, crops and animal breeds are disappearing for a variety of reasons. In most 'developing' countries, traditionally home to much of the world's agrobiodiversity, monoculture models of agricultural 'development' have for decades pushed out diverse traditional systems and encouraged or coerced farmers to switch to a smaller number of varieties. FAO estimates that about 75% of the genetic diversity of agricultural crops has been lost during the last century. A survey of 75 US crop species, carried out by the Rural Advancement Fund International (RAFI), found that 97% of the varieties listed in old United States Department of Agriculture catalogues are extinct (Fowler and Mooney 1990). Equally dramatic losses have been recorded in Europe: in Germany about 90% of the historical diversity of crops has been lost and in Southern Italy about 75% of crop varieties have disappeared (Hammer et al 2002). Even the genetic diversity within these species has declined dramatically. For example, 75% of rice varieties grown in Sri Lanka are descended from one maternal parent, along with 62% in Bangladesh, and 74% in Indonesia (Groombridge 1992).

Animal breeds are also being lost, and around 20% are at risk of extinction. 190 of some 7,600 breeds in the FAO global farm animal genetic resources database have become extinct in the past 15 years; a further 1,500 are considered at risk of extinction (Rischkowsky and Pilling 2007). Some countries have been especially badly hit; in India, for instance, all 18 indigenous breeds of poultry are considered threatened.

The destructive trends in relation to agrobiodiversity have recently been summarised in the Millennium Ecosystem Assessment (MEA): "Genetic diversity has declined globally, particularly among domesticated species. Since 1960 there has been a fundamental shift in the pattern of intra-species diversity in farmers' fields and farming systems as a result of the 'Green Revolution'. Intensification of agricultural systems, coupled with specialization by plant breeders and the harmonizing effects of globalization, has led to a substantial reduction in the genetic diversity of domesticated plants and animals in agricultural systems" (MEA 2005, p55).

These losses matter. As the MEA puts it: "Such declines in genetic diversity lower the resilience and adaptability of domesticated species. Some of these on-farm losses of crop genetic diversity have been partially offset by the maintenance of genetic diversity in seed banks. In addition to cultivated systems, the extinction of species and loss of unique populations (including commercially important marine fishes) that has taken place has resulted in the loss of unique genetic diversity contained in those species and populations. This loss reduces overall fitness and adaptive potential, and it limits the prospects for recovery of species whose populations are reduced to low levels" (ibid, p15). It follows that the conservation of agrobiodiversity, both *ex situ* and *in situ*, is a priority.

Agrobiodiversity and wild biodiversity

As farming practices change, the cultural landscapes that have developed from them are also eroded or abandoned. Such systems often contain much wild biodiversity. Extensive grazing systems on grasslands and prairies (Bradley and Wallis 1996), in savannah lands (Rockström and Steiner 2006), and in open woodland or heath (Webb 1998) can maintain habitats in a state very similar to the original, supporting high levels of biodiversity (West 1993). Artificial habitats such as hedgerows (Green et al 1994), agro-forestry systems (Donald 2004), and remnant natural habitat on farmland (Dover 1997) can all support high wildlife populations in some situations. Large proportions of the species living in a region are likely to be found in agricultural systems (Pimentel et al 1992). Many of the ancient agricultural and agroforestry production systems have associated high wild biodiversity values. In Europe, for example, the thousand hectares of managed chestnut woods that occur in the Parnon mountain range in the eastern Peloponnese (Greece) are an area of extraordinary wildlife diversity with 12 endemic plants and many threatened and rare species (Moussouris and Regato 1999; Beaufoy et al 1995).

Thus, just as varieties of domesticated plants and animals depend on the continuation of traditional farming systems, so many wildlife species are equally reliant on such forms of land management. Indeed in many long-inhabited and long-utilised landscapes, there is a spectrum from 'cultivated' to 'wild' biodiversity, with occasionally some blurring between the two. It is interesting in this respect that many traditional societies do not make a clear distinction between 'wild' and 'domesticated'. These are seen as forming a continuous spectrum, all being conceived of as part of the web of life.

Conserving agrobiodiversity

The Millenium Ecosystem Assessment referred to above provides many good reasons for including agrobiodiversity amongst the forms of biodiversity to be conserved. The homogenisation of food production systems and globalisation of markets marginalises many traditional producers, undermines agrobiodiversity, and degrades landscapes. So the conservation of agrobiodiversity also addresses issues of food security, traditions, culture and identity, as well as the conservation of nature for its intrinsic values. Often, conservation can only be successfully pursued through an approach that involves the whole landscape and associated management systems. These may not necessarily require conserving whole farmed landscapes in their entirety, but at least their essential qualities need to be considered in developing management strategies.

Following lobbying from signatory countries, particularly in the developing world, the Third Conference of Parties (COP) of the CBD in 1996 set up a 'Programme of Work on Agricultural Biological Diversity' and at the Fifth COP in 2000 it was agreed that agrobiodiversity must be addressed in National Biodiversity Strategies and Action Plans. The issue of agrobiodiversity also fits well into the CBD's 'three pillars', i.e. biodiversity conservation, sustainable use, and benefit sharing. However, agrobiodiversity remains a poorly understood concept by most CBD signatory countries (Gemmill 2001). Furthermore, agrobiodiversity and its associated components were not mentioned in the CBD's 'Programme of Work on Protected Areas'. Questions arise, such as: Does a threatened livestock breed equate in terms of conservation importance with a sub-species of a wild animal or plant? How should conservation of livestock and crop varieties be pursued, and who should be involved in this? Is there a positive correlation between conservation of agrobiodiversity and conservation of wild diversity, or are the two mutually contradictory or in competition? The answers to some of these questions may be highly site specific.

Tools for the conservation of agrobiodiversity

While the potential of Category V protected area models to protect both wild and domesticated biodiversity has been identified (see below), this is not the only internationally recognised means that is available for *in situ* conservation. It is useful to review other mechanisms before considering the place of Category V protected areas in detail. Table 1 therefore summarises a number of other tools at the international level which are about managing and protecting sites where important resources of agrobiodiversity might occur. One or more of these mechanisms are relevant to nearly all the case studies in this volume[7].

Agrobiodiversity and protected areas

In general, the idea that the conservation of agrobiodiversity is a potentially valuable function of a protected area is as yet little recognised. For example, it would appear from the case studies that it hardly ever appears explicitly in protected area legislation, and rarely in management plans. Indeed, a study by WWF found that the degree of protection in places with the highest levels of crop genetic diversity is significantly lower than the global average; and even where protected areas did overlap with areas important for crop genetic diversity (i.e. landraces and crop wild relatives), little attention was given to these values in the management of the area (Stolton et al 2006). However, there are some signs in the analysis of the case studies that follows, that things are changing and that some protected area managers are beginning to see an important role for protected areas in this regard, even if this is not yet formally recognised. One reason for the slow development

Fruit trees in Canyon de Chelly National Monument, USA.

Photo: Jennifer Lavris

of awareness in this area may be that there is little contact in general between scientists and others working on agrobiodiversity, and scientists and others working on the conservation of wildlife in protected areas.

However, the potential for using the Category V type of protected area for the conservation of agrobiodiversity has been identified in the IUCN guidelines of 2002 on the management of Protected Landscapes/Seascapes. Indeed the guidelines identify the conservation of agrobiodiversity as a distinguishing purpose of this category. Thus while other categories may be just as effective in conserving crop wild relatives, Category V is also suited to the conservation of landraces and domesticated livestock varieties[8]. The guidelines also explain why this category of protected area might – prima facie – be expected to be particularly rich in landraces and traditional livestock varieties: "In general, farming systems in remoter regions, and in more rugged terrain, have been less subject to 'improvement' through the use of modern varieties. Because these physical characteristics are also a feature of many Protected Landscapes, Category V protected areas tend to be among the last strongholds of rare and endangered domesticated breeds of cattle, sheep, goats, pigs, fowl etc., and varieties of crops, such as cereals, vegetables and fruit. They survive because farming methods in such places are less likely to have succumbed to the use of modern, highly productive varieties. Often, too, their use is associated with cultural traditions. Therefore, though few – if any – Protected Landscapes have yet been created primarily in order to safeguard such valuable resources, many existing Category V protected areas can be considered as a means of protecting 'hot spots' for agrobiodiversity. This means that they could have potential application in the centres of agrobiodiversity and important gene pools…" (Phillips 2002).

The next section of this chapter explores the extent to which this claim is borne out in practice.

Overview of the case studies

There are twelve case studies in this volume: two from Asia, four from Europe, one from Africa, two from North America and three from South America. The information that these case studies contain, has been drawn on in writing this overview. Though a still wider set of case studies would have been desirable, it was outside the scope of this volume. We consider that those described here provide a wealth of data from which valuable lessons can be drawn. Collectively, the case studies provide evidence that protected areas can be used to achieve effective conservation of agrobiodiversity.

It should be noted that all the case studies in this volume are about sites that not only conserve agrobiodiversity, but also protect landscapes, important wildlife, and natural ecosystem values, as well as associated cultural values – a point that is brought out in several of the case studies themselves. So all these sites protect multiple values and play an important role in the conservation of biological and cultural diversity.

The case studies represent a wide range of situations in respect of their protected area status. Several of them are already on the UNEP/WCMC World Database on Protected Areas (WDPA) as Category V protected areas. In other cases, part of the area has been assigned to another category. Many, however, have not been recognised as a Category V protected area under the IUCN system because the national protected area systems of which they are a part have not yet gone through a process of classification according to the IUCN system of management categories. Some of these sites have, or could have, other forms of international recognition or protection. The different situations are summarised in table 2.

Table 1
Complementary forms of international recognition that might help conserve agrobiodiversity at site level

Mechanism	**Status and geographical application**	**Basic purposes**	
World Heritage (WH) Convention	Global treaty under UNESCO auspices, adopted in 1972.	Identify and protect places of 'outstanding universal value' (OUV).	
Biosphere Reserves	Global programme under UNESCO auspices, inaugurated in 1976.	To innovate and demonstrate approaches to conservation and sustainable development.	
Globally Important Agricultural Heritage Systems (GIAHS)	A global programme of FAO, adopted in 2002.	To establish the basis for the global recognition, conservation and sustainable management of GIAHS, as well as their associated landscapes, biodiversity, knowledge systems, and cultures.	
Indigenous Biocultural Heritage Area	Proposal debated at a side event at the CBD (COP8, 2006).	A means to identify and value traditional knowledge systems related to agrobiodiversity.	
Latin American Ethno-botanical Sister Garden Network	Informal network (Latin America) established at the VIIth International Congress on Ethno-biology, 2000.	To support community-driven conservation efforts in ethno-botany.	
Natura 2000	A European network with common standards, recognition procedures, etc., established under European Union law, based on the 1979 Birds Directive and 1991 Habitats Directive, and aiming to conserve species and habitats.	To establish a Europe-wide network of effective protected areas to conserve habitats and species.	
European Landscape Convention	A Europe-wide treaty adopted in 2000 under the auspices of the Council of Europe.	To promote the importance of landscapes in Europe.	
The Programme of Work on Protected Areas of the CBD	A global initiative of the CBD (COP 7, 2004).	To support the establishment and maintenance of a comprehensive, effectively managed, and ecologically representative system of protected areas.	

	Relevant Measure	Potential outcome in respect of agrobiodiversity	Relevant case study(ies)
	Relevant category is 'Cultural landscapes – continuing, organically evolved' type.	The protection of the area's OUV could be relevant to agrobiodiversity conservation.	Philippines rice terraces WH Cultural Landscape.
	Creates individual Biosphere Reserves with core, buffer and transition zones. These have 3 functions: conservation, development and logistical support (incl. education, training, research).	The conservation of genetic variation is a specific aim of Biosphere Reserves, and this should receive support through research, monitoring, education and training.	Rhön (Germany), and could be relevant to other case studies, e.g. Nepal and Ecuador.
	For the period 2007-2014, pilot sites will implement dynamic conservation management to help national and local stakeholders protect and sustainably conserve the systems and their components.	While initially focused only on pilot sites, the GIAHS could eventually have global implications for agrobiodiversity.	Pilot sites include Philippines rice terraces and Andean agriculture (Peru) – latter includes potato-growing landscapes of the Southern Andes. In the long term, it might be relevant to other case studies in Ethiopia and Ecuador.
	None yet proposed.	From this initiative should eventually emerge the better protection of traditional knowledge systems that conserve agrobiodiversity.	Potato-growing landscapes of the Southern Andes.
	Inclusion of a garden as a scientific research and educational centre.	The provision of a stronger scientific basis for the conservation of ethno-botany.	Quijos Valley, Ecuador and potato-growing landscapes of the Southern Andes.
	Establishes Special Areas of Conservation and Special Protection Areas (for birds).	Could be used to conserve agrobiodiversity where this in turn helps to protect habitats and wild species.	Rhön (Germany) and the Garrotxa Natural Park (Spain).
	Encourages authorities to protect, manage and plan landscapes throughout Europe.	Could be used in association with other measures to conserve traditional agricultural landscapes.	All three European case studies (Germany, Spain and England).
	Sets out a detailed programme of action for parties to the CBD.	While there is no specific reference to agrobiodiversity, measures to strengthen protected areas could help where conservation of agrobiodiversity is a management objective.	All case studies that include protected areas.

Table 2
The status of the areas covered by the case studies

Case study	**Is the area recorded by a Category V protected area on the UNEP/ WCMC database?**	**Is the area covered by another category of protected area?**	
Farmscapes of the Quijos river, Ecuador	No. There are no Category V protected areas in Ecuador.	No, but the area lies between three established protected areas: one Category II and two Category VI areas.	
Agrobiodiversity and conservation in the Garrotxa Natural Park, Spain	Yes. The entire area is a Category V protected area.	No.	
Potato-growing landscapes of Southern Andes, Peru	No, though there are Category V protected areas in Peru.	No.	
Rhön, Germany	Yes, in the Thuringian part, which is a Nature Park.	Some areas in Hessen and Bavaria are Category IV; the case study site is affected by the European Landscape Convention (see Table 1).	
Rice terraces of the Philippine Cordilleras, Philippines	No, though there are Category V protected areas in the Philippines.	No.	
Gaspé Peninsula, Quebec, Canada	No.	No.	
Borana pastoralist landscape, Ethiopia	No.	No.	
Agrobiodiversity in England's Protected Landscapes (a national level case study)	Yes, all areas discussed are Category V.	Some (relatively small) areas within the Category V areas are Category IV.	
Agricultural biodiversity around protected areas in Nepal	No.	No, but three mini case study sites are near protected areas.	
Canyon de Chelly National Monument, USA	No. A process to classify US protected areas according to IUCN management categories is currently underway.	Designated a National Monument within the US National Park System.	
Chimborazo, Ecuador	No.	Chimborazo Faunal Production Reserve is listed as Category VI in the WDPA database.	
Stara Planina Nature Park, Serbia	No (presumably too recently designated to be included).	No.	

	Are there other forms of protection that are, or might become, internationally recognised?	Does the author offer additional commentary on status?
	The site is a member of the Latin American Ethno-botanical Sister Garden Network.	The author considers that the area meets the criteria of Category V; and implies that Biosphere Reserve status might also be relevant.
	No; the area is affected by the European Landscape Convention (see Table 1).	No.
	There is a proposal to recognise the area as an 'Indigenous Biocultural Heritage Area' (see Table 1).	The author strongly argues for Category V recognition by the Peruvian authorities.
	The area is a UNESCO Biosphere Reserve and also contains three Natura 2000 sites; the area is also affected by the European Landscape Convention (see Table 1).	The author notes the different regional approaches to landscape management and protected area classification, which are a legacy of the area once being divided by the 'Iron Curtain'.
	Part of the area is a World Heritage Cultural Landscape (see Table 1). The area is also a pilot site in FAO's Globally Important Agricultural Heritage System (GIAHS).	The author considers the area as fully meeting the criteria for Category V.
	No.	The local community seeks recognition of the area as a 'paysage humanisé', a new Quebec designation which would be equivalent to Category V.
	No.	The authors consider that the area as a whole meets Category V criteria (and that parts of it meet criteria for Categories Ia, Ib and III).
	No, though one or two areas might be nominated as World Heritage Cultural Landscapes; several areas contain Natura 2000 sites and all are affected by the European Landscape Convention (see Table 1).	No.
	Possibly as a UNESCO Biosphere Reserve.	The authors recommend that various protected area categories be used, with Category V for Community Conserved Areas.
	Possibly could be considered as a candidate World Heritage Cultural Landscape.	The author considers that this area meets the criteria for Category V and should be listed accordingly when classification of US protected areas is updated in the database.
	No.	The author notes that the presence of páramo landscapes corresponds with Category V.
	Efforts to create a transboundary Stara Planina Peace Park are underway and a memorandum of understanding has been signed by the Governments of Serbia and Bulgaria.	In Serbia's national system the Nature Park designation corresponds with Category V.

It is thus clear that the current survey does not focus exclusively on those areas listed as Category V on the WDPA (in fact, they account for fewer than half the sites), but on protected areas whose landscape qualities and management objectives appear to the authors to be equivalent to or, in some cases, evolving towards, Category V approaches.

A more detailed analysis of the case studies reveals a number of consistent themes, relating to the significance of agrobiodiversity in each of the areas, the kinds of threats that both agrobiodiversity and the human communities that depend upon it face, and the kinds of solutions that are being worked out. While of course there are obvious differences, especially between conditions in Europe and Gaspé on the one hand and the developing country case studies on the other, there is also a remarkable degree of communality about the threats and solutions. The key issues are identified below, and some tentative conclusions are drawn.

The significance of agrobiodiversity

The case studies demonstrate a wide range of agrobiodiversity: rare and locally adapted breeds of livestock of all kinds, diverse landraces of globally important crops like rice and potatoes, and diverse and often threatened varieties of fruit and vegetables. All the examples are associated with many years of human occupation of land, and genetic manipulation by selective breeding – as much as 7,000 years in the case of Peru, 2,500 years in the Canyon de Chelly and 2,000 years in the Philippines. In Nepal, Europe and Ethiopia there is evidence of many hundreds of years of adaptation; even in the case of Quebec, there are nearly 200 years of evolutionary history involved. As a result, these case study sites contain a storehouse of genetic material which cannot easily be replaced. On these grounds alone, there is a strong case for their conservation.

In many case studies, the traditional range of agrobiodiversity is important to the economic well-being of the population. A notable case is that of the Peruvian Potato Park, where the area's economy is largely dependent on the potato and where there is now an interest in developing 'agro-ecotourism' around the story of potato cultivation. Equally, the people of the Philippines rice terraces are dependent on rice cultivation. In other examples, such as Quijos and the three European case study chapters, many local varieties of crops, fruit and livestock have been lost or are in decline (for reasons which we shall explore below), but there is a consensus that they could be an important element in reviving the rural economy.

Every case study shows that the value of agrobiodiversity is intimately associated with the social and cultural values of the human communities involved. In the Philippines, for example, complex rituals that bind the community together are associated with the cultivation and harvesting of rice, and its preparation in the form of food and drink; the rearing of the cattle of the Borana is similarly at the heart of the local culture. In Nepal, there is a conscious effort to revive and maintain the richness of the agrobiodiversity heritage by holding 'diversity fairs'; similar events are held in Garrotxa in Spain. And even where – as is the case in England, Rhön, Garrotxa and Gaspé – these locally-evolved varieties of livestock and fruits may be less important now in economic terms, they retain much of their social and cultural significance, and can still be used to restore a sense of cultural identity and of place, as well as being important features in the landscape.

In addition to direct and potential economic, social and cultural values, the systems of land use associated with agrobiodiversity described in the case studies often favour the conservation of wild biodiversity. In general, these systems involve less intensive interventions – for example, less drainage, less intensive tillage, less reliance on large machinery, and less use of artificial fertilisers, pesticides and fungicides. Such relatively low intensity systems of land use provide more room for nature alongside crops and livestock. And in many cases they create habitats – wetlands, grasslands, remnant areas of scrub and woodlands, etc. – in which wildlife can thrive. This, indeed, is a point picked up in many of the case studies. Moreover, in examples as varied as England and Chimborazo in Ecuador, the use of traditional breeds of livestock helps to create wildlife-friendly habitats. But while the conservation of wild biodiversity and the conservation of agrobiodiversity very often go hand in hand, it is important to note that there are many gaps in our knowledge about the precise relationship between traditional land use systems and wildlife conservation, as noted, for example, in the Ethiopian case study.

The basis for successful conservation of agrobiodiversity

At first sight, the nine case study chapters tend to tell two different stories. On the one hand, the five developing country examples emphasise the importance of a strong, coherent rural or agrarian society which can resist outside pressures, notably those from governments or globalised markets, which threaten agrobiodiversity. The Quijos case study, for example, reports on the vulnerability of the area to the impact of global influences; while the Peruvian Potato Park case study stresses the many self-help measures that are being taken to reinforce the traditional potato farming system. Most of these studies also stress the importance of strong community institutions and land tenure rules that protect farmers.

On the other hand, in the four case study chapters from the developed world (Gaspé and the three from

Chimborazo Volcano, Ecuador

Europe), the emphasis is more on re-creating a market for the produce from traditional land use systems – for meat, cheese, fruit and so on. This needs to be based less on price and more on greater public awareness of the nutritional, health, environmental and food quality arguments for buying such products, as well as their link to conserving the cultural landscapes associated with their production.

But on closer examination, it is possible to see that in practice both sets of case studies identify the same pre-conditions for the successful conservation of agrobiodiversity. These include:

- A social element – strong communities which value traditional land use systems but are capable of adapting to changed circumstances.
- A governance element – systems of governance and land tenure that ensure that local people's rights are protected, their customary laws respected and their views taken into account; and that they are able to have a meaningful say in determining their own futures through effective participation in appropriately constituted institutions.
- An economic element – a market for the products that come from systems of farming that rely on agrobiodiversity conservation, in which cost is not the only consideration.
- A degree of wider support – from international bodies, governments and the general public, which values the communities who depend on traditional systems of agriculture with their associated agrobiodiversity, as well as the products where these enter the market economy.

Current trends and threats

There is one theme that is common to all the case studies: the pressures from outside that undermine the ability of local communities to sustain the systems of land management that have helped to develop and conserve agrobiodiversity. The effects of globalised markets have been almost entirely negative in this respect in every case. In some cases – Borana for example – government intervention has also been damaging.

In the three European case study chapters especially, the most obvious effects of globalisation are economic. Thus one can see a trend over the past 20 or 30 years in which globalised markets, involving the large scale production and long distance transport of foodstuffs, have created consumer expectations, such as for cheap food and all-the-year-round fruit and vegetables of standardised quality and appearance, which cannot be met by the kind of relatively small operators described in many of the case studies. In response, many of these communities are working to develop and promote niche markets, which give added value to the livestock, fruit and crops that they can produce.

In the case studies from developing countries, the economic effects of globalisation are often very evident – in Quijos for example. But social and cultural impacts may be even more devastating. For example, the life of

a subsistence rice farmer in the Philippines is not easy, so the attractions of city life may tempt him (or more often his sons) away, leaving the farm systems, which are heavily dependent on labour, undermanned – and then undermined. Another recurring problem is that seasonal routes for livestock are often disrupted by infrastructure, intensive farming and urban development, thus undermining traditional ways of life – as in Stara Planina in Serbia.

Other threats are reported too: population pressures, pollution, climate change, ethnic tensions, loss of cultural identity, lack of conservation funds and so on. To that extent, the issues faced by rural communities in the case study areas are no different from those faced elsewhere. But in the case study areas, these issues and problems come with a loss of landscape vales and biodiversity of all kinds that are associated with traditional forms of land management.

Emerging action to conserve agrobiodiversity

The case studies describe many problems but they also give an account of how communities, sometimes supported by official or semi-official bodies, have taken action to conserve agrobiodiversity and the production systems that depend on it. In the Potato Park and Gaspé, for example, there is a strong movement of community self help. In other cases, outside agencies (e.g. the World Heritage Convention in the case of the Philippines rice terraces) have been instrumental in helping to reinforce local efforts, though in the case of Borana not always with success. In the European examples, and in Nepal, protected area agencies have taken the lead, and in Quijos an ethno-botanical research centre has adopted this role.

What are these bodies doing? A number of strategies seem to be emerging:

- Reinforcing local institutions to improve governance – e.g. Borana, Potato Park, Nepal
- Supporting local groups dedicated to agrobiodiversity conservation – e.g. Garrotxa, Gaspé, Nepal
- Providing advice to local farmers, etc. – e.g. England, Philippines rice terraces
- Developing new markets for agrobiodiversity products – e.g. Rhön, England, Garrotxa, Gaspé (including branding and standard setting)
- Developing international networks – e.g. Quijos
- Supporting scientific research – e.g. Garrotxa, Quijos, Nepal
- Promoting supplementary economic activity, such as tourism – e.g. Potato Park, Gaspé, Garrotxa
- Developing public support – e.g. Rhön, Garrotxa, Gaspé, Potato Park, Nepal
- Supporting landscape-scale programmes and initiatives – e.g. Nepal, Quijos, Rhön.

The use made of Category V status

Table 2 may be viewed as representing a progression – thus, in some countries systems of Category V protected areas are already well established in legislation, and the contribution to the conservation of agrobiodiversity is understood; while in others the importance of conserving agrobiodiversity is becoming clearer but the potential that Category V offers in this regard is not yet widely appreciated. In a number of cases, one might expect that, in time, formal Category V protected areas will be established.

Thus in two cases the areas are formally designated as Category V protected areas, and the protected area agencies involved are engaged in supporting conservation programmes (Garrotxa and England); and they appear in the WDPA as Category V protected areas. In a third case, Rhön, part of the area is defined as Category V. In two other cases (Quijos and Nepal) the areas studied are part of a complex of protected areas; and four have not been formally recognised as protected areas at all (Borana, Gaspé, Potato Park, Philippines rice terraces) – in both situations, they do not appear as Category V protected areas in the database. While several of these are traditionally Community Conserved Areas (notably Borana and the Potato Park), and part of the Philippines rice terraces have achieved World Heritage status as a Cultural Landscape, all four remain outside the nationally recognised protected areas system. How far this matters is debatable; after all, the most important question is not into which particular box the area has been allocated on a global database, but whether the communities involved have access to effective conservation mechanisms.

The fact that some areas have been officially recognised as Category V and others have not, is often a measure of national governmental action (or inaction). Thus if a government considers that an area meets the criteria of Category V, it can put it forward for inclusion in the WDPA database and the United Nations List of Protected Areas. If it fails to do so, there was till now no other means by which an area could be added to these databases. As many governments have not yet fully appreciated the potential value of Category V as a conservation tool, this may explain why they have neither created national legislation to identify and protect such areas, nor so far put forward Community Conserved Areas that meet the criteria. The WDPA structure is now being developed to include information (including data on Community Conserved Areas) that comes from non-governmental sources. With this innovation, it will become possible for communities, NGOs, scientific institutions, or others to suggest Category V areas that have not been officially recognised for inclusion in the database. This will, however, not be possible for the UN List, which remains populated exclusively by sites that have been put forward by government

The Rice Terraces of the Philippine Cordilleras

agencies. In some cases the position is further complicated by the government's failure to classify its national system of protected areas using the IUCN categories.

A case can be made for the benefits that flow from a more formalised Category V status, and it is interesting that in several cases (Gaspé, the Potato Park and Nepal), local communities and others actively aspire to achieve this form of recognition. Taken as a whole, the case studies suggest that formal support and recognition for local efforts to conserve agrobiodiversity are highly desirable, provided these are sensitive enough to the diverse institutional and customary arrangements that communities have evolved on their own. Governments could assist such areas by creating national legislation for the designation of Protected Landscapes, in ways that would sustain local community efforts, not replace them. More particularly, formal recognition of an area through Category V designation could be helpful by:

- Securing legal recognition of the value of the area and its agrobiodiversity, and the need for its protection
- Putting in place an effective agency that can lead, or play a supportive role, in attempts to conserve agrobiodiversity
- Helping to secure the resources and staff needed for management and other services (e.g. education, research, public awareness) in support of agrobiodiversity conservation
- Achieving greater public recognition of the importance of the area.

The challenge

Sustaining agrobiodiversity in protected landscapes in the face of current challenges requires more than simply 'protection' in a conventional sense. There is a need for a more holistic, landscape approach. But in many cases it will also require a complex mixture of legal, policy and support mechanisms, including secure land tenure, secure access to critical agricultural inputs including water and seeds, facilitation of organic farming and animal husbandry, marketing and branding of local products with farmer-led quality control and certification, developing value-added products, agro-tourism, etc., all designed to underpin traditional land use systems and the agrobiodiversity that they depend on and support. An underlying practical issue is the need to re-establish the importance of local varieties of crops and livestock and locally developed food production systems. The value of such approaches is likely to increase as the need for adaptation to climate change, animal and plant disease etc. becomes better recognised.

Frequently the landscapes which help conserve agrobiodiversity are under multiple types of ownership; typically much of it is private land, but also state or community controlled areas and, increasingly, land owned (or at least controlled) by corporations. Rights over at least some of the land are often disputed. It follows that innovative governance mechanisms will be necessary: in government managed protected areas, the role of government protected area agencies must, in these cases, extend

beyond 'nature conservation' in a traditional sense, and must include cooperation with the communities that are the traditional guardians of agrobiodiversity; and in the case of Community Conserved Areas and Private Protected Areas, the role of government agencies must include facilitating and supporting the local owners/managers. Often a greater sharing of rights and responsibilities will be needed than has been the case in the past. The question of who has intellectual rights over agrobiodiversity is also something that can be central to the survival of both crop or livestock varieties and the human communities that have developed and maintained them. Agrobiodiversity can ideally provide an incentive for protection in areas where land is already overstretched, and can be the spur to building alliances between conservation organisations and local communities.

All of which is fine in principle, but hard to achieve in practice. There are indeed many questions to which this volume can give only partial answers. How does the landscape approach work when traditions change? How can modern knowledge help, and synergise with, traditional knowledge systems, rather than displace them as is currently the case? How can farmers and pastoralists be helped to face modern challenges, including those of climate change and economic globalisation? How can mobile and nomadic lifestyles of many pastoral communities, so essential to conserving ecosystems and species/genetic diversity, be continued or revived? How do we create a balance between conserving traditional approaches and fossilising lifestyles that should be given the chance to grow and expand? How is success achieved, maintained, shared and measured across continents and cultures?

The current volume gives a tantalising glimpse of the potential to conserve agrobiodiversity as part of the Category V approach. It also demonstrates the legitimacy of agrobiodiversity conservation as an objective for this kind of protected area. And it contains some excellent examples, from which a number of initial lessons have been drawn above. But while we believe that there is much evidence among the case studies of the potential value of Category V in the conservation of agrobiodiversity, it is clear that this work is still at an early stage of development. Certainly there is much to be learnt about how Category V models can be used to support traditional approaches and conserve agrobiodiversity. Building on our preliminary study, we hope that IUCN and WCPA will support further work to deepen and widen knowledge about this important topic in the future.

1 The term 'agrobiodiversity' is sometimes written as 'agri-biodiversity'.

2 We use 'livestock' here to mean all animals reared for human use, including mammals and birds. We use 'crops' to mean all plants grown for human or animal food. An alternative term for this kind of agrobiodiversity is 'domesticated biodiversity '.

3 The term 'wild biodiversity' is used throughout this volume to encompass wild species and sub-species – the 'natural' form of biodiversity – as distinct from domesticated species of livestock and crops.

4 The IUCN's definition of a protected area is "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed though legal or other effective means" (IUCN 1994).

5 The CBD's definition of a protected area is a "geographically defined area which is designated or regulated and managed to achieve specific conservation objectives" (United Nations 1992 Article 2).

6 See Stolton et al 2006 for a methodology that has been developed for identifying conservation priorities with respect to crop wild relatives, both nationally and for individual protected areas.

7 There are other agreements that relate to site protection, such as the Ramsar Wetlands Convention, but these are not relevant to any of the case studies. Likewise there are other agreements that relate to the conservation of agrobiodiversity but are not concerned with site-specific measures.

8 It should be noted that in a number of Category IV protected areas, rare breeds of livestock are used as a means of grazing to ensure the management of diverse habitats that favour biodiversity conservation. But in such cases, the conservation of agrobiodiversity is not an end in itself, but a means to an end.

Acronyms

CBD	Convention on Biological Diversity
COP	Conference of Parties of the CBD
FAO	Food and Agriculture Organization of the United Nations
GIAHS	Globally Important Agricultural Heritage Systems
MEA	Millennium Ecosystem Assessment
OUV	outstanding universal value
UNEP-WCMC	The World Conservation Monitoring Centre of the United Nations Environment Programme
WDPA	World Database on Protected Areas
WH	World Heritage
WCPA	World Commission on Protected Areas

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Agrobiodiversity in the farmscapes of the Quijos River in the tropical Andes, Ecuador

Fausto O. Sarmiento

Summary

The conservation of rural landscapes has become an important anchor for novel approaches towards sustainable mountain development around the world. Largely because of their anthropogenic nature and their dynamic processes, farmscapes of the Tropical Andes are used as an alternative, inclusive conservation model to the traditional, exclusive, national park model. In the Quijos river basin of Ecuador, a private ethnobotanical reserve is presented as an example of a new form of community conservation, based upon an 'inverse' biosphere reserve model, in which the core natural areas are located in the periphery, the private ethnobotanical reserve is the buffer, and the cultural landscape of the Quijos river basin in the centre is human-dominated. The many factors contributing to biodiversity protection of the surrounding protected areas are enhanced by the utilitarian function of ethnobotany, particularly ethnomedicine, and bioprospecting.

Introduction

With the changing demographics of mountain regions, and the increased pressure on resources to satisfy the demands of growing cities in the lowlands, the rural areas of Latin America are experiencing worldwide dynamics that are transforming community-driven, subsistence-based economies into a more global, urbanized and industrial-based economy (Sarmiento 2001). Human/environment interactions due to global climate change and necessary dynamic adaptation to economic and social transformations make mountain communities vulnerable to external forces, while environmental changes put the resilience of time-tested cultures under pressure (Sarmiento et al 2000). Biodiversity is also often put under stress by these changes. So novel conservation and development practices are required, and modern conservation approaches such as protected landscapes need to be considered and applied where appropriate (Brown et al 2005).

The mosaic created in human-dominated forest areas of Papallacta, with volcano Antisana in the background.

Among the many ways in which culturally rich sites help to protect biodiversity, the Andean region shows potential to become an exemplar for places elsewhere. The protected landscape approach appears to be successful in generating poverty alleviation options associated with eco-tourism, non-traditional forest products, ethnobotany and ethnomedicine - and even helps meet spiritual and non-material needs (Sarmiento 2003; Sarmiento et al 2005). However, this trend has received minimum attention from social scientists in the Americas, particularly in the Andes, where little research has been done hitherto on the human dimension of global climate change (MRI 2006). It is pertinent to emphasize resilience, adaptation for resource allocation, and the human drivers of landscape change, in the context of globalization and sustainability. The realization of the cultural landscape approach, supported in social science research, should help end the debate as to whether nature or culture is responsible for highland Andean ecosystem development (Ellenberg 1979); and the new political ecology of conservation will include people as an integral element of protected areas, particularly when dealing with indigenous people and traditional economic practices.

For example, during the last two decades, structural reform projects and capital investment in the mountainous regions of the Ecuadorian Andes have helped to bring about a significant change in land use practices, away from the traditional, agriculturally based economy, and towards a new, industrially based one in which dairy farming and exotic cultivars (e.g. broccoli, asparagus) dominate. In the pre-montane and cloud forest belts of the Sierra region, change has taken the form of flower cultivation, and the mining of copper and gold. Such changes have led to a shift from the traditional rural landscapes created over long periods of time by generations of country folk, towards a landscape dominated by an aggressive pattern of resource exploitation containing mining operations, a transformed farmscape with new roads and increased traffic, the emergence of new cultural values, and the neglect of tradition (Sarmiento 2002).

Three sectors of the economy may be considered as being the driving forces behind these socioeconomic developments, all indicative of a more aggressive, competitive globalized framework: tourism, agriculture and mining. But these sectors could also help alleviate the poverty of local communities in the region and assist the conservation of the rich biodiversity of the tropical Andes. In theory, by working with all stakeholders in assessing future scenarios for conservation and sustainable development, it should be possible to take advantage of the opportunities, and address many of the challenges, that are posed by this change; tourism, agriculture and mining interests could therefore be encouraged to become stewards of the landscape (Brown et al 2000; Hamilton 1996). However, such a novel approach has not yet been fully implemented by provincial or state governments. And because of the complexity of Andean landscapes and the differential pressures of globalization upon the isolated, marginalized communities of campesinos and indigenous peoples, their ancestral practices and traditional ecological knowledge are at great risk of extinction.

Ethnobotanical Sister Gardens Network

To compensate for the vacuum caused by the lack of state-oriented initiatives to conserve cultural diversity and its links to biodiversity conservation, an initiative to develop ethnobiological approaches emerged in the late nineties. A network of groups drawn from the local communities, and working with universities and non-governmental organizations (NGOs), has made a major contribution within the field of ethnobiology by setting up a network of ethnobotanical garden sites.

Participants of the international IUCN-WCPA Mountain Connectivity Workshop in 2006, representing countries of every continent including New Zealand, Australia, Russia, China, South Africa, Spain, Italy, Switzerland, Scotland, England, the United States of America, Canada, Mexico, Costa Rica, Colombia, Bolivia, and the host country, Ecuador.

The VIIth International Congress of Ethnobiology at the University of Georgia in Athens (Georgia, USA) (UGA 2000) gave formal recognition to the Latin American Network of Ethnobotanical Sister Gardens. Members of the network agreed to comply with the Code of Ethics of the International Society of Ethnobiology, and with the notions of previous, informed consent of the members. The network initiated work to help establish private, community-driven, conservation efforts in ethnobotany,

Baeza and the river watershed, with evidence of cattle ranging the understory of remnant montane forest patches; not a single cow can be seen; however, the erosion generated by trampling attests to heavy usage.

The Ethnobotanical Sister Gardens Network.

including ethno-medicinal knowledge and the application of such knowledge in educational efforts for conservation and development. At that time, several groups were already collaborating with the Latin American Ethnobotanical Garden at the University of Georgia; this is seen in the table, which shows the founding membership of the Latin American Ethnobotanical Sister Garden Project.

The ethnobotanical garden of ECOSUR, in Mexico, was originally a research-oriented unit, but later changed into a group of community-held gardens in the Chiapas highlands, working to maintain traditional knowledge of medicinal plants, with a heavy emphasis on outreach and conservation. The ethnobotanical garden of EARTH (Escuela de Agricultura de la Región Tropical Húmeda) University in Costa Rica included a learning-by-doing approach in the training of young students from the tropics, promoted ethnobotanical applications in their study programme on ecological agriculture, and developed a demonstration site for community use of ethnomedicinal and ornamental tropical plants. The Villa Ludovica Garden in Santa Marta, Colombia, contributed with the special collection of plants used by the communities of the Sierra Nevada de Santa Marta based on their ancestral knowledge of useful plants, other natural products (including clays and other soil materials), and organic, holistic agriculture. Dr. Miguel Culaciati in the Huerta Grande Garden, Argentina, had developed educational programmes and short-term enterprenurial projects for nutritional, medicinal, ornamental and perfume applications of plant-based materials. The Cumanda Reserve in Baeza, Ecuador, had conserved an extensive sample of biodiversity-rich tropical montane cloud forest to secure the habitat of wild varieties of commonly used plant species. The Parque de las Papas, in the Pisac Valley of Peru, had been exemplifying community-driven practices in agrodiversity conservation, particularly on different potato varieties (see also Case Study on this site, elsewhere in this book). Finally, in Chile the Omora group had developed ethnobotanical collections in Isla Navarino and had initiated scientific research on the biomedical potential of species known by natives of southern Chile, which was instrumental in the declaration of the Biosphere Reserve of Cape Horn.

Each of the garden sites is required to make contact with the local university to provide for academic and

The members of the protected landscapes workshop in 2002, representing Colombia, Peru, Bolivia, Argentina, Chile, the United States of America, Canada, India, and the host country, Ecuador.

Table
Latin American Ethnobotanical Sister Garden Network: Founding membership, 2000

on Map	Name	Country	Locality	Group	Target
1	LAE Garden	USA	Athens, GA	University	Research
2	Jardín EARTH	Costa Rica	Guácimo de Limón	University Community	Education
3	Jardín etnobotánico ECOSUR	Mexico	San Cristóbal de las Casas, Chiapas	University	Outreach
4	Jardín Villa Ludovica	Colombia	Santa Marta	NGO	Outreach
5	Reserva etnobotánica Cumandá	Ecuador	Baeza	NGO	Research Conservation
6	Parque de las Papas	Peru	Pisac	NGO	Outreach Conservation
7	Jardín Nugkui	Peru	Santa María de Nieva, Jaén	NGO Ecumenical	Education Outreach
8	Jardín Miguel Culaciati	Argentina	Huerta Grande, Córdoba	NGO	Education
9	Jardín Botánico Omora	Chile	Isla Navarino	NGO	Research Conservation

scientific backing, as well as with local community groups to ensure the effectiveness of the operation. As a result, several NGOs have been brought into being with the mandate of including the ethnobotanical sister garden site in their target conservation efforts.

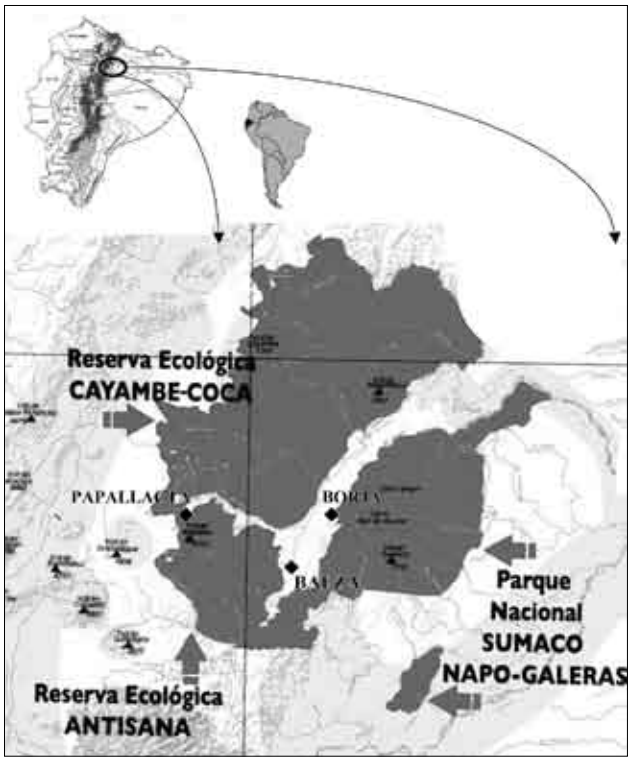
During the ensuing six years, the Sister Gardens network has progressed in developing infrastructure at the individual sites, and conducting training workshops at biannual meetings of the network held in different locations (e.g. in USA, Argentina and Costa Rica), thanks to the support received from their local hosts and the Exposition Foundation of Atlanta. Through a grant from the Exposition Foundation, work is being done to encourage the network towards more tangible outcomes, such as field courses, normal university classes, study abroad opportunities, and research.

New members of the network include the Communal Gardens of the Highland Chiapas in Southern Mexico, the Dominga Garden at the Ecolodge San Luis in Costa Rica, and the Vilcabamba Garden in Highland Peru. New sites have been proposed in Tucumán, Argentina; Lima, Peru; Otavalo, Ecuador; Mérida, Venezuela; Cuchimatanes, Guatemala; Samana, Dominican Republic; Fajardo, Puerto Rico; and Minas, Honduras. The guidelines and protocols to join the Sister Garden Network are still managed from the Latin American and Caribbean Studies Institute (LACSI) of the UGA where the original effort started.

Cumandá Ethnobotanical Reserve as an example

The Quijos river basin is located on the eastern Andean slopes towards the Amazon, known as the CisAndean ecoregion of the Tropandean landscapes (Pugh and Sarmiento 2004). It has been traditionally used as the gateway to the Orient, ever since before the Europeans selected that route in their conquest of 'El Dorado' and the 'discovery' of the Amazon river. The mountain pass that opens between the Antisana and Cayambe snow-packed volcanoes, is astride the continental divide of the Andes. From this cold, wind-swept region of Páramo[1], the watershed starts with little mountain brooks and white water rapids to end further down the basin in the spectacular waterfall of San Rafael, after which the river Coca enters the Amazon flood plain.

The Quijos river basin comprises almost the entire altitudinal transition from lowland habitats to the highland Andean forests. Ecotonal properties that are noted with increased elevation include an augmented forb layer[2], the diminishing heights of canopy trees, and the diminishing girth of tree and shrub boles. These habitats encompass most of the drainage basin and harbour its biological richness. Different zones experience different climatic limits, reflecting a meteorological regime that is influenced by the Massenerhebung effect[3]. On the slopes, adiabatic winds



Map of the study site showing the ecoregions of the Tropandean landscapes.

rise daily towards the ridges, but these are compensated for by descending katabatic winds that bring humidity to the valleys at night. This effect encourages species that can capture the abundant precipitation, leading to prolific epiphytic gardens on the branches and exposed surfaces, and waterlogging the soils. Biologically, speciation is very active in this ridge-and-valley topography (Wuethrich 1993), where constant humidity produces cloudiness that enhances UV-ß radiation. In Eastern Ecuador, there is one continuous cloud forest surrounding the city of Baeza. The high degree of biodiversity in the tropical montane cloud forest belt is impressive in almost every taxon.

A profusion of lauraceous trees with aroids, mosses, ferns, and orchids occurs mostly between 1800-2200 m, as an ecotonal height for the intermixing of both forest types, as predicted by the classification of Grubb et al (1966) who compared lower (700-1800m) and upper (1800-3400m) montane forests in the Tropandean region. Cañadas identifies an intermediate zone of mid-elevation forests, where *Cecropia* spp., *Xeroxylum andinum* and *Dictyocaryum* spp. are conspicuous (Cañadas 1983). This is the habitat for 'cascarilla', the national tree of Ecuador (*Cinchona officinalis*); other genera of the area include *Clussia, Barnadesia, Oreopanax, Schefflera* and *Weinmannia*. Tree ferns, especially *Trichipteris pilosissima* and *Cyathea poeppigii*, are found widely in these mountainous landscapes, as is the conspicuous mountain bamboo (*Chusquea* spp.) that covers recently exposed landslides that often appear on the steep topography. These landslides occur because of tremors and earthquakes, but even more because of recently cut access roads and other mountain pathways. Other important indicators of this montane habitat are palm species, especially those adapted to growth closer to the ground (e.g. *Geonoma*, *Chamadorea*). Because of the scarcity of flat lands, most plant species require root systems that can resist the forces of gravity, or ground hugging stems, such as corms, bulbs, rhizomes, runners, stolons, tubers and crowns. Representative bird species include *Penelope montagnii, Crypturellus cinereus, Buthraupis montana,* the big *Cephalopterus* spp., as well as the other Cotingidae including *Rupicola peruviana*. Several endemic species have been described for the area, including the equatorial quetzal *Pharomacros antisianum*. Finally, the list of endangered species includes flagship mammals, such as the mountain tapir (*Tapirus pinchaque*), the Andean bear (*Tremarctus ornatus*), the equatorial cougar (*Puma concolor bangsi*) and the Andean tigrillo (*Leopardus pardalis*).

The biodiversity of the site is even greater in the transition zone between the pastures and the forest areas. Cats and bears, for instance, are often found near cultivation plots or sites where cattle are reared.

These natural ecosystems contain much genetic material that is important to people living in the region. For example, the naranjilla (*Solanum quitoense*)[4] is vulnerable to infestation by nematodes in the monocultured soils of the open areas, but wild stock that is genetically resistant to the worms can be found in the surrounding forest. Likewise, local tea is traditionally improved by the collection of *Guayusa* leaves in the forest nearby. Also, the presence of heirloom varieties of walnuts and some palm species in the forests encourages culturally sensitive forms of conservation.

Amidst this wonderful natural backdrop, the human-dominated landscapes of the valley bottoms reflect an old tradition of frontier agriculture and livestock ranching. The city of Baeza, founded on the site of a settlement of an important indigenous group, the Quijos/Canelos, was erected under Royal decree from Spain, recognising the importance it held at the time of the 'Encounter'. Only two other cities received such prestigious recognition: Quito (the seat of Quito, capital of the Shyris empire) and Cuenca (the seat of Tomebamba, the northernmost Inca citadel). So, long before its incorporation into the Western world, the Quijos river basin had been much influenced by people (Cuellar 2005). Indeed, it is thought that the population around 1540 was up to three times greater than that in the year 2000: 60,000 then, as against 20,000 people now. And the immensely complex and varied culture and nature of the area has created a kind of 'archipelago' of land use mosaics, corresponding to different elevations in this montane farmscape (Uzendoski 2004).

Conservation paradox: an inverse biosphere model

The Quijos river valley lies between three important legally established Ecuadorian protected areas:

1) Sumaco-Napo Galeras National Park (Category II), part of the Gran Sumaco Biosphere Reserve
2) Antisana Ecological Reserve (Category VI)
3) Cayambe-Coca Ecological Reserve (Category VI).

Both Antisana and Cayambe-Coca Reserves are part of the largest grouping of protected area units in the country, known as the Condor BioReserve. Indeed, the Quijos river valley stands at the centre of a concentration of the largest conservation areas of Ecuador, a core landscape affected by human activities and surrounded by a buffer of remnant patches of forest, which, in turn, are enveloped by the big protected areas of the Gran Sumaco and the Condor BioReserves. It is as if a negative photographic image of the standard Biosphere Reserve model (core-buffer-support zone) had been applied to the area. Another way of looking at it is that foreign influences have brought about the establishment of the big protected areas, whilst the local people have pursued their own efforts to eke out a living within the valley, without destroying their own identity or the landscape that they have created over centuries, and have had to do so in the face of intrusive new development forces (Eastwood and Pollard 1993).

The mountain pass of Guamani, at the higher reaches of the watershed.

An extensive network of pathways or *culuncos* criss-crossed the area connecting the Quijos valley with other prehistoric and historic market centres, such as Pimampiro and Quito. Since colonial times, this was one of the only three access routes to the Amazon region in Ecuador. Today, this network continues to be a key transportation asset, though the former gravel *penetration* road has been replaced recently by the paved *carretera interoceánica*. The land exploitation of the *colono* (or colonial) period has greatly altered the original landscape into a mosaic of pasturelands, croplands and remnant forest patches. Although the original Quijos people have disappeared, rich archaeological evidence of their presence abounds in the area. Baeza, in the heart of the Quijos valley, is the only city towards the Ecuadorian Amazon territory that holds the rank of National Cultural Patrimony. The life of *mestizo*[5] in the Quijos river and of Cofan Indians[6] in the Oyacachi river represents important samples of traditional practices of alternate economic options in a working, living landscape (Sarmiento 1997; Levin and Reenberg 2002).

Community conservation efforts

Several cycles of different economic activity have come and gone within the valley, each leaving behind the mark of degradation or degeneration of the original forest composition and soil structure. The Baeza township and the entire Quijos river valley have experienced boom and bust cycles in response to different kinds of resource extraction. These started with timber, and then the extraction of products from the alder tree (*Alnus acuminata*)[7]. Next came plantations of naranjilla or lulo (*Solanum quitoense*), palmito (*Euterpe edulis*) and walnuts (*Juglans neotropica*), and finally the dairy industry with introduced, improved milk cattle. These extraction cycles have altered the original forest cover to pasture lands, and thereby exacerbated the problems of soil erosion and created monotonous landscapes. The most recent fashion of exploitation is that of mountain fisheries, particularly trout production (*Oncorhynchus mykiss*). Ecotourism (including whitewater rafting) poses a new challenge: how to find an appropriate administrative framework for conservation and development in the area.

Because of the destructive pressures of development on traditional land use systems and communities, further exacerbated by the opportunities offered by the booming oil exploitation further down the river, a group of interested people began to work for the protection of the area. Unlike BINGOs (big international Non Governmental Organizations), SOMEGOs (Small or Medium Environmental Governmental Organizations) and NOCANGOs (National or Capital based Non Governmental Organizations), they constitute an assortment of faith-based organizations with ecumenical and socioeconomic goals instead of conservation goals. Their approach contrasts with the conservation enterprises that began in the capital city of Quito and which are funded by multilateral conservation organizations. This small group of local residents felt the need to come up with endogenous alternatives (Chaurette et al 2003), and began by forming environmentally friendly groups in Baeza and in Papallacta. The Rumicocha Foundation was created in the

higher parts of the Quijos Valley, whilst the Foundation for the Amazon Region of Ecuador (FundRAE) started to work with bottom-up approaches in the lowlands. The group within the FundRAE that started the Cumanda Ethnobotanical Reserve is native to Baeza, its members belonging to families that colonized the area in the early 1940s and 1950s.

To make this more personal: one of these people, Doña Virgilia Escobar de Rodríguez, recalls the time when a journey from Quito was a week-long expedition, and it was worth leaving a notarized will before departure; now it takes just two and a half hours on a paved road. Her son, Jack Rodríguez, an ecotourism entrepreneur and passionate conservationist of the area, records the efforts of his ancestors in managing the area for the protection of landscape quality, including scenic beauty and diversity of biota and of culture.

Land belonging to FundRAE was converted into a private protective forest, adjacent to the Cayambe-Coca Ecological Reserve, thus providing an effective barrier to discourage further invasions from poachers and landless peasants. The forest reserve became Cumanda Ethnobotanical Reserve as it became increasingly common to recognise the importance of ethnobiology and its place in determining conservation priorities (Bennett 1992). The Cumanda Ethnobotanical Reserve became part of the Latin American Ethnobotanical Sister Gardens Network for the key role it plays in protecting aspects of colono culture, maintaining local and traditional practices and ecological knowledge, and maintaining its community driven processes for nature conservation and development.

The development of ecotourism in this valley has resulted in the revival of the old town of Baeza. Previously forgotten and neglected, it is now being rebuilt, with public offices and housing in the style of the colono architecture of a bygone era. Baeza is now a very tempting place to stay, with its decorated plaza and its library/information centre honouring the late legislator, Dr. Alberto Sarmiento, a pioneer in Amazonian conservation in Ecuador (Sarmiento 1952; Sarmiento 1957). There are also some excellent restaurants, where the main dish is fresh fish from the many pisciculture projects around the area, with trout prepared in many different flavours at very attractive prices. And so, because of ecotourism, Baeza has become a magnet for people making a day trip from Quito. The Cumanda Ethnobotanical Reserve offers facilities for ecotourism connected not only with nature protection, but also an educational garden, and a restaurant serving organic foods produced on site, with the milk and derivatives produced on the farm. Ecotourists that choose an agro-tourism package can join in milking the cows, working in the garden, repairing the fences or labeling the nature trails. The Cumanda reserve is now part of the International Agenda for Botanic Gardens in Conservation[8], part of Botanic Gardens Conservation International (BGCI), which works for the conservation of endangered flora. The hostel in the reserve, overlooking the Quijos river, offers facilities for short or long stays, for family or group gatherings, and even for small conferences or international workshops. For instance, the Task Force on Protected Landscapes of the World Commission on Protected Areas (WCPA) of the IUCN met in Cumanda to help delineate the strategy for conservation of protected landscapes in the Andes, and to prepare the participation of the group organizing a workshop within the Vth Symposium of Sustainable Mountain Development of the Andean Mountains Association that took place in Jujuy, Argentina, in 2003. In November 2006, the International Workshop for Mountain Protected Area Connectivity Conservation of WCPA used Cumanda as a demonstration site for a field trip.

Conclusion

The creation of the Cumanda Ethnobotanical Garden has served conservation efforts in many ways. It has provided exemplars for local, grassroots organizations to incorporate the notion of conservation into their development efforts. It has also provided case studies on specific species or groups of species of interest in the area. It has generated employment and converted a transitory attraction into a tourism destination. It has empowered the local economy and, with that, raised the profile of Baeza nationally and even internationally. It is now known for first-rate kayaking and whitewater rafting in the Andes. Working with ethnobotanical applications, enhancing knowledge of tropical species, and recuperating traditional ecological knowledge of people associated with tropical montane cloud forest environments, the Cumanda Ethnobotanical Reserve is poised to become a good case study of the value of Category V protected areas.

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1 The Paramo is a zone of tropical alpine grasslands, located in the higher elevations of the northern Andes, between the upper tree-line (about 3500 m altitude) and the permanent snow line (about 5000 m). The ecosystem consists mostly of glacier-formed valleys and plains with many lakes, peat bogs and wet grasslands mixed with shrublands and remnant forest patches.

2 A forb is a flowering plant with a non-woody stem that is not a grass.

3 The Massenerhebung effect describes variation in the tree-line based on mountain size and location. In general, mountains surrounded by large ranges

will tend to have higher tree-lines than more isolated mountains, due to heat retention and wind shadowing. This effect is important for determining weather patterns in mountainous regions, as regions of similar altitude and latitude may nonetheless have much warmer or colder climates based on surrounding mountain ranges.

4 The naranjilla (Ecuadorian Spanish, diminutive of 'naranja') or lulo (Colombian Spanish, from Quechua) (*Solanum quitoense* Lam.) is a subtropical perennial plant from northwestern South America. The juice of the naranjilla is somewhat green and is used as a beverage. Ripe naranjilla fruit is delicious, but it must be harvested when fully ripe, otherwise it can be quite sour.

5 *Mestizo* is a term of Spanish origin used to designate people of mixed European and indigenous non-European ancestry. The term has traditionally been applied mostly to those of mixed European and indigenous Amerindian ancestry who inhabit Latin America. A *colono* is a mestizo settler that occupies the valley in traditional ways.

6 The Cofans are one of the oldest surviving indigenous cultures of the Amazonian rain forest. They live in their traditional homeland on the banks of the large rivers of what is now northeastern Ecuador and southeastern Colombia. Fewer than 1,000 Cofan remain, with most living in Ecuador. Hunters, fishers, and subsistence agriculturists, they are famous for their efforts to protect their rain forest home from the oil industry, mining companies, and colonists. Cofan are craftsmen and naturalists, with a deep understanding and appreciation of their environment.

7 *Alnus acuminata* wood is light brown-yellow to pink, odorless, tasteless, and without differences between the heartwood and the sapwood. The wood dries easily and preserves well. It has even grain, seasons fairly well, and is easy to work and finish by hand or machine. Despite its light weight, it is tough and strong, and is sometimes used for construction. Its timber is also used for fuelwood, posts, poles, light lumber, boxes, broom handles, domestic implements, plywood cores, particle boards, musical instruments and match sticks.

8 The International Agenda for Botanic Gardens in Conservation is a global policy framework for botanic gardens worldwide to contribute to biodiversity conservation, particularly as it relates to the implementation of the Convention on Biological Diversity. The Agenda was launched at the First World Botanic Gardens Congress in Asheville, U.S.A. in 2000.

Acronyms

ECOSUR	The College of the Southern Border, Mexico
EARTH	Agricultural School of the Tropical Humid Regions
FundRAE	Foundation for the Amazon Region of Ecuador
UGA	University of Georgia, Athens, Ga. USA.

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About the Author

Fausto O. Sarmiento was founder of several conservation organizations and became executive director of the National Museum of Natural Sciences in his native Ecuador, when the human dimension was incorporated into the design of small, private protected areas. As a mountain scholar who bridges ecology with sustainable development in Tropandean landscapes, he emphasizes the role of culture in nature conservation. He is Deputy Vice-Chair for Capacity Building in the WCPA-Mountains Biome and is member of the WCPA Protected Landscapes Task Force. He is Science Advisory Board member, on behalf of the International Human Dimension Program (IHDP), to the Mountain Research Initiative (MRI). He is currently an associate professor of mountain science at the Department of Geography, University of Georgia.
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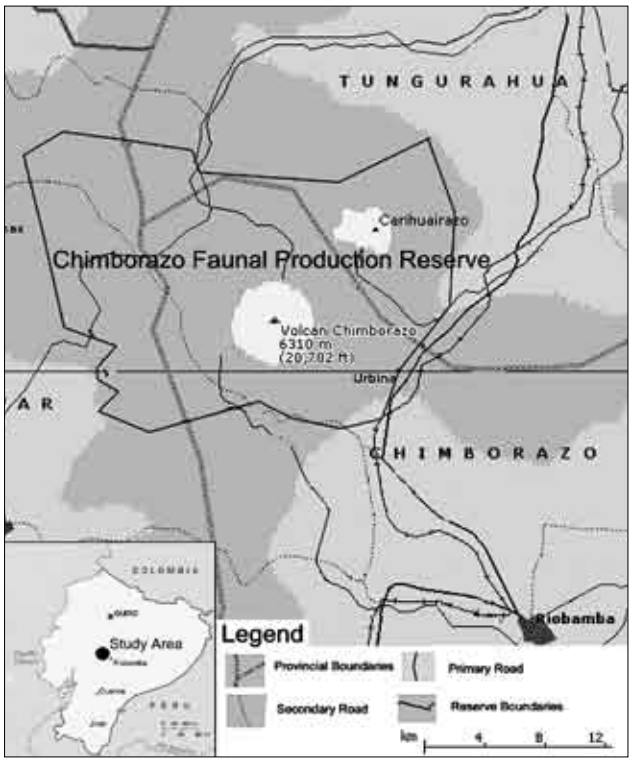
The impact of native versus introduced livestock in the Chimborazo Faunal Production Reserve, Ecuador

Julie S. Rosenthal

Ecuador's Chimborazo Faunal Production Reserve is a protected area that not only allows, but actively encourages, the use of indigenous domesticated animals by the local population within its boundaries. The reserve was designated in 1987 and covers 58,560 ha, including large areas of high grasslands, or páramo, a landscape typical of the Andean region. The páramo landscape is the product of both the physical characteristics of these high altitude areas, and centuries of human intervention in the form of livestock grazing and other practices (Sarmiento 2002). While the Chimborazo Faunal Production Reserve is listed as a Category VI protected area in the World Database on Protected Areas, the presence of páramo landscapes that have been shaped by the interactions of people and nature over time, along with aspects of its management objectives, is arguably in keeping with those of Category V protected areas. With domestic animal diversity declining on a global scale (Rischkowsky 2007), the Chimborazo Faunal Production reserve serves as an important case study to examine the implications of promoting domestic animal diversity within a protected area. Lessons learned here will be of value to other Category V protected areas in the Andean region.



Domesticated llamas have been present in the Ecuadorian highlands for at least 1500 years. Alpacas were probably introduced during the Incan conquest, around 1470 AD. The arrival of the Spanish in the late 15th century, with their European cattle, horses, sheep and burros, led to the near disappearance of native camelids in Ecuador. While remnant populations of llamas have survived in the Chimborazo region until today, alpaca were last reported there in 1871. Recent efforts to augment the llama population in Ecuador and reintroduce alpacas included the establishment of the Chimborazo Faunal Production Reserve, which has a primary objective of protecting the habitat of native camelids (both wild and domestic) in order to promote their survival and recovery.

Although livestock grazing can be detrimental to natural landscapes, environments that have a long history of grazing can become tolerant, or even dependent, on the grazing system to retain their qualities. An examination of the literature on the effects of grazing on individual plants, soils and plant communities has revealed that grazing does not necessarily harm the environment and that, in some cases, grazing by domesticated animals may even enhance soil conditions and plant production.

A recent study was undertaken to determine whether there were ecological benefits in encouraging the husbandry of native camelids in the Chimborazo Faunal Production Reserve, instead of the use of the exotic forms of livestock introduced by the Spaniards. An investigation of the pastures used by llamas, alpacas, sheep, cattle and horses examined the impact of each type of animal on plant diversity, sward height, pasture composition (in terms of bare ground, live plant cover, and dead plant cover), and palatability[1] of the more abundant species, with respect to the animals grazing in each pasture. Analysis of this data revealed a significant difference in pasture condition between the llama pasture and pasture grazed by cattle and horses. The llama pasture, which had a higher stocking rate than the cattle and horse pasture, was in better condition. Little difference between the alpaca and the sheep pastures was revealed in the data analysis; however, local informants indicated that they had observed remarkable improvements in the condition of the pasture utilized by

the alpacas since 2000, in areas which had previously been grazed by sheep.

On a species level, this study reveals that the domesticated animals that have inhabited the Chimborazo region for the longer period of time have the least ecological impact. Whether this is due to long-term co-evolution of these animals with the vegetation, or whether this is simply a function of the morphology and behaviour of the studied animals, is unclear. The results of this research suggest that the managers of the Chimborazo Faunal Production Reserve should continue to encourage llama production within the Reserve and to support initiatives that can increase the value of products from these animals, such as the use of llamas as pack animals in ecotourism services, the production of traditional riding chaps made from llama skins, and the improvement of llama fibre for garment and handicraft production. While the study does not recommend that cattle and horses be eliminated entirely from the Reserve, it notes that if the value of the more ecologically benign llamas is increased, there may be a way to reduce the numbers of the introduced livestock without any net economic loss.

The use of highly productive, introduced breeds of livestock continues to be encouraged by national governments and development agencies world-wide; a practice that has led to the disappearance of several indigenous breeds around the world. The loss of indigenous breeds can be prevented if their unique characteristics can be used to their fullest advantage. Reduced ecological impact on the environments in which such breeds evolved could very well be a strong incentive for the use of indigenous livestock instead of introduced breeds, especially in and around protected areas.

The report on this study (Rosenthal 2006) offers several potential explanations to account for these findings. Recommendations based on these findings, as well as economic and other concerns, are provided regarding the management of the Chimborazo Faunal Production reserve in particular, as well as regarding protected areas in general.

1 Palatability means how desirable each plant species was to the livestock. If a pasture is predominantly comprised of undesirable species, it is likely to be an indication that grazing pressure here is higher than in pastures covered by species that the livestock find desirable.

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Agrobiodiversity conservation in the Garrotxa Volcanic Zone Natural Park, Spain: Experience and recommendations for future directions

Emili Bassols Isamat, Jordi Falgarona Bosch, Josep-Maria Mallarach Carrera and Bernat Perramon Ramos

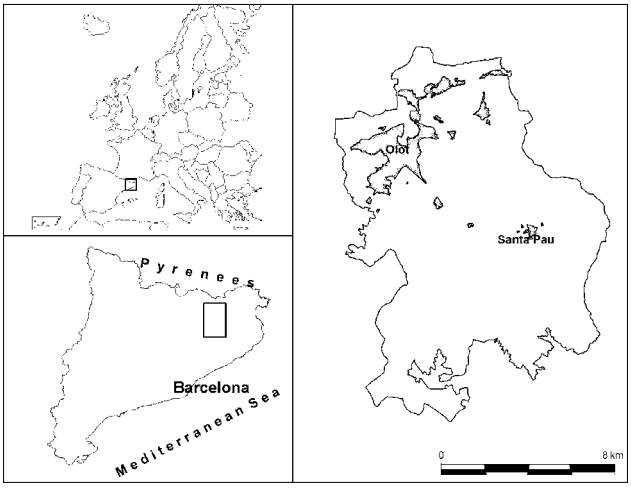
Summary

The Garrotxa Volcanic Zone Natural Park, Catalonia, one of the leading Category V protected areas in Spain, has been active in agrobiodiversity conservation since 1990. This paper summarizes the challenges that face the conservation of domesticated biodiversity in the European agrarian policy context, the accomplishments in the conservation of fruit trees and other local vegetable varieties, and the strategy for agrobiodiversity conservation in this Park, a strategy that could be extended to the natural areas system of Catalonia. Of note is the development of cooperation between farmers, growers, scientists, local schools and restaurants, to value, conserve and use the local plant varieties.

Main features and values of the Garrotxa Volcanic Zone

The Garrotxa Volcanic Zone Natural Park is situated on the southern flank of the Pyrenees in Catalonia, in the northeast of Spain. This is a mid-mountain environment with altitudes that range between 200 and 1000 m. The valleys, where the greater part of human activity is concentrated, are between 300 and 500 m above sea level. The Park has a surface area of some 14,000 ha, of which 980 ha are designated Nature Reserves (Category III).

The predominant climate is humid Mediterranean, with average annual rainfall of close to 1000 mm, fairly evenly distributed through the year, and without dry



Situation of the Garrotxa Volcanic Zone Natural Park in South-western Europe

summers. The orientation of the valleys favours temperature inversion which results in an inverse distribution of the vegetation. The average annual temperature is 12.4º C in the valley bottoms, and the growing season for vegetation lasts 8 to 9 months.

The distribution of land uses is the result of natural factors and of many hundreds of years of human activity. The predominant land cover is forest (65%), which occupies land with slopes greater than 20%, while the areas of cultivation (22%) and pasture (5%) are concentrated on land with less pronounced slopes. The remaining 8% in the valley bottoms is occupied by urban zones and the associated infrastructure, and by riparian forests. The surface area given over to farming has been in sustained decline over the last four decades as a result of the diminishing value of agrarian products, the intensification and mechanization of agriculture, progressive rural depopulation, and other associated socio-cultural changes.

The Park contains the best-conserved volcanic zone in the Iberian Peninsula and one of the most representative in continental Europe. This is a prehistoric volcanism with well conserved forms, notably volcanic cones, lava flows and lacustrine and palustrine deposits associated with the barrages produced by lava emissions. The sedimentary record, spanning more than 300,000 years, is of great scientific interest in the study of the Quaternary (Pérez Obiol 1987).

Thanks to its situation in a zone of transition between two biogeographic regions, the Mediterranean and the Alpine, and the prevalence of a mosaic landscape with a variety of local climates, the Park has a high degree of biodiversity. 1,125 taxa of vascular flora (Campos 2001) and 274 species of vertebrates have been identified, consisting of 185 species of nesting birds, 49 species of mammals, 18 species of reptiles, 13 species of amphibians, and nine species of fishes (Minuàrtia 2005). The other recognised value is the beauty of the landscape which inspired a landscape painting school, a result of the harmonious adaptation of human activity in the environment. The cultural heritage comprises an extensive repertoire of rural buildings and some 25 small churches, for the most part Romanesque (11^{th}-14^{th} century AD), around half of which regularly host popular gatherings and festivities.

The population is concentrated in the urban areas, mostly in the valley of the river Fluvià. Despite being legally excluded from the protected area, the impact of these settlements, which form an urban continuum almost 10 km long, is very considerable especially as they lie within the boundaries of the protected area (see map). The total population of the Park is close to 40,000 people, of whom 2,850 live within the protected rural area and the remainder in the ten urban areas. The most important of the ten urban areas is Olot, the district capital, with a population of almost 30,000. Of the 18,650 people in paid employment, 47% work in the service sector, 39% in industry, 11% in construction and only 3% in the agrarian sector (Statistical Office of Catalonia 2004). Most of the industry is located in industrial estates. Tourism, almost non-existent when the Park was established 25 years ago, has experienced sustained growth since then, with a predominance of family-run restaurants and rural accommodation.

Mosaic landscape of the basaltic plateau of Batet, at the centre of the park.

The legal situation of the Natural Park

The volcanic zone was declared a protected area by a Law passed in 1982 by the Parliament of Catalonia, which created a Natural Area of National Interest and 26 Strict Nature Reserves of Geobotanical Interest. It was the first protected natural area established by an autonomous government in Spain. 1985 saw the introduction of the Law of Natural Areas of Catalonia, defining the instruments of protection and developing the autonomous legal framework. This law redefined the volcanic zone of the

Garrotxa as a Natural Park, and the Strict Nature Reserves as Managed Nature Reserves.

In 1994, after a lengthy participative process, the management plan of the Park, known as the Special Plan for the Garrotxa Volcanic Zone, was approved by Decree. At present this Plan is under review and is expected to be approved in 2007.

The major part of the Park is under private ownership (95%). Communal woodlands are small in size and few in number. The other publicly-owned properties are the river beds and three Nature Reserves. The private ownership of the land is very fragmented, with over a thousand different proprietors. Ownership of the natural resources lies with the proprietors of the land, except for the water and the subsoil which are public property. Most of the forestry properties are privately owned, while the farms are generally tenanted.

The Park is part of the system of natural areas of Catalonia, created by Decree of the Government of Catalonia in 1992. This system consists of 145 units covering 21% of the territory of Catalonia. The Park is included in the World Database on Protected Areas (WDPA) as a designated Nature Park in Spain, with the name 'Zona Volcànica de la Garrotxa' (Site Code 15431), and is categorised as an IUCN Category V protected area.

In 2006 the Government of Catalonia presented its proposal for the inclusion of sites in the Natura 2000 network, which encompasses about 30% of Catalonia's land. The network is a European initiative established by the Directive 92/43/EEC, based on bioregional criteria and aiming to protect habitats and species of European significance. The entire Park is included in the proposal and contains 16 habitats and 11 species of European interest.

The administrative situation of the Park

Within the Spanish state, responsibilities for planning and management of protected spaces have been devolved to the autonomous governments. Direct responsibility for the Park lies with the Catalan government's Department of the Environment and Housing, which provides the entire budget and chairs its governing body.

The remit of the Park's governing body, the Park board, is established by a Decree of 1983. Its duties include: implementing the Law of Natural Spaces; proposing measures to improve the living conditions of the local population; drawing up a programme of action and a budget; preparing an annual report for publication; and giving prior notice to the responsible agencies of any type of works, operations and exploitation liable to affect the protected area. The board has 11 members: 3 represent the local town councils, 3 represent the scientific community, and 5 represent the autonomous government.

There are 19 staff members on the management team which is structured in six sections: steering; rural improvement; natural heritage; public use; administration and supervision; and maintenance. In addition, there are regular inputs from 15 people working in private companies which have an annual contract with the Park; they help in areas such as architecture, quality management systems and conservation of fauna, and also help at the Centre for the Conservation of Cultivated Plants (see below). The team works within a management system that received a UNE-EN ISO 9001:2000 compliance certificate in 2000. Garrotxa is the first Park in Spain to meet this Standard. In May 2007 it was also awarded EMAS Environmental Management System verification[1].

Since 1991 the Park has operated with the help of the Cooperation Council, consisting of 40 members. The Council works to promote the participation of the local population by engaging with existing clubs and associations. The Council has sector-specific working groups which include representatives from associations of local hunters, farmers and stock breeders

Main agrobiodiversity features

Agriculture arrived in the area over 6,000 years ago (Burjachs 1987). However, the major agrarian transformations did not take place until the Roman era, around 2,200 years ago (Alcalde and Burjachs 1991). The present system of rural population derives from the Benedictine model of colonization, which received a powerful impetus during the 10th-12th centuries AD. The Industrial Revolution took place here at the end of the 18th century and has had a great impact on agrarian activity. There is extensive fragmentation of land ownership; properties in the mountain areas tend to be 5 ha to 25 ha, while on the flatter land many properties are very small, of 1 ha or less. This pattern of fragmentation has given the landscape its mosaic-like quality. Currently there are about 650 isolated houses in the Park, almost all of them occupied, of which only 142 (21%) are estimated to be working farms, while 3% are engaged in rural tourism (Font 2006).

The current agrarian model dates from the 1960s and 1970s, involving mechanization using fossil fuels and the widespread application of pesticides and chemical fertilizers. While arable and livestock farming in the Garrotxa Natural Park still reflects the characteristic structure of the Catalonian countryside, based on family units living in

traditional farmhouses, the dominant agrarian model in place today outside the Park is very intensive and consumes high levels of inputs (water, agrochemicals, plant material, nutrients, fossil fuel energy, etc.). This creates agricultural systems with low levels of autonomy, sustainability and stability.

While this model has served to produce a large volume of food, it has at the same time resulted in the degradation of some of the area's natural resources and a loss of agrobiodiversity. Thus some crops and livestock, including many varieties which are well adapted to local conditions, have been lost. The principal causes of this loss have been the conjunction of commercial interests, the difficulty that traditional varieties of crops and livestock have in adapting to the use of modern machinery and present-day systems of production, the demands of the workforce, and the loss of traditional trades and their replacement by more profitable alternatives.

Up to the end of the 18th century the traditional Mediterranean crops – wheat (*Triticum* sp.), vines (*Vitis vinifera*) and olives (*Olea europaea*) – predominated, but there were also fodder plants, garden vegetables, rye (*Secale cereale*), mixed crops of wheat and rye, oats (*Avena sativa*), barley (*Hordeum vulgare*), millet (*Panicum miliaceum*) and buckwheat (*Fagopyrum esculentum*). This last was typical of the district and was eaten by people and animals alike. During the 19th century vines and olives were ousted by potatoes and maize. Following the transition from a period of self-sufficiency (1939-59) to the period of mechanization, there was considerable expansion of stock farming, especially of cattle and pigs. In recent decades livestock farming has greatly intensified with fewer farms but larger numbers of livestock, while arable farming has in many cases assumed a subordinate role, mainly producing fodder and grain cereals for the livestock.

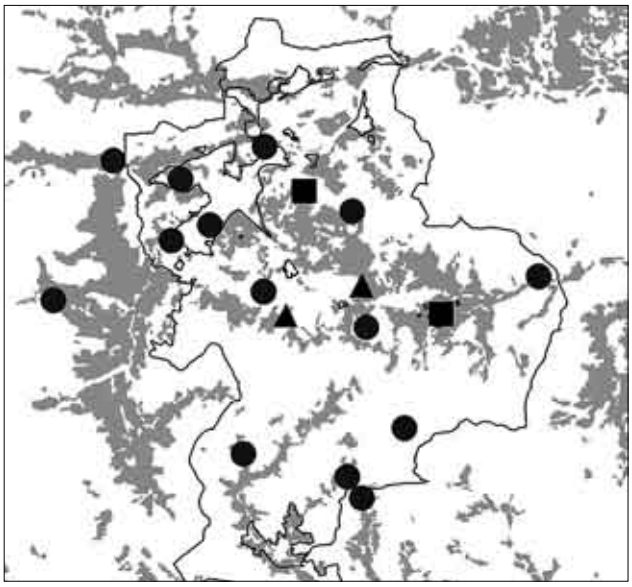
At present the main cultivated crops in the Park are winter cereals (wheat, barley, oats, rye, spelt (*Triticum espelta*), triticale), maize, sorghum (*Sorghum* sp.), ryegrass (*Lolium* sp.) and alfalfa (*Medicago sativa*). On a smaller scale some farmers continue to grow other crops not related to stock farming, such as legumes (haricot beans (*Phaseolus vulgaris*), chickpeas (*Cicer arietinum*), broad beans (*Vicia fava*), peas (*Pisum sativum*), etc.), garden vegetables, tubers and buckwheat.

Past and present agrarian practices

The soil and climatic conditions of the Natural Park are optimal for the practice of agriculture on flat land. Some 27% of the surface area of the Park is given over to agriculture, of which 80% is used to grow crops, the rest being permanent pasture. Livestock farmers also exploit some of the wooded zones for mountain grazing. In recent years the area used for agriculture has declined, while the extent of the forested area has increased (Minuàrtia 2002). This is due to the abandonment of more marginal farmland that does not have the characteristics demanded by present-day agriculture. The result is natural regeneration of the forest, initially with a preponderance of scrub and thicket.

The diversity of uses of agricultural land, interspersed with different forest communities, has resulted in a rich and varied landscape in the form of a mosaic. This has a very positive effect on biodiversity. The relationship between the Park's agrobiodiversity and its wild biodiversity is a product of the structure and variety of the rural landscape which has evolved over the centuries through the interaction of human activity with the different types of local vegetation, soil and climate.

The loss of agrobiodiversity will increase the instability of the agricultural system for two main reasons. First, a reduction in agrobiodiversity means that each crop species or variety that is still in use, has a higher representation among the total crops grown. Therefore a negative impact on one of these species or varieties will have a greater repercussion on the whole. Second, when one of the original species or varieties that is best adapted to local conditions is lost, production generally becomes less reliable; this is because locally-adapted crops and livestock, though producing lower yields on average, are less susceptible to negative conditions such as drought.



Agrarian lands of the Zona Volcànica de la Garrotxa Natural Park and surrounding areas. Grey areas = agricultural land. Triangles = location of CCCP at Can Jordà and Can Passavent. Squares = location of buckwheat (Batet de la Serra) and bean (Santa Pau) fairs. Circles = Farms that cooperate with the Park in agrodiversity conservation.

The intensification of present-day agriculture and livestock farming has caused certain environmental problems, the most serious of which is the contamination of underground water by nitrates. At present, most of the agrarian soils and aquifers of the Park are affected by pollution from nitrates of agricultural origin (Bach 2005).

Another negative impact is that of wild fauna on crops. The species that causes the most problems for crops and pasture is the wild boar (*Sus scrofa*) which has grown in numbers because of the absence of natural predators and the abundance of dense woodland in which it can take refuge. At a more localized level there can also be plagues of nematodes, Diptera, Lepidoptera, etc., which damage crops and find refuge in wild biodiversity.

Opportunities and threats

In recent years agriculture has tended to experience a progressive loss of social and economic importance in the Park. It seems probable that this tendency will continue in the years ahead, given that only 8% of the livestock farmers working in the Park are less than 40 years old and that more than 60% of the farmers' children do not intend to take over the family farms in the future (Font 2006). This situation discourages investment in infrastructure, holds back economically efficient technical management, and generally makes it more difficult to improve production and increase, or even maintain, competitiveness.

It is difficult to improve profitability by direct retailing of agricultural products or by adding value through the processing of such products because the necessary facilities, such as slaughterhouses, do not exist. Moreover, established channels of commercialisation resist such innovation and there are very strict regulations that must be met in food production and processing. In addition, the agrarian sector has become highly controlled and bureaucratised, which does nothing to motivate the farmers. A further problem is the appearance of large, highly intensive livestock farms with little or no involvement in arable agriculture: little use is made of the animal manure from such farms, which poses an increasing threat of contaminating aquifers.

If, to all these factors, we add globalisation, which introduces lower-quality agrarian products into the market, bringing down prices and undermining the seasonal nature of production, then the expectations of improvement in the agrarian sector must be low. Nevertheless, there are factors that provide grounds for optimism.

The Park's very existence confers an added value on the territory that, in turn, attaches to the products grown and processed there. This helps to add value to the farmed areas of the Park which are thus better protected from the threat of transformations, such as being developed for residential use, than similar farmed areas elsewhere. Indeed, the Park already has characteristics that make it attractive to farmers: there are well-established agrarian associations, an extensive agro-business network, good cooperation between the agrarian sector and the restaurant sector, a model of environmentally friendly tourism, a rural cultural model with an identity of its own, extensive livestock farming that maintains the landscape, an agrarian skills training centre, and the manufacture of local quality products. What is more, the recent upsurge of consumer interest in local quality products clearly helps the recovery and consolidation of a diverse farming economy and its agrobiodiversity which were in danger of being lost. In this context of new opportunities, the Park has a fundamental role to play in promoting and protecting these traditional products through certification of origin, quality and production processes, encouraging the growing of traditional crops and/or crop varieties, and supporting quality brands that serve to differentiate and enhance these local products. The public authorities can also create incentives to manufacture local products by facilitating their processing, creating the necessary infrastructure, providing support for marketing, and other such services.

Over the last ten years civil society groups have taken a number of initiatives to address agricultural and related issues in the Park:

- The key agrarian associations in the Park are the Cooperativa del Camp d'Olot and the Associació Ramadera i Agrària per a la Defensa Ambiental. The latter was founded in 2003 to pool forces in conserving the quality of the environment in response to the problem of contamination by nitrates of agrarian origin, especially in zones of great ecological value such as the Park.
- The bean fair of Santa Pau (*Fira del fesol*) and the buckwheat fair (*Fira del fajol*) of Batet are both very popular. The latter is a festive, fun event and a showcase for local products and producers. The 2007 fair included, for the first time, activities to encourage interest in the value of local products as well as various technical workshops on this theme.
- Since 1996, the Fundació Garrotxa Líder has been actively involved in developing a district-wide strategy to promote local agricultural produce of quality. The strategy is based on the conviction that a key element in promoting quality produce is the identification of products based on local agricultural varieties, and that this is a very effective means of differentiation from other products in the market. The foundation was set up to encourage local development, in association with the European Union's Leader initiative, so as to involve all the social actors in the territory in a participative

and integrated way of working. In the last four years it has concentrated on developing and accrediting a Code of Sustainable Management for enterprises in the Garrotxa, with the aim of helping businesses adopt economic, social and environmental measures that respect the people and the habitat. The Park has been a patron and member of the Board of Management of this foundation since the outset.

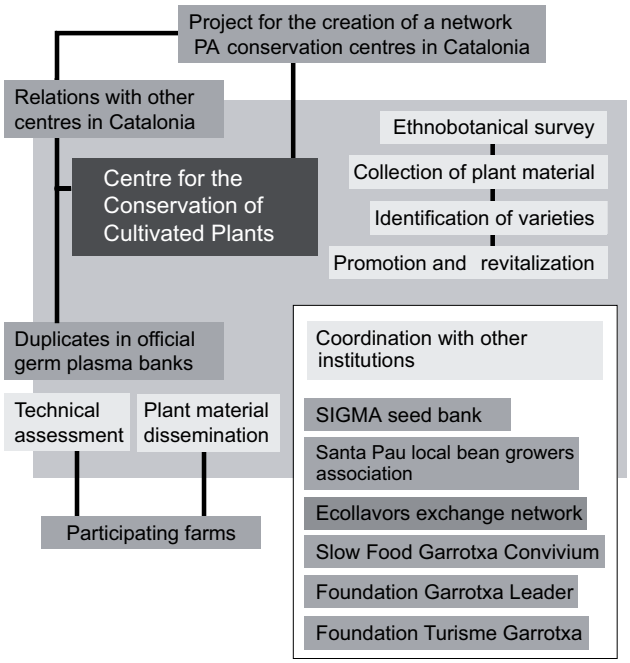
- The Garrotxa Environment and Public Health Consortium launched its seed bank project in 2004 as a response to the loss of crop biodiversity. The objective was to recover and preserve the district's historic varieties of domesticated edible plants, together with information on their cultivation and uses. The conservation of these seeds is both *ex situ* (in a seed bank and in experimental test fields) and *in situ* (on each of the participating properties). The consortium also cooperates with other bodies and works in close coordination with the Park.
- The Slow Food Association is an international association with over 80,000 members in more than a hundred countries. It seeks to protect certain traditional eating habits from the accelerated pace of modern life, and at the same time promote gastronomic culture, help us educate our palates, conserve agricultural biodiversity, and protect traditional foods in danger of extinction. There are now eleven Slow Food groups, or Convivia, in Spain. The aims of the Slow Food Association overlap considerably with the aims of the initiatives mentioned above, and at the start of 2007 the Garrotxa Slow Food group was set up with the aim of promoting local products and their utilization in the district's restaurants. In this they are supported by the 'Volcanic Cuisine' association of local restaurateurs, founded in the Park itself.

Management policies and practices for maintaining or enhancing agrobiodiversity

As the heritage of agrarian diversity comes under increasing threat, its conservation has become a greater concern. There are a number of reasons for this: historical, cultural, economic, biological, ecological, and an interest in landscape and gastronomy. Of all Spain's autonomous communities, Catalonia has introduced the most initiatives for the conservation of genetic resources in the widest sense. The most active agents here have been the different tiers of the administration, followed by professional associations and private initiatives (SEAE 1996).

The strategy of the Park in this respect can be summed up under the following categories:

- Encouraging research into traditional varieties.
- Promoting ecological and/or organic agriculture.
- Introducing criteria for sustainability in livestock farming.
- Advising the owners of participating properties.
- Carrying out schemes to improve and restore agrarian habitats.
- Developing a model of management of the rural environment that favours the continuing presence of farms in the territory.
- Participating in actions for the conservation, promotion and marketing of local products.
- Establishing permanent lines of dialogue with the livestock sector.



Tasks developed from the Park CCCP, showing relationships with other local institutions involved in agrodiversity conservation.

The Park undertook direct actions to conserve agrarian diversity in 1990, in light of the first survey to identify and locate the traditional varieties of fruit trees in the district of the Garrotxa (Arribas 1989). This survey identified 53 traditional varieties of 8 species of fruit trees. Among these are 19 varieties of apple, many of which were in a critical situation in terms of conservation. Planting of the first fruit trees with grafts from those traditional varieties commenced during the same year in the Can Jordà fruit orchard, a public property managed directly by the Park, surrounded by a wooded Nature Reserve. A back-up orchard of fruit trees was established there, to be integrated

into the future Centre for the Conservation of Cultivated Plants (CCCP). The objectives of the CCCP are:

- To contribute to the conservation of traditional varieties of cultivated plants.
- To improve understanding of these varieties.
- To develop practical experience in ecological fruit growing.
- To encourage the cultivation of ecological fruit on participating properties.
- To boost biological agriculture.
- To publicize the uses and possibilities of these varieties and involve different social agents in their conservation and utilization.

At present, the CCCP occupies about 4 ha. It is run in accordance with the criteria and standards laid down by the Catalan Council of Ecological Agricultural Production, to which it adhered in 1999. The maintenance of the CCCP is carried out by workers from a local cooperative for mentally and physically handicapped people, thus aiding their access to paid employment.

The CCCP comprises a preservation fruit orchard and a show orchard, and also cultivates traditional varieties of herbaceous plants. Of these, the preservation orchard is the principal element, and the one that receives most input, devoted as it is to local varieties of fruit trees that are in urgent need of conservation and that are potentially the most useful for the Park. The preservation orchard currently has 292 fruit trees of 8 species (apple, pear, cherry, plum, peach, apricot, medlar and persimmon) including 59 varieties. In addition, the show orchard has around 60 old and traditional fruit tree varieties of 7 different species, most of them from southern France.

Safeguard fruit orchard of Can Jordà, Garrotxa Volcanic Zone Natural Park

A second survey was conducted in the Garrotxa district in 2005 with two objectives: to discover unknown traditional varieties of fruit trees in order to incorporate these into the CCCP and to revisit the properties surveyed in 1989 in order to evaluate the degree of genetic erosion. The findings were disturbing, indicating that in just 16 years almost 50% of the genetic material located in 1989 had been lost and, still more worrying, that two-thirds of the respondents who had provided information on the uses of these varieties were no longer there, having since died or gone to live in the city (Arribas 2004). In this light, priority is now being given to collecting and processing information relating to the uses of these varieties and to their traditional processes of production and preparation. The disappearance of a variety brings with it the loss of a cultural heritage of great interest, as age-old tools, skills and facilities are abandoned.

With regard to traditional herbaceous crops, a survey conducted in the district in 1995 located 61 varieties of 21 different species of cultivated plants, including garden vegetables, many of which were found to be cultivated by only a few farmers and were in danger of disappearing (Arribas 1995). Accordingly, the CCCP cultivates varieties that are in evident regression such as: buckwheat of the 'pota de gall' and 'arracada' varieties; maize of the 'creu', 'queixal' and 'blanca' varieties; beans of the 'tabella brisa' variety; and potato of the 'mora' variety.

In order to draw greater public attention to the problems associated with the loss of agrobiodiversity, in 2003 a small-scale replica of the CCCP was established on a plot by the side of a walking route near the Croscat volcano. The walking route is used by 40,000 people every year. The 30 fruit trees of 5 species planted here were selected on the basis of their historical and culinary interest and the real risk of their disappearance. This project won the European Day of the Parks award from Europarc-Spain in 2003.

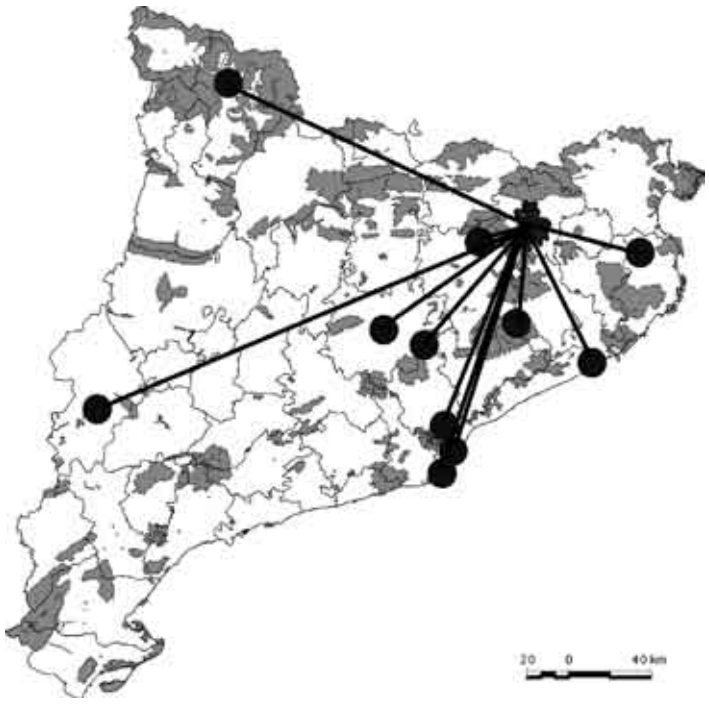
Thus the CCCP has become a standard setter in the conservation of traditional varieties of fruit trees: it is the most important *ex situ* collection of its kind in Catalonia today, and one of the best in Spain.

The current focus of work is oriented primarily towards the dissemination and use of these traditional varieties, in the belief that the best way of conserving them is for other growers to plant them on their land. The Park thus establishes agreements with interested private landowners, whose holdings are recognised as participating properties; these owners receive advisory support from the Park for a period of time. In addition, the Park has established an agreement with a public company to cultivate trees that were grafted with traditional varieties from the CCCP nurseries.

At the same time, the Park works with local public and private organizations engaged in the conservation of plant genetic resources. For example, it has set up a seed bank with the Garrotxa Environment and Public Health Consortium to conserve the local varieties of cultivated plants and promote their uses to revitalize the agrarian sector. The Park is also co-operating with the Santa Pau Bean Growers Association, in a project involving the Higher School of Agricultural Engineering in Barcelona, to genetically improve the 'tabella brisa' bean, the variety

Table:
List of the varieties of local fruit trees at the back-up orchard of fruit trees of Can Jordà, Zona Volcànica de la Garrotxa Natural Park

Apricot	**Cherry**	**Medlar**	**Pear**	**Apple**	**Peach**	**Plum**
Del llop	Aiguardent	Del país	Aigua	Aiguardent	Gavaitx	Camós
	Barregana		Bastons	Aulines	Melicotó groc	Clàudia
	Blanca		Coure	Camosa	Mollar blanc	Clàudia
	Cor de colom		Cuixa de dama	Camosa agre	Préssec vermell	Falsa clàudia
	Sant Isidre		Hivern	Capçada	Vinya gavaitx	Frare negre
			Pell de galàpet	Cor glaçat		Frare negre
			Pericot	Cua llarga vermella		Frare verd
			Petita	Del ciri		Groga
			Sant Jaume	Ciri vermell		Porc
			Xata	Eugènia		Pruna d'assecar
				Gofia		Sant Joan
				Marge		Sant Miquel
				Palau del bisbe		Pera decana d'hivern
				Pic de Pedris		
				Reineta		
				Reineta daurada		
				Sant Jaume àcida		
				Sant Joan		
				Sant Miquel		
				Sucre		
				Terrera		
				Totxa		
				Ull de nespre		
				Verda		



Protected areas system in Catalonia indicating the location of areas and institutions that are cooperating with the Park on agrobiodiversity conservation.

most characteristic of the volcanic zone. Other significant initiatives include work with the Ecollavors association, which contributes to the conservation of local plant genetic resources through the exchange of seeds among farmers engaged in ecological agriculture.

The recently created Slow Food Garrotxa Convivium is a direct consequence of the greater awareness created by some of the local initiatives mentioned above. One of its main objectives is to promote the use of local products in the context of a cuisine committed to authenticity and added value.

Various approaches are used to promote and publicise activities for the conservation of the agrarian diversity of the Park; these include the publication of articles in local magazines, participation in local fairs (e.g. the Saint Luke's Fair (*Fira de Sant Lluc*) in Olot and the buckwheat fair (*Fira del fajol*) of Batet de la Serra), and the strengthening of links with other centres around Catalonia. To this end the Park has established relations with other protected natural spaces that have shown an interest in initiating similar projects, such as the Alt Pirineu Natural Park, or which have adopted a more educational focus, such as the Metropolitan Park of Collserola. The Park also cooperates with a project run

by the Fundació Alícia, centred on the monastery of Sant Benet del Bages, which will establish a replica of all of the local varieties conserved at the CCCP, combining a public-awareness exercise with a food and agriculture assessment.

Finally, the Park proposes to duplicate its materials and deposit these in official germ plasma banks, such as the bank at the Spanish National Institute of Agrarian Research and Technology. This measure should be seen as a safeguard against some potential phytosanitary problem or blight which could lead to the loss of very scarce genetic material.

Strategies and proposals for agrarian diversity

The Park has been active for more than 15 years in the conservation of agrobiodiversity through the CCCP, a pioneering venture in Catalonia with few equivalents anywhere in the Spanish state. The aim now is to raise the public profile of the CCCP and to boost its presence in the Catalonian livestock sector, above all in the district of the Garrotxa, since many people are still unaware of this initiative. The expansion of the number of participating farms offers a guarantee against the risks inherent in conservation on a single site.

In order to attract specialists studying domestic diversity to the CCCP, the Park has expanded, and will continue to expand, the collection of books, magazines and articles on genetic resources and sustainable agriculture held at its Documentation Centre. Indeed, two of the most frequently consulted works in the Documentation Centre are the surveys of traditional fruit trees and traditional horticultural plants carried out in the district.

Another proposal is to encourage research into animal breeds traditional to the Garrotxa district. As yet, there is no catalogue of these and all that is available is a small stock of bibliographical information on a few breeds. Only a small number of traditional domestic breeds now remain, and their situation is critical.

Two of the lines of work being pursued by the Park require urgent development: i) ensuring greater involvement of private landowners; and ii) consolidating a joint platform for working with other bodies in the district that are directly or indirectly involved in the conservation of domestic biodiversity. As we have seen, there are a number of interesting initiatives in the district of the Garrotxa relating to the conservation of plant genetic resources and the promotion of local products, and one of the emerging challenges is to enable all of these to advance together in the same direction by complementing initiatives, combining efforts and sharing responsibilities. The role of the Park should be to act as a catalyst and, at the same time, to take up such commitments as are agreed by all the agents involved, in particular the district office of the Department of Agriculture, Food and Rural Action of Catalonia, which has executive powers in this area. In order to link together all the different bodies and coordinate future actions, it is desirable to draw up a joint strategy for conservation of agrobiodiversity in the Garrotxa district. Such a joint strategy should include a diagnosis of the present situation and an action programme to set out responsibilities, available resources and time scales. This strategy would also be useful in incorporating, at the local level, the conservation measures in the instruments of the European Union's new Common Agricultural Policy (CAP), given that the CAP envisages a more sustainable, market-oriented agriculture that also seeks to promote rural development. In this context, contracts for land exploitation, which are managed by the Department of Agriculture, Food and Rural Action, envisage ongoing technical consultancy for the duration of the five years of the contract, and new grant funding for landscape and environmental improvement measures. These contracts offer another opportunity for introducing measures that directly favour domesticated biodiversity of crops and livestock.

Ecological agriculture can be viewed as a set of practices that are most in harmony with the conservation of the natural environment. Many people believe that this model of management should exclude the use of genetically modified crops.

Many of these considerations should have a place in the new law on biodiversity and the natural heritage of Catalonia, currently in process of elaboration, since the law aims to address the conservation of biological diversity in a comprehensive and multi-sectoral manner.

Another interesting perspective is the relationship of tourism with the conservation of agrobiodiversity. The Park has recently renewed its affiliation to the European Charter for Sustainable Tourism for 2006-2011, which will enable it to continue to support the development of tourism in the district according to criteria of quality and sustainability. This should lead to proposals that support and promote Garrotxa's traditional local varieties of crops and livestock. The aim is to link sustainable tourism initiatives (including agro-tourism) throughout the district, so as to encourage greater interest in the conservation of agrobiodiversity.

Another initiative promoted from the manager of the Park is a proposal to compile the first catalogue of Catalonia's traditional varieties of cultivated plants. Every district of Catalonia is more or less aware of its traditional species and varieties, but there is a real need to assess the degree of conservation and determine which varieties

are subject to genetic erosion. This proposal includes the creation of a network of centres for the conservation of agrobiodiversity in Catalonia's Natural Parks and Natural Areas of National Interest. It seems clear that the effective conservation of the genetic heritage cannot be guaranteed by a single large centre containing all the country's existing genetic material. Instead, there is a need for a number of local centres, distributed throughout the territory, more directly managed by local actors and closer to their immediate rural environment. So the plan is to locate these centres in a certain number of protected natural spaces, representing between them the country's different agrarian habitats, each centre being responsible for its own maintenance. Several protected natural spaces in Catalonia have already begun to move in this direction: thus the Baix Llobregat Agrarian Park has an interesting collection of fruit trees comprising 62 traditional varieties; the Sant Llorenç del Munt Natural Park has a modest collection; and the Alt Pirineu Natural Park has commenced an ethno-botanical survey to locate historic varieties of fruit trees and intends to plant these on an estate managed by the Park itself. The above proposal is due to be presented by the Park's managers to the directors of the protected natural spaces of Catalonia in order to canvass their views on the viability of the project.

The conservation of agrobiodiversity must be incorporated into all decisions relating to the management of protected natural spaces in Catalonia. This strategy should make a significant contribution to conserving the local domestic genetic resources and revealing the problems associated with their loss; it should also stimulate public awareness, involve more people, and so defend the valuable heritage we have inherited from our ancestors.

Other rural features of interest

Traditional stock farming activities have had a great influence on the landscape of the Park. Thus there are scattered farmhouses, dry stonewalls[2] and other elements, many of which are now in decline, such as hedges, windbreaks and outbuildings thatched with straw (Aranda et al 1997)

The characteristic dwelling of the rural landscapes of the Park is the *masia* farmhouse: an organic complex of buildings, often of considerable size, consisting of the main house, stables for animals, and huts for storage, laid out around the farmyard. Many fields and plots are delimited by walls or hedgerows. The microhabitats that these create contribute to the diversity of the landscape and biota.

Over the course of the centuries a dense network of paths has been developed, linking the farmhouses and villages in the area. Although most of these paths are not passable for modern vehicles, they are (when kept up) passable for people on foot and pack animals. Another

Traditional hut

significant network of paths is made up of those that were established by the numerous transhumant herds that traversed this area up until the 1960s, moving between their alpine summer pastures in the Pyrenees and their winter pastures on the coastal plains.

Similarly, stonewalls are of great importance throughout the landscape of the volcanic region, where they constitute a network of many hundreds of kilometres. Constructed by hand over hundreds of years, these dry stonewalls help to shape the landscape. They are used for terraces, field and property boundaries, the edges of paths, etc. They are generally less than 2 m high and 1 m wide, but in some cases can be as tall as 5 m and as wide as 3 m (Aranda et al 1990). These constructions of un-mortared volcanic stone are a habitat for many species of fauna, especially reptiles and insects, and are particularly rich in bryophytes (lichens and mosses) of which almost 100 species have been identified (Solé 1987).

The hedgerows are formed of trees, mainly ash (*Fraxinus excelsior*) and field maple (*Acer campestre*), or bushes (box, whitethorn, bramble). At times they are backed by dry stonewalls. One of the most characteristic types is the maple hedgerow, since it can not only be pruned, but can also have its branches woven together horizontally, linking one tree with the next to form a very dense hedge of considerable aesthetic and biological interest, which is home to many species of birds and insects.

Rye (*Secale cereale*) was a common winter crop grown in stony volcanic soils that would not support richer cereals such as wheat. Ground into flour, rye was usually fed to the livestock, but could also be mixed with wheat for human consumption. A small portion of the hay, which can grow to 2 m, was used as thatch for the roofing of huts. The roofs had to be re-thatched each year, adding new hay and replacing damaged structural elements. A roof would be completely re-thatched only every ten years or so, and the whole job could be done with the hay from 0.2 ha of rye.

The traditional practices of thatching roofs and weaving windbreaks of maple began to go into decline in the 1940s with the general advent of paid employment, above all in industry, and the resulting loss of people working on the land. Only a few local people now possess these skills and can still create the traditional features of such interest for the landscape and its biodiversity.

1 EMAS (EU Eco Management and Audit Scheme) is a voluntary EU-wide scheme which gives recognition to organisations who have implemented ISO 14001 and produced a public statement about their performance.

2 Traditional stone walls made without the use of mortar or cement. The stones are secured by the skill of the wall builder.

Acronyms

CAP	Common Agricultural Policy
CCCP	Centre for the Conservation of Cultivated Plants
WCPA	World Commission on Protected Areas

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The Potato Park, Peru: Conserving agrobiodiversity in an Andean Indigenous Biocultural Heritage Area

Alejandro Argumedo

Summary

The Potato Park is a landscape conservation model focussed on the conservation and sustainable use of plant genetic resources through traditional Andean approaches to agrobiodiversity and landscape conservation. The Potato Park, as its name denotes, is an Indigenous Biocultural Heritage Area (IBCHA) that celebrates the tremendous diversity of native potato species and varieties characteristic of Andean food systems. As an IBCHA, the Potato Park has been proposed as a sui generis system for the protection of traditional knowledge because it aims to protect traditional knowledge systems within their cultural, temporal and spatial dimensions using a combination of positive and defensive protection tools (www.andes.org.pe website).

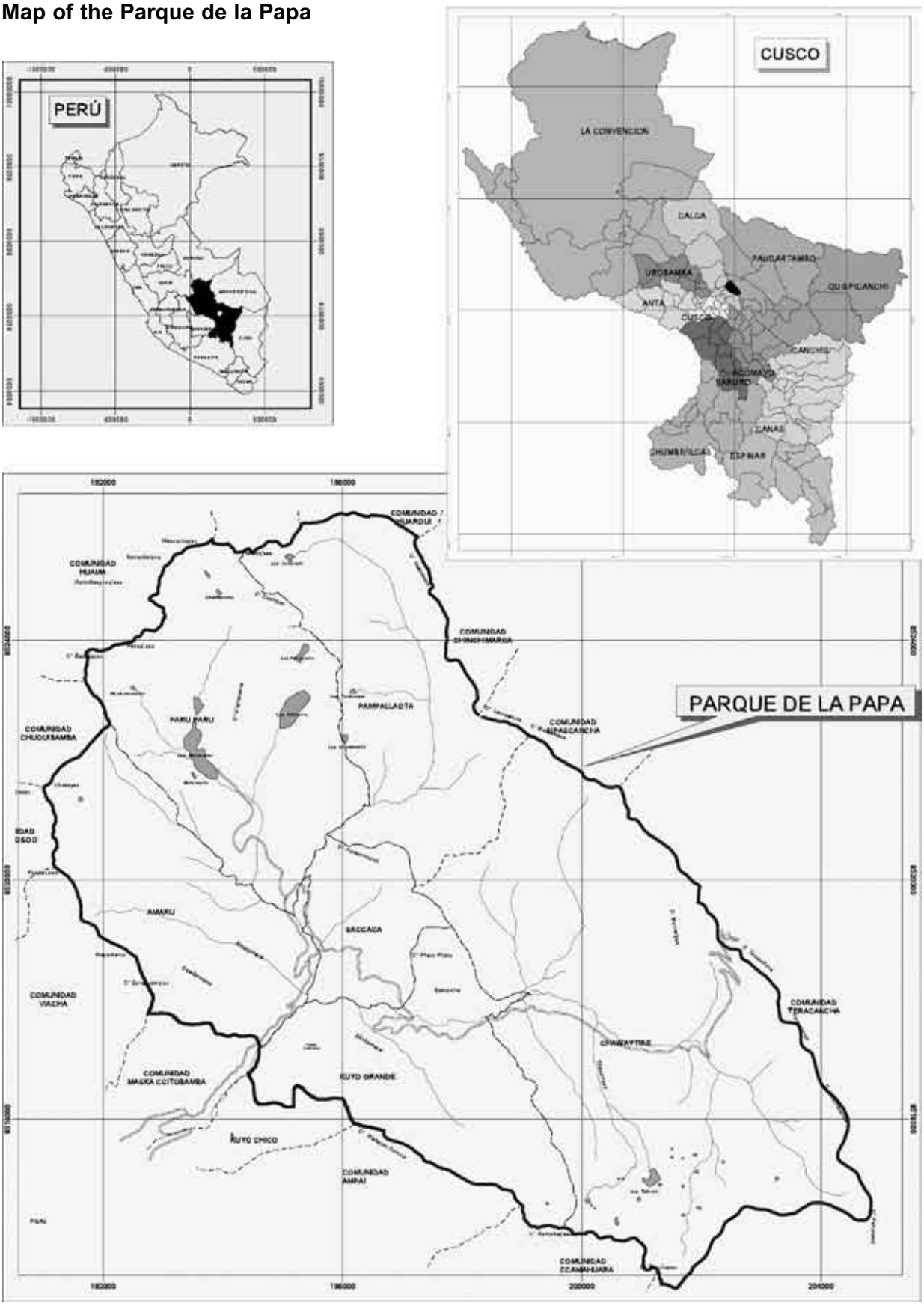
The IBCHA model, which resulted from the process of establishing the Potato Park, describes a community-led and rights-based approach to conservation which protects and enhances local livelihoods and biocultural diversity using the knowledge, traditions, and philosophies of indigenous peoples related to the holistic and adaptive management of traditional agricultural landscapes. An IBCHA incorporates the best of contemporary protected area practice and rights-based governance approaches, including the approaches of IUCN's Category V Protected Areas and Community Conserved Areas (CCAs).

Description of the protected landscape

The Andean Mountains are among the most biologically and culturally diverse regions in the world. The region contains two recognised hotspots of biodiversity, two of the eight important centres of origin of major cultivated species (Vavilov Centres), and 20 of the 36 World Heritage Sites of South America. The Andean countries harbour more than 205 languages. This great diversity, however, is deteriorating rapidly in the face of global trends. Current conservation approaches in the region are deficient in that they have failed to comprehensively address socioeconomic, cultural, political and institutional challenges.

The Potato Park is located within this context of cultural and biological diversity nurtured by Andean farmers. Quechua communities in the Pisac, Cusco area of Peru have established the Potato Park as a community-based, agrobiodiversity-focused conservation area. This initiative has brought together 7,000 villagers from six indigenous communities (Amaru, Chawaytire, Cuyo Grande, Pampallaqta, Paru-Paru and Sacaca) to jointly manage their communal land for their collective benefit. Their aim is to conserve their landscape, livelihoods and way of life and to revitalize their customary laws and institutions.

Map of the Parque de la Papa



The Potato Park is located about 40 km from Cusco and about 3 km from the Pisac archaeological site. It includes 8,661 ha of community-managed land which ranges between 3,200 and 5,000 m above sea level. The Andean landscape of the park includes quechua and puna zones, with a season for gathering from the wild and for agriculture which coincides with the rainy season beginning in December. The area includes several high mountain lakes, rock paintings, a number of Inca historic sites and colonial churches.

The region is an important micro-centre of origin and diversity of the potato. The potato has been cultivated by Andean farmers for over 7000 years. This tradition continues today with over 900 varieties of native potatoes currently being grown in the park area, together with various other Andean food crops. Traditional farming includes raising domesticated animals such as guinea pigs and llamas. Many wild species are used for food, medicines and ritual purposes. Traditional farming techniques, including the use of traditional tools, complementary plantings and ritual offerings to Pacha Mama (Mother Earth), are commonly practiced by the indigenous people of the park. The ancestral 'mita', or community labour, is still widely practiced in the area.

Traditional Andean societies are based on principles of ecological, productive and social sustainability, leading the Inca society to be classified as an example of a sustainable society (Sponsel 2007). The society had, at its core, a profound respect for Pacha Mama (Mother Earth) and reverence for the power and fragility of the Apus, the Mountain Gods. These principles have historically been integrated into landscape conservation strategies which combined the management of agricultural spaces with natural and culturally important areas (huacas) in a holistic management system. The management and agricultural practices of the Potato Park are based on such principles including exchange, reciprocity and nurturing. As per the belief in reciprocity, the earth gives crops to the farmers and, in return, the farmers give elaborate 'pagos' (offerings or payments) to the earth. This approach to management of traditional agricultural systems is ecosystem based, and provides a nurturing environment for creating diversity and maintaining the health of domesticated and wild plant and animal species as well as diverse ecological formations.

The Andean potato farmers' most important resources are local knowledge, their landscape and biodiversity. However, local knowledge may not be enough to respond to internationally regulated economies and new market opportunities. Using their resources to improve livelihoods requires developing new technologies using participatory techniques and improving linkages to international economic and food systems. Politicians and researchers are showing increasing awareness of the significance of biological diversity in landraces and cultivated crops and of farmers' traditional knowledge as the cornerstones of long-term food security. The Potato Park experience incorporates the maintenance of traditional knowledge and practices with adaptation to changing international economic relations to provide for the food security of Andean indigenous peoples (www.andes.org.pe website).

The models of protected areas and community conserved areas can provide direct benefits to farmers if their needs and priorities are recognised. Conservation approaches that focus on farmers' needs and include sustainable community management of agrobiodiversity, can address a wide range of concerns including crops and seeds in the fields, marketing, empowerment, as well as institutional and policy issues.

Description of the agrobiodiversity features

The Potato Park area is a centre of diversity for a wide range of Andean food crops including Quinoa (*Chenopodium quinoa*), Kiwicha (*Amaranthus caudatus*), Tarwi (*Lupinus mutabalisis*), Oca (*Oxalis tuberosa*), Mashua (*Tropaeolum tuberosum*) and, most importantly, the potato (*S. tuberosum*). The wealth of the area is based on the 1,200 traditional varieties or landraces of potato that are named, known and managed by the local people. A typical farm plot may contain 250-300 varieties.

The economy of the area around the Potato Park is largely dependent on the potato, both in terms of local consumption and the regional barter trade. This trade has important nutritional, as well as economic value, allowing the highlanders to exchange the carbohydrates and meat that they produce (in the form of potatoes, guinea pigs, llama and alpaca) for vegetable protein from the grains produced at middle altitudes, and for vitamins and essential fatty acids from the fruits and vegetables grown in sub-tropical gardens at lower altitudes that are nearer the Amazon. Vertical trade of this kind has been an integral part of the economy of the region since pre-Inca times. (Marti and Pimbert 2005)

The cultivation of this agrobiodiversity must be seen within the context of the traditional farming systems which have nurtured the diversity and continue to do so. One of the salient features of traditional farming systems throughout the developing world is their high degree of biodiversity. These traditional farming systems have emerged over centuries of cultural and biological evolution and represent accumulated experiences of indigenous farmers interacting with the environment using inventive self-reliance, experiential knowledge, and locally available

resources. In Latin America alone, more than two and a half million hectares under traditional agriculture in the form of raised fields, polycultures, agroforestry systems, etc. are evidence of successful adaptation to difficult environments by indigenous farmers (Altieri 1995). Many of these traditional agro-ecosystems, still found throughout the Andes, constitute major *in situ* repositories of both crop and wild plant germplasm. Plant resources are directly dependent upon management by human groups; thus, they have evolved in part under the influence of farming practices shaped by particular cultures and the forms of sophisticated knowledge they represent. The complexity of these production systems and the value of the indigenous knowledge upon which they are based must be recognised and appreciated as powerful resources and as complementary to western scientific knowledge. The study of agricultural biodiversity cannot be separated from the cultures that nurture it.

Legal status of the protected landscape

The Potato Park is not officially recognised as a Category V Protected Area under the IUCN, or as part of the national protected areas system of Peru, although it has great potential to be considered as part of a complementary system of protected areas.

A proposal for legal recognition of the Potato Park as IBCHA is being developed, based on the following national and international legislation: FAO International Treaty (Article 9); Convention on Biological Diversity (Article 8(j) and 10(c)); Peruvian General Law on the Environment; Peruvian Constitution of 1993; and ILO 169 Convention (approved by the Peruvian Parliament). The following elements are being considered for inclusion in the proposal:

- Introduce the concept of the Collective Biocultural Heritage of indigenous peoples and include measures for its protection
- Based on Article 149 of the Peruvian Constitution, and Articles 3, 4, 5, 7 and 8 of the ILO Convention, establish that the Potato Park will be managed under customary laws and practices of the communities that reside in or depend on the Park
- Underline the importance of the Biocultural Heritage Area for the maintenance and protection of the culture and food security of Andean communities, as well as for the conservation and sustainable use of agrobiodiversity
- Declare and recognise the Potato Park landscape as a mega-centre of diversity of native potatoes
- Declare the Potato Park a GMO-free zone.

A great obstacle for the Potato Park has been the lack of options for its official recognition within the National System of Protected Areas (SINANPE). To this day, the Potato Park enjoys no legal recognition in spite of

Pampallaqta and potato field

numerous meetings with government agencies like *Consejo Nacional del Medio Ambiente* (CONAM) and the *Instituto Nacional de Recursos Naturales* (INRENA). Largely due to the unfriendly policy and institutional environment on the national level, ANDES has looked primarily to the international level to build support for the Park. In 2001, for example, ANDES collaborated with the Rockefeller Foundation to test the viability of the Park as a sui generis system for the protection of traditional knowledge. This study, which emphasized that traditional knowledge could not simply be protected by laws, but had to be protected on the ground where people are part of a cultural process of protection and livelihoods, was meant for international audiences, especially the World Intellectual Property Organization where the results were presented in 2005. In 2003 the Fifth World Park's Congress in Durban, South Africa, where Potato Park technicians arrived to present their new model of conservation, also contributed to building international recognition for the Park.

Locally, the Potato Park is recognised as a conservation area and is quickly becoming a popular ecotourism destination. Technicians from the Potato Park, along with ANDES staff, are currently working with organisations in three other areas to establish other Indigenous Biocultural Heritage Areas based on the Potato Park model and experience.

Administrative status of the protected landscape

The Potato Park is a locally managed community conserved area using the model, developed by ANDES, of an Indigenous Biocultural Heritage Area. The IBCHA model describes a community-led and rights-based approach to conservation based on indigenous traditions and philosophies of sustainability, and the use of local knowledge systems, skills and strategies related to the holistic and adaptive management of landscapes, ecosystems and biological and cultural assets. An IBCHA incorporates the best of contemporary science and conservation models and rights-based governance approaches, including the approaches of IUCN's Category V Protected Areas and Community Conserved Areas (CCAs). An IBCHA also includes positive and defensive protection mechanisms for safeguarding the Collective Biocultural Heritage (CBCH) of indigenous peoples.

CBCH includes the cultural heritage (i.e. both the tangible and intangible, such as customary law, folklore, spiritual values, knowledge, innovations, practices, and local livelihood and economic strategies) and the biological heritage (i.e. diversity of genes, varieties, species and ecosystem provisioning and regulating) of indigenous communities. Biological and cultural heritage are inextricably

Community registers

linked through the interaction between local peoples and nature over time and shaped by their socio-ecological context. This heritage includes the landscape as the spatial dimension in which the evolution of IBCH takes place. The heritage is passed on from generation to generation and developed, owned and administered collectively by indigenous communities according to customary law.

IBCHAs are based on deeply-rooted Andean traditions of biodiversity and landscape management. Therefore the approach uses context-specific indigenous knowledge, practices and innovation systems, customary laws, principles, norms and institutions, and traditional organisations of collective action. IBCHAs aim to ensure the sustainable livelihoods of indigenous cultures and their future generations by:

- relying on local resources to create alternative economies
- reinforcing indigenous cultural and spiritual values (such as gratitude and respect for Pacha Mama, Mother Earth, and the Apus, the Mountain Gods) in order to achieve sustainable resource exploitation
- using customary laws and institutions to develop effective management, conservation and sustainable use of biodiversity and ecosystems outside formal protected areas.

Though IBCHAs are voluntarily established, they are obliged to have a management plan, a five-year master plan, yearly reports and a monitoring and auditing system. Authority for the Park is shared between the villages, each of which elects one chairperson to coordinate the work of the Association. Concerted efforts are made to integrate traditional religious beliefs and understanding into the management.

Coordination between the ANDES and the Potato Park is rooted in the close collaboration between formal and informal Quechua technicians. These technicians have diverse experience in a wide range of disciplines, especially in traditional knowledge associated with the use and adaptive management of natural resources. The practice of working with community elders and others with specific cultural and environmental knowledge, reflects the respect and value ANDES places on traditional knowledge. Initial collaborative projects implemented by ANDES, including building of greenhouses and a medicinal plant collective, helped to bind the six communities of the Potato Park together and build confidence in collaborative efforts. In 2001, the Association of the Potato Park Communities was founded to serve as the management authority of the Park. The Association was strengthened in 2002 when it was officially entered into the Public Registry so that the Potato Park's Interpretation Centre in Sacaca could be officially owned by all six communities. Finally, the Association gained the formality it enjoys today when it signed the Repatriation Agreement with the International Potato Centre in Lima (GRAIN 2005).

Potatoes for food

Other preliminary steps leading up to the current governance model in the Park included visits by community members to the Island of Taquile on Lake Titicaca where locals have established a successful ecotourism project based on traditional knowledge and norms of administration. Unlike in Cuzco, where a strong hacienda tradition has heavily contributed to local communities' affinity for conflict, the people of Taquile have always remained isolated from outside influences and have maintained strong principles of solidarity and strategies for conflict resolution. Community members from the Potato Park also travelled to the Gran Chaco protected area in Bolivia to bring home more experiences on community-led conservation.

The Potato Park is dedicated to safeguarding and enhancing Andean food systems and native agrobiodiversity using the adaptive and holistic approach of the IBCHA model. In the case of the Potato Park, the epistemological bridges prescribed by the IBCHA approach link traditional and science-based understandings of the multiple functions of agricultural biodiversity – including the close interaction between wild and domestic plant and animal diversity – and how they sustain local livelihoods. The traditional knowledge, innovations and practices of Quechua peoples are showcased in the Park for their

essentially modern significance and utility, including for the purposes of nutraceuticals, pharmaceuticals, biotechnologies, agro-ecotourism activities and community-based conservation. In terms of the rights-based approach prescribed by the IBCHA approach, the Potato Park is concerned with indigenous peoples' self determination and securing the Quechua people's tenure and rights to agricultural biodiversity, local products, traditional knowledge, and related ecosystem goods and services (Argumedo and Pimbert 2005).

As an IBCHA, the Potato Park has been proposed as a sui generis system for the protection of traditional knowledge because it aims to protect traditional knowledge systems within its cultural, temporal and spatial dimensions using a combination of positive and defensive protection tools (Argumedo and Pimbert 2005).

Past and current land/water use practices

The natural environment of the Andean Mountains is characterized by a tremendous variation in vegetation, soils and climate over relatively short distances, creating significant reservoirs of species and ecosystem diversity. The Andes are also sacred landscapes, where ancient cultures have developed an intimate knowledge about their environment, guided by an ethic of respect for all forms and expressions of life.

A long line of human cultures has left significant traces of modification on the Andean landscape, both through intentional management and unintentional mismanagement. The result is a human created landscape, which in the past was even more intensively utilized than it is today.

Potato flowers

At the time of the Spanish conquest, the Incas cultivated almost as many species of plants as the farmers of all Asia or Europe. On mountainsides up to four kilometres high, and in climates varying from tropical to polar, they grew a wealth of roots, grains, legumes, vegetables, fruits and nuts. In Peru alone, an estimated one million hectares of steep slopes were converted into agricultural fields using terracing, irrigation canals, catchments and reservoir structures. Today over half of these terrace-covered slopes have been abandoned. A recognised centre of origin and diversity of more than 90 food crops and 5 animal breeds (Brack 2003), traditional agricultural landscapes continue to give the Andes its unique character.

The high Andean cultures thus constitute one of the best examples of long-term, large scale experimentation in sustainable land use. Over centuries of life in the Andes, Quechua and Aymara peoples have mastered the adaptive management of the complexity of their ecosystems by using diversity as a management principle to create the resilience needed to inhabit such a harsh environment. Their integrated management and land use planning systems maintained mosaics of land use types, including agricultural and natural areas and the maintenance of border habitats for wildlife. Andean indigenous peoples have nurtured plants and animals to provide food, carefully selecting tastes and textures that make good food, resulting in a great diversity of genetic resources, varieties, breeds and sub-species. This diversity was developed as a result of the free-flow of genetic resources between food producers, i.e. women and men farmers who safeguarded agricultural biodiversity. Traditional farming systems also include the diversity of species that support production – soil biota, pollinators, predators, and so on – and those species in the wider environment that support diversity.

Agriculture and related land use continue to define Andean landscapes, provide for sustenance of local communities, and exert great influence on the environment, economy, society and culture of the mountains. Traditional Andean livelihood strategies are based on maximizing the value of biodiversity to increase security and to buffer shocks. The crops grown at the highest altitudes are tubers, including the potato (possibly the highest altitude crop in the world), as well as ulluco, oca and mashua. Yields are lower than maximum yields obtained with intensive agriculture as there is a trade-off between productivity, risk management, external subsidies and degradation. The Andean community approach to optimizing diversity is evidenced by the large numbers of potato varieties that farmers cultivate, the regular use and management of wild resources, and the importance of domesticated and semi-domesticated animals within the household economy and landscape. These diverse varieties, breeds and systems underpin food security and provide insurance against future threats, adversity and ecological changes.

The multiple functions of traditional agriculture in the Andes extend beyond the production of food, fibre, medicines, timber and other goods for immediate benefit. Additional functions include food security, environmental sustainability, development and social and economic well-being.

Traditional agro-ecosystems are genetically diverse, containing populations of variable and adapted landraces as well as wild relatives of crops. The resulting genetic diversity confers at least partial resistance to diseases that are specific to particular strains of the crop and allows farmers to exploit different microclimates and derive multiple nutritional and other uses from within-species genetic variation. In the Potato Park, along with many other Andean crops and wild relatives, other species are regularly havested from the wild for foods, medicines and ritual purposes. Diversity, as a principle, has nurtured creativity among the local communities, along with a deep knowledge of species taxonomy, distribution, life cycles as well as ecological processes and natural resource management. Tools and techniques created to manage diversity include the practice of managing mountain verticality to enhance complementarity between life zones. Such a practice depends on cooperation among indigenous communities living in diverse biological environments with distinct cultural identities, and is responsible for the rich diversity of landscapes, ecosystems and biological and genetic resources in the Andes. Traditional barter markets continue to be used to facilitate the exchange of plant and animal material while minimizing vulnerability to market forces. This type of cooperation has resulted in a dynamic biocultural-ecological network through which a diversity of biological resources is shared, based on the principles of duality, reciprocity and equilibrium. These principles, three pillars of the Andean cosmovision, continue to guide the daily life of indigenous peoples and serve as the core principles of the agricultural and landscape management systems, customary laws, cultural and spiritual values, and socioeconomic organization that have allowed for cooperation among communities settled in different ecological zones.

Comprised primarily of collective landholdings, forests and small farms, the traditional Andean landscape contributes greatly to the country's economy, albeit informally since no records in the national accounting books tabulate the exchange of goods and services flowing through the biocultural ecological networks that crisscross this landscape. An increase or decrease in GDP, therefore, does in no way reflect the role of these networks in cushioning the social impacts that rapid changes, brought about by globalization and trade liberalization, are producing in remote and neglected indigenous communities.

Conscious management policies and practices

Although the concepts of environmental protection and cultural preservation are arguably foreign to the Andean worldview, these concepts are nevertheless a consequence, identifiable by outsiders, of the interaction between indigenous communities and their natural environment. This interaction, embodied by the traditional Andean landscape, protects cultural and biological diversity and a wide array of ecosystem goods and services that provide for clean air, water, and soils, and help reduce the threat of climate change. This protection is made possible, in no small part, by the spiritual values of indigenous peoples whose sacred relationship with the land constitutes spiritual capital and may be the key for achieving sustainability in the Andes. Thanks to the environmental protection offered by the traditional Andean landscape, the biocultural resources of the Andes are well-preserved and draw a large number of visitors, making tourism one of the largest and most dynamic sectors of the Peruvian economy.

Andean agricultural landscapes and their agricultural biodiversity can also provide the basis for biotechnologies (old and new), natural product development, ecotourism, and other activities important for income generation in the local, national and global economies. The establishment of the Potato Park is an attempt to use traditional agricultural systems for landscape conservation, firstly to maintain native plant and animal species in their original habitat, secondly to promote the conscious management of biodiversity in wild and cultivated species, and thirdly to provide sustainable livelihood opportunities for indigenous communities.

The development of the Potato Park took a major step forward in December 2004 with the Agreement on the Repatriation, Restoration and Monitoring of Agrobiodiversity of Native Potatoes and Associated Community Knowledge Systems, made between the Association of Communities of the Potato Park, represented by ANDES, and CIP. The agreement is legal under Peruvian law, and is a legal sign of the restoration of rights that indigenous peoples once had.

The indigenous communities to whom the potatoes have been repatriated, will not seek patents over these varieties as they are against patents. Patents represent a model of property that does not fit into their worldview, as indigenous people are used to exchanging and sharing information in open ways. The agreement with CIP legally prevents anyone else from claiming intellectual property rights over the communities' knowledge and resources. Under the CIP agreement, CIP scientists and local farmers are repatriating potato varieties from CIP's collection of specimens (the agreement initially covers 206 varieties). CIP has agreed to pay for the cost of reintroducing the varieties, as an acknowledgement of the benefits the organisation has derived from the indigenous knowledge of the region. The repatriated varieties have been distributed in the Potato Park and replanted in the area, where they are used for local food security, medicines and ceremonies. These varieties are also being distributed to other indigenous communities in the area.

The repatriation of native potatoes is helping support the work of the Association of Communities of the Potato Park to develop alternative economic activities. Examples of local projects which are managed by economic collectives include:

- the Sipaswarmi Medicinal Plants Women's Collective which develops and sells natural medicine and natural soaps using local resources and traditional and modern knowledge
- a landscape-based agro-ecotourism venture which includes a network of walking trails, a potato-oriented restaurant, and workshops and stores for the production and sale of local handicrafts
- the Arariwa, a native potato repatriation and seed development collective
- the Tijillay T'ika Women's Audio-Visual Collective where members of a women's cooperative are being trained in making and digitally editing videos in the local language, to record and share knowledge about local resources and how to manage them.

A database of traditional medicinal knowledge is also being established to protect against biopiracy. The Indigenous Biocultural Heritage Registers are a comprehensive approach to protection based not only on the intellectual components of traditional knowledge, but also on the distinct cultural, biological and ecological character of traditional knowledge systems (Argumedo and Pimbert 2005).

Managing data base

A network of barefoot technicians, who are elected by their communities because of their expertise in traditional knowledge, are developing a dynamic process of horizontal learning and knowledge exchange. For example, the barefoot technicians have been supporting other communities by providing information, supporting exchange of experiences and cross-community visits, offering participatory planning and evaluation methods at the community level, organising training courses and advocating for the needs, visions and rights of indigenous peoples and their knowledge systems. Organisations of collective action such as Local Learning Groups and experts in traditional knowledge spearhead community training as well as processes to gather, organise and apply traditional knowledge. Local Learning Groups have been trained as community facilitators and leaders to enhance indigenous knowledge and to strengthen the institutional capacity of communities to manage local knowledge and innovations in the Park's conservation and development programmes.

As well as ensuring the conservation of potatoes, the communities plan to regenerate native forests, most of which were cut down in the 18th century to provide timber for Spanish silver mines. Currently, the main tree species on the hillsides is alien Eucalyptus, planted in the 1940s and 1950s; but though it is valued for being fast growing and is currently the main source of fuel wood, it negatively affects soil quality. Nurseries for growing thousands of seedlings of native species have been set up. By regenerating native forests, the villagers hope to promote greater biodiversity which will also help fulfil the objective of encouraging agro-ecotourism.

The Park is developing an autonomous programme for managing tourism and ensuring that local people benefit equitably. A new research and visitor's centre is being established to help with administration, marketing and coordination. The Potato Park is also in discussion with the National Institute of Culture to agree on a system for co-management of archaeological sites and sacred sites in the area.

The new sense of unity that has been established between the communities of the park has brought other ancillary benefits. A history of (occasionally violent) land conflicts between the communities has been largely overcome, in part through the revival of the customary village boundary festival, in which each village's links with the land are celebrated each year by walking the boundaries. As Association Chairman Wilbert Quispe has remarked, "Before this project we were divided and were losing our diversity, native potatoes, wildlife and many other things…We were also forgetting how to manage this variety. Our aim is to reunite our villages in order to restore our traditional ways of managing our landscape."

Key challenges, threats and responses

In spite of the enormous importance of Andean agricultural landscapes for the cultural and socioeconomic well-being of indigenous peoples and the ecological health of the Andes Mountains, conventional conservation and development initiatives have not focused on preserving these landscapes. On the contrary, neo-liberal policies of recent governments have all but neglected conservation of the traditional agricultural landscape and have favoured short-sighted agricultural policies promoting the use of new and foreign technologies for agricultural production. These technologies have included hybrid crops as well as new means for storage, transport and organization geared towards creating an export economy.

Such policies have deep implications for the cultural, biological and landscape diversity of the Andes as well as for the economy and livelihoods of indigenous peoples. In the last 50 years alone, a large amount of the genetic diversity of the most important Andean crops has disappeared from farmers' fields. This has increased agricultural vulnerability, reduced the nutritional variety of rural people's diets, and erected obstacles for the exchange of knowledge and resources within Andean ecological networks.

Agricultural policies have also systematically neglected native species and races of domesticated plants and animals, vital for the nutrition of the poorest people. The production of commercial-variety crops for the market requires high inputs of fertilizers and pesticides which are having a serious impact on numerous endemic and threatened species, medicinal and food plants, and sanctuaries for plants and animals. At the same time, global warming and natural resource extraction are having a measurable impact on mountain glaciers, the availability of water, and pollution.

In order to survive droughts and other climatic challenges, indigenous people traditionally shared knowledge relating to the climate and remedial agricultural practices such as planting different crops or developing highly advanced irrigation systems. Such practices have historically enabled local resilience to outside forces which threaten food security. However, increasing preference for occidental technologies - caused by poorly conceived development efforts and national and international free market trade policy - has led to a marginalization of the indigenous way of life and the devaluation of indigenous practices.

The present policy environment threatens to forcibly alter the very essence of Andean culture and spirituality and the traditional landscapes it has enabled. Particularly alarming is that the maintenance of these traditional

landscapes is the only sensible strategy to preserve *in situ* repositories of crop germplasm. Unless such a strategy is adopted in Peru, the world could soon lose a centre of origin and diversity of important food crops which reinforce global food security. Furthermore, neglecting traditional landscapes will have deep implications for the survival of indigenous peoples, their traditional resource rights, ecosystem goods and services, biological and genetic diversity, food and health security, and ultimately the cultural identity and sustainable development of Peru. The steady erosion of wild and domestic biodiversity and the persistently high ranking of the rural Andes as the poorest region of the country has, nevertheless, not influenced government policy makers to enact measures in support of traditional agricultural landscapes.

Understanding links between farming communities and the use of natural resources is critical to fostering greater harmony between agriculture and ecosystems that support peoples and other species. Community-based approaches have been proposed as an alternative to top-down conservation and development models. Efforts towards decentralisation are recent and have yet to fully run their course. Current conservation and development thinking argues that community involvement is by no means easy, and nor is it guaranteed to succeed. Not all communities are small, homogeneous entities with shared values and qualities that facilitate collective decision making. Many are, in fact, heterogeneous in ways that often impede their ability to conserve resources.

Although the international community has begun to emphasize the need to involve farming and local communities more centrally in the management of agricultural biodiversity, there are huge gaps in knowledge and institutional constraints that limit national capacities to scale up these approaches. In order to help fill these gaps and constraints, ANDES, the 'Sustaining Local Food Systems, Agrobiodiversity and Livelihoods' Program of the International Institute of Environment and Development, and six Quechua communities of Pisaq, Cusco, Peru, undertook action research with local communities. This research indicates that a rights-based approach to conservation, which fully respects the cultural and spiritual values and practices of indigenous communities, can harness the best attributes and decision-making processes of local organizations in order to promote the objectives of conservation and sustainable use of biocultural resources (IIED website).

There is much to be learned from traditional Andean management philosophy and policy. However, this traditional knowledge is rapidly deteriorating with the synergistic effects of population and consumption growth, poverty, and free-market economies as they steamroll further and further into remote Andean valleys.

Agrobiodiversity for the future: Plans and recommendations

The Potato Park model

The Potato Park experience is an inspiring example of how the six disparate Quechua communities converged in defence of their common biocultural heritage. The story of the Potato Park is about how the interests of these communities are worked out within a new organizational framework that demands cooperation and constant renegotiation. The communities have come to understand that only through cooperation will they be able to defend their rights in the face of imminent change brought on by the Peruvian state and the global market place.

The Potato Park has demonstrated that successful biodiversity and ecosystem management depends largely on the recognition of property rights, the dynamics of ecosystems, and indigenous knowledge. This ensures the conservation and sustainable use of biodiversity at all levels, contributing to the equity, opportunity, security and empowerment of local and indigenous communities, as well as to the sustainability of the biological resources and landscapes. The Potato Park is an excellent example of biocultural restoration, which has resulted in a wide range of biodiversity, agricultural and cultural benefits to the local communities, as well as safeguarding an important global resource for future generations. A long term goal of the Potato Park is to re-establish all the world's 4,000 known potato varieties in the Park.

There is a great deal to be learned from the Park with regard to geographic issues such as:

globalization of food production; cultivation of local food economies, development and anti-development arguments; GMO policies and power; globalization-from-below (inter-local solidarity and resistance); the devaluation and revaluation of home-scale economy and domestic crafts/knowledge; and re-empowerment of rural communities. In short, the Potato Park heralds an important next chapter in the geographic story of agriculture, justice, and alternative ecological knowledge systems.

CIP Agreement: *In situ* and *ex situ* complementarity

The agreement with CIP is in many ways unprecedented. Its collaborative origin, as well as its language of repatriating knowledge systems, is critical and inspiring. It can serve as a model for combining *in situ* and *ex situ* conservation strategies.

In response to the alarming pace of crop genetic erosion, particularly in the South's centres of diversity, FAO, the Consultative Group on International Agricultural

Research (CGIAR) and various national governments initiated global plant genetic conservation efforts in the early 1970s. Collecting missions were launched to Southern centres of diversity, and gene banks were constructed and expanded for safeguarding collected germplasm. To date, the storage of seeds in gene banks has been the standard approach to plant genetic resource conservation. The vast majority of attention, funds and scientific expertise has been devoted to *ex situ* collections, focusing particularly on major crop species.

Today, there is growing appreciation for the fact that *in situ* conservation is a crucial element in the conservation of agricultural biodiversity, and must be complementary to gene bank collections. The future of world food security depends not just on stored crop genes, but on the people who use and maintain diversity on a daily basis. After decades of neglect in official circles, the Convention on Biological Diversity, Agenda 21 and FAO's Global Plan of Action aim to redress this imbalance by placing greater emphasis on *in situ* and farmer/community level management of genetic resources. The Global Plan of Action recognises the need for complementary conservation systems, and aims to secure existing *ex situ* collections while also strengthening *in situ* conservation and the capacity of farming communities.

Experience shows that diversity is only secure when diverse conservation strategies are employed. *Ex situ* and *in situ* approaches are not mutually exclusive; no single method of conservation is optimal for all situations, and no single method can succeed alone. Different conservation systems can complement each other and provide insurance against the shortcomings of any one method. Ultimately, the success of both *in situ* and *ex situ* approaches depends on forging strong links between the two. In practical terms this means conservation and utilization using both institutional scientific innovation and the community genius of farmers and indigenous peoples.

Agro-ecotourism and traditional agricultural landscapes

The Potato Park model includes incorporating agro-ecotourism as a complementary and effective economic activity within the framework of the traditional agricultural production of local people. The viability of this model for potential application within the framework of the Ruta Cóndor is considered in the section below. The

Potato varieties

economic activities proposed are the creation of communal businesses that develop and offer tourist products based on the utilization of genetic resources, native biodiversity, goods and services of the ecosystem, and the aesthetic and cultural values of the landscape. Through these activities, incentives will be established for the *in situ* conservation of genetic resources and for the creation of policies and poverty alleviation strategies based on the conservation and sustainable use of Andean biodiversity.

Cusco is important for tourism in Peru because it is the centre of the pre-Hispanic Inca culture. However, the rural population benefits only marginally from tourism. One source of income is through the sale of their produce, mostly derived from the unique biological resources of the region. In recent years there has been a loss of traditional conservation practices and other customs (food, dress, etc.).This has been mainly because of the increasing use of high-yielding species and varieties in commercial agriculture, climatic factors, pests, diseases, inappropriate agrarian policies and development activities, and poverty which increases the migration of indigenous youth (with their knowledge, experience and customs of traditional Andean agriculture).

In the communities of the Potato Park, it is the local farmers who have conserved the wide range of local varieties of Andean root crops on their farms. Rather than focusing on the maximisation of yield or income, they recognise the need to spread risks by planting mixtures of species on their small parcels of land to guarantee a harvest every year. The incentives provided by the development of agro-ecotourism could facilitate new mechanisms for promoting traditional conservation and sustainable use practices. During guided tours to the communities, tourists will see the remarkable morphological and agronomic variety of Andean plants and tubers in demonstration plots, a potato museum, and restaurants with menus based on traditional Andean produce. An educational programme about Andean crops and culture and the participation of young people in agro-ecotourism in order to reduce migration are also proposed.

Ecological networks and agrobiodiversity corridors: The Ruta Cóndor

The Potato Park is a pilot project for a larger initiative in landscape conservation in the Andes. Over the last 30 years, biodiversity conservation efforts have taken a more holistic approach by focusing on ecological networks. The World Summit on Sustainable Development recognised that a necessary action to achieve the 2010 biodiversity target is to "promote the development of national and regional ecological networks and corridors." Furthermore Point 1.2 of the Program of Work on Protected Areas of the Convention on Biological Diversity calls for establishing protected areas in a mosaic of habitats in order to maintain entire ecological processes (Bennet 2006). Corridors play a key role in ecological networks, conserving the flows and linkages that exist between fragmented ecosystems. Many different types of corridors exist, ranging from biological corridors to sustainable development corridors (e.g. the MesoAmerican Sustainable Development Corridor). Based on this concept of connectivity, ANDES plans to link fragmented IBCHAs via a corridor that has the multiple, yet complementary, objectives of conservation and meeting local food needs. This food sovereignty corridor, the Ruta Cóndor, will link cultural and biological resources of Andean communities.

The Potato Park as *sui generis* system

The livelihoods of indigenous communities worldwide depend on the preservation and protection of their extensive traditional knowledge relating to biodiversity management, that has been cultivated over many generations. The idea of *sui generis* protection of traditional knowledge and biological resources began with the debate on the Philippine accession to the World Trade Organization (WTO) in 1994. This debate led to the creation of one of the key agreements of the WTO, the TRIPS Agreement, which provided for sui generis protection of plant varieties as an exception to what may be considered as patentable subject matter.

Prior to 1994, there were discussions on issues related to the protection of traditional knowledge and the associated biological and genetic resources, but these were mainly among academic circles and NGOs. In 1994, MASIPAG and some scientists from the University of the Philippines at Los Banos held a workshop on the issue and proposed policy measures on community intellectual rights. This was aimed at stopping biopiracy, which was seen to result from the country's accession to the WTO.

As a *sui generis* system, the Potato Park respects, preserves and maintains the knowledge, innovations and practices of indigenous Quechua communities, and recognises their right to control the use of their knowledge based on their own vision, needs, and customary laws and practices, for their primary benefit. Protection is not limited to knowledge. Other aims can be met with the IBCHA model, including protection of biodiversity, landscapes, cultural and spiritual values, and customary laws and practices. This kind of holistic protection can contribute to empowerment and alleviation of poverty among indigenous peoples.

Acronyms

ANDES	Association for Nature and Sustainable Development
CBCH	Collective Biocultural Heritage
CCA	Community Conserved Area
CIP	International Potato Centre
FAO	Food and Agriculture Organisation
GMO	Genetically Modified Organism
IBCH	Indigenous Biocultural Heritage
IBCHA	Indigenous Biocultural Heritage Area
MASIPAG	Farmer-Scientist Partnership for Development
TRIPS	Agreement on Trade Related Aspects of Intellectual Property Rights
WTO	World Trade Organisation

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Conservation by consumption: *In situ* conservation of agrobiodiversity in the Rhön UNESCO-Biosphere Reserve, Germany

Doris Pokorny

Summary

The Rhön UNESCO-Biosphere Reserve has been committed to conserving agrobiodiversity through product development and regional marketing since 1991. Important ecosystem types, such as species-rich grassland and traditional fruit orchards, have been effectively conserved through the *in situ* conservation of agrobiodiversity (Rhön sheep and apple varieties).

Driven by the common vision and enthusiasm of the main stakeholders in the region to preserve the traditional cultural landscape of the Rhön, many promising projects have emerged. Although still limited to a niche market, the experiences in the Rhön demonstrate that the conservation of agrobiodiversity is possible if it is based on close cooperation and networking at a regional scale. Experience has shown that successful agrobiodiversity conservation is mainly dependent on economic self-sufficiency – since without a market, agrobiodiversity cannot be conserved in the long-term. Furthermore, agrobiodiversity conservation depends both on the commitment of farmers (land owners) and consumers' attitude and willingness to pay 'a little extra' for the positive conservation outcomes. Adequate interpretation programmes are also important.

The Rhön Biosphere Reserve

The Rhön is situated in the centre of Germany, 150 km east of Frankfurt (see map) and was designated by UNESCO as a biosphere reserve in 1991. It is one of Germany's 13 biosphere reserves and covers an area of 1,850 km². The Rhön is a rural area with a total population of 162,000 (as of 2004) living in numerous small villages and towns over 42 municipalities. The area covers five districts within three federal states or 'Länder': Bayern (Bavaria), Hessen (Hesse) and Thüringen (Thuringia). As biosphere reserves in Germany are within the jurisdiction of the individual 'Länder' governments, the Rhön has three independent, but closely co-operating, administrative units.

The Rhön is an area of low mountains, rolling hills and highlands reaching a maximum altitude of 950 m above sea level. The climate is both sub-continental and sub-oceanic. The mean annual temperature ranges from 5°C in the highlands to 8°C in the lower areas. The mean annual precipitation follows a gradient ranging from 1,000 mm in the west to 550 mm in the east.

Typical rural settlement structure.

Photo: Vogel

Land of panoramic views – the Rhön is an old cultural landscape.
Photo: Vogel

The Rhön's land use history can be traced back to the 9th century. For 40 years during the 20th century, however, the area was divided by the 'Iron Curtain'; until German reunification in 1990, the Thuringian side was in the former German Democratic Republic. The major structural differences in land use on both sides of the former Iron Curtain are still apparent today.

Managed forests (mainly mixed forests or broadleaf beech-woodlands dominated by *Fagus sylvatica*) cover 40% of the area; 35% is grassland (both pasture and meadows including bogs and other landscape features), 18% is arable land and 7% is settlements, roads or other infrastructure. Due to the harsh climate and poor soils, large parts of the Rhön are regarded as marginal agricultural areas.

Although pristine or natural ecosystems have long since disappeared, the cultural landscape is very rich. Biodiversity conservation in the Rhön means preserving habitats, many of which are of European importance in the framework of the Fauna, Flora and Habitats Directive (92/43/EEC) (e.g. nardus grasslands, mountain hay meadows and semi-natural dry grasslands). These habitats are important for a range of endangered and rare animal and plant species which are protected on the regional, national and European level (e.g. Black stork - *Ciconia nigra*, Red kite - *Milvus milvus*, Corncrake - *Crex crex* and *Bythinella compressa*, an endemic snail species). The genetic resources of livestock and cultural crops are also a vital part of the man-made landscape, and last, but not the least, the landscape aesthetics are considered worthy of conservation.

The areas of high biodiversity values are mainly dependent on extensive grassland management. Conservation goals in the Rhön can thus only be achieved with close cooperation between farmers and the nature conservation or agricultural authorities which provide grant schemes and programmes for adapted management.

Generally speaking, the aim of biosphere reserves is the conservation of abiotic resources and biodiversity (including agrobiodiversity) integrated within a sustainable regional development approach. "Conservation by consumption" could be the motto which appropriately encompasses these objectives. Agrobiodiversity conservation plays an important role in this context as, besides the need to conserve rare agricultural breeds and varieties, it can provide valuable habitats for wildlife and economic opportunities for niche products and markets.

The visions and goals of the biosphere reserve, developed through a comprehensive discussion process with stakeholders in the region, are laid out in the Management Framework for Conservation, Maintenance and Development of the reserve (Grebe et al 1995). The framework is not legally binding but is used as a 'soft' planning tool. It will be updated in the near future.

According to UNESCO's Statutory Framework for Biosphere Reserves (UNESCO 1996), all biosphere reserves require this type of overall management concept as well as a zoning plan. Core and buffer zones and a transition area need to be defined in order to spatially fulfil the different functions of a biosphere reserve. In the Rhön the most important zone is the buffer zone, locally known as the 'maintenance zone', which covers 40% of the reserve. It is not surprising that the core zone (i.e. wilderness area) is less than 3%, given the region's long history of land use. The transition zone, which contains all the settled areas and infrastructure as well as a more intensive land use, covers 57% of the total area.

Legal status of the Rhön Biosphere Reserve

The three administration units of the Rhön differ in their structure and jurisdiction. Whereas in Thuringia the whole biosphere reserve area is designated as a protected area, in the Bavarian and Hessian regions the biosphere concept is considered as a planning tool and not a protected area designation.

Although the whole area does not have protected area status, there are a variety of protected areas within the biosphere reserve. These include:

- Protected Nature Reserves (Naturschutzgebiet): Protected areas according to Länder nature conservation legislation. They are equivalent to the 'maintenance zone' of the biosphere reserve, which has legal status only in Thuringia.

Protected areas (national/EU categories) in the Rhön Biosphere Reserve

	Protected Nature Reserves as parts of the buffer/ maintenance zone of the Rhön BR	**Woodland Reserves as parts of the core zone of the Rhön BR**	**'Natura 2000' as parts of the buffer/ maintenance and transition zone of the Rhön BR**
Bavarian part	4902 ha	293 ha	FFH 22.496 ha SPA 19.000ha
Hessian part	4558 ha	101 ha	FFH 11.378 ha SPA 41.984 ha
Thuringian part	5254 ha*	762 ha*	FFH 13.066 ha SPA 18.084 ha

* Since 28.04.2006 the term 'protected nature reserve/woodland reserve' has been formally adapted in the Thuringian part to comply with the wording for the UNESCO zones; thus the terms 'maintenance zone' and 'core zone' are used now.

The Lange Rhön Nature Reserve - one of the protected areas which makes up the Rhön Biosphere Reserve.
Photo: Vogel

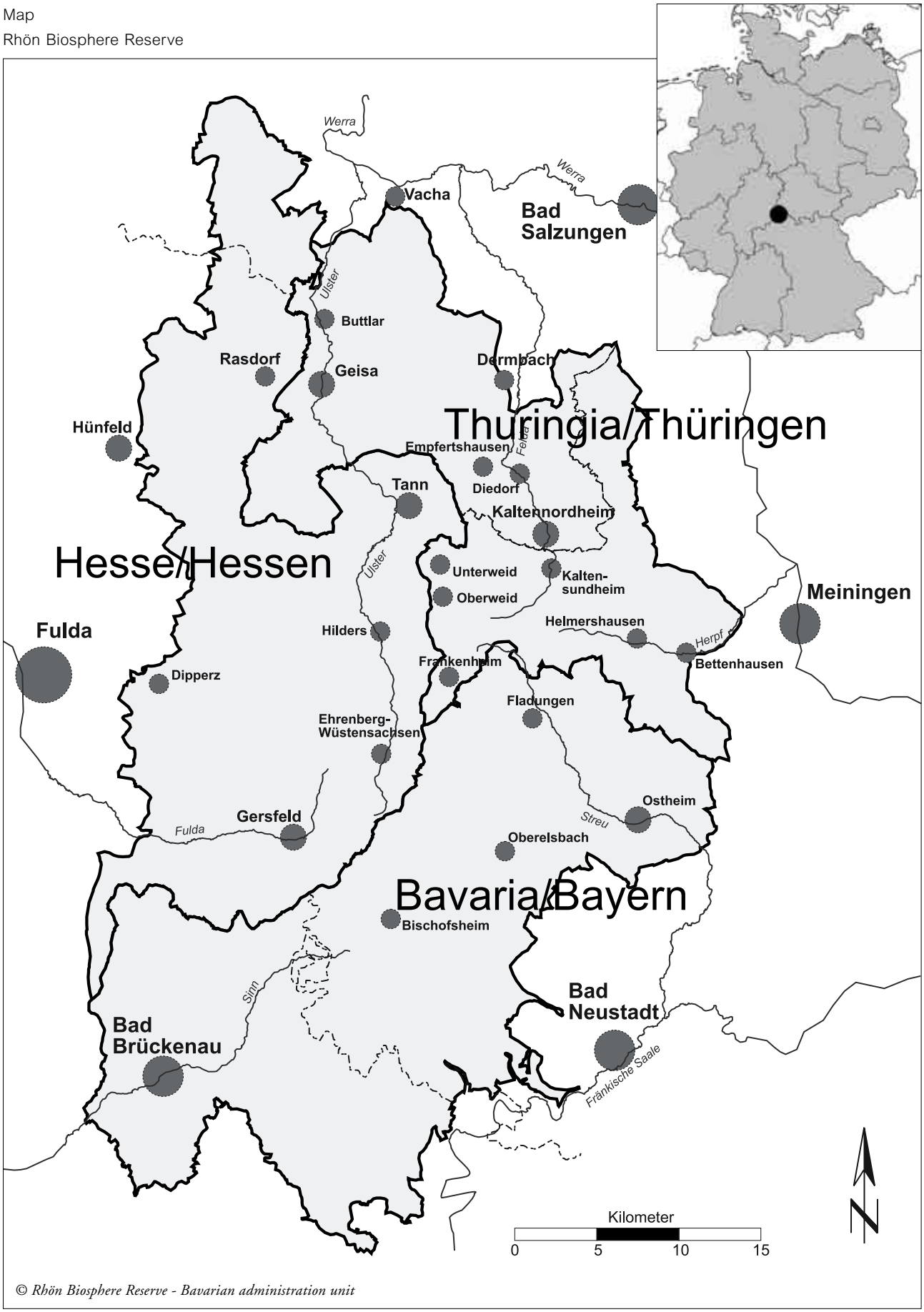
- Woodland Reserves (Naturwaldreservat): Protected areas according to Länder woodland legislation 'Waldgesetz'. They are equivalent to the 'core zone', which again has legal status only in Thuringia.
- 'Natura 2000' sites (FFH/SPA-Gebiet): Protected areas according to EU legislation.

As the different categories of protection spatially overlap, the 'net nature conservation area' needs to be identified in order to reveal the area of the Rhön which is actually dedicated to conservation. In the trilateral Rhön biosphere reserve this makes up 46% of the total area; which means roughly 85,000 ha are legally considered as 'priority areas' for nature conservation. Except for the woodland reserves/core zones, all priority areas for nature conservation are managed by local farmers as land owners or as leaseholders. Thus, conservation in the context of cultural landscapes remains mainly a question of adapted land use. It depends on negotiations with the landowners who are mostly eager to cooperate as long as adequate state subsidies are provided.

In addition to the above, the biosphere reserve in Hesse and Bavaria has the status of a Nature Park (Naturpark). This category spatially restricts the development for housing areas, industrial areas and other built up areas in order to prevent urban sprawl. The nature park area exceeds the area of the biosphere reserve.

To sum up, the Rhön biosphere reserve for Thuringia may be considered as a protected area in the IUCN sense, whereas for Hesse and Bavaria it is in effect an umbrella for a conglomerate of different nature conservation categories which differ in their protection status. This may be the reason why, to date, only the Thuringian part of the biosphere reserve has been listed as an IUCN Category V area on the World Database on Protected Areas. Whether or not the Hessian and Bavarian parts of

Map
Rhön Biosphere Reserve



the Rhön, and thus the biosphere reserve altogether, would qualify as a Category V needs further examination and evaluation. However, technically the preconditions are basically fulfilled: the Rhön cultural landscape is an area which demonstrates, according to IUCN requirements, "the interaction of people and nature over time [which] has produced an area of distinct character with significant aesthetic, ecological and cultural value and with high biological diversity." (IUCN 1994). The Rhön example is thus fairly typical of the challenges posed when it come to managing and categorising protected areas that extend beyond single administrative boundaries and jurisdictions.

Who makes the biosphere reserve work?

Success or failure of the Rhön biosphere reserve idea depends upon the local people, on their commitment, creativity and preparedness to take economic risks or try out new ideas. Indeed, biosphere reserves rely on cooperation in many ways: they deliver action at the local level, are voluntary rather than regulatory, involve the co-ordination of numerous stakeholders rather than a single management agency, and have multiple benefits in terms of conservation goals, economic values and social well-being (e.g. through job opportunities). They are forward-looking, bring together disparate groups into new partnerships, and yet seek to match action with the conservation of landscape qualities and the quality of life. They also solve conflicts through approaches that focus on win-win solutions.

In the Rhön, putting the biosphere reserve idea into practice is a question of facilitation, moderation and/or coordination, rather than a classic protected area management approach. The biosphere reserve coordinators' tasks concern the integration of the biosphere reserve's visions and goals into regional conservation and development concepts. Biosphere reserve coordinators motivate and bring partners together; moderate and mediate; coordinate projects and set thematic and spatial priorities; and assist in fundraising for model projects and accompany projects, e. g. through applied research.

The aim of biosphere reserve coordination is to bring together wider public responsibility for a biosphere reserve ('top down' in terms of financial and human resources), and local initiative ('bottom up' in terms of ideas and activity). The challenge for biosphere reserves in the Rhön, as well as in other areas, is to find the proper balance between the 'top down' and 'bottom up' approaches, so that appropriate resources from government, commitment of the private sector, and volunteer passion with a connection to local communities can be maximised. Coordination, rather than management techniques, seems to be the right tool, since biosphere reserves have a non-regulatory and consensus mandate.

In this sense, the Bavarian, Hessian and Thuringian administration units jointly care for the Rhön. However,

Local people have become proud of what their region has to offer.

Photo: Vogel

they differ decisively as to their jurisdictions and organisational levels. Whereas the Thuringian administration unit belongs to the provincial (Länder) government and is linked to the Ministry of the Environment, the Bavarian administration unit belongs to a lower level, the regional government, and the Hessian administration is part of the district council. The administration units work in close cooperation, and a trilateral technical advisory committee consists of representatives with science backgrounds, as well as representatives from various agencies and interest groups.

Unlike National Parks or other protected areas, the designation of the Rhön as a biosphere reserve does not affect existing jurisdictions. Thus, for example, the responsibility for nature conservation in the reserve remains within the nature conservancy, for forest management it remains within the forest administration, for tourism development it remains within the tourism agencies, etc.

Besides the public administrations, not-for-profit organisations supporting the Rhön biosphere reserve exist in each part of the Rhön. A regional work group (ARGE Rhön) of the concerned five district councils was set up in 2000.

Agrobiodiversity features and conscious management practices in relation to maintaining or enhancing agrobiodiversity

Land use in the Rhön biosphere reserve is mainly characterized by agricultural and forestry activities. Roughly 9.5% of the agricultural land in the reserve is farmed organically according to EU Guidelines. The conservation of agrobiodiversity focuses on the Rhön sheep (a regional breed), and regional fruit varieties (mainly apples) which have traditionally been cultivated in orchards (see below). Another traditional breed, Yellow Franconian Cattle (Gelbvieh), is also important in areas where conservation projects require low intensity grazing. This breed originated in Franconia (Northern Bavaria) in the early 19th century as a dual purpose animal for beef and milk production. It used to be quite common throughout the Rhön until the 1960s but, mainly for economic reasons, it almost disappeared in the region while becoming quite common overseas (e.g. in Canada, U.S. and South America). Although the breed is neither rare nor threatened, it can play an important role in conserving traditional agriculture.

Rhön apples, an economically successful resource

Fruit orchards with high stem fruit trees are a typical feature of the Rhön landscape. They are found in the countryside, as orchard belts around villages and along footpaths and roads. In 1993-94 about 1,000 ha of fruit orchards were identified by remote sensing in the Rhön biosphere reserve, as well as an additional 180 km of fruit trees along roads and paths. Altogether it is estimated that there are 120,000 fruit trees.

Fruit orchards are culturally, historically, ecologically and economically important, as they:

- provide additional income (through production, processing)
- contribute to the strengthening of regional marketing
- contribute to the beauty of the landscape, especially in the spring time and autumn
- support the regional image of the Rhön as an eco-tourism region
- provide, when they are old, habitats for numerous rare and endangered wild flora and fauna (Degenbeck 2003).

Apart from this, the intrinsic genetic value of the numerous fruit varieties is important in the context of conserving *in situ* agrobiodiversity. The conservation of old or traditional varieties may become increasingly important

Traditional apple orchards contribute to landscape aesthetics and ecological values.

Photo: Vogel

Rhön apple market in Hausen offers more varieties than any supermarket ever could.

Photo: Vogel

for the fruit industry in general, even though many of the varieties would not meet today's standards (with regard to size, appearance or yields). Old varieties often are more robust and resistant to diseases and pests and are better adapted to unfavourable climatic and soil conditions. Last, but not least, they have a more aromatic taste than their modern 'relatives'.

The different varieties have a wide range of uses (as fresh fruit, making fruit juice or wine, or for cooking). Generations of farmers and land owners have propagated and selected the different varieties and have shared them with others, thus spreading the varieties throughout Europe and overseas. Fruit varieties are therefore not only an important genetic resource, but also a valuable cultural asset.

From 1960 onwards, fruit grown in plantations in other regions of Germany and abroad became widely, and cheaply, available. This made it less worthwhile for landowners to keep their own traditional orchards, which consequently decreased dramatically throughout the country. Until 1974, the EU even paid a bonus for every high stem fruit tree that was replaced by modern, intensively cultivated fruit varieties (Degenbeck 2003). This trend was, however, less marked in the Rhön due to the unfavourable climatic conditions.

The remaining fruit orchards in the Rhön were mainly preserved due to the rights of licensed private households to distil their own schnapps, rights which were passed on from generation to generation. Also, the tradition of homemade fruit juice for private consumption was never fully given up and the commitment of local gardening associations helped to maintain the orchards. From the 1970s onwards the main threats to orchards were structural land reform and the increase in settlements as new housing and industrial areas were developed outside old village boundaries, and began gradually encroaching on the traditional orchard belts. Attempts to halt the loss of agrobiodiversity began in the mid-1980s when state subsidies were granted to landowners in order to keep their traditional orchards (ironically this was also co-financed by the EU). However, subsidies proved to be an insufficient motive for landowners to maintain and replant traditional fruit orchards. A suitable market was also needed.

In 1995, a transboundary apple initiative founded by local people for the conservation of orchards, was set up in cooperation with the biosphere administrations. With the financial help of the EU-funded LEADER programme of the European Community Initiative for Rural Development, and with seed money from a regional, bottled water enterprise, a comprehensive inventory of the genetic potential of fruit varieties was undertaken in the biosphere reserve. Every orchard owner was invited to have their varieties identified by fruit experts. To date, 176 apple, 38 pear and 12 plum varieties have been identified. The potential seems to be even greater as many varieties were unknown to experts and have not been clearly identified yet.

Organic Rhön apple juice – key product for the conservation of apple orchards.

Photo: Vogel

Private enterprises joined the Rhön apple initiative and tried to find the best marketing potential for the different varieties. Today the initiative promotes organic fruit production in orchards and has about 2000 landowner and producer members, including a core of active members representing areas such as gastronomy, fruit pressing enterprises, breweries, garden centres, etc. Together they seek new strategies for processing and marketing fruit.

A wide range of organic apple products has emerged, and is sold in regional and even national markets. The main products are organic Rhön apple juice and a mixed drink of organic beer and apple juice called 'Apfelbier'. Other products include dried apple chips, apple champagne, cider, wine, vinegar, mustard and jam. A yearly apple fair and apple market, an apple interpretation trail, four *in situ* conservation sites for rare apple tree varieties, and the publication of a recipe book for regional apple dishes are further examples of how the conservation of agrobiodiversity can be marketed.

As a result, the price for apples from traditional orchards has increased four-fold since 1990. In fact the marketing strategy has worked so well that there is now a shortage of organic fruit in the region. Planting new organic apple orchards needs to be promoted among land owners. Since an orchard is a very long-term investment (high stem fruit trees need ten years to fully develop), incentives are necessary. This is why the Rhön apple initiative has launched a programme called "1000 Apple Trees" – indicating the amount of young trees that need to be (re-) planted each year. Landowners get a partial refund of the costs for the plants. An even bigger stumbling block is the time consuming pruning of older orchards in order to keep them healthy, productive and long-lasting. Thus an incentive programme for pruning old trees may also be needed.

The main goal, which was to stop the decrease in fruit orchards in the region, has only partially been reached because of the still ongoing removal of orchards through settlement development (Bayerische, Hessische und Thüringer Verwaltungsstelle Biosphärenreservat Rhön 2007). Thus the future challenge is to not only stop this trend, but to increase the number of fruit trees through a different policy towards settlement development (e.g. though local land use planning). The biosphere reserve administrations can, however, only give advice on these issues – the action taken depends on the willingness of the community councils concerned.

To summarise, the apple project is a trans-disciplinary approach to conserving agrobiodiversity. It includes the involvement of people from many different professions and relies on cooperation between the private sector, NGOs and various administrative bodies. The approach corresponds perfectly to the idea of the biosphere reserve (Pokorny and Whitelaw 2000).

Rhön sheep, an important source of agrobiodiversity

The Rhön sheep is a traditional breed (landrace), well adapted to cold and wet climates (Sambraus 1986). It is resistant to diseases, lambs easily and is suitable both for transhumance and for keeping in paddocks – altogether it is a robust breed, suitable for rough grazing on poor grass land or fallow land in low mountain areas.

Rhön sheep – once a neglected breed has become the region's mascot.

Photo: Vogel

It is estimated that the Rhön sheep dates back to the 16th century, though the breed was not recorded until 1844 (BN 2005). Napoleon is said to have discovered the breed when marching with his troops through the region, and exported it in large herds from the Rhön to France as "mouton de la reine" (Queen's sheep). Around the 1850s, Rhön sheep were distributed throughout the former Deutsches Reich.

While in former times wool production (for personal use) was the main reason for farmers keeping small herds of Rhön sheep, it is the meat that is important today. The wool, due to its coarseness, has become a side product, suitable only for outer clothing or as insulating material. Furthermore, the market price of the wool does not cover the costs of shearing. The meat quality of this breed, however, is regarded as excellent, but the market for it has not developed as the animals are small, take too long to mature and provide a smaller amount of high quality meat per animal when compared to other breeds.

This is why the number of Rhön sheep dropped dramatically in the first part of the twentieth century, so that by 1960 only 300 ewes were registered in herd books (BN 2005). In Thuringia the breeding of Rhön sheep stopped with the compulsory transformation of private farms to state-owned agricultural cooperatives in the 1960s; thus in 1975 less than 100 animals were registered. Eventually the Rhön sheep became listed in the national red data book for endangered domestic animal breeds.

In the mid-1980s the genetic value of traditional breeds was rediscovered, resulting in the setting up of a breeding programme in Thuringia. At the same time, on the other side of the former Iron Curtain, an initiative of a nature conservation NGO helped save a small herd of 40 Rhön sheep by buying them and leasing them to a farmer in the Bavarian Rhön for further breeding. Many years later this was repeated with a larger herd of 300 Rhön sheep which were leased to a farmer in the Hessian part of the Rhön.

This measure was a decisive first step in conserving the endangered breed. However, without the development of a market for the meat, it would not have been sustainable in the long-term. Economic sustainability was provided with the designation of the Rhön as a biosphere reserve in 1991, when the direct marketing of agricultural products become an important issue.

Since then, local initiatives have, step by step, successfully promoted the marketing of lamb cuts and lamb sausages via direct marketing. A cooking competition organised by the biosphere reserve association also raised the interest of regional restaurant owners in Rhön sheep products, and Rhön lamb dishes can now be found on the menus of selected restaurants. Producers have contracts with restaurants, while private consumers can buy Rhön sheep meat and sausages from farm shops. The cooperation with the gastronomic association, "From the Rhön – for the Rhön", which promotes the consumption of local produce, is key to this success.

Between 1995 and 2005, the population of Rhön sheep more than tripled. Seed money from the LEADER Programme made this possible, together with long-term agro-environmental programmes for sheep grazing. By 2005 there were 3,324 ewes registered in herd books in the three parts of the Rhön. Although there are still only three main breeders, the total number of breeders has increased to 33. However, even this greatly expanded population of sheep does not satisfy the increasing demand for Rhön sheep products in the region, with the result that the meat price has almost doubled since 1985.

The Rhön sheep has become a very successful regional niche market product through direct and/or regional marketing within the Rhön. However it remains outnumbered by other sheep species (e.g. Merino Landrace) that graze in the Rhön. Although it will never be competitive on the national lamb meat market, it is a successful product thanks to the value added by the local recognition of its tasty and high quality meat.

Today Rhön sheep are once more spread throughout Germany. The Rhön biosphere reserve plays a significant role in conserving this traditional breed, as 48% of the total herd book population in Germany (6,860) is found there. The ultimate indicator of success is that the Rhön sheep is no longer considered endangered (Lindner 2006).

Besides its contribution to the conservation of agrobiodiversity, the Rhön sheep has become the mascot of the region. It has become a symbol for sustainable rural development, linking the best possible management of agriculture, nature conservation, landscape maintenance, tourism, gastronomy and regional marketing. Activities linked to the breed include a Rhön sheep shop (opened in 1996), guided walks, a Rhön sheep festival (since 1994), a Rhön sheep hotel (since 1991) and a Rhön sheep recipe

The farmers Zita and Josef Kolb received the biosphere reserve award 2005 for their commitment to the Rhön sheep project.

Photo: Vogel

book (1999). Those behind the Rhön sheep project were awarded the Bavarian Rhön biosphere reserve award in 2005.

Globalisation, however, still takes its toll. Unfortunately a local enterprise in the Thuringian Rhön which had, among other items, successfully produced soft toys of Rhön sheep, closed in 2001. Since then these sheep toys have been produced in East Asia.

There is potential for an increase in the population of Rhön sheep as the regional market for it still has the capacity to expand. However, this will depend primarily on enabling conditions such as agro-environmental policies. There is also potential for a more tight-knit network linking the Rhön sheep to eco-tourism activities.

Framework for successful marketing

A combination of marketing success and support through public funding is necessary to maitain projects such as those described above. As almost all agricultural activities within the EU are subsidised, agrobiodiversity projects cannot be expected to be economically successful without some kind of financial support. Furthermore, they would never be successful in the long term without specific marketing initiatives.

The most important strategy for the conservation of agrobiodiversity in the Rhön biosphere reserve, is cooperation on various levels. To achieve this, networks are needed between producers (farmers), processing enterprises (e.g. artisan butchers or bakers) and retailers (e.g. farm shops and regional supermarket chains). And, most importantly, consumers need to be adequately informed and convinced of the quality of the regional products and services. In order to make sure that a quality standard is guaranteed, a regional label has been developed. Rhön sheep and Rhön apples take advantage of this scheme to promote their regional authenticity, although the label is not tailored to agrobiodiversity projects in particular, but to regional products in general. The Rhön quality labels can be used within the five Rhön districts, which means that the area serviced by the labels goes beyond the Rhön biosphere reserve.

As a precondition for using the Rhön labels, the products and services must meet defined standards and criteria. The enterprise also needs to become a member of the private biosphere reserve associations, which then qualifies it to be a "partner enterprise of the biosphere reserve". The enterprise then receives a plate and a certificate and is involved in the network of information and cooperation, e.g. participation in promotion weeks and fairs. The labelling process will include a control mechanism, the procedure and details of which are still in the discussion stage.

Applications for the Rhön quality label have increased consistently since it was launched. 85 enterprises were using the label by mid-2005, and by the end of 2006 the number had increased to 120 enterprises, more than half being local restaurants. More than 13% of the restaurants in the Rhön biosphere reserve that serve German cuisine, now offer "regional Rhön cuisine" according to the Rhön label standards.

The quality label for organic agricultural products, however, is not as yet widely used. Primarily this is because

Product labels in the Rhön

Rhön labels for products and services		**General regional Rhön label**
		
Since 2005: regional quality label for enterprises for conventional products and services; on the basis of regionally defined quality criteria.	Since 2005: regional quality label for certified organic agricultural products (e.g. Rhön sheep or Rhön apple products); on the basis of criteria for EU-certified ecological products.	Since 2003: general regional Rhön label to make the Rhön better known and to support the region and its economy; not to be used for products or services.
Can be used on request by the private sector. A precondition is the acknowledgement of the enterprise as a "partner enterprise of the Rhön biosphere reserve".		Can be used on request by both the private and public sector, as well as agencies, associations etc.

there are still not many organic enterprises in the Rhön and secondly, because many people do not see any extra value in a regional label as they are already certified for organic production. Many enterprises are also mainly selling their produce on the national rather than the regional market.

One very important partner in promoting agro-biodiversity products is the NGO, Slow Food (www.slowfood.de). Founded in 1985, this worldwide association, which has its origin in Italy, has 80,000 members and promotes the protection of traditional food, recipes and agrobiodiversity in general. It is a counter movement to the idea of 'fast food'. Members see themselves as conscious consumers and gourmets who wish to foster the culture of eating and drinking, and thus promote responsible farming and fisheries, animal friendly production and breeding, artisan food processing, and the safeguarding of regional diversity. Slow Food supports networks of producers, retailers and consumers to develop better transparency in the food sector and an increased awareness of food quality. The Ark of Taste is an international project run by Slow Food, aimed at saving local and regional food, domestic breeds and crop varieties from extinction. The Ark of Taste recognises products which meet strict criteria such as excellent taste, sustainable production, threat by extinction etc., and is a registered trademark of Slow Food International. The Rhön sheep as a breed has been acknowledged as 'a passenger' of the ark - alongside a local pork sausage type called 'Ostheimer Leberkäs'.

Strong private sector involvement is needed in order to promote agrobiodiversity products. Numerous cooperation projects have evolved with the Tegut Foundation (www.tegut.com) which is the most important supermarket chain in the region, carrying quality and organic food. As its headquarters are in the Rhön, Tegut is especially committed to regional products, although this is still a niche market. Tegut is an important trading partner for the marketing of organic Rhön apple juice, and is interested in marketing the Rhön quality label (especially organically produced beef, pork, lamb and goat). Though the quantities produced are still too small to be stocked by the supermarket chain, there is much potential for future development.

The regional marketing idea also needs to be integrated with other tasks of the biosphere reserve, such as interpretation. In Germany people generally only spend 13% of their income on food, compared to France or Italy where people spend an average of about 23% (Hirschfelder 2006). This shows that quality food does not have a high standing in Germany as compared to luxury goods such as fast cars or fancy kitchens/kitchen utensils. When it comes to food, a cheap price is the main criterion for the choice of products. In the Rhön, consumers' knowledge and attitudes are developed through biosphere reserve interpretation programmes, especially for children. They learn about natural food and food processing, e.g. how to make fruit juice or bake bread, and what a healthy, regional, environmentally and socially responsible breakfast would consist of. Apart from the issue of agrobiodiversity, the ongoing trend towards increasingly processed food (novel food) and the concentration of the food industry on a few global players also needs to be pointed out, including the expected side-effects such as increased areas given over to monoculture, loss of the countryside, and consequently the loss of biodiversity in general.

Conclusions relating to agrobiodiversity

The following conclusions can be drawn from agrobiodiversity projects in the Rhön biosphere reserve:

- The success indicator for conserving agrobiodiversity is mainly economic. Without a market, agrobiodiversity cannot be conserved in the long run, although the provision of public grants is also important. Furthermore, agrobiodiversity conservation depends mainly on the consumers' attitude and their willingness to pay 'a little extra' for the positive side-effects of the products linked to agrobiodiversity.
- A common vision for the management of the region is important; both through the process of development and as a basis for activities. Multilateral partnerships between and within administrations, the private sector and NGOs need to be fostered.
- Local actors with courage, vision and enthusiasm are needed, especially those who are prepared to cooperate in wide networks.
- Adequate logistical support is needed to set up a regional label for quality products and services in the agrobiodiversity sector. Business partners on various levels (e.g. producers, food processors, retailers, restaurants) need to be linked.
- Consumers' attitudes need to be addressed in interpretation programmes, with special attention given to agrobiodiversity and food quality.
- Agro-environmental grants focussing on agrobiodiversity are necessary. This needs to be integrated into a consistent philosophy. Needless to say, traditional Rhön products would not be compatible with the use of genetically modified organisms (GMO), and the Rhön region has therefore been recognised as one of 68 GMO-free regions in Germany in 2005 (MLUV 2005).

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Links

www.biosphaerenreservat-rhoen.de
General information on the UNESCO biosphere reserves: www.unesco.org/mab

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Evolving culture, evolving landscapes: The Philippine rice terraces[1]

Cristi Nozawa, Melissa Malingan, Anabelle Plantilla and Je-el Ong

Summary

Rice is the second most widely consumed grain in the world and the main staple in Asia today. The Philippine rice terraces, as established thousands of years ago by the people of the Cordilleras, have enabled the conservation of the more than five-hundred varieties of rice suitable for high altitude wet paddy farming and associated invertebrate and plant species. They have done so with very little soil erosion and optimal use of water resources. The local people and their rice culture and traditions are the living "genebanks" for highland rice varieties and "traditional research centers" for high altitude sustainable farming technologies. The people of the Cordilleras and, in particular, local communities in Kalinga, Mountain Province and Ifugao lived their lives for thousands of years allowing the continued existence of a diversity of highland rice varieties and wild flora and fauna found only in this region to exist from the ice age through to current times. Some of these rice terraces have been inscribed as a World Heritage Site in recognition of their outstanding beauty and value as an organically evolving cultural landscape.

The Philippine rice terraces and its people represent the Category V definition of Protected Landscape as follows: "an area of land where interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value. And often with high biological diversity." However, there are great challenges to maintaining this interaction between nature and people in the Philippine rice terraces and of particular importance is the abandonment of many terraces for various reasons. Challenges include farming management problems such as controlling invasive alien species, repairing the damage to terraces by earthworms, disrupted waterflows, insufficient labour and role reversals, and making the farm economically viable. Other challenges include deforestation and introduction of exotic tree species; the decline of traditional practices such as the roles and rituals of the *mumbaki* in local community life; challenges from

tourism and maintaining the relevance of the local communities heritage at the local and international levels. The key recommendation from this case study is to implement a comprehensive multi-stakeholder programme with local peoples' active participation to arrest the trend of abandonment of the terraces in the Cordillera region and the decline in use of traditional rice production practices. Some of the solutions include instilling pride and identity among the younger generation; conserving traditional rice varieties and sustainable farming practices; recognition of tenurial rights and strengthening governance; support for sustainable and culture sensitive livelihoods; and using environmental and heritage impact assessment processes for development projects and, lastly, an inventory of community-conserved areas among the Philippine rice terraces and their respective communities.

Description

Rice is the second most widely consumed grain in the world, and is the main staple in Asia today. At least 114 countries grow rice. In 2004 world rice production was around 600 million tons. The Philippines is among the top ten rice-producing countries in the world (IRRI website). Almost 100 million people belonging to the poorest section of society are believed to depend on upland rice.

Rice terraces are elevated paddies carved along the sides of mountains. The Philippine rice terraces are the most extensive in the world and occur at the highest elevation recorded, between 500 – 1,350m above sea level. They are maintained in a flooded condition, since water prevents the paddy from cracking and so checks landslides (Roxas 1996, Concepcion et al 2003).

The Philippine rice terraces are found in the North Central part of Luzon in the Cordillera Autonomous region of the Philippines. But the terraces are only found in the provinces of Benguet, Kalinga, Apayao, Mountain Province and Ifugao. Of these terraces, the ones in the Ifugao are more popularly known and were recognised as a World Heritage Cultural Landscape in 1994 for their outstanding universal value. The four clusters designated as World Heritage sites are in Banaue (Batad and Bangaan); Mayoyao (Mayaoyao Central); Kiangan (Nagacadan); and Hungduan. These four clusters of rice terraces were given World Heritage status because they are "outstanding examples of living cultural landscapes devoted to one of the world's most important staple crops – rice, as noted in the nomination dossier submitted to the UNESCO World Heritage Committee". The terraces represent living traditions and picturesque landscapes that have persisted over 2000 years in harsh mountainous conditions. Carbon dating of a post on the terraces of Ifugao shows that the establishment of the terraces dates from the 7th to 16th century AD.

This study will present the rice terrace landscape as several units of a protected landscape that spreads over a wider area than the four clusters in the World Heritage list.[2] It ably represents an IUCN Category V protected area where the way of life of the people of the Cordillera and their worldview of the natural environment has produced the magnificent landscapes of the rice terraces. By so doing they have evolved a diversity of upland rice varieties and conserved the surrounding forests and other associated flora and fauna.

Demography and Physical Features

The region is characterized by very rugged mountainous terrain, with very steep slopes (more than half of the land surface has a slope above 50%) and fast flowing rivers. The climate has no pronounced wet or dry seasons (Alcala 1976) unlike most parts of the country, but the area is subject to typhoons like the rest of Luzon Island. Furthermore, the region is geologically unstable and prone to earthquakes and landslips.

The Cordillera contains 13 major river basins, making the region a major watershed for the island of Luzon. The main drainages of the Cordillera are the Agno, the Chico, and the Magat rivers. The latter two are the main tributaries of the Cagayan River which provides the water for the fertile soils of the Cagayan Valley, east of the Cordillera.

The area under rice production in the region totals 201,153 ha, or 11% of the region's land area. The terraced areas are 22.7% of all agricultural lands, an area of 45,773 ha (National Statistics Coordination Board, NSCB, 1999). The most extensive areas of rice terraces are those in the Ifugao province (14,175 ha in 1999, and 17,000 ha in 2003) and in the Mountain Province (12,957 ha in 1999).

The region's population stands at 1,365,412 and is considered the least populous region in the Philippines, based on 2000 data. Since 1980 it has also been the least densely settled region, with an average of 75 people per square kilometre.

Anthropologists believe the indigenous people of the Philippine Cordillera share cultural practices such as terrace field rice cultivation, the custom of headhunting and worshipping of skulls, animal sacrifice in rituals, feasts of merit, and building of stone circles or megalithic monuments (i.e. in burial grounds found in Mayaoyao, Ifugao). This includes the indigenous peoples of Tinguian, Isneg, Kalinga, Bontok, Kankana-ey, Ibaloi, Ibanag and Ifugao. There is debate among anthropologists as to the 'ethnicity' of groups in the Cordillera. As Goda puts it, "one can be a Kalinga, a Bontok and an Ifugao at the same time by tracing one's kin or family lines". The current ethnic categorizations are based on historical and political reasons.

Different local communities are defined by their shared inheritance of terraces and forest areas. Traditionally, people decided local community boundaries based on natural features such as valleys, rivers and mountains, as well as through agreements with neighbouring communities (Goda 2001).

Biogeography

Geological influences, which help to determine the biological provinces of the Philippines, indicate that "the life story of the Philippine (islands) begins in the tertiary period", when uplifting of the lands shaped the mountains of the Cordillera (Dickerson 1928, Heaney 1998)

Forests in the Cordillera include mid-mountain and mossy forests. The forest flora is essentially characterized by the dominance of a species of pine, *Pinus insularis*. Dickerson noted that approximately 350 species of plants characteristic of temperate areas were endemic to the Philippines and known only from the Benguet-Bontoc region and nowhere else in the world. In general, the flora of the Cordillera is mainly of Formosan influence.

There are a number of endemic animals found in the Cordillera including the Philippine brown deer *(Cervus marianus*), the Luzon bushy tailed cloud rat (*Phloemys pallidus*) (Philippine Red Data Book 1997), two threatened butterfly species that are considered relicts of the ice ages *(Papilio benguetanus* and *Papilio chikae* or *schoenigiand)*, and at least three globally threatened Philippine endemic birds, namely the Luzon water redstart (*Rhyacornis bicolour*), the flame breasted fruit dove (*Ptilinopus marchei*), and the ground dwelling whiskered pitta (*Pitta kochi*) (Haribon Foundation 2001). The Cordillera region has been known to be a major route for some migratory birds, particularly forest migrants using the East Asian Flyway.

The Philippine rice terraces and their important agrobiodiversity features

The Philippine rice terraces are significant in terms of conservation of rice varieties and associated plants and animals. The terraces are also significant as a living example of sustainable forest, land and water use practices at high altitudes and on steep slopes. This section outlines the important agrobiodiversity features of the Philippine rice terraces.

The terraces as important repositories of highland rice varieties

There are at least 565 known rice varieties grown in the Philippine Cordillera (International Rice Research Institute, IRRI, 2006). Sources in IRRI indicate that all but five of the rice varieties that have been collected by researchers are traditional forms. Many more farmers may have kept their own rice varieties from researchers. Therefore the total number of rice varieties could be larger than the current collection in IRRI. Thus the rice terraces act as an *in situ* gene bank for traditional rice varieties suitable for conditions similar to the highlands of the Philippine Cordillera. The terraces are community-managed experimental rice paddies for generating different varieties of rice suitable for such conditions, and are based on the diverse cultural preferences of the farmers themselves. The terraces are traditional research centres for highland rice and high altitude sustainable farming technologies.

Each village has its own preference in terms of rice varieties. For example, in barangay Maligcong, Bontoc, Mountain Province, the native varieties of *Tadlayan* and *Farsang* are preferred because of their taste and because the other varieties are harder to thresh. In Hingyon, Ifugao, many farmers prefer the *Imbú-ukan Tinawon* rice variety, despite its once-a-year cropping, because of its aroma and fluffy texture when cooked. Meanwhile, the rice farmers of Hungduan, Ifugao, prefer the *Pinidua* varieties which give higher yields.

The generations of rice farmers in the Cordillera, particularly the women, are the primary holders of traditional knowledge on seed selection and conservation of traditional rice varieties. These traditional varieties have gone through generations of selection processes based on their suitability to the local micro-climates of each village, the elevation and the soil types of the terraces, the amount and seasonality of the water source, as well as particular family and community preferences for taste, texture, smell, and colour of the rice. Preferences are also based on other grain and plant qualities such as non-shattering panicles, resistance to birds and rats, etc. The diverse preferences of farmers have allowed the diverse rice varieties to evolve over time.

Farmers classify varieties through plant morphology and waxiness of the grain. Local people also classify rice according to gluten content. Local rice is classified as *ipugo* (non-glutinous) or *daya'ot/dayakkot* (glutinous). Non-glutinous rice is grown mainly for direct consumption, while glutinous rice is produced for wine *(tapuy)* and rice cakes for religious rituals (Roxas 1996).

Traditional rice varieties have a 'low shattering' characteristic so that they can be transported from the high terraces with limited loss of rice grains or seeds. Plant morphology separates local varieties into two classes, namely *tinawon* and *pinidua/pidua* (*linawang* in Banaue). *Tinawon* is known as the 'yearly' or 'dry season' crop, or winter rice. *Tinawon* type varieties are highly cold tolerant

and are suited to high elevations. The *tinawon*, which, according to the local people, belongs to the *bulu* type, is a version of japonica rice[3]. *Tinawon* is the dominant rice type in the Ifugao area, accounting for roughly 80% of the varieties and 95% of the quantity of rice grown. Seeding to maturity takes seven to nine months and the plants achieve a height of 120 to 160 cm.

In the lower elevations (less than 700 m above sea level) where two crops per year are possible, the 'rainy season' crop is *pinidua*. *Pinidua* is of the indica group [4]. *Pinidua* accounts for 20% of the varieties grown in the region. They have more tillers, weaker stems and shorter panicles, and the grains have a 'high shattering' characteristic. Double cropping is possible due to a shorter growing season (160 days). *Pinidua* or *Pidua* is called the 'second crop', 'wet season crop', or summer rice. *Pinidua* in the local dialect also refers to two-season cultivation where planting can happen in both dry and wet seasons. *Pinidua* types are moderately cold susceptible and are therefore suited to medium and low elevations (Roxas 1996; interview with R. Bahatan 2006).

Similarly, Bontoc Mountain Province also has two general types of rice. These are the *Chinakhon* for the dry season or the first crop, and the *Pak-ang* for the wet season or the second crop of rice. The latter is planted in the fields along the Chico River and Agkhoyo River only, and not on the upland fields.

Traditional rice varieties are still the preferred varieties in many farms in the Cordillera, as per information from the municipal and provincial agriculture officers in the Mountain Province. Traditional farming practices have also persisted, but are under pressure.

Other plant and animal food sources in the existing land use mosaic

Traditional rice is an important food crop but it is not often the main meal constituent in the Cordillera. It is supplemented by locally grown sweet potatoes or by rice bought from the lowlands. Rice is grown on the terraces in association with other crops like taro (*Colocasia esculenta*). Edible snails, bivalves (*Lamellibranchiata*) and mudfish (*Channa striata*) or dojo or yuyu fish are also collected from the fields. Weeds which grow on stonewalls are cut and used as green manure crops. Azolla ferns are collected from pondfields to construct mounds for onions (*Allium cepa*) and pechay (*Brassica campestris*) planting (Roxas 1996). Table 2 shows examples of the plants and animals found on the terraces in 2007.

Areas for sustainable forest and land management practices

The rice terraces, forests and swidden farm complexes, and the associated traditional practices, represent sustainable land management. The people of the Cordillera distinguish hundreds of terrain variations relating to forms and combinations of rock, soil, water and vegetation. In the Ifugao province, eight intermediate level categories of land use cover all major vegetation types and agriculturally significant landform types (Conklin 1980). The existing land uses in Ifugao normally include: public or communal forests *(inalah/alah or hinu-ob)*; privately owned forests or woodlots (*muyong* or *pinugo*); swidden farms *(uma/habal);* cogon land or communal grasslands *(magulun)*; cane grasses *(mabilau)*; rice terraces or paddy fields *(payo)*; settlement area (*boble*); and the outflow in river or brooks *(wangwang*).

In Bontoc, Mountain Province, the land use classification can be broadly divided into two: land used in daily life, and land unsuited for agriculture. The categories for land used for day-to-day living include the forest lands

(*filig*), the slash-and-burn fields or *kaingin* (*oma*), the area for settlements (*sa-ad*), and the irrigated fields (*payew*). The land unsuited for agriculture can be subdivided further into at least seven categories.

Traditional rice production process

To understand the agrobiodiversity in the Philippine rice terraces, it is important to understand the whole traditional rice production process.

The main factors affecting the rice production cycle are the natural environment and environmental changes in the Cordillera. The climate limits the production. Sunlight received depends on which direction the terrace is facing. Rice varieties that are adapted to the topography grow slowly. The higher the elevation, the longer the growth period of the rice.

The exact end of an Ifugao year is determined not by the Gregorian calendar but by the conclusion of harvest rites. The location of the fields determine the rice production schedule.

The actual rice production activities are also affected by the availability of labour, particularly in barangay Maligcong in Bontoc, and in Amganad in Banaue. Sometimes the terrace walls are larger than the arable land areas, and maintenance of the terraces is required almost year round, requiring a great deal of labour. The elements of the rice production cycle are explained in Table 3, which includes a summarised description of the production phases, activities included in the phases, genders of the people involved, and associated rituals.

Changes in traditional practices

The use of traditional rice varieties is continuously under siege. Government programmes that persistently introduce modern technologies, chemical fertilizers and pesticides may be adversely affecting agrobiodiversity on the terraces. The practice of integrating mudfish with rice-based farming systems seems to have greatly diminished. A lower percentage of the farmers now perform manual removal of pests. Organic fertilizer is widely used but not all the farmers practice the *pingkol* or *inagoh/inado* systems (organic mounds).

Many irrigation canals have been concrete-lined to reduce water loss in transit. However, nothing is known of the effect of the weight of concrete on the terrace structures, especially on earthen walled terraces. Nor are there studies showing how the higher speed of water flow affects equity in water distribution across the paddies. Rubber hoses have to be used to move the water from farms on higher elevations to farms on lower elevations, thus allowing the farmers to skip abandoned paddies.

The increasing human population in some areas, and the resulting increase in demand for firewood and timber products for housing and woodcarving, is contributing to deforestation, and therefore also affecting water supply and flow. The introduction of exotic tree species for reforestation is also having an impact on the watershed functions of the *muyong*.

In some areas, especially those near urban centres, many rice terraces have been converted to settlement areas, some even into resorts and commercial establishments. There are no local land use plans that ensure the preservation of the rice terraces. The farmers are increasingly dependent on the government for the maintenance and repair of their irrigation systems, whereas earlier they used to do the maintenance and repair work themselves. The management of the terraces has been removed from local communities and government agencies through the years by authority vested in them by different laws. Please refer to the section on legislation and management for further details.

Changing associated intangible heritage

There is a ritual for almost every stage in the rice production cycle, as well as for major social events such as weddings and burials. Rituals are performed by the village priest (*mumbaki*) or by the landowners themselves. Rituals may last from a few hours to several days. Animals, usually chickens, pigs or carabaos (*Bubalus bubalis*, a domesticated species of water buffalo), are sacrificed as part of the ritual. Conklin documented 37 types of rituals of the Ifugaos (Conklin 1980). 17 of these are agricultural rites linked with rice production and consumption, while 16 are concerned with health, property and changes in family and individual status. The number of rituals linked to rice production has now been reduced drastically. Ana Habbiling and Manuel Dumulag, farmers from Banaue and Hungduan respectively, now perform less than seven rituals (Tables 4a, 4b). Some rituals are now practiced with a mix of traditional and Christian practices.

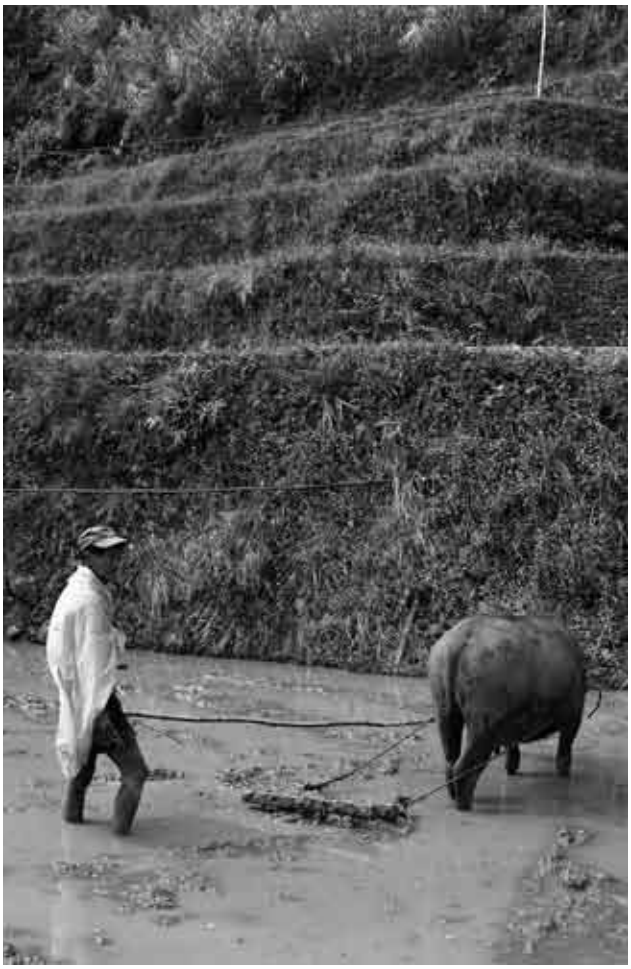
Law and governance

Traditional laws governing land and water use

The property laws pertinent to this case study are those relating to rice lands and forest lands. These property laws pre-date the current national laws relating to forest lands and private land ownership. The rice terraces are mainly community-conserved areas, but in some terraces a form of co-management is emerging with the decentralisation of local government.

Communal properties consist of rice lands, forest lands and heirlooms. In the Mountain Province there are three different types of communal property rights: land owned by kin groups, land used for men's houses and land owned communally by the entire community. The lands and articles of value that have been handed down from generation to generation are not seen as the property of any individual. Present holders are only transient, and have fleeting possession or occupation; this is insignificant in duration in comparison with the decades, and perhaps centuries, that have usually elapsed since the field or heirloom came into the possession of the family. So in place of ownership of property, it is more appropriate to think of the land as being held in trust for future generations. It is a great misfortune when family property, long in the possession of a family, has to be sold. It is never disposed of for light or trivial reasons, nor is it disposed of without exhausting every effort to keep it within the family (Barton 1969, Goda 2001).

Forest lands, valuable principally because of the woods that grow on them, are often the common property of a group of kinsmen and their families. Such ownership of the *muyong* or *pinugo*, and of the terraces, has been challenged by various national laws under which all public lands and natural resources, including forest lands (defined as any land above 18º slope), belong to the State (Presidential Decree No. 705 or the Forestry code of the Philippines). Land can only be owned through a Torrens land title[5].



Legal status or designation of the rice terraces

There are a variety land designations covering different parts of the Philippine Cordillera and, in many cases, the rice terraces. Most parts of the Cordillera are designated by the government as forest land owned by the State, because most of it is above the 18º slope. Other parts of the Cordillera are covered under the designation of watersheds or parks. Examples of designations include the Magat watershed and the Balbalasang, Balbalan National Park.

The Philippine rice terraces, including those on the World Heritage List, were not included in the initial list of sites under the National Integrated Protected Areas Systems (NIPAS) Act of 1992 (Lim, pers. comm. 2007, Phillips 2005). Although it would be possible to place the terraces under this law it is not necessary to do so. Moreover, the Indigenous Peoples Rights Act (IPRA) of 1996 makes it possible for government agencies to recognise the ancestral domain covering land and water areas, based on customs and traditions of a local community.

Using IUCN-The World Conservation Union's definition of Category V protected areas, it is clear that the rice terraces of the Cordillera, whether or not they are part of the World Heritage designation, are excellent examples of lived-in, working, and organically evolved landscapes. The site falls within Category V because it is an area where the local people of the Cordillera have produced a dramatic landscape with fantastic panoramas and unique traditional cultural practices that have not only attracted artists and tourists alike, but have maintained important biologically diverse systems through centuries of traditional management. Aside from the landscape's aesthetic appeal, it has, through several generations, been managed as an integral part of the cultures of the people of the Cordillera. Through traditional knowledge systems, the communities have maintained an ecologically and biologically viable integration of natural and human created systems. The landscape of the Philippine rice terraces is defined by established integral patterns of mixed farming that include management of communal and private forests, swidden cultivation of sweet potatoes, paddy-field cultivation of rice, the multiple intercropping of many secondary domesticates, and the raising of pigs, chickens and other forms of livestock. In the process, the landscape has evolved and maintained a genetic pool of highland rice of more than 500 varieties, thereby assuring the world of genetic resources in a gene bank managed by local people. This

gene bank has the potential to contribute to sustaining rice farming for upland farmers even as climatic changes affect global agricultural patterns. The terraces fully illustrate all of the eight essential and five desired characteristics identified in the guidelines for selection of Category V protected areas (Phillips 2005) (see Table 4).

Management status of the rice terraces that are part of the World Heritage Site

As early as 1973 the rice terraces were officially recognised as being among the irreplaceable treasures of the country, through a Presidential decree. Subsequent national decrees created penalties for modifying or destroying the terraces. Most of these decrees focused on the physical aspect of the landscape.

On 18th February 1994, Executive Order No. 158 was issued creating the Presidential Commission called the Ifugao Terraces Commission (ITC) for the restoration and preservation of the Ifugao Rice Terraces. The Secretary of Tourism was the chair of the Commission, and the Secretary of Agriculture was the Vice Chair.

With a new president coming into power in 1999, the ITC became the Banaue Rice Terraces Task Force (BRTTF) through Executive Order Number 77 in 1999. A change in the presidency brought about the demise of the BRTTF with Executive Order No. 72 in 2002, and the BRTTF was replaced with the Ifugao Rice Terraces and Cultural Heritage Office (IRTCHO) under the Office of the Provincial Government of Ifugao. The IRTCHO's initial reason for being was to manage a grant approved by the National Commission on Culture and Arts. Finally, in 2006, the provincial government created the more permanent Ifugao Cultural Heritage Office (ICHO).

The practical benefits of local institutions managing a local area that was traditionally managed by local people, are obvious. On the other hand, the three-year terms of local government officials pose a challenge to the continuity of programmes, particularly in the World Heritage Site. Today local people in the World Heritage Site expect local government units, particularly the barangay and the municipal government units, to help repair common structures such as irrigation canals, terrace walls and footpaths (Ifugao Rice Terraces Masterplan 2004).

The rice terraces of the Philippine Cordillera were inscribed on the World Heritage List in 1995 under criteria (iii), (iv) and (v). The terraces were the first to be inscribed as a cultural landscape of the organically evolving type. In December 2001, the World Heritage Committee decided to include the rice terraces of the Philippine Cordillera on the List of World Heritage in Danger. The joint International Council for Monuments and Sites (ICOMOS)/IUCN mission in 2001 was alarmed at the continuing trend of abandonment of the terraces. Their recommendations included strengthening institutional arrangements, funding, short-term work programmes, tourism development, programme planning, and international outreach. To date, the sites remain on the list of World Heritage Sites in Danger. This listing has generated mixed reactions from the relevant national and local government officials, ranging from hope that the government will increase its current level of support for this World Heritage Site, to anger from local communities. Some local community leaders think that being on the World Heritage list of sites in danger favours conservationists interest to "preserve the people and their living traditions" and does not allow for much needed development. The perception that the intention is purely preservationist has angered some local leaders.

Management of the rice terraces outside the World Heritage clusters

In areas outside the World Heritage clusters, the management of the terraces and the related swidden and forest areas remains primarily with the private owners and the community. In the village of Maligcong in Mountain Province, for example, the community elders continue to decide on the important agricultural events in the community such as the beginning of planting and harvest season. In Balbalasang, the elders in the community continue to decide on matters that relate to the welfare of the village, including negotiating boundary conflicts and dealing with commercial mining interests.

For each village, the day-to-day decisions about the terraces, forests and swidden areas remain primarily in the hands of local people. With the advent of the Local Government Code in 1991, the barangay and municipal governments now take some major decisions. Decisions relating primarily to infrastructure support and other livelihood activities are expected from local government officials. The establishment of the ITC or BRTTF ran counter to the country's push to decentralise most decision-making processes to the lowest level of governance possible.

Key challenges and threats

No people, no terraces. No rice, no terraces.

The main challenge in the Cordillera is ensuring the continuity of traditional rice farming practices on the terraces while meeting the development needs and aspirations of the local people. A single crop a year is not enough to meet their basic human needs. The rice terraces are not

spared from the menace of alien invasive species such as the golden kuhol (*Pomacea caniculata*); earthworms have also caused some terrace walls to collapse.

Research has shown decreasing interest among young people in rice production as contributing to the labour-related challenges (Villalon 2005). Between 1980 and 1998, the amount of time spent on agriculture has fallen by as much as 70%. More people, particularly men are migrating to find employment outside of the communities. One consequence is that "women (are) devoting more time on the farm than the men and assuming the primary role of securing supplemental food for the family and animals" (CECAP 2003). Women are having to take on what used to be the work of men in the farms such as preparing the fields for planting. This may take women away from their traditional role of being primary knowledge holders for rice seed selection on the terraces.

Deforestation and introduction of exotic tree species

With increasing population and consequent increase in demand for firewood and timber products, the density of trees in the communal forests has declined. The government has encouraged the planting of exotic tree species to replace the indigenous trees that have been cut down. In areas where significant numbers of exotic tree species were planted, lower water tables have been observed, as well as decreases in the volume of water supply.

The declining place of traditional rituals

Mumbakis were very important in the rituals in the Cordillera, but few exist today and fewer people are being trained to become *mumbakis*. Becoming a mumbaki is very demanding. The "high cost associated with the conduct of the ritual, and rapid cultural change taking place…brought about mainly by urbanisation and modernization of cultural beliefs" may have contributed to the change (Concepcion et al 2003). The *mumbaki* may disappear in the next generation of people in the Cordillera. With them will vanish the rituals that allow the people to remember the names of their ancestors and the herbs associated with healing and pest control in the rice paddies.

Challenges in the maintenance of culture and heritage

Is it important to save the terraces? At the global level, the designation of some of the terraces as a World Heritage Site indicates international recognition of the outstanding universal value of this cultural landscape. But the terraces have great local significance too. For local people, they symbolize their ancestors' efforts and their connection to the land and the environment. Their identity as a people is linked to the maintenance of the terraces. The terraces hold the families together; families do not sell their land as this usually runs the risk of being discredited by the community. While working in the fields has been equated in the past to a life of poverty, this perception is now beginning to be corrected by efforts to incorporate cultural practices into the formal school systems in Ifugao province, and by "the school of living traditions," a term used for the process of transferring knowledge on culture and tradition to the next generations. The province of Ifugao has initiated the school of living traditions where traditional practices are learned by young people from the Cordilleras at two levels: in schools and in the community, with approaches varying according to the most effective way of imparting these practices and traditions.

Challenges from tourism

Although tourism has contributed to the local economy, it has also degraded many of the attractive rural settlements where the terraces are found. Most local people stress that tourism should not be the reason for preserving the terraces. The ineffective management of the tourist influx has resulted in a range of adverse environmental and land-use impacts. For example, hotels and inns, particularly in Banaue, have mushroomed; there are no standards to regulate design and location, and so modern structures stand out and do not blend with the terraced landscape; traditional homes are disappearing and some new homes are built on former terraces; and more people creates more garbage. Furthermore, the benefits from tourism have not trickled down to the terrace farmers themselves.

Tenurial claims on the terraces and in the forests

The slow process of issuing Certificates of Ancestral Domain Title (CADT) and Certificates of Ancestral Land Title (CALT) is not unique to the Cordillera. While there is a national law recognising traditional rights, customs, traditions and properties of indigenous peoples, the implementation of this law is impeded by many factors. First, the cost of delineation of ancestral domains and the inadequate operations budget of the National Commission on Indigenous Peoples (NCIP) combine to slow down the rate of implementation. Second, there is the continuing challenge posed by the conflict between the implementation of the IPRA and other laws, such as the Local Government Code and the Mining Act. Mining, as per the national government's economic agenda, currently takes priority over the indigenous peoples' concerns.

World Heritage Site management

Some local people claim that it is an additional challenge for them to manage a World Heritage Site; there is a common

perception that many proposed development actions were not implemented because they were considered inappropriate for a World Heritage Site. The question for experts and World Heritage managers, particularly those working in cultural landscapes such as this, is how to reconcile the need of local people for the continuing evolution of their living traditions, their demand to share in economic development, and the national and international requirement to conserve the outstanding universal values of the area, including its intangible heritage values. This challenge requires an environmentally and culturally sensitive path towards development in the rice terrace landscape area.

Some responses from government, civil society and the community

Repairing the terraces and irrigation canals

Local government units have provided financial and material resources to some local communities in the Ifugao province for the repair of eroded terrace walls and damaged irrigation canals. But when the government offers resources in this way, it can generate further expectations from the local community for the government to provide resources for activities that were formerly undertaken by the community as joint community work through 'bayanihan'. In other provinces, the repair of terraces and irrigation remains a community responsibility.

Support for marketing of traditional rice varieties

The local government office has also supported rice marketing, primarily that of the *tinawon* varieties. Organically grown, manually pounded and following strict guidelines, the rice has found its way into international markets. Some farmers have started to market their rice as 'Heritage Rice'. However the supply of rice is not steady, and current prices are considered by producers to be too low.

Documenting and learning some of the rituals in modern times

Work to document specific Ifugao traditional practices, including pest management practices, is on-going. The ICHO has also encouraged local people to document their history, culture and traditions. Starting in the 1990s, the various rituals were re-enacted during town feasts. A school of living traditions has also been initiated in Ifugao by the local government unit with support from the National Commission for Culture and the Arts. Initially its aim was to educate young people on their traditional

songs and dances, but today it also teaches other important traditions such as the *hudhud* (one of 19 masterpieces of Oral Intangible Heritage of Humanity as recognised by the United Nations Education, Scientific and Cultural Organization (UNESCO). The National Commission on Culture and Arts of the Philippines and the Local Government Units support most of these initiatives.

Support from civil society

Two local NGOs, the Save the Ifugao Terraces Movement (SITMO) and Revitalized Indigenous Cordilleran Entrepreneurs, Inc. (RICE), work in the area. SITMO is primarily working with selected communities on participatory community mapping, alternative livelihood activities, and documenting traditional rice farming practices and associated varieties of rice. RICE is focusing on facilitating the export of traditional rice varieties with the support of the local agriculture offices. This is to help increase revenue from selling traditional rice varieties. Church groups are also involved in various local projects in their own areas. Possibly the strongest civil society influence in the region today comes from the Christian churches.

Possible ways forward

The issues and challenges faced in this living cultural heritage are complex. Working to understand and conserve the traditional knowledge system and the existing natural systems (forests and geology) should underpin all interventions in the Philippine rice terraces.

The key recommendation of this paper is to implement a comprehensive multi-stakeholder programme with local peoples' active participation, to arrest the trend of abandonment of the terraces in the Cordillera region and the decline in use of traditional rice production practices. This key recommendation can include, but is not limited to, the following specific actions:

Instilling pride in culture and identity among the youth

Actions that instil pride in the younger generation in their culture and identity, as well as activities that generate a positive experience of terrace farming traditions and rituals, may be critical to the survival of the terraces. The government, the formal education system, and even the church groups can play constructive roles in this. Some local government officials have shown an interest in the idea of expanding the scope of the school of living traditions beyond the re-learning of the *hudhud*, to include re-learning the practices of rice terrace farming. This could also include some support for terrace farming in schools and in the private sector (e.g. the tourist sector) on special days when people could rediscover their 'terrace farming roots'. Public acknowledgment of the unique national and global contribution of the terrace-farming people may also be helpful. Broad-minded church groups should be encouraged to recognise the relevance of continuing the rituals and practices (including the survival of the *mumbaki*) associated with rice farming, in an increasingly Christianised community in the Cordillera.

Conserving traditional rice varieties and farming practices

Support is needed for research into traditional rice varieties, knowledge systems and land management practices. But more important is that the results of such research should be given back to the community for better-informed decision-making. As this traditional knowledge is documented, and its values determined, it needs to be brought together with the best available information from western knowledge systems. The current challenges from the golden kuhol and earthworms may be addressed by farmers using local knowledge as well as field observations and experimentation techniques. Research should be undertaken to increase productivity of the rice fields without damaging biodiversity and culture.

Recognition of tenurial rights and strengthening governance

There is a need to accelerate the processing of ancestral domain claims and the development of the corresponding ancestral domain sustainable development and protection plan prepared under the IPRA. It will be important, though, to ensure that other management plans, such as the comprehensive land use plan (CLUP) of the local government units and the master plan of the World Heritage Sites (in the case of the villages in the World Heritage clusters), will complement ancestral domain plans. This will help ensure that efforts to strengthen community processes, including governance mechanisms, will have a 'legal basis' and be nationally recognised. A more relevant governance system is needed. Each village should be able to evolve its own governance mechanisms depending on its unique situation. In some cases it may mean the strengthening of traditional decision-making process, involving a group of elders. Other villages may opt for some co-management arrangements with their local government units, depending on the reliability of local government and peoples' preferences.

Support for sustainable and culturally sensitive livelihoods

Local communities should be properly compensated for their continued contribution to the conservation of the watershed of the Magat Dam, and for their contribu-

tion to providing living models of sustainable land use management practices. This will encourage the continued conservation of traditional rice farming practices on the terraces, by enabling the local farmers to meet their basic needs without sacrificing their traditional practices. The compensation system can also be used to support useful research, the school of living traditions, and the development of sustainable livelihood opportunities that are sensitive to the culture and practices of the people and their traditional rice production.

There is also scope to invest in sustainable livelihood options that provide added value to terrace produce and create employment. Such investment can also support the education of children of those farmers that continue to work the terrace farms, through a programme that encourages children to adhere to traditional methods of terrace farming, thus passing knowledge from one generation to the next. Government agencies should also encourage the planting of indigenous trees to help improve the timber stand and to reforest denuded areas.

Develop and implement an Environmental and Heritage Impact Assessment system (EHIA)

The concept of impact assessment is often thought of as a modern and western concept. However, if one looks closely at Conklin's 1980 account of the Ifugao worldview of the environment, culture and society, a critical part of this worldview is the concept of looking at the long term impact of making decisions that modify nature or culture (Conklin, 1980).[6] It is therefore important for the people to look back at their traditions and rediscover the most relevant parts of their traditions that could be used to cope with present day conditions. The Ifugao (and probably most of the local communities in the Cordillera) have, within their own traditions, a way of looking at the modification of nature and culture through a long-term lens – exactly as modern day EHIAs should. EHIAs allow for the use of the best available knowledge to consider the long-term impact of a development project on the environment and the people. By incorporating local knowledge systems into such assessments, it should be possible to identify the best available mitigation measures that are attuned to the heritage and culture of the community, and that minimise the adverse impacts that come with any proposed development.

Inventory of community-conserved areas or co-managed areas in the Cordillera

It was mentioned earlier that most of the rice terraces have historically been managed communally through a complex set of traditional laws. Considering the inclusion of the rice terraces as a possible category V protected area should contribute to completing the network of protected areas in the country. It is also possible that other categories of protected areas may be nested (i.e. sacred sites as category 1a, but strictly managed for purposes of customs and traditions, and not for science *per se*) in the protected landscape/seascape. Mapping of these community-conserved areas, or even in some cases co-managed areas, could help connect the Balbalasan-Balbalan National Park and the Mt. Pulog National Park.

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1 The recent field work and research for this was done with the support of the Australian Regional Natural Heritage Programme to IUCN WCPA SEA through BirdLife International's project entitled "Strengthening Protected Areas Management and Networks in the ASEAN region".

2 The information in this case study comes from farmers from the local communities in Balbalasan-Balbalan in Kalinga province, Maligcong, Bontoc in the Mountain Province, the World Heritage clusters, and Amganad in Banaue, Ifugao province.

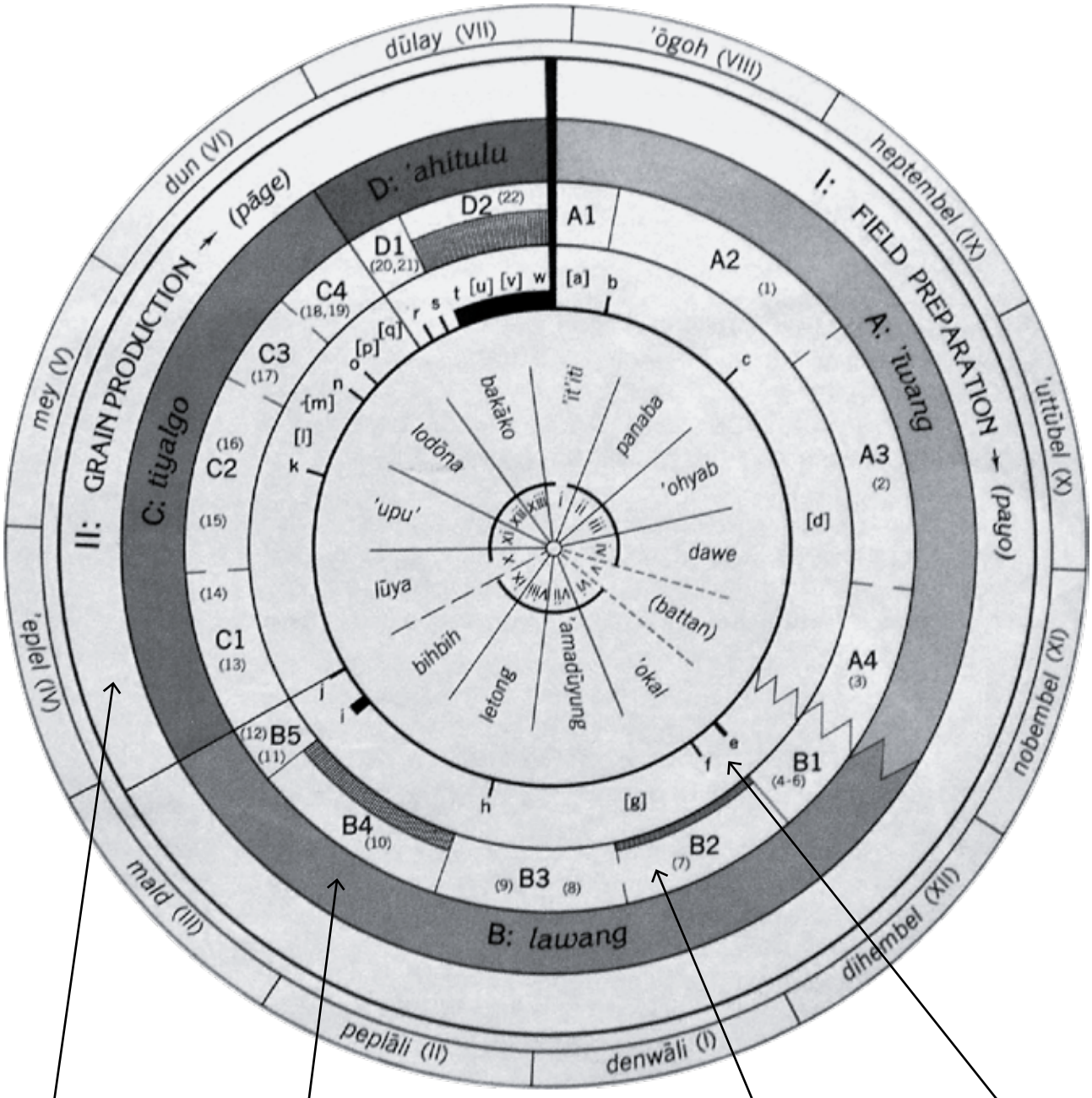
3 Japonicas or *Oryza sativa ssp japonica* (particularly temperate japonicas) are commonly grown in Japan, South Korea, Northern China, Europe, the USA and Australia. It has good grain qualities (glossy appearance, considerable stickiness, soft and smooth textures) preferred by consumers.They are tall, low tillering, and long maturing, have large dark green leaves and long, heavy, non-shattering and mostly awned grains (i.e. grains with hair-like appendages).

4 Indica rice or *Oryza sativa indica* is usually grown in hot climates. It is cold sensitive and found mainly in the tropics, especially in Southeast Asia (Asia Rice Foundation website and University of Nevada website).

5 A system of land titles put in place during the American occupancy of the Philippines, over land "bought" from the Spaniards but traditionally owned by the original inhabitants of the islands.

6 Conklin cites four "general principles that underlie the Ifugao interpretation of environment, culture and society". These are: "1) it is assumed that all resources and units of time and space are distributed unequally; 2) most of these differences are ranked; 3) many ranked statuses of person, property and natural phenomena are significantly modifiable by intentional human activity; and 4) such modification is most effectively achieved by skilled long-range calculation and competitive action". The first and last principles are especially useful and relevant in the context of Environmental and Heritage Impact Assessment.

Figure
Diagram of rice production cycle from Conklin (1980)



Box
A brief description of the prevailing units of planning and governance in the Philippines with particular reference to the Cordillera.

To understand the current administrative status of the rice terraces, it is important to understand the units of planning and governance in the Philippines today. The breakdown of area planning units in the Philippines begins with a region that is composed of provinces. Each province in turn is made up of municipalities and each municipality is made up of barangays or villages. Local communities in the Cordillera do not have a one to one correspondence to a barangay. Sometimes two traditional village units can belong to one barangay. Neither are the community elders equivalent with the local political leadership. Although the region is the biggest planning unit next to the country, this is not a political or governance unit and is not headed by an elected official but rather an aggregate group of elected officials from the provincial level that form the regional development council or RDC. However, the national development plans are based on the regional development plans developed by the RDCs. The province after the national level is the first political or governance level down and each of the provinces have an elected executive official that is the Governor of the province. A provincial legislature is also elected as part of the provincial local government unit. At the municipal level there is a parallel system with the Mayor as the executive officer and a corresponding municipal level legislature. At the barangay level, the barangay council is the executive officer with the barangay council as the legislature. However, in certain areas where there is a group of community elders, this does not equal to the local elected leaders at the barangay level. The current administrative status does not necessarily correspond to the traditional governance structures. This is the existing governance context in which the rice terraces and its people currently function. The prevailing planning and governance units are based on the Local Government Code passed in 1991 as Republic Act No. 7160. A more recent law, the Indigenous Peoples Rights Act of 1997 (Republic Act No. 8371) recognises traditional governance mechanisms of ancestral domains of indigenous peoples. How these two laws are implemented in ancestral lands remains to be seen in many parts of the Cordilleras.

Table 1
Some of the plants and animals of importance found in the rice paddies.

Biodiversity	**Importance**
1 *Bagiw*	Water plant that allows farmers to plant *pechay* and beans. It is also the plant eaten by the *battikul* and is the habitat of *ginga*, u-*ulhong* and *battikul*.
2 *Battikul* (flask snail *Pila luzonica*)	Food source
3 *Ginga* (pond snail *Lymnaea viridis*)	Food source. The shell is coal-roasted for lime
4 *Ú-ulhong* (matures to dragon flies)	Food source
5 *Kallangga* (native cricket)	Food source
6 *Luklukab* (insect)	Food Source
7 Mud fish	Food source
8 *Aggudung* (white horned shells *Potamides spp.*)	Food source. The shell is coal-roasted for lime
9 *Tikkam* (clam)	Food source
10 *Kulippo* or ‘oleppo (round snail *Vivipara burroughiana*)	Food source
11 *Dojo* / Yuyu (freshwater fish- *Miagurnos anguillicaudatus*)	Food source. This is a fish introduced by the Japanese; adapted to the rice paddies without any observed adverse effect to the native species.
Source: Local farmers in Banaue and Hungduan 2007; Conklin, 1980; CECAP, 2004	

Table 2
Summarised description of the phases, activities, people and rituals of the rice production cycle (adapted from Conklin, 1980)

Phase I: Field Operation (*payo* 'pond fields')

Phases and Seasons	Periods and Events
A – Off Season (iwang)	
This is the longest season. It begins after the last ritual holiday of the preceding harvests. Agricultural efforts are focused on preparing pond-field terraces for a new rice crop. Token weeding is done and outlets are blocked to raise water levels in the terrace. Pond fields are cleaned and decaying vegetables are treaded to enhance fertility of the soil. Maintenance and reshaping of terrace slopes is done. It is also a time of illnesses, deaths, funerals and prestige feasts, with wet cold days and occasional typhoons. Woodlots are planted and swiddens are harvested and replanted. There is abundance of shellfish, vegetables, wild mushrooms. This season lasts from late July/early August, until late November/first part of December.	**A1 Initial Postharvest Period *(lu'luwah)***
	A2 Early Off Season *('iwa'iwang)*
	1 Weeding, treading and wet mulching time *('ahilamun)*
	A3 Mid Off Season *(ginawang-di-iwang)*
	2 Spading time *('ahigaud)*
	A4 Late Off Season *(na iwang)*
	3 Wall cleaning time *('ahiloba)*
B. Planting Season (*lawang*)	
The season of field work and rice planting. Terraces are prepared for full inundated cropping. Marginal slopes and sides of inundated terraces are cleaned of interstitial, marginal slopes and sides of terraces. Nurseries are prepared. All nurseries are fully seeded. Focus is also on improving soil conditions and completing terrace dykes. It is also during this season that fully seeded seedlings are transplanted to inundated pond-fields. This season lasts from late November/first part of December, until March.	**B1 Terrace Work Period *('ahi'amu)***
	4 Second weeding and wet mulching time *('ahibalin)*
	5 Margin cleaning time *('ahidaluh)*
	6 Soil preparation time *('ahipaphod)*
	B2 Rice Planting Period *('ahihopna')*
	7 Rice panicle planting time *('ahihopna')*
	B3 Soil Working Period *('ahilawang)*
	8 Green manuring time *('ahibuluh)*
	9 Dyke finishing time *('ahibanong)*
	B4 Rice Transplanting Period *('ahiboge)*
	10 Seedling transplanting time *('ahiboge)*
	B5 Field Completion period *('ahi'ulpi)*
	11 Field marking time *('ahi'ulpi)*
	12 Second field marking time *('ahihogophop)*

Estimated Effort (gender Performing Work)	**Rituals**
	a. district welfare ritual *(ubaya)*
	b. initial agricultural rite *(lu'at)*
~30 workdays/ha of terraced land (women)	
	c. rice consumption rite *('apuy)*
~10 to several hundred workdays per ha. Depending on repairs and new constructions) (men)	
	d. rice loaf ritual *(ba'le)*
~6 workdays/ha (women)	
	e. seed bundle rite *(lohwang)*
~105 workdays/ha (women)	
~100 workday/ha (women)	
~12 workdays/ha (women*)	
	f. seedbed declaration rite *('opdah)*
~4 workday/ha (women)	g. construction completion ritual *('ulpin-di-pa'aggaud)*
	h. mature seedling rite *(bage)*
~45 workday/ha (men *)	
Part of the ~45 workday/ha (men*)	
~46 man days/ha (women, men help bring seedlings)	
	i. field completion and marking rites *('ulpi)*
No information available	j. final field marking ritual *(hagophop)*
No information available	

Phase Ii: Grain Production (page 'rice')

Phases and Seasons	Periods and Events
C. Dry Season (*tiyalgo*)	
This is the season the rice seedlings are growing. It is also the time for planting crops in swidden land areas. It is also a time to maintain the fields. These are cleared of weeds that have taken root in between tillering rice plants, as well as larger plant pests; the weeds and plant pests are bunched for deep treading into pond-field mud. Rice stems bulge with developing panicles and demand for irrigation water peaks. Irrigation channels are frequently checked. The maturing rice is inspected. Weeding takes place, but the focus is on preventing further build up of the rat population. This season lasts about 3 months, from late March/early April, until mid/late June.	**C1 Early Dry Season *(bo'bo'lana)*** 13 Seed planting time *('ahi'oho')* 14 Swidden clearing time *('ahi'uma)* **C2 Height of Dry Season *(tongtong-di-tiyalgo)*** 15 Swidden planting time *('ahitanum)* 16 Rice weeding time *('ahi'ago'o)* **C3 Rice Booting Period *(mumbiyah)*** 17 Irrigation tending time *('ahipaliyan)* **C4 Rice Heading Period *('ahibuhbuh)*** 18 Wall weeding time *('ahilupung)* 19 Margin weeding time *('ahipadig)*
D. Harvest Season (*'ahitulu*)	
This is the shortest season in the Ifugao calendar. Prior to harvesting, seed selection is done. It is a time of homecoming, beer brewing, drinking, feasting, merrymaking, and intense ritual and agricultural activity. It takes 7-10 days for the completion of repairs of granary roofs and for the collection of bast for tying the bundles of grain. Rice is brewed and final preparations for the harvest are made. The last period is devoted to continuous religious observances related to the constant direct handling of the new crop. Rituals are more faithfully observed and more universally participated in than at other seasons. This concludes the agricultural year. This season lasts for about 1 month, towards the end of June or beginning of July.	**D1 Rice Ripening Period *(holdang)*** 20 Rrice toasting time *('ahihanglag)* 21 Early reaping time *('ahi'udol)* **D2 Rice Harvesting Period *('ahitulu)*** 22 Rice bundling time *('hiboto')*

References:
**CECAP 2000*

Estimated Effort (Gender Performing Work)	**Rituals**
~6 workday/ha (women)	
80-90 days/ha (men)	
	k. general agricultural ritual *(tinungul)*
~50 workday/ha of new swidden land (men)	l. pond-field medicine ritual *(tamol)*
~36 work day/ha (women)	
	m. irrigation works ritual *('ulpin-di-ala')*
20 workday/ha (men)	n. crop growth ritual, part one *('alup)*
	o. crop growth ritual, part two *(topdad)*
~30 workday/ha (women)	p. thunderstorm ritual *(gito)*
~8 workday/ha (women)	q. typhoon ritual *(puwo')*
4 workday/ha	r. preharvest ritual *(hanglag)* s. early harvesting rite *(lodah)*
~80 workday/ha	t. main harvest rites *(pumbot'an)* u. joint kindred harvest *(baddang)* v. induction of ritualists *(liyah)* w. concluding harvest rites *(tungo)*

Table 3a and 3b
Two examples of the rituals preferred by specific farmers in Ifugao (January 2007)

Table 3a
Rituals as per a Female Farmer in Banaue

Ritual	**Timing and Explanation**
1. Loa	This is done before sowing of seeds or seedbed preparation. A chicken (male of female) is killed.
2. Bornat	This is done before transplanting of seedlings. A chicken (male of female) is killed.
3. Ulpi	This is done 2-3 days after transplanting. Two or three chickens are killed.
4. Hagophop	This is merrymaking that includes singing and chanting called *liwliwa*. Feet are stomped to drive away the spirits. This lasts for 1-2 days.
5. Hanglad	This is done before harvest when the palay is beginning to ripen. 2-3 chickens are killed. Two bundles of mature rice are roasted; this is called tinukpi and is eaten only by the family that will harvest.
6. Po-or	This is done on the day before the harvest. One chicken is killed in the late evening and another 12 chickens are killed in the granary. The 12 chickens are for the 12 goddesses. (Nowadays only 3-4 chickens are killed, which is enough for the people who join in the prayer.)
7. Ngilin	This is done during harvesting. A pig, chickens or ducks are killed. (Carabaos are not favored by the goddesses. On the other hand, black pigs are used for sick people.)
8. Hu-kap	This is done after every ricefield has been harvested usually during the first part of August. This ends the one-year rice cycle.

Table 3b
Rituals performed by a male farmer in Hungduan

Ritual	**Timing**
1. Hoka	This is done before seedbed preparation to appease the goddess of cereal. Rice from the granary is taken and brought to the field. A chicken is killed for this ritual.
2. Tunod	This is done before transplanting. A chicken is killed for this ritual.
3. Kulpi	This is done 1 month after transplanting to appease the gods to protect the seedlings from pests and natural calamities.
4. Kahipage	This is done when seedlings already have grains. The ritual is performed to make the harvest bountiful. A chicken is killed and the best grains are placed in a wooden box together with the butchered chicken. The box is placed in the granary.
5. Kahi-ani/Kahi-butok	This is done during harvest.
6. Luwa	This is a one-day recreation ritual, usually performed during the half moon. The tug-o-war game is usually played. The grains are kept in the granary after this ritual. A pig and a chicken are killed. (Nowadays, this is commercialized by advertising it as a tourist event.)
7. Tungo	This is a day of complete rest, immediately after the luwa. Noise is prohibited on this day.

Table 4
Characteristics of the Philippine rice terraces vis-à-vis the selection criteria for Category V protected areas (based on Phillips et al)

Selection criteria for Category V protected areas	
Essential Characteristics	**Characteristics in the Philippine Rice Terraces**
Landscape and/or coastal and island seascape of high/or distinct scenic quality	The diverse terraced landscapes which follow the contours (up to 50% slope) and elevation of the mountains of the Cordillera, present a fantastic view of a landscape created by local people over thousands of years until today.
Significant associated habitats, and flora and fauna	The forests (either private or community forests) still harbour unique species of plants that date back to the ice ages, and represent the southern most representation of the Himalayan flora. Several faunal species endemic to the island of Luzon are also found in the Cordillera.
Evidence that a harmonious interaction between people and nature has endured over time and still has integrity	A majority of the complex terrace system continues to function, and still represents a working landscape that includes the rice paddies, the irrigation systems and the forests (both for private and wider community use).
Unique or traditional land use patterns e.g. as evidenced in human settlements	The traditional land use patterns can be broadly divided into two: land used for daily life and land unsuitable for agriculture. The first set of land use patterns includes primarily those vegetation and land use types associated with rice production or subsistence farming. These include the public or communal forests *(Inalah/hinu-ob)*; woodlots *(muyong/pinugo/filig)*; swidden farms *(uma/habal)*; the communal grasslands (*magulun*); the settlement areas *(boble/sa-ad)*; and finally the rice terraces or paddy fields *(payo/payew)*. There are numerous categories of land unsuitable for agriculture, describing the hundreds of variations that the people of the Cordillera recognise in their natural environment.
Valued for the provision of environmental services e.g. watershed protection	Estimated flood water conserved by the terraces in the Ifugao province alone is 150 million cubic meters per year, worth U$0.75 million per year.
Valued for sustainable use of natural resources	Estimated soil conserved by the terraces of the Ifugao province alone is 422,315 tons per year, worth U$6.5 million per year. There is also a complex system of water use, distribution and sharing among the farmers. There is also a tradition of sustainable farming practices developed and used by farmers.
Unique or traditional social culture as evidenced by local customs, livelihoods and beliefs	There are hundreds of traditional rituals practiced by the people of the Cordillera, many of which are associated with the rice production cycle. There is a ritual for every event in local community life, from weddings, thanksgiving and burials, through to sickness and the period after a death.
Opportunities for public enjoyment through recreation and tourism consistent with lifestyle and economic activities	Some of the more public events have attracted visitors from different parts of the country and even from around the world. The beauty of the rice terraces and its associated culture has provided an iconic symbol or vision for tourism in the Cordillera. For example, the wooden figure of the 'bulol' (the guardian of the rice granaries) is now a popular tourist product, symbolic of the region.
Suitability for scientific research	The biological diversity of the region is under-researched. Only the ethnography of the people of the Ifugao province has been extensively studied. The engineering marvel of the terraces have never been studied scientifically. The wealth of topics for scientific research (biophysical, socio-cultural, etc.) is enormous.

Important for education	The people, their culture, and their environment are important for educating not only the Filipino people, but the peoples of the world. The ingenuity of the people of the Cordillera; the origins and history of the Filipino people since pre-colonial times; the sustainable farming and forest management practices; and the conservation of traditional rice varieties, are all elements of the Cordillera that have educational importance.
Recognition of artists of all kinds and cultural traditions (new and from the past)	Filipino visual and musical artists have found inspiration in the terraces of the Cordillera. Traditional Cordillera craft designs like woodcarvings and woven clothes have been acknowledged in modern furniture, interior design and fashion design.
Important for agro-biodiversity	There are over 500 known highland varieties of rice collected by IRRI. There may be many more in the hands of women farmers, not given to IRRI researchers.
Potential for ecological and landscape restoration	The key challenges are the abandonment of rice paddies and the diminishing forest cover of the watershed areas. The potential and need for restoring the terraces is unquestionable. Programmes to restore the terraces through local government and community actions are now underway. The need for forest restoration using indigenous tree species is also very real and can generate local interest easily if supported by some technical input.

Glossary

Aggudung
A variety of shell with a cone pointed tip found in the rice paddies that are harvested for food. The shells are later made into lime, which is mixed with betelnut during betelnut chewing (moma).

Baddang
Cooperation, assistance or help. In the rice production cycle, baddang is normally done during the transplanting and harvest period where relatives and neighbors volunteer to help to ensure that the seedlings are planted, or that the ripe palay are harvested, on time. Meals and snacks are provided by the owner. During harvest time, baddang provides a festive mood among the workers.

Barangay
The smallest local government unit in the Philippines.

Battikul
The native variety of kuhol that used to abound in the rice ponds before the introduction of the golden kuhol.

Bayanihan
A Philippine tradition of community help or support for a big task or amount of work that needs many people to accomplish. These include helping a family in planting or harvesting rice from their own fields and moving a whole house from one location to another.

Bulu
A local term of a type of japonica rice in Banaue.

Chinakhon
A term in the Mountain Province pertaining to a class of rice for the dry season or the first crop.

Filig
Mountain Province term for forest lands.

Ginga
A variety of edible shell found in the continually flooded rice paddies of Ifugao. It is differentiated from the other edible shells because of its very thin shell.

Hinu-ob/Hinoob
Ifugao term for a public forest. Also known as alah or inalah.

Hudhud
One of 19 masterpieces of Oral Intangible Heritage of Humanity as recognised by the United Nations Education, Scientific and Cultural Organization (UNESCO), in Ifugao.

Inado system
Also known as inagoh or pingkol in Ifugao. Practiced in Ifugao, it is the post-harvest system of composting rice straw and grasses on the rice paddies, by forming mounds of these materials and covering them with soil. The water in the rice pond is maintained. Vegetables, such as pechay and beans, and other condiments such as onions, are planted on these mounds while the organic matter decays underneath. Instead of fallowing, this simply allows the rice pond to stay idle and the organic matter to decay until the next planting season. The inado is one means of supplementing the food needs of the farmer. Excess produce is sold in the market. A similar practice is found in the Mountain Province, called baliling/asi-faliling.

Inagoh
Please refer to Inado system.

Kaingin
A shifting system of farming, involving slash and burn.

Low shattering
A characteristic of the rice plant to shed its flowers or panicle during maturity at very low levels. The low shattering characteristics of rice grown in the Cordilleras allows the rice to be tied in bundles and carried at both ends of a pole from the terraces by the farmers with very little grains lost along the way.

Mabilau
Ifugao term for cane grasses.

Magulun
Ifugao term for cogon (Imperata cylindrical –common grass found in South East Asia) land or communal grasslands.

Mumbaki
Village priest who usually performs rituals.

Muyong
Ifugao term for the privately-owned forest, grove, or woodlot located on top of the rice paddies. Also called pinugo or pinucho in Ifugao, tayan in the Mountain Province, and lakun in Kalinga.

Oma
Mountain Province term for slash and burn fields or kaingin.

Pak-ang
A Mountain Province term pertaining to a class of rice for the wet season or the first crop.

Panicle
Grouping or arrangement in which flowers are borne on a plant.

Payew
Mountain Province term for irrigated fields.

Payo
Ifugao term for rice terraces or paddy fields.

Pingkol
Please refer to Inado system.

Pinidua
Ifugao term for a class of rice variety known as rainy season crop.

Sa-ad
Mountain Province term for settlements.

Tadlayon
Mountain Province term for a class of rice variety.

Tinawon
Ifugao term for a class of rice variety known as dry season crop.

Wangwang
Ifugao term for the outflow in rivers or brooks.

Acronyms

ADSDPP	Ancestral Domain Sustainable Development and Protection Plan
ASEAN	Association of South East Asian Nations
BRTTF	Banaue Rice Terraces Task Force
CADT	Certificate of Ancestral Domain Title
CALT	Certificate of Ancestral Land Title
CAR	Cordillera Administrative Region
CECAP	Central Cordillera Agricultural Programme
EHIA	Environmental and Heritage Impact Assessment
ICHO	Ifugao Cultural Heritage Office
ICOMOS	International Council for Monuments and Sites
IPRA	Indigenous Peoples Rights Act
IRRI	International Rice Research Institute
IRTCHO	Ifugao Rice Terraces and Cultural Heritage Office
ITC	Ifugao Terraces Commission
IUCN	International Union for the Conservation of Nature and Natural Resources or World Conservation Union
NCIP	National Commission on Indigenous Peoples
RICE, Inc.	Revitalize Indigenous Cordilleran Entrepreneurs, Inc.
SITMO	Save the Ifugao Terraces Movement

Interviewees

Ifugao

1. Cesar Pelagio from Hapao, Hungduan, Ifugao. He was the former mayor of Hungduan in 1988-1990.
2. Manuel Dumulag, 72 years old from Hapao, Hungduan, Ifugao
3. Donato Bittaol, Barangay Captain of Baang, Hapao
4. Fr. Valentin Dimoc, parish priest of Hungduan, Ifugao
5. Bgy. Captain of Hapao, Hungduan
6. Hon. Hilarion Bumangabang, Mayor of Hungduan
7. Mr. Raymund Bahatan, Provincial Agriculturist, Provincial Agriculture, Environment, and Natural Resources Office (PAENRO)
8. Ms Maribel D. Bimohya, Information Officer of Office of Governor
9. Engr. Carmelita B. Buyuccan, Provincial Planning and Development Coordinator, Provincial Planning and Development Office (PPDO)
10. Ms. Rebecca W. Bumahit, Project Superintendent, Kataguwan Center, Lagawe, Ifugao
11. Hon. Glenn Prudenciano, Governor of Ifugao
12. Ana Habbiling, farmer in Amganad, Banaue
13. Peter Dugninon, an agriculturist by profession and currently employed as Community Facilitator, Special Projects, Municipal Government of Asipulo, Ifugao. He was the one who started experimenting on a local tree as solution to the ¨kuhol¨ problem. His home experiments (in basins) have been successful. He has received positive feedback from local farmers who informally field tested his experiment
14. Nora B. Luglug, Head, Ifugao Cultural Heritage Office (ICHO). She is currently following up with a farmer who claims to be using an indigenous tree species in solving the giant earthworm problem in his rice paddies.
15. Martha N. Urbano, Municipal Agriculturist, Hingyon, Ifugao.
16. Jimmy Cabbigat, Municipal Agriculturist, Banaue, Ifugao.
17. Fr. John B. Habawel, an Ifugao Catholic priest, currently the Rector of the Immaculate Mary School of Theology in Vigan, Ilocos Sur.

Mountain Province

1. Clayton Cobsilen, 69-70 years old from Malibcong, Bontoc, Mountain Province
2. Julie and Nobel, 19 and 18 years old respectively from Malibcong, Bontoc, Mountain Province.
3. Edith Osing, does not know her age and is from Malibcong, Bontoc, Mountain Province
4. Laurence and Florence Cawaon, do not know their ages and are from Malibcong, Bontoc, Mountain Province.
5. Genevieve E. Falag-ey, Agriculturist-Rice Crop, Provincial Agriculture Office, Mountain Province
6. Emilia T. Magwa and Catherine Agcon, staff of the Municipal Agriculture Office, Bontoc, Mountain Province.

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Cristi Marie C. Nozawa is currently head of the Asia Division of BirdLife International. She also acts as the Vice-chair for IUCN WCPA in South East Asia.

Anabelle Plantilla

Anabelle Plantilla is the Executive Director of Haribon Foundation and is an environmental planner by profession. She has worked with the Department of Environment and Natural Resources as Head Executive Assistant to the Secretary (Minister) of the Department.

Melissa Melingan

Melissa Melingan is an Ifugao and is an engineer by profession. She used to be the municipal planning officer for Lagawe in Ifugao and a programme officer of the Friedrich Ebert Stiftung in the Philippines.

Je-el Constantino Ong

Je-el Constantino Ong is the Head of the Organisational Support Unit of Haribon Foundation and has been a regular tourist to the Cordilleras since the 1970s. She is an engineer by profession and was a manager at the biggest electrical utility company in the Philippines before joining Haribon.

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Agrobiodiversity in the Stara Planina Mountain Nature Park, Serbia

Sergej Ivanov

The Stara Planina Nature Park is located in the northern part of the Balkan mountain system, a range running 560 km eastwards from Eastern Serbia, through central Bulgaria to the Black Sea. In Serbia, the Stara Planina massif extends over the south-eastern part of the country with significant variation in altitude ranging from 300 m to 2,168 m. The Stara Planina region is historically rich in agrobiodiversity, particularly indigenous varieties of sheep, goats and cattle which are adapted to the harsh conditions of the high grasslands. Traditional grazing patterns of these indigenous livestock varieties are, in turn, important to the wild biodiversity of these grasslands.

Due to its rich biological and geological diversity, as well as its cultural heritage, a significant portion of the region is managed under official nature conservation regimes.

On the Serbian side of the mountain, the Stara Planina Nature Park (SPNP) was established in 1997, encompassing a territory of 142,220 ha. It is part of a national system of Nature Parks, whose management objectives correspond with those of IUCN Category V protected areas. Since 1996 an effort has been underway to create a trans-boundary Stara Planina Peace Park between Serbia and Bulgaria, including a memorandum signed by the two governments, and active cross-border programmes supporting interaction among communities and local governments.

The park and large areas outside its boundaries host a great variety of landscapes, habitats, natural phenomena and cultural heritage. Extended semi-natural grasslands (which, together with the less predominant alpine natural grasslands, form a continuous belt along the mountain range) are among the most important values of the park and the region. These grasslands are very rich in species (52 plant communities and about 1,190 plants), many of which have medicinal and aromatic properties and are important for honey production.

An important feature of the Stara Planina region is the indigenous varieties of sheep, goats and cattle which, until about 50 years ago, dominated the landscape in large flocks that moved seasonally between the lowlands and highlands. However, in recent decades many people have either left the area or shifted towards more intensive livestock-rearing of introduced higher-producing breeds. While there was a population of about 300,000 in the 1950s, there are now approximately 11,000 sheep found within the SPNP, most of which are either exotic or mixed breeds. Only a few very small herds of the pure breeds (e.g. Zackel sheep (Pirot strain, Karakachan strain, Bardoka and Svrljig strain) and Balkan goat) remain, mostly on isolated farms owned by old farmers who retain them because of emotional attachment or because they cannot afford to 'upgrade' to the exotic varieties.

Because the introduced breeds are unable to tolerate the harsh conditions of transhumance grazing, they are kept at the lower elevations near the larger villages. The result has been overgrazing in these areas and abandonment of highland pastures. In the absence of moderate seasonal grazing in the highland pastures, natural succession processes speed up and valuable grassland species are replaced by tree species (e.g. *Betula verrucosa, Crataegus* spp., *Populus tremula* and *Salix* spp.), bushes (*Juniperus nana, Juniperus communis, Rosa* spp. and *Vaccinium* spp.) and herbaceous species (e.g. *Veratrum album, Pteridium aquilinum* and

Verbascum spp.). The appearance of these species represents a significant change in the structure and botanical composition of the grasslands. The absence of livestock flocks in the high pastures has also led to the decline, and in some cases disappearance, of birds of prey and other predators. The Egyptian and griffon vultures (*Neophron percnopterus* and *Gyps fulvus*) have disappeared because of the decrease in sheep flocks, which used to be an important component of their food base. Revival of grazing in high mountain grasslands is also of great importance for the protection of meadow birds, and mammal species like the ground squirrel (*Citellus citellus*), marbled polecat (*Vormela peregusna*) and others.

For these reasons, increasing the practice of extensive livestock production has been identified as a key tool for reversing biodiversity loss and ecological degradation in mountain meadows in the Stara Planina Nature Park. This is being done by reviving high-mountain sheep-breeding, restoring local indigenous sheep, goat, cattle and horse breeds, and also restoring some of the traditional agricultural practices. Ensuring economic viability will be essential for increasing and maintaining these livestock.

The Transitional Agriculture Reform Project, a joint project of the International Bank for Reconstruction and Development (IBRD) and the Global Environment Facility (GEF), aims to assist the Government of the Republic of Serbia in establishing an efficient system for providing support to the agri-food sector. The Global Environment Objective for this project is to conserve ecological systems, agrobiodiversity and wild biodiversity in the production areas of the Stara Planina Nature Park. With the support of incremental GEF funds the project will help to integrate these global objectives into agriculture and rural development in the target area. A series of strategic public investments will aim to: (i) improve and strengthen the Government of Serbia system for delivering rural development measures in a manner consistent with IPA-RD (Instrument for Pre-accession Assistance for Rural Development) best practices; (ii) improve the knowledge and capacity of agricultural producers and processors to manage and implement rural development measures; and (iii) improve management of the Stara Planina Nature Park in partnership with local communities and other stakeholders.

The project plans to increase the awareness, capacity and incentives for people living in and around the globally significant Stara Planina Nature Park, to adopt agricultural, land use and natural resource use practices that help to maintain biodiversity in both natural and agricultural ecosystems. The project will particularly emphasise support for sustainable rural tourism, and for the development of high value products based on locally adapted livestock and crop varieties (e.g. Stara Planina kachkaval cheese, Pirot kilim (wool carpets) etc.). Accessing premium markets for environmentally friendly products and regional specialties is essential to compensate for the small scale and relatively high costs that are inevitably associated with this type of production. The development of financially viable economic activities and production systems is the key to maintaining a critical mass of livestock in the area and to countering trends towards agricultural intensification and unsustainable tourism development (e.g. infrastructure-intensive ski resorts and unplanned/illegal tourism-related construction). For maximum impact, the project will particularly target four livestock breeds and associated products which, preliminary assessments have indicated, are most likely to be commercially successful (e.g. organic pork from Mangalitsa pigs; a well known cheese made from the milk of Zackel and other local sheep). Focusing on a small number of products will enable the producers to achieve the production volume required for a viable commercial product.

The high mountain pasture "Muchibaba" within the Stara Planina Nature Park is one of three pilot sites where farmers will receive special payment for bringing their sheep flocks to graze.

About the Author

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Conserving agrobiodiversity on the Gaspé Peninsula of Québec, Canada: A potential role for *Paysage humanisé* designation

Adrienne Blattel, Gilles Gagnon and Jean-Claude Côté

Summary

Located on the northeastern coast of Québec's Gaspé Peninsula, Estran is a region with a breathtaking landscape characterised by a string of coastal villages along the Gulf of St. Lawrence, with the abrupt plateaus of the Appalachian mountain range as a backdrop. Although fishing and forestry are currently the main industries, agriculture has developed as a complementary industry, tucked away in the pockets of warmer and more fertile river valleys. The complex land use practices in Estran, in which farming, forestry and fishing have historically been closely linked, have resulted in a unique rural landscape and a legacy of agricultural traditions that is surprising to find this far north.

Based on these distinctive landscape values and the associated biodiversity, including agrobiodiversity, the residents of Estran have recently considered the designation of the region as a *paysage humanisé* (translated as living landscape). This designation is a new kind of protected area in Québec, in keeping with the IUCN Category V management objectives, and is modelled after other protected landscapes such as Regional Nature Parks in France and Belgium. The designation has been introduced by the province in an effort to increase biodiversity conservation, particularly on private lands, while encouraging sustainable rural development. There are currently no designated *paysage humanisé* protected areas in Québec; however, a number of nominations are being prepared. While efforts to pursue *paysage humanisé* status in the Estran region are currently on hold, this active, resident-driven process has great potential to increase local sustainability in general. As part of this process, communities have been inventorying biodiversity and identifying threats to biodiversity.

The tiny village of Manche d'Épée.

Photo: Annie Bélanger

Introduction to Estran

Estran, which stretches approximately 60 km along the shore of the Estuary and Gulf of St. Lawrence in Québec, Canada, covers 624 km^2. The residents of Estran are studying the possibility of applying for the area to become a *paysage humanisé* (translated as living landscape), a new Québec-based landscape designation.

Located on the northeastern coast of Québec's Gaspé Peninsula, the climate in Estran is characterised as subpolar and subhumid. The average growing season is tempered significantly by the proximity to the sea, affording coastal Estran between 120 and 140 growing days, versus only 80 to 120 growing days farther inland.[1] Vegetation generally falls within the temperate nordic zone, with mixed coniferous and deciduous forest. A milder microclimate in the valleys has played a crucial role in the distribution of vegetation, enabling vegetables, fruits, and Sugar Maple groves to thrive (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

Taking advantage of these mild valley microclimates, early settlers in Estran established subsistence agriculture in the 1840s, bringing with them species and practices from southern Québec. But primarily they came to fish and practice forestry, only cultivating the land to complement these activities. In recent decades, the collapse of primary resources such as fish, forests and mines has led to extremely high unemployment and youth outmigration. The collapse of the cod fisheries in the early 1990s, as well as recent mine closures, has exacerbated the problem of Estran's plummeting population. The current population is under 2,800, down from over 4,000 in 1981 (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

Estran generally has a high level of biodiversity because of the varied terrestrial, aquatic and marine ecosystems. Over 180 birds have been reported within Estran, a wide variety due to the rivers and saltwater habitats. The region is also located along an important migration corridor for gannets. Atlantic Salmon, lobster, deer, moose and lynx are characteristic of the region. The dominant type of forest consists of mixed resinous and birch trees (*Betula alleghaniensis* or *papyrifera*, depending on the altitude) and includes old-growth forest of trees over 120 years old. This old growth forest makes up 12% of forested land (Municipalities of

Typical seaside cliffs in Estran.

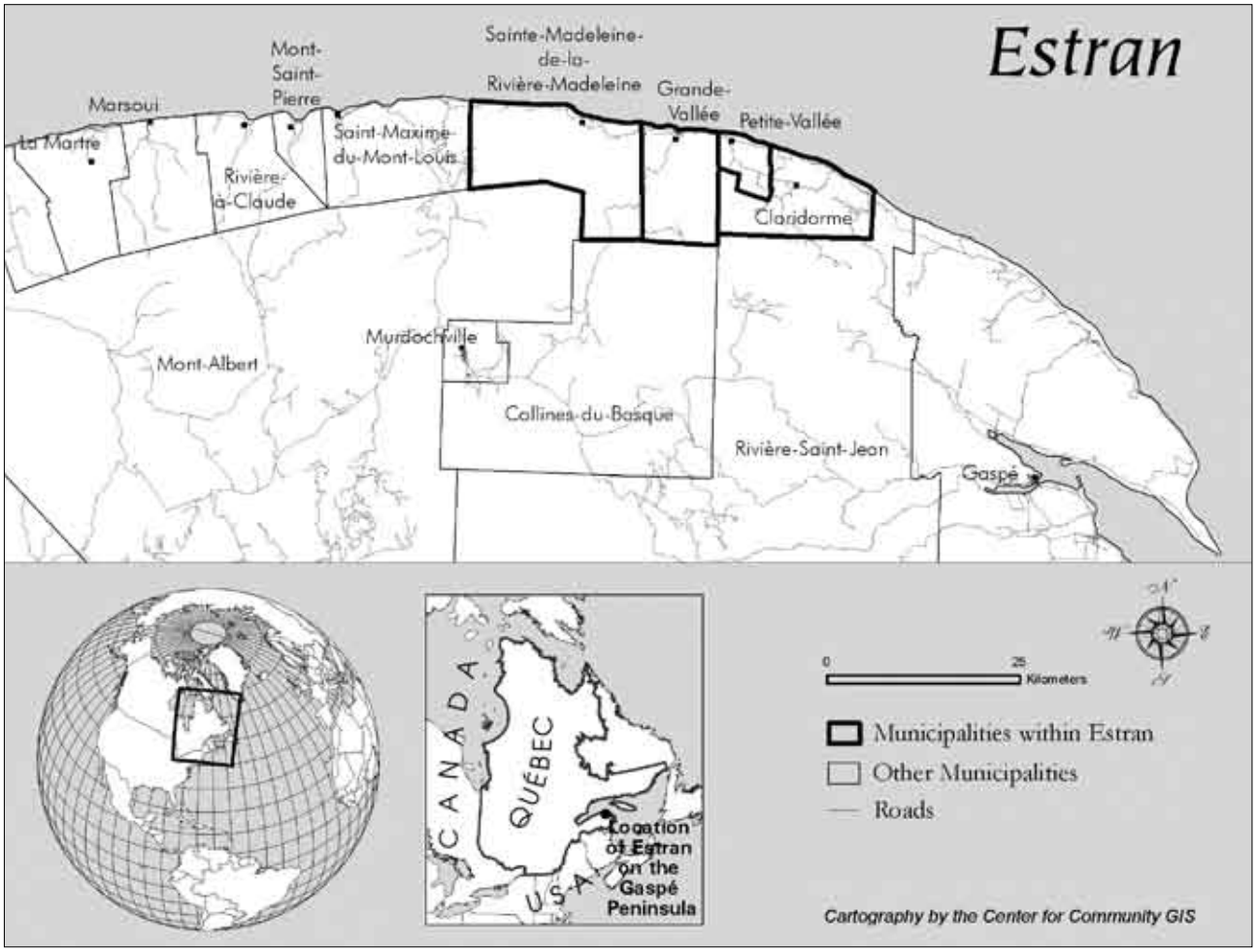
Photo: Annie Bélanger

Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006). Agricultural biodiversity occupies a spectrum that includes cultivars brought by early settlers, maple groves tended by residents, and wild biodiversity attracted by the cultivated and fallow fields. Of special interest are old orchards and fruit varieties that have adapted to the growing conditions that are unique to this part of Québec. The presence, use and selection of Sugar Maples (*Acer saccharum*) this far north, is exceptional and particularly noteworthy. Finally, the presence of rich and dynamic fallow and cultivated fields in close proximity to the forests has resulted in varied habitats that support a high level of wild biodiversity.

Significant agrobiodiversity features

The *paysage humanisé* model was designed to emphasise preserving anthro-biodiversity, and is likely to often focus on agrobiodiversity features. Initial findings suggest that there is a unique agrobiodiversity context in Estran, based on the agricultural history and specific climatic conditions of the region. Although very little research has been conducted on this topic to date, the regional organization, Estran Agenda 21, plans to inventory and characterise the agrobiodiversity as part of a potential *paysage humanisé* project (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

As noted above, the Sugar Maples of Estran are of particular importance. There are two types of Sugar Maple groves found in the area: the Sugar Maple-Yellow Birch forests, characterized by a forest strata dominated by Sugar Maple and with a significant presence of Yellow Birch; and Sugar Maple-White Birch forests, dominated by Sugar Maple and White Birch (*Betula papyrifera*). Both exist at the northern limit of their range, either as a result of a pre-Ice Age warming episode that allowed them to reach Estran's temperate valleys, or because maple



seeds were transported here by St. Lawrence River ice (Lepage 2005).

The warming episode scenario suggests that a genetically unique strain of Sugar Maple might exist on the Gaspé Peninsula. Elsewhere in Québec, the Black Maple (*Acer nigrum*) has cross-fertilized with the Sugar Maple; natural selection has eliminated most of the intermediate species and favoured the characteristics of the Sugar Maple. However, the Black Maple never reached the Gaspé Peninsula and therefore the local Sugar Maples may consist of a rare genetic strain. In addition, it has been suggested that Sugar Maples at the northern limits of their range are genetically hardier than others (Lepage 2005).

Wild biodiversity in Estran is supported by the varied habitat, inextricably linked to agricultural practices. To date, research has focused on floristic biodiversity. In 2006, an inventory and mapping of agricultural land use identified various habitats and their dominant floral species (Bisaillon et al 2006) as follows:

Cultivation:	potatoes, strawberries, asparagus, oats
Pasture:	field thistle, white clover, goldenrod, fireweed
Fodder:	red clover, alsike clover, cleavers
Fallow fields:	raspberry, red osier, mountain-ash, willow, alder, poplar, grasses
Plantations:	White Spruce
Wild forest species:	Balsam Fir with Yellow and White Birch, and with pockets of Sugar Maples growing in specific conditions; poplar, spruce, white cedar, willow, alder

Prairies and cultivated fields may contain unique vegetation. They provide significant habitats for birds and many species of mammals that take advantage of the open spaces and nearby forest edges which offer shelter and food. Prairie species found during the inventory include timothy or millet (*Phleum pratense*), alfalfa (*Medicago sativa*), oats (*Avena sativa*), red clover or field clover (*Trifolium pratense*), and Alsike clover or hybrid clover (*Trifolium hybridum*).

Inventorying agrobiodiversity in an abandoned field in Estran.
Photo: Gilles Gagnon

Legal status of the *paysage humanisé* protected area designation

Estran's four municipalities (Saint-Madeleine-de-la-Rivière-Madeleine, Grande-Vallée, Petite-Vallée and Cloridorme) submitted a formal request for designation as a *paysage humanisé* in 2006. This initiative has stalled recently, but *paysage humanisé* designation is still a strong possibility for the future. *Paysage humanisé* is a new type of designation in Québec that follows the guidelines for Category V Protected Landscapes. There are currently no designated *paysage humanisé* protected areas in Québec. Any municipalities, backed by resident groups, may apply to the Québec government to obtain this status through a process that involves garnering local support, inventorying biodiversity, and drafting a multi-stakeholder management plan. The *paysage humanisé* protected areas, once designated, are managed by municipal authorities through a conservation agreement with the local communities. It is the local communities that will be the driving force behind the designation (MDDEP 2002).

The *paysage humanisé* concept was developed over the past four years by the Province of Québec's Ministry of Sustainable Development, Environment and Parks (MDDEP). MDDEP's goal in creating the *paysage humanisé* status is to protect remarkable inhabited territories in order to maintain their attributes and harmony, while allowing human activities to continue in these ecological-cultural areas. Sustaining agrobiodiversity will therefore be an important objective of the *paysage humanisé* protected areas. *Paysage humanisés* will be officially recognised as protected areas under the Québec law that deals with the conservation of natural heritage; they will thus be part of Canada's official protected area system.

The Category V protected area status would play an important role in the sustainable development of the Estran region. It would recognise and protect the distinctive cultural and natural values of Estran, by helping to preserve and promote Estran's unique traditional agricultural practices and associated biodiversity. Category V status would help promote traditional, optimized forms of agriculture, and lead to the increased viability of such agriculture in the long term. It could also lead to more coordinated land-use planning, thus better protecting Estran's landscapes, and helping to move toward greater economic sustainability.

Administrative status of the potential *paysage humanisé*

If Estran were to achieve the *paysage humanisé* designation in the future, its four municipalities would draft a collective agreement outlining the roles and responsibilities of each in implementing and managing the protected area (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006). The municipalities mandated a non-profit organisation, Estran Agenda 21, established in 2003, to investigate the possibility of Estran acquiring *paysage humanisé* status. At the time of publication, Estran Agenda 21 was undergoing internal restructuring; in principal, however, it consists of representatives of each of the four municipalities that make up Estran.

The mission of Estran Agenda 21 is to encourage the social, economic and environmental revitalization of Estran, and to facilitate a local action plan for the 21st century through public consultation and education. The plans of Estran Agenda 21 are based on the sustainable development action programmes adopted during the United Nations Conference on Environment and Development (the Earth Summit) in 1992.

A short history of land use practices

Estran has been inhabited, although not continuously, for at least 6000 years. Mi'qmaq, Innu and Iroquois peoples variously inhabited or traded within Estran over the past centuries. Today, no Aboriginal groups live in Estran. The first settlers from Europe arrived in the late 17th century (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

Human presence has significantly altered the landscape, habitats and biodiversity in Estran. Prior to European settlement, the land was entirely forested with the exception of wetland areas. With settlement, valley ecosystems changed profoundly to include village centres, prairies and cultivated fields. Initially forests were cleared for agriculture, to provide locally consumed food. But in the 1870s, forestry began in earnest. Today forestry is the primary practice on public land, which accounts for over 75% of Estran. Private land, which covers 150 km^2, is concentrated along a 2 km coastal strip (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

The effects of rapid land-use change in Estran raised concerns in the early 20th century. In 1938, local innovators Esdras Minville and Father Bujold carried out an "experiment" in sustainable development that involved transforming the Grande-Vallée-des-Monts Seigneury into settlement lands with three complementary activities: forestry, fishing and agriculture. Minville correctly assumed that unchecked forestry would eventually prevent any agricultural development, and that unplanned agriculture in the region would lead to the underharvesting of wood in some areas (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006). He argued that a new approach to agriculture was necessary to respond to the unique growing conditions and constraints in Estran. In particular, he felt that landowners should possess smaller parcels than elsewhere in Québec. He called for a forestry co-operative, working in tandem with fisheries or agriculture. Because of the absence of local markets and the distance from regional markets, Minville believed that agriculture in Estran needed to be oriented toward feeding families and sustaining the forestry co-operative.

Minville's ideas had a profound effect on the region: agriculture developed in a varied and flexible way, used little land, and was productive. The landscape still reflects this mix. During the later 20th century, many people from larger centres moved to Estran to benefit from the economic boom linked to the mines and forestry. These "gentleman farmers" often brought horticultural species with them to remind them of home. Thus, a portion of the anthro-biodiversity in Estran stems from species introduced from more urban areas.

Today, only 250 hectares of land are cultivated in Estran (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006). Prairies and cultivated fields may contain certain species of interest, but they are significant mainly because they provide a crucial habitat for the many bird and mammal species that seek the combination of open spaces and nearby forest edges offering shelter and food.

Conscious management policies and practices

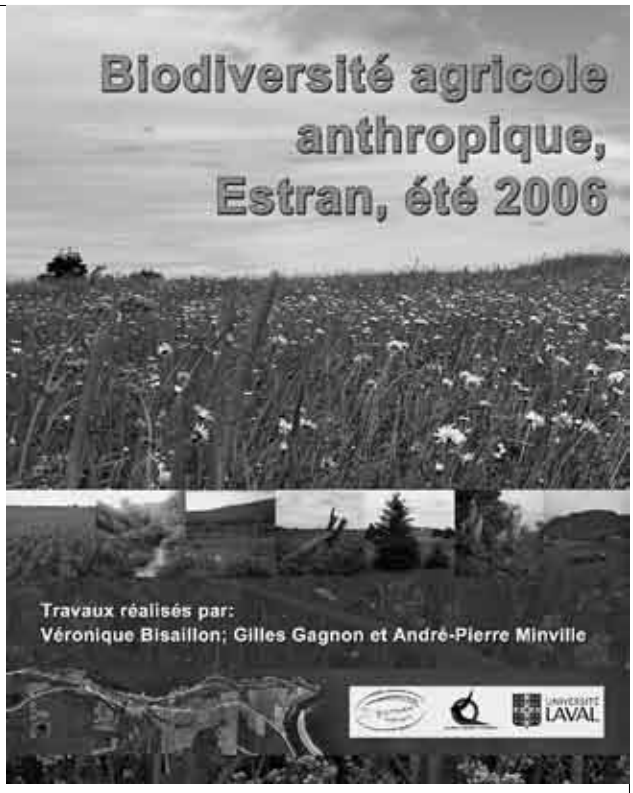
Three types of protected areas currently exist in Estran: an ecological reserve (Category 1a), protected faunic habitats for white-tailed deer, and protected riverbanks along salmon rivers. None of these protected areas specifically protect agrobiodiversity, and nor do they address traditional management knowledge. The *paysage humanisé* project would focus on protecting agrobiodiversity, and would address the dearth of protected areas currently in Estran.

Inventorying Biodiversity

Estran Agenda 21 sees inventorying biodiversity as the first step to conservation. Further studying local biodiversity will help Estran Agenda 21 understand the pressures exerted on various species and habitats, determine conservation priorities, and inspire local residents to protect habitat and species.

Estran Agenda 21 is in the process of inventorying forest, aquatic, and anthro-biodiversity, including agricultural biodiversity. Researchers have been conducting a literature review, studying maps and aerial photos, conducting site visits, and interviewing local landowners and scientific experts. For forest habitats, Estran Agenda 21 compares pre-industrial and contemporary maps to determine the degree of change. Aerial photographs from 1960 allow Estran Agenda 21 to track changes in agricultural habitat.

A study of vegetational biodiversity linked to agriculture was conducted in the summer of 2006. The study evaluated the biodiversity of cultivated lands and fallow fields within Estran. This will enable residents to characterize current agrobiodiversity, map out pressures and threats to species, and find solutions to protect agrobiodiversity. The study involved a comprehensive inventory and mapping of land use in agricultural plots, as well as interviews with local landowners. The land was divided into approximately 250 polygons, each representing a homogenous use or occupation. Researchers inventoried flora in each plot, noted structures that encourage wild biodiversity (including hedgerows, fences and old buildings), and inventoried vegetation in the transition zone between different ecotones. Land cover was classified as agricultural (cultivated, pasture or for fodder), fallow fields, and plantations of resinous trees *(Bisaillon et al 2006)*.



For more information on inventorying biodiversity in Estran, please consult: Bisaillon 2007.

Key challenges and threats

Declining agriculture

Agrobiodiversity is a fairly new concept in Canada and, as such, has not benefited from the same level of research as wild biodiversity conservation[2]. The lack of research on agrobiodiversity in Estran poses a challenge to preserving it. Many individual residents possess in-depth, hands-on knowledge of Estran's agrobiodiversity and the presence of historic cultivated species, varieties and cultivars.

The need to capture traditional knowledge and undertake scientific research is even more urgent, given the decline of agriculture in Estran. Cultivated lands are being abandoned due to demographics. As other industries become more attractive, the workforce is turning away from agriculture. It is challenging to convince seasonal employees to participate in the labour-intensive, non-lucrative harvests, when they could earn higher seasonal wages through forestry, fisheries or mining. Young people are leaving the region to seek post-secondary education and better job opportunities elsewhere. The farming population is ageing and not passing on land to their children, opting instead to sell it for other uses (Bisaillon et al 2006). Declining agricultural activity threatens the region's

Abandoned agricultural equipment in a field in Estran.
Photo: Gilles Gagnon

local food source, employment opportunities, economic development, and even potential *paysage humanisé* status.

Many abandoned plots are turning fallow, which is attracting rich wild biodiversity. However, with time, these plots will revert to forest and there will be an accompanying loss of wild biodiversity, including birds, small field mammals, pasture vegetation and prairies (Bisaillon et al 2006). If traditional agricultural practices are not maintained, agrobiodiversity will also be lost.

Although agriculture is unlikely to ever become a major activity in the region, the *paysage humanisé* project aimed to both protect and enhance agrobiodiversity by enabling research, supporting traditional practices, and attempting to render traditional practices economically viable (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

Reduced viability

One major challenge in maintaining agriculture in Estran lies in traditional land use patterns. Historically, cultivated lands were passed down within families and divided between children, resulting in increasingly tiny plots. Today, some plots suitable for reaping hay and sustaining livestock are owned by multiple landowners, making it complicated to continue raising livestock. For instance, one plot in Cloridorme covers less than one hectare of land and is owned by three different people. Thus, land fragmentation is making agriculture inefficient in parts of Estran (Bisaillon et al 2006).

Reforestation

Because forestry practices on the Gaspé Peninsula are widely believed to be in need of major restructuring, forestry represents one of the most significant challenges to preserving the landscape, ecology and economy of the region. At the same time, Estran Agenda 21 considers forestry as a key strategic resource for sustainable commercial activity.

In addition, much cultivated land is being reforested in White Spruce plantations. Reforestation may acidify the soil, rendering it unsuitable for cultivation or for deciduous trees such as maple groves (Bisaillon et al 2006).

Poor land-use planning

The lack of coordinated land-use planning in general could be threatening the viability of agriculture, forestry and tourism. As pastures and cultivated lands become reforested, the rural landscape itself is transforming. Forests growing along Highway 132 could potentially reduce panoramic views of the ocean, which attract visitors. Forestry is conducted without special regard for the landscape. Windmill parks are being built near Estran along the panoramic Highway 132 corridor. New buildings are fragmenting the landscape as well, and existing urban and rural planning tools and legislation do not currently hold sufficient power to keep these developments at bay.

In Estran, despite its isolation, some land use conflicts occur that resemble those in more affluent, densely populated areas. New residents and visitors to Estran are changing the demographics of the region. Many are less interested in farming than the local population. They are able to purchase land for cottages and homes at high prices, which inflates the cost of land and makes it more difficult for local youth to purchase land. In addition, newcomers are building cottages and other property on potentially cultivatable lands (Bisaillon et al 2006).

Organizational challenges

As with any protected area, it will be necessary to convince local residents that the project belongs to them and could be driven by them, as much as it belongs to the provincial government, Estran Agenda 21 or the passionate volunteers who have spearheaded the process. As with many community-based conservation organizations, Estran Agenda 21 is currently experiencing complex internal politics which are proving to be the greatest challenge of all!

Recommendations relating to agrobiodiversity in Estran

Planning, policy and protected areas

In order to protect agrobiodiversity, there will need to be mechanisms for land-use planning and protection. Much of this would be achieved through the creation of a *paysage humanisé*, which would include a combination of voluntary conservation and flexible legislation. As part of a *paysage humanisé*, Estran Agenda 21 has recommended increasing the number of protected areas, safeguarding rare species and ecosystems under the highest level of protection available in Québec, and making use of all available conservation mechanisms (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

The limited cultivatable land in the valleys should be protected by deliberate planning to mitigate impacts of incompatible land use. Estran Agenda 21 recommends actively pursuing the continuation of agricultural activities in the region in order to conserve agrobiodiversity. A first step of consolidating the 300 ha of available agricultural land through financial incentives and policy support could make it easier and simpler to lease or buy land. In order to maintain agrobiodiversity, preliminary studies have already identified land that could be readapted for agriculture.

Certain areas that have been left fallow are in varying states, ranging from grasslands to near-forests. Estran could easily adapt an additional 100 ha for agriculture (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006). In addition, the authors of this case study recommend regulating the practice of reforesting agricultural lands with White Spruce, through policy.

Similarly, maple groves should be maintained, restored and expanded through legislation that would encourage their long-term sustainability. Since maple groves are rarer and smaller than elsewhere in Québec, and are operated more for cultural tradition than for profit, perhaps they should not be subject to the same provincial legislation that governs maple groves throughout Québec. Since Estran's maple groves are intrinsically valuable, both in terms of biodiversity and cultural tradition, Sugar Maples should be protected from excessive wood harvesting, and maple groves on private lands should be protected under municipal legislation (Lepage 2005).

The authors recommend adopting a *charte du paysage*, or landscape plan, to help integrate landscape preservation into all other local development plans.

Finally, there is great potential for biodiversity and ecosystem conservation on private lands. Yet, no support programmes to encourage voluntary conservation exist. A government-supported promotion of voluntary conservation, through financial incentives, would lead to increased private conservation (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

Sustainable economic development

The 25-year vision of Estran Agenda 21 addresses a number of interrelated goals, including economic, social and environmental development (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006). Clearly, the sustainability of the regional economy must be a prerequisite to any attempt to protect agrobiodiversity. If there is no one onsite on the farms to sustain the traditional practices that lead to agricultural biodiversity in the first place, this agrobiodiversity will be impossible to maintain.

Stemming the tide of migration out of the area, and ensuring that people can continue to live fulfilled lives in Estran, will require innovative, multi-disciplinary approaches. For example, Estran's Agenda 21 suggests basing agriculture on collective models, such as cooperatives, as one way of moving toward a sustainable economy. To truly address demographic challenges, it will also be necessary to look beyond industry, and rethink social issues faced by residents, such as access to post-secondary education (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

Diversifying agricultural production, including developing local *produits du terroir*, will be one way to make agriculture viable in Estran. Agriculture will, in turn, maintain the traditional landscape, which will help build a sustainable tourism industry. In order to maintain rich, yet transitional, fallow lands that support both forest and field species, Estran could consider using sheep or other livestock to establish a cycle that would keep the fallow lands from reverting to forest.

The rich ecological and cultural history associated with the maple industry merits preservation. Economically, exclusive labels and increasing tourism could lead to interesting opportunities, which would encourage producers to continue the practices that maintain the area's unique Sugar Maple groves. Perhaps one day visitors will sample maple syrup in Estran, as they would wine in more southern climates. The legislation in Québec that governs *appellation contrôlée* status mentions protected areas and the products associated with them. Thus, the creation of a *paysage humanisé* in Estran could potentially make it easier for maple producers in the region to gain the prestigious limited appellation. Establishing an association of maple sugar producers could also help them gain limited appellation status (Lepage 2005). Maple producers could also harvest high quality wood for furniture as a way to diversify use of the maple groves.

Education and participation

The authors of this case study believe that encouraging ongoing traditional practices of agriculture will depend on improving its image, particularly among youth. Currently, agriculture has a somewhat negative image as a career choice for rural youth. Perhaps a slight reorientation of this already small-scale agriculture towards organic agriculture would help entice youth involvement (as it has elsewhere in Canada, albeit mainly around cities). Organic agriculture encourages the production of heirloom species. In addition, a system of organic food box distribution could help farmers reach local markets, and would have positive health impacts on the population.

Existing protected areas, such as the Manche d'Épée Ecological Reserve, could play a much greater role in educating the public about conserving both wild and agricultural biodiversity, and about the importance of the maple groves.

Part of Estran Agenda 21's vision is to create a resident-managed protected landscape that would espouse the values of participatory democracy and solidarity. This would involve ongoing consultation and participation of residents in various public interest issues. Estran Agenda 21 could engage local participation by educating the public about how the *paysage humanisé* project could be of benefit to them. For instance, researchers found that when interviewed, landowners who practiced hunting were more supportive of the *paysage humanisé* concept when they learned how the

protected area could protect apple orchards that attract deer. In addition, landowners were receptive when presented with detailed maps of the land, which facilitated discussion and allowed them to share their knowledge of the land.

Further research

As noted above, scientific research on Estran's agrobiodiversity is woefully lacking. Further scientific research on the possibly distinct ecology and genetics of Estran's Sugar Maples would support the development of protective policy and legislation (Lepage 2005). Protected areas in Estran could play a role in this by monitoring the state of local maple groves.

Local ecological knowledge about species and cultivar distribution, as well as about traditional agricultural practices, should be inventoried and passed down from elders to youth. Such locality-centric education would place a high value on conserving both biodiversity and agriculture in Estran (Municipalities of Sainte-Madeleine-de-la-Rivière-Madeleine et al 2006).

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Abbreviations and glossary

appellation contrôlée
a guaranteed and controlled designation of a product's place of origin meeting specific conditions of production, tradition and notoriety, linking a product with a place and human know-how

Estran Agenda 21
A local non-profit organisation dedicated to the implementation of Agenda 21 in the region of Estran on Québec's Gaspé Peninsula.

MDDEP
Ministry of Sustainable Development, Environment and Parks, Province of Québec

paysage humanisé
living landscape

produits du terroir
high-quality products marketed based on their regional specificity, made locally using traditional skills

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The Borana conserved landscape, Ethiopia

Marco Bassi and Boku Tache

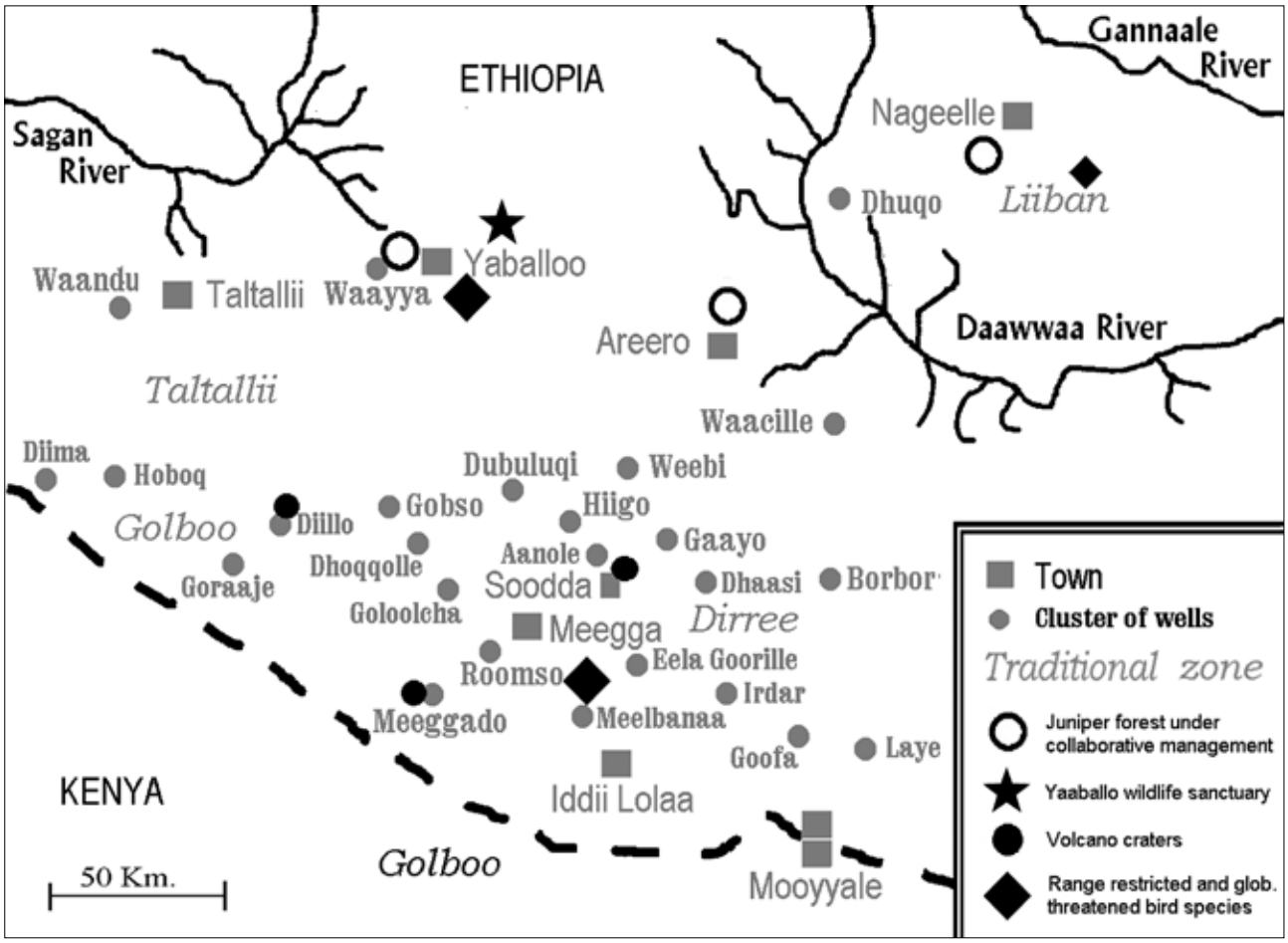
Summary

The Borana Conserved Landscape is a large and officially unrecognised community conserved area in Southern Ethiopia, managed according to indigenous governance. It includes diverse ecological zones and a variety of key natural and human-modified resources, and hosts a range of both domesticated and wild biodiversity of high international relevance. Within the broader landscape (IUCN Protected Areas Category V) certain zones are customarily managed under more restrictive rules of access and use, corresponding to the IUCN categories Ia (Strict Nature Reserve), Ib (Wilderness Area), and III (Natural Monument). In addition there is a government protected sanctuary and three government protected forests, the latter recently converted into co-managed protected forests by incorporating some elements of indigenous governance. A process is still needed to achieve a fuller recognition of the entire landscape, by empowering the indigenous community.

Community conserved areas and indigenous conservation

In the Horn of Africa many pastoral and agro-pastoral groups have fully fledged and still operative systems of indigenous governance. These are often well-known because of classic anthropological studies, although their relation to the environment, and specifically to conservation, is only recently receiving more attention, particularly since Community Conserved Areas are now recognised as a protected area governance type. Community Conserved Areas (CCAs) have been defined as "natural and modified ecosystems, including significant biodiversity, ecological services and cultural values, voluntarily conserved by indigenous peoples and local and mobile communities through customary laws or other effective mans" (Borrini-Feyerabend et al 2004).

Communities that, for centuries, have been living in a certain territory with specific identities must have



View of a traditional well site in the vicinity of a volcanic lake, intensively used by livestock and humans, but kept in a 'natural' state, free from settlement and agricultural practices.

developed devices for their immediate survival and to ensure their long-term sustainability. Over time the natural landscape is shaped by eco-compatible human actions, while culture develops in strict association with the modified environment and the need to preserve the key resources.

Under these ideal conditions the implications for biodiversity are twofold. On the one hand, the need to preserve key resources induces a condition of 'indigenous conservation', defined as the direct or indirect action of environmental conservation based on culture and a collective identity (Bassi, in press). Conservation is achieved through norms and mechanisms of inclusion and exclusion, often operating at various collective levels. The savannah, arid lands, and forests that have been selected by State authorities as sites for special biodiversity protection from the colonial time onwards are not 'natural' habitats, but human modified environments providing the habitat for specific wild species. On the other hand, human beings select specific domesticated breeds capable of thriving in their 'naturally' modified environment. In relation to pastoralism, the concept of agrobiodiversity should be centred on the interplay between wild and domesticated species, since pastoralism is based on a direct interplay between domesticated stock and wild plants, and is obviously heavily conditioned by the composition of wild grasses, bush species and trees. Also, as mobility and access to a variety of natural resources are a built-in feature of pastoralism, it is also necessary to consider the overall landscape where these activities take place.

In the Horn of Africa, CCAs are often totally informal and unrecognised. The imposition of statutory law and new tenure systems, the transfer of decision-making capacity to formal State officers, the economic marginalisation of many local groups, protracted warfare, and processes of mass migration are progressively eroding the ideological base and legacy of indigenous conservation. Despite its decline, in many areas indigenous governance still provides an extraordinary conservation asset, as in the case of the Borana Conserved Landscape.

The Borana Conserved Landscape

The Borana are part of the Oromo, the largest nation of the Horn of Africa. The Oromo were politically characterized by their *gadaa* system of generational classes and the hereditary *qaalluu* (high priests). Being scattered over a large and diverse territory, the Oromo have established various *gadaa* centres in Ethiopia, each providing the governance structure for a certain portion of the territory. The Borana are a pastoral sub-group of about 400,000 people, with a distinctive territory in the semi-arid lands of Southern Ethiopia and Northern Kenya. In Ethiopia, their customary territory corresponds to the southern portion of the former Sidamo Region as demarcated during the imperial and Derg time, from the confluence of the Ganale and Dawa rivers in the East to Lake Chew Bahir in the West. Some portions of this land were jointly used with other pastoral and agro-pastoral groups. The area between the two rivers is Libaan, while the highlands to the west of the Dawa are known as Dirree. In Kenya the Borana are nowadays concentrated along the border in Moyyale Marsabit and Isiolo districts. The Borana have a single encompassing *gadaa* system and five recognised *qaalluu*. They have managed to maintain their governance system, although the political influence of *gadaa* is now confined to Ethiopia, especially Libaan and Dirre, with competences informally recognised by the local administrators, and limited to pastoral issues and Borana internal affairs.

The whole of the large territory of the Borana, and particularly the Ethiopian homelands still under *gadaa* governance, can be considered a community conserved landscape, due to the variety of specific rules and practices that have historically assured its sustainable and eco-compatible use. It includes diverse ecological zones and a variety of key natural and human-modified resources. This is fully compatible with IUCN Protected Areas Management Category V, Protected Landscape/Seascape (Phillips 2002). As described below, within the broader landscape certain zones are customarily managed under more restrictive rules of access and use. Taking into consideration the emerging trends in interpreting the IUCN categories (Borrini-Feyerabend et al 2004; Dudley et al 2004), the ceremonial grounds are compatible with IUCN categories

Ia (Strict Nature Reserve), the juniper forests with category Ib (Wilderness Area), and the volcanic craters and the traditional wells with category III (Natural Monument). The same landscape also includes some government managed protected areas, while some have recently been converted into co-managed protected areas.

The different natural resources are all conceived by the community as strongly complementary, and are the shared heritage of the whole community. This is communicated through a sacramental process, as in the following extract from a prayer:

Dirreen nagaa	Peace for Dirre
Dirrii liiban nagaa	Peace for Liiban
Tulaan sallan nagaa	Peace for the nine Tulaa wells
Baddaan sadeen nagaa	Peace for the three Forests
Malbee golboon nagaa	Peace for Malbee and Gol boo
Booqqee sadeen nagaa	Peace for the three Booqqee
Baddaa gammoojjiin nagaa	Peace for the forest and the drylands

The management of rangeland

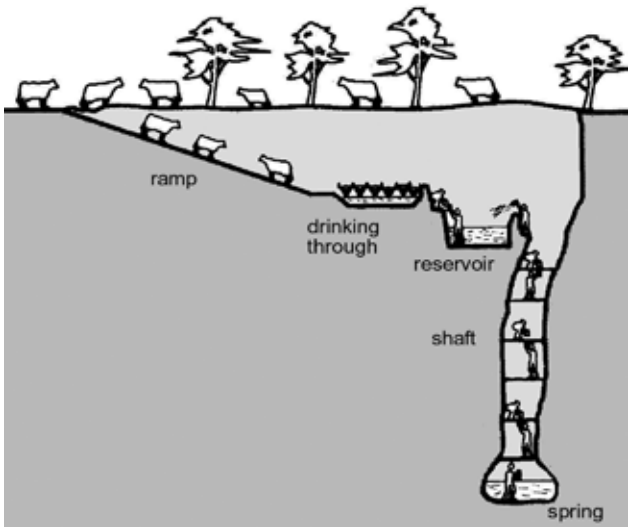
Liiban and Dirree are the two main macro-regions of the Borana in Ethiopia, including both critical wet and dry season pastures. *Malbee-Golboo* are the dry lowlands in northern Kenya, along the Ethiopian border, a critical wet season pasture. The sound management of the rangeland is promoted through norms of inclusion/exclusion designed for pastoral activity and known as *seera marraa bisaanii* – 'the law of grass and water'. The Borana 'law of grass' shares the basic principles of most East African pastoral groups. Although no family can be directly denied access to the rangeland, the law differentiates between dry season pastures (with permanent water points) and wet season pastures (with good grass but only accessible during rains). It imposes the maxmum use of wet-season pasture whenever possible, thus minimising pressure on the most intensely utilised rangelands served by permanent water points. In practice, this is achieved by dividing lactating (and thus less mobile) cattle from dry stock and other stock species. There are also provisions for restricting access to certain areas (*kaloo*), which are kept as a reserve for certain stock categories during the dry season. These norms and practises have a direct impact on the ecology of the rangeland, particularly on the composition of grass species. Additional practices contribute to controlling the composition of bushes and trees, such as controlled fires, selective cutting of bushes for firewood, and the periodical movement of villages to avoid depletion of trees.

The conservation ethos is not always expressed in explicit terms. Indigenous conservation is often indirectly achieved in accordance with culturally-specific values, beliefs and ritual practices. For instance, the Borana share with the other Oromos cultural beliefs associated with particular trees. The most important is the Sycomoro (*Ficus sycomorus*) (vernacular: *odaa*), symbolically associated with the *qaalluu*, the high priests of the society. Other trees are protected because their branches are used in rituals, or to make ritual/cultural sticks and objects, or for the production of edible fruits for humans and livestock (e.g. *Acacia tortilis;* vernacular: *dhaddacha*), or for their positive ecological interaction with the growth of forage. Further, certain tree species are planted close to the burial place as part of funerary rituals. These trees are carefully cared for later on. The overall result is a species-selective tree management at the country level. In the savannah areas, poverty is forcing some families to engage in charcoal production. However, the burning of protected trees still raises strong social concern. The Borana also strongly complain about the destructive tree-cutting practices of non-Borana groups that have been resettled by the government on their land.

Borana cattle in a foora camp, 2006.

The management of water

The second set of customary laws indirectly regulating the ecology of the rangeland, is the 'law of water'. This law is highly articulated and peculiar to the Borana and their environment. It is characterised by the presence of traditional wells (*eela*), distributed in localities where the aquifer can be reached[1]. Access to key dry-season rangeland is achieved by gaining access to these permanent water points. Nine of these well complexes - the *tulaa sallan* (the nine *tulaa* wells-complexes) - have a special ritual and symbolic relevance, for the particular qualities of the water and the surrounding environment. The *tulaa* wells can be as deep as 40 metres in the localities of Meelbanaa, Irdar (Egdar), Goofa (El Gof), Laye (El Lae), Dhaasi (Dhas), Weebi, Waacille, Hiigo, and Gaayo. The norms regulating access to the wells are based on the investment required for digging, clan affiliation, assignment of individual and collective ownership rights, and rights of access (i.e. priority



Cross-section of a tulaa well

is given to clans and families that have actually invested in the well. There is also a limited quota for outsiders, including members of other ethnic groups and wildlife) (Bassi 2005; Oba 1998). There are special provisions to ban any permanent or temporary human settlement in the vicinity of the wells. In the normal cycle of well excavation and collapse, wells serving over-exploited rangelands are abandoned and new ones are developed elsewhere.

The distribution of the well clusters has encouraged the Borana to select, over the centuries, their particular breed of zebu cattle, internationally known as the 'Boran breed' after the attention received in several studies promoted by ILCA/ILRI (International Livestock Centre for Africa, later developed into the International Livestock Research Institutions). Borana cattle are able to walk long distances in hot and sunny climates, normally drink every third day, and are very efficient converters of pasture forage into body fat which is used during periods of drought. They have the capacity to put on weight easily after the dry season and provide an optimal balance of meat and milk production for market and household consumption. Because of their outstanding performance in hot and dry climates, the Boran breed has, from the 1920s onwards, been introduced in commercial schemes and cross-bred in Kenya, Tanzania, Uganda, the Democratic Republic of Congo, Zambia, Australia, the United States, Brazil and Mexico (ILRI website). Recently a proposal has been formulated to preserve the 'pureness' of the breed in Boranaland (Zander and Mburu 2005).

The three-day watering interval allows the Boran breed access to rangelands located up to one and a half days walking distance from the wells. This explains the exploitation of pastures not accessible by other breeds during the dry season, and a lower concentration of stock in the proximity of the wells, where over-exploitation tends to occur due to the convergence of herds from various directions.

Gurracha Duuba shows a well where previously water was found at the surface.

This capacity, and the herding practice of separating stock types, has positive implications for the long-term grass composition of the different zones. The three-day rotation also allows well access to a larger number of pastoral units and the allocation of each day to different clans, thus fostering inter-clan cooperation and reducing the potential of inter-clan competition and conflict. In economic terms, the Borana cattle have been the main beef export from Ethiopia to the Gulf States, and a major source of foreign currency during the socialist period of Ethiopia.

The juniper forests

The *baddaa sadeen* are the three largest juniper (*Juniperus procera*) forests in the Borana Conserved Landscape; Baddaa means 'forest with tall trees' and 'a dark green forest'. As in several other forests in the Horn of Africa, the *baddaa sadeen* are too humid for permanent pastoral settlement. However, some open patches contain excellent pasture and provide permanent springs. Traditionally they were therefore used as dry-season pastures. The forests have an important function as a last refuge for grazing in case of drought, and are a reserve for medical and ritual plants. They were not subjected to special management provisions, apart from the very strict prohibition against starting fires in the forest.

The forests have a high symbolic value; they are conceived as something belonging to the 'outside' - the realm of nature, being close to God *(the alolla)* (Kassam and Megerssa 1994). They are also a metaphor for human society, hence highly valued in social terms. Gurracha Duuba, a Borana elder living outside the Manquubsa forest near Nagelle town, clearly articulated these values during an interview conducted in September 2002. The Manquubsa forest was nearly destroyed by a fire in 1999 and the remaining area was seriously affected by illegal and selective cutting of juniper trees for house construction in the town:

> "The juniper trees are like the Borana elders (*jaarsa*): they stand taller than the others and have a long white beard (whitish lichen – *arrii* – is often hanging on the juniper's leafy branches). Just as there cannot be Borana society without elders, the *baddaa* (forest) will follow into chaos when all the junipers are cut or destroyed. I was told long ago [referring to an oral prophetic text] that one day we would have seen a big light from very far and the *baddaa* would disappear…[referring to the great 1999 fire]."

The juniper trees *are* thus the elders and the forest *is* the Borana society, since there is a dynamic link between the two. This link is reflected in prophecy. The prophetic text the elder was referring to is well known by the community and provides a list of events representing the reverse of orderly social life. These events announce a cosmological crisis, an apocalypse (Bassi and Boku 2005). The 'light' (i.e. the fire) destroying the forest is thus equated with the disappearance of orderly human society and is conceived as a step towards, when translated in western scientific language, an ecological disaster at a global level. The symbolic inter-dependence between the forest and human activity is further qualified in the rest of the interview:

> "The forest attracts the clouds. It makes them stop and rain. It also produces rain: in the forest there is always humidity and mist. It produces rain. We can see it by the fact that it has springs and produces all-year-round high quality pasture. Due to the forest destruction now, the nearby plains (Diida Liiban) and other places do not receive enough rain anymore, and many of the permanent springs in the forest have dried up. But rain is still good in my place, Xuxxuffe, due to the remaining patch of forest nearby".

Gurracha Duuba illustrated his points during a walk in the forest. He showed us several surface water points that have dried up during the last few years. He also showed us how deep they have to dig now to find the water in the same point, requiring a line of 10 standing men to draw water to the surface. The analogy with theories of global warming is clear, although the cause-effect relation between forest and climatic change here is at a local scale.

The volcano craters

The *Booqee sadeen* are the three volcano craters found in Borana territory, providing different salts and high quality water for both human and cattle consumption. They are kept open and can be used by wildlife, but access by the community is regulated through a balance of customary and statutory laws, the latter imposing a tax on salt extracted by the local community. When the government announced, in national newspapers, a public bid for industrial mining in the craters, the entire community mobilised and managed to conserve the customary use of the *Booqee*.

Crater lake producing minerals for livestock (and wildlife) consumption.

Borana governance

The different resources discussed above, together ensure the maintenance of a viable pastoral system. They are common resources, in the sense that all pastoral units have the potential to use the territory and gain direct or indirect rights of access in response to unpredictable climatic patterns. However, both management and access are strictly regulated through practice, customary norms, belief systems, and laws of inclusion/exclusion, which protect the resources from outsiders and regulate the internal allocation between groups, sub-groups, individuals and families.

This regulation is achieved through indigenous governance built on the highly complex *gadaa* system of generation classes (Legesse 1973). Every eight years a new generation class, represented by elected leaders from the major clan divisions, takes the leadership of the *yaa'a,* the mobile ritual villages of the Borana. Ceremonies are performed in different sacred sites scattered over the landscape, mostly in the shade of a Sycomoro tree. The tree and the surrounding area, known as *ardaa jilaa,* are fully protected and maintained in a natural state (Taddesse 1995). The representatives of the *gadaa* generation class are also responsible for the organisation of the *Gumi Gayoo*, the general assembly of the Borana held once in every eight years. The event lasts over a month and involves thousands of people in democratic debates. The general assembly also serves as supreme court of the Borana and their legislative body. Formal customary laws (*seera*) are orally announced on these occasions. Law enforcement is assured by the Borana practice of discussing judicial cases and reaching binding decisions by consensus in a large variety of formal assemblies, held either locally by variously defined residential communities or at central level by each clan. Assemblies are led by different types of titled leaders. The *abbaa gadaa*, the *qaalluu* and the *hayyuu* are the most authoritative, having served for not less than 16 years in one of the Borana *yaa'a*. All titled leaders and influential men are called *jaarsa*-elders, a term implying political prestige (Bassi 2005).

This system illustrates the mechanisms of indigenous governance, based on the political philosophy of each group, and manifesting itself through a number of correlated visible elements, including:

- norms (customary law and practice) and procedures regulating the decisional processes, including law making, conflict management and dispute settlement
- the settings where binding decisions are made, normally in various councils and meetings
- customary institutions, defining political and ritual roles, and political and juridical personnel
- ritual practices.

The Gumi Gayoo general assembly.

Symbolic constructs of social and economic groupings, norms, juridical and judicial procedures, culturally-specific sanctions, political and juridical personnel, and local or indigenous knowledge are all inter-connected elements taking shape in relation to the specific territorial asset.

A Sycomoro marking a ritual ground. The Borana only manage to protect the tree, while the surrounding area is now cultivated by newcomers.

Agrobiodiversity and the state-induced decline of the conserved landscape

The environmentally sound management of natural resources assured the development and conservation of a unique agrobiodiversity heritage in Borana territory.

To date, ecological studies have focused on the direct inter-relation of stock with wild species, and hence, primarily on vegetation dynamics and their response to grazing (Oba et al 2000; Coppock 1994), from the point of view of both indigenous and scientific knowledge (Oba and Kotile 2001). In addition to the Borana cattle breed, specific to this territory and later disseminated world-wide, there are several important breeds of goat, sheep, donkey, horse and camel. Very little is known on the relation between the pastoral-modified environment and other wild biodiversity; although it is documented that the Borana conserved landscape provides the habitat for a variety of important, globally-threatened, range-restricted and biome-specific wild species (EWNHS 1996).

The Acacia-Coommiphora open woodlands and bushlands of the area suppport 43 species of mammals, including the endemic Swayne's Hartebeest (*Alcelaphus buselaphus swayeni*) and 283 species of birds, including the endemic Abyssinian Bush Crow (*Zavattariornis stresemanni*), the White-tailed Swallow (*Hirundo megaensis*) and the Sidamo Lark (*Heteromirafra sidamoensis*). It is possible that the Abyssinian Bush Crow, found only in the land of the Borana, is actually dependent on a pastoral-modified ecology. This species, whose classification has been difficult, is in fact only found in a restricted range, in the middle of the *tulaa* wells area, which is locally known for having been intensively used by cattle-pastoralists for several centuries. The globally-threatened and little-known Sidamo Lark is found in a very small area southeast of Nagelle Borana (Robertson 1995).

Dry evergreen forests and patches of forests with *Juniper procera* are also important because they occur in low rainfall habitat (below 1,000 mm) and they host the restricted-range Prince Ruspoli's Turaco (*Tauraco ruspolii*) (Borghesio 1997). Plants of wild coffee and chat (an evergreen shrub widely grown for its mild narcotic effect) are also found in the forests scattered through Boranaland.

From the 1970s onwards the Borana environment was confronted with major land use changes. The socialist government limited mobility within the ethnic territory and promoted agriculture. The situation degenerated further after the change of government in 1991, with the political marginalization of the Borana. UN-backed returnees programmes and other development initiatives supported by international funds meant that entire portions of Borana territory, including two *tulaa* localities, were entrusted to neighbouring groups. More land resources were lost by the Borana in the process of economic liberalisation and globalisation. Large ranches were acquired by international investors. Extensive portions of land around the towns, located in critical dry-season pastures, were assigned to town dwellers and to non-Borana immigrants, for small-holding cultivation. Since common property and indigenous land rights are not recognised in Ethiopia, the Borana's territory has been treated as if their common property land were 'no-man's land', to be assigned to whoever claimed it.

The Borana have been squeezed into the driest pockets where their grazing land was bound to deteriorate, and deprived of their drought grazing reserves (Oba 1998). The only possible survival strategy for the Borana has been to engage in farming in the remaining least suitable places, both to obtain some food during years of good rain, and to secure some land rights to the community in the long run.

The Borana institutions and norms appear increasingly unable to cope with the development and resettlement policies. Decisions on land allocation and land use are simply imposed upon them by the State administration. In addition, massive immigration of people who do not share the values attached to Borana governance, have made the traditional governance ineffective at the landscape-level, with a tremendous overall de-legitimizing effect. The impact on biodiversity conservation is also tremendous,

despite the establishment of some formal protected areas within the Borana territory by the Socialist government. The open woodlands, especially in the wetter zone providing the habitat of the Abyssinian Bush Crow, are becoming smaller and fragmented. Unregulated overgrazing is turning them into dense bushes. Agricultural encroachment and overgrazing are taking place even within the Yaballo sanctuary, established to protect this outstanding biodiversity complex. A recent road-side count of the Abyssinian Bush Crow by Borghesio and Giannetti indicates a population decline of 80% since 1989 (Borghesio and Giannetti 2005).

The juniper forests (*baddaa*) of the Borana conserved landscape are devastated. The smaller patches scattered over the landscape are almost completely destroyed. The three largest forests (*baddaa sadeen*) were classified as National Forest and accordingly protected and managed by the government. All were seriously affected by the fires in 1999, and all are seriously endangered by commercial timber extraction and agricultural encroachment by non-Borana newcomers. Of the three, the Manquubsaa Forest (Nagelle) has almost entirely disappeared. The Arero forest remains dense only in some blocks, having entirely disappeared in the remaining parts, while the Yaaballo Forest is highly exploited with some remaining dense patches (Borghesio et al 2004).

During field-surveys conducted by the authors in 2002 with SOS Sahel-Ethiopia, it appeared that nearly all the ceremonial grounds, previously held in a natural state by the Borana, were affected by the development of new settlements and extensive farming, mostly practiced by non-Borana newcomers, or were incorporated into private ranches managed by external investors. The customary leaders have been forced to negotiate access to their holy grounds at the time of ceremonies.

Although international cooperation strongly supports the development of new boreholes, the Borana still manage to independently maintain those traditional wells that they can still access. However, the system of norms and the enforcing mechanisms that prevented settlement close to wells, are losing their efficacy. While most pastoralists still keep their mobile villages far from the *tulaa* wells, some wealthier Borana have started to construct permanent houses and shops in the vicinity of the wells, which could possibly develop into the rapid formation of a new town, being close to a water source.

Unfortunately, while this changing pattern of land use is destroying the sustainable pastoral management and dependent biodiversity, it is not producing any relevant economic gain. Boranaland is not suitable for agriculture due to low and irregular rainfall. Both the pastoralists and the immigrating farmers only manage to survive on food donations from abroad.

Valorizing and revitalizing Borana governance

In the previous paragraphs we have shown a fundamental convergence of interests and a comparable conservation ethos between the Borana community and global conservationists, despite indigenous conservation being primarily motivated by sustainable livelihoods and ritual. We have also described how customary governance is under heavy external pressure, and is currently incapable of dealing with the new challenges. We are therefore challenged by the question of how to bridge global biodiversity conservation goals with the values and practices of the local and indigenous communities, while respecting the basic principles of equity, and building on local cultural notions and models. In other words, what are the possibilities and constraints in applying a CCA approach to this region?

Applying CCAs in the Horn of Africa mainly means recognising, valorising and formalising indigenous (or customary) governance and customary tenure systems based on common property. The provisions for collective rights guaranteed under International Labour Organisation (ILO) Convention No. 169 and the Draft United Nations Declaration on the Rights of Indigenous Peoples – with their explicit reference to customary laws, customary leadership, customary legal and decisional procedures, customary land tenure, and self-determination – obviously provide paramount guidance. Unfortunately collective rights are hardly recognised in the legislation of Ethiopia or any other of the countries of the Horn of Africa. Collective rights may implicitly be considered or recognised as a secondary claim in some sectoral law or policy document, usually under the heading of 'community' or 'local community'. However, the concept of 'community' or 'local community', lacking any reference to the environment-specific cultural elements, is too generic for indigenous conservation to regain efficacy. Some recent guidelines and recommendations developed in the context of the IUCN and the CBD may provide more specific guidance to promote appropriate policies and legislation at national level, but more work in this area is clearly needed.

Even in the absence of specific country-level legislations, some interesting attempts to realize the value of indigenous conservation have been made on the ground, mainly in relation to collaborative forest management. In a CCA approach, reference to customary leadership is crucial. The Borana Collaborative Forest Management Project was established in 1999 by SOS Sahel, with funds from the EU, to stop the process of serious degradation of the three largest juniper forest of Borana Zone. The project staff implemented action based on an in-depth analysis of tenure, resource use and customary governance. The project has been working to rebuild respect and recogni-

tion for the *gadaa* system as a legitimate governance structure, and has acknowledged the *gadaa* leaders as primary stakeholders and key partners to the Forest Department (Boku and Irwin 2003). The main customary leaders have systematically been involved in the preparatory debates. However, the formal recognition so far achieved does not involve Borana governance as a whole, as only customary leaders and elders have been included in new, locally established management committees. This limits the relevance of the action to forests, which are only one component of the Borana conserved landscape. Even with this limited scope, there are problems of implementation. According to Borbor Bule, a well-known local elder, the sustainable management of the forest will be possible only when the management responsibility and authority are entrusted to elders who are the custodians of the resources. The elders should have the power to impose sanctions in case of damaging behaviours, based on explicit agreements where the traditional structure has a leading role, and the administrative structure a supporting one (Boku and Irwin 2003).

Customary tenure, collective rights and primary stakeholders

Indigenous conservation is primarily based on customary tenure and, especially for pastoralists, on communal use of resources. Once the customary tenure system is replaced, indigenous governance and customary law no longer make any sense and indigenous conservation is gone forever. Legitimizing customary tenure in the first place means recognising the collective rights of the indigenous communities. But even if the legal environment is not conducive to this, there are a number of alternative solutions in the context of environmental protection and collaborative management. In the Borana Conserved Landscape the rapid environmental deterioration is associated with competing claims between the indigenous communities and other encroaching groups or opportunistic newcomers, all claiming access to the same natural resources. Both the indigenous communities and newcomers belong to the 'local community' category. They are simultaneously using the local natural resources. Both have claims and rights, though based on different legitimising principles. Dealing with conservation implies making choices about legitimate claims, and giving priority to those who have established long-standing associations with the natural resources. Hence, a culturally-grounded approach to environmental conservation requires a clear differentiation between primary and secondary rights. We propose, therefore, that primary rights are ascribed to the communities and groups that, through an historical association with a territory, have developed cultural and functional devices for the conservation and sustainable use of natural resources in that territory.

It has rightly been observed that a superficial application of stakeholder analysis leads to a misleading sense of equality between stakeholders (Hughes 1996). Grazia Borrini-Feyerabend suggests criteria to differentiate between stakeholders in collaborative management, including existing rights to land or natural resources, continuity of relationship with the resource, unique knowledge, and historical and cultural relations with the resource at stake (Borrini-Feyerabend 1996). An ODA report suggests differentiating between 'primary stakeholders' who have rights, and 'secondary stakeholders', who simply have interests (ODA 1996). Putting theory into practice is not, however, so easy, and the identification of the rights-holders in the Borana landscape was considerably complex. In the Borana Collaborative Forest Management Project, it was therefore decided to differentiate between primary and secondary stakeholders on the basis of direct or indirect use of the forest, whilst acknowledging the relevance of historical and social factors in determining rights over the resources (Boku and Irwin 2003). In order to overcome the difficulties of differentiating between stakeholders, it is advisable to clearly define 'primary stakeholders' with reference to cultural and historical criteria. Accordingly, we propose to recognise primary stakeholders as those members or sections of the local community that can legitimately claim primary rights on the resource at stake.

Need for institutional development

The process of recognition of customary governance implies a process of harmonisation with national and international demands. This requires specific actions at national level, in terms of recognising the relevance of collective and cultural rights and customary tenure systems, through policy, legislation and guidelines. It also requires specific actions at a local level, in terms of re-contextualisation and innovation. The effective revitalisation of indigenous governance requires more than a simple codification of customary laws (i.e. directly incorporating them into the legal framework) or undertaking negotiations with the existing customary leaders. It requires attention to be given to all the interrelated elements of indigenous governance. In the case of Borana Conserved Landscape it is possible to rely on the variety of customary bodies and institutions to stimulate the revision of norms. However, customary

leaders and local actors, who may be marginal to modern processes and training, are often incapable of dealing with new threats and situations. It is therefore necessary to enhance the capacity of the customary leadership to deal with new challenges. This can be achieved by *ad-hoc* capacity development initiatives and also by institutional change at the local level, where there is an interface between indigenous and State institutions, and modern and indigenous knowledge.

1 The deep wells are known as the 'singing wells' because of the way they are operated, giving the impression of songs coming directly from the earth.

Glossary of local terms

abbaa gadaa
'father of the gadaa' the leader of the Borana nominated every 8 year

Alolla
The 'outside' the realm of 'nature'

ardaa jilaa
cerimonial ground

baddaa
forest with tall trees or a dark green forest

baddaa sadeen
the three largest juniper forests in the Borana Conserved Landscape

booqee sadeen
the three volcano craters found in Borana territory

eela
traditional wells

Gumi Gayoo
the general assembly of the Borana held once in every eight years

hayyuu
customary officers of the Borana with juridical functions

jaarsa-elders
titled leaders and influential men

kaloo
areas which are kept as a reserve for certain stock categories during the dry season

qaalluu
high priests

seera
formal customary laws

seera marraa bisaanii
the law of grass and water

tulaa sallan
well complexes

yaa'a
the mobile ritual villages of the Borana

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Conserving agrobiodiversity in England's Protected Landscapes[1]

Lyndis Cole in co-operation with Adrian Phillips

Summary

This case study has a national, rather than a site, focus. It recalls that traditional farming systems, based on locally-adapted breeds of livestock and varieties of fruit (agrobiodiversity), were once widespread throughout England. Since about 1940, many of these have been lost through the industrialisation of agriculture and the emergence of a consumer preference for cheap, standardised food, much of it traded internationally. This has led to the loss of landscape, cultural and biodiversity values in rural England. However, some traditional farming systems using local breeds and varieties survive. These traditional farming systems often support valued wild species and habitats, and help to maintain important landscapes, many of which are designated as Category V Protected Areas (Protected Landscapes). While farming in these areas remains under pressure, the case study describes several recent conservation initiatives within Protected Landscapes. Some aim to reinforce the viability of existing farming operations based on locally-adapted livestock and local varieties of fruit; others aim to re-introduce lost breeds and varieties. Their success will be good news for nature conservation, heritage landscapes, local communities, the welfare of farms and farming, and for the consumer

England's Protected Landscapes

England's Protected Landscapes are of two kinds: National Parks (NPs), and Areas of Outstanding Natural Beauty (AONBs). There are nine NPs[2] and 36 AONBs[3]; all are lived-in, working landscapes and are listed as Category V in the World Database on Protected Areas. The NPs cover 10,502 sq kms (8% of land area); the AONBs cover 19,595 sq kms (15%) – see map.

Seven NPs are to be found in upland areas, based on the older, harder rocks that occur in the South West and in the North, and where the landscape has been shaped by hill farming traditions adapted to a rugged terrain and a relatively harsh climate. The other two parks are focused respectively on an internationally important wetland ecosystem (the Broads) and an equally important forest and heathland system (the New Forest). Between them, the parks are home to over a quarter of a million people. Many AONBs are in rather gentler country to the south and east of England, often on chalk, limestone and sandstone ridges. Other AONBs are designated along England's varied coastline, and cover hills and upland areas of the North, the Welsh borders and the South West.

Together the NPs and AONBs constitute England's finest landscape heritage and contain a large part of its most valued biodiversity. Most of the land within them is privately owned (including significant ownership by conservation NGOs), though some is owned and managed by public bodies. Farming is the dominant land use in all Protected Landscapes, though tourism and other activities are often more important economically.

Legal status of the Protected Landscapes

NPs and AONBs owe their origins to legislation passed in 1949 (which applied also to Wales). The first park was established in 1951; the most recent in 2005. The first AONB was designated in 1956; the most recent in 1995. Legislation for NPs was last updated in 1995 and for AONBs in 2000. Landscape protection has the same status in law in both types of area, but the purposes of the two designations differ:

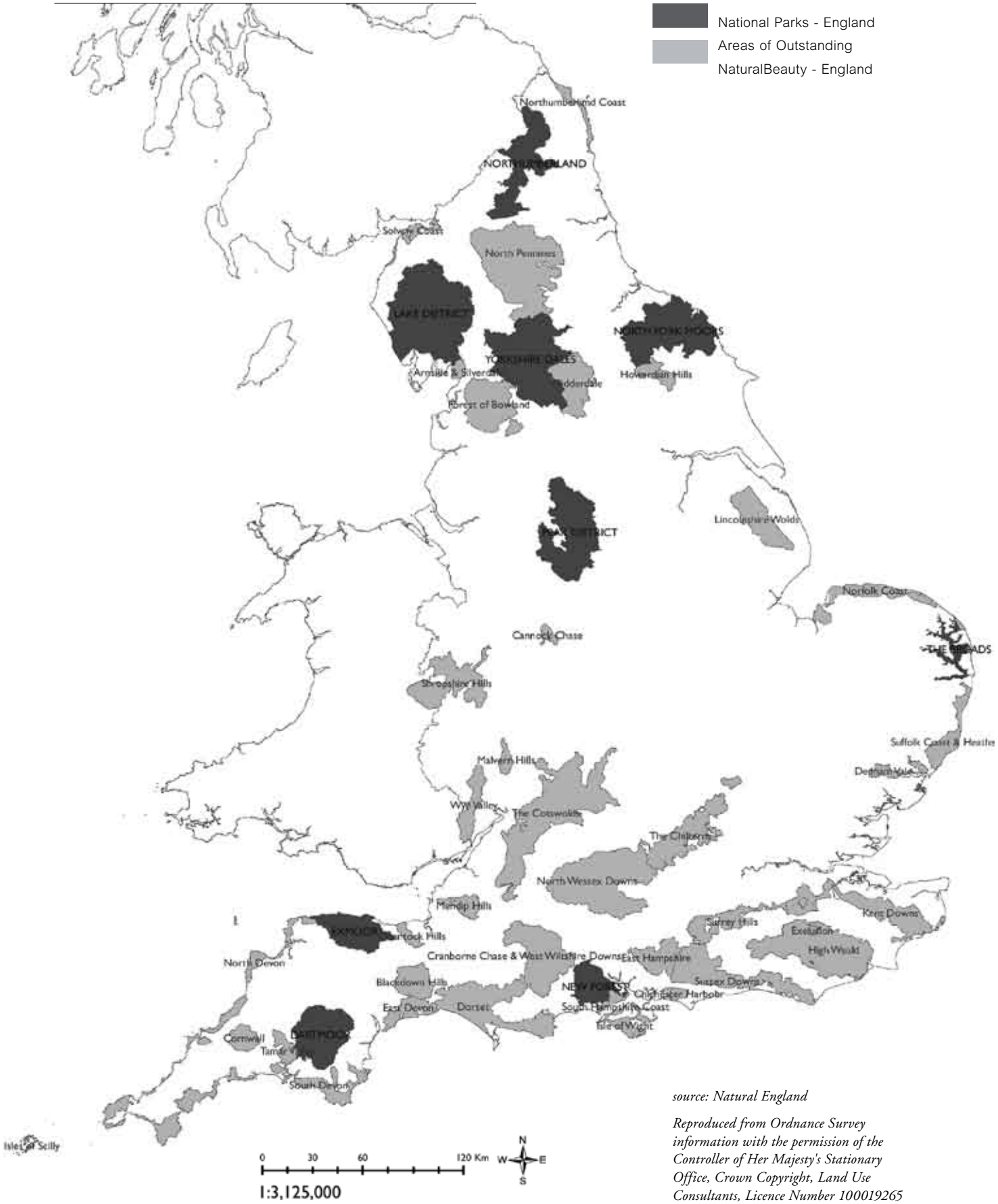
- NPs:
  a) conserving and enhancing natural beauty, wildlife and cultural heritage;
  b) promoting understanding and enjoyment of the area's special qualities[4].

If there is a conflict between the first and second purpose, the national park authority (see below) must give precedence to the former. In addition, park authorities are required to help promote the economic and social well-being of local people.

- AONBs:
  - conserving and enhancing natural beauty, wildlife and cultural heritage.

  Where an AONB board is set up (see below), it has a duty to increase public understanding and enjoyment of the area, and to help promote the economic and social well-being of local people.

England's Protected Landscapes



source: Natural England

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Administrative status of the Protected Landscapes

Each NP is administered by its own independent authority. The national park authorities' membership is partly drawn from local government and local parishes (commune level), and partly appointed by the Environment Minister[5]. The governance of the parks, therefore, is broadly akin to the IUCN model of a government-run protected area, but with elements of a co-management system. The authorities' remit reflects the purposes as set out above. To this end, they have powers to plan and control development and land use, assist landowners in the management of the area (which is relevant to the theme of this paper), and help people understand and enjoy the area's qualities. They are required to prepare and keep up to date a park management plan. Each park employs a full team of office and field staff: there are about 1,000 staff in all nine parks. Most funding is provided by government, reflecting the areas' special needs. All public bodies are required to have regard to the purposes of national parks in any work that they plan that may affect the conservation of the area. The national agency, Natural England[6], maintains an oversight over the parks as a whole and can advise government and others about their needs.

Most AONBs are administered by the constituent local authorities in which they are located. While their conservation responsibilities are broadly similar to those of the parks, planning powers remain with the local authorities. In most AONBs, there is a joint advisory committee or partnership that brings together the local authorities and farming, environmental and other groups. Usually one local authority administers the staff team, although increasingly such teams have their own independent office. In two cases[7], recent legislation has been used to establish AONB Boards, which operate in a similar way to national park authorities (but without planning powers). As with the parks, the work of public bodies must have regard to the AONBs' purpose. Natural England maintains an oversight of the AONBs, and supplements the funding provided by local authorities.

The authorities that administer NPs and AONBs have a range of powers and resources that they can draw on to influence agricultural practice and, indeed, assist in marketing agricultural produce. This enables them to support projects relating to agrobiodiversity, as illustrated in the examples below.

Setting the scene[8]

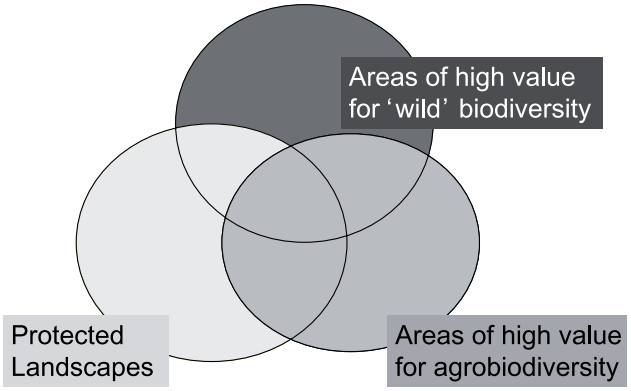
Agriculture has had a fundamental influence over the creation and management of nearly all of England's landscapes, including those that are now designated as Protected Landscapes. The response of agriculture over millennia to local conditions resulted in the rich diversity of locally distinctive landscapes and biodiversity that used to characterise much of rural England.

But during the past two-thirds of a century, changes in agriculture have greatly altered and simplified the English rural landscape. First national policy, and then the EU's Common Agricultural Policy (CAP), promoted the industrialisation of agriculture. These policies encouraged the intensive production of a limited number of major commodities, replacing traditional[9] approaches where agriculture was adapted to local conditions.

On the consumption side, the early industrialisation of Britain broke the direct link between millions of people and food production. Later, years of food rationing during and after the Second World War produced a generation unacquainted with traditional local foods that reflected their locality. The result is a population that has become accustomed to standardisation in food and "*the insidious monotony of apparent choice imposed by supermarkets*" (Mason and Brown 2004). Generic foodstuffs (commodities), marketed nationally and internationally and with an emphasis on price (and size and colour), have largely replaced traditional food production systems that used numerous different breeds and varieties suited to local conditions. Only more recently has a reaction developed, with a growing interest in the consumption of locally produced food and the production of regional (or locality) foods.

The industrialisation and intensification of agriculture led to a loss of those local, distinctive features and qualities that had helped to create a very diverse landscape, characterised by numerous local differences. Thus, much of the inherited patina of local landscapes, created and maintained through past centuries of local agricultural systems uniquely adapted to local conditions, has been rubbed out in the past 65 or so years. In short, increasing uniformity in English food has helped to bring about increasing uniformity in the English landscape.

Whilst it is dangerous to generalise, the remnants of these traditional farming systems, and the traditional landscapes and wild biodiversity that they support, are now largely (although not exclusively) concentrated in the more marginal areas of England. Precisely because they tend to be the areas of wilder landscapes and more remote from urban influence, many of these areas are also designated as NPs or AONBs. Here many old farming traditions and related traditional knowledge survive, along with land management practices that have helped create and sustain the rich variety of these Protected Landscapes. Here too are many of the repositories of native breeds and endangered varieties of fruit that have played their part in shaping the landscape and which are now being revived to assist in conserving wild biodiversity, expanding the local food economy, supporting farm viability, and diversifying the wider rural economy (see diagram over page). It is these aspects of agrobiodiversity that are the main focus of this paper.



Protected Landscapes and Areas of High Value for Wild Biodiversity and Agrobiodiversity

Past and present land use

The dependence of wildlife on traditional farming systems

While traditional forms of farming were associated with a wide range of agrobiodiversity in livestock and fruit (see below), farming of this type was often also associated with a rich wild biodiversity. Because traditional farming and associated land management practices used relatively low levels of inputs, tolerated the presence of 'neglected' areas on the farm, encouraged a mixture of land uses on one farm holding, and created a range of semi-artificial habitats, they produced a range of semi-natural environments that favoured a variety of wild fauna and flora. Often livestock 'mimicked' the role of large herbivores in controlling vegetation, browsing trees and grazing pastures. This is especially important where, as in England, most of the original large herbivores no longer exist. It is for this reason that several grazing projects are described below.

In looking at management needs today, the link between conserving wild biodiversity and conserving agrobiodiversity can be very direct: for example, hardy breeds of cattle and ponies can help to keep open scrub vegetation, which supports bird populations; and orchards of large, old varieties of fruit tree are ideal for creating a biodiverse-rich habitat of wood pasture. On the other hand, it is not always the case that a particular traditional breed of animal is needed to graze grassland, for example, to produce the desired benefits for wild biodiversity: sometimes a modern breed will do the job as well, provided that the right intensity of grazing is secured.

Animal breeds

Agricultural animals have evolved and were bred to suit local conditions. England has a significant number of distinctive native breeds of cattle and sheep – perhaps more than any other country in the world relative to its size (National Steering Committee for Farm Animal Genetic Resources 2006).

Most of these breeds are linked to particular parts of the country where their characteristics were developed by selective breeding over the centuries. The place names associated with many traditional English breeds of cattle and sheep are testament to their local evolution and affiliation. The following cattle breeds, for example, are associated with Protected Landscapes: Lincoln Red, North Devon, South Devon, Sussex, and traditional Hereford; and these sheep breeds: the Cheviot, Cotswold Sheep or Cotswold Lion, the Dorset Horn and Poll Dorset, Exmoor Horn, Hampshire Down, Portland, Southdown, Wiltshire Horn, Whiteface Dartmoor and Greyface Dartmoor.

Each breed has a story to tell. The Cheviot sheep, once characteristic of the Northumberland National Park border country, was recognised as a hardy breed as early as 1372. Like other 'longwool' breeds, the Cotswold 'Lion', now the symbol of the Cotswold AONB, probably originated from sheep kept on large estates by the Romans; later it became a mainstay of the English wool trade, while creating and maintaining species-rich limestone grasslands, which are now of international importance for biodiversity and are a defining feature of the Cotswolds AONB. The Wiltshire Horn (now found in the North Wessex Downs AONB, and the Cranborne Chase and West Wiltshire Downs AONB) probably originated from sheep that grazed the downlands in the Stone Age. The Herdwick sheep, found only within the Lake District National Park, may have descended from a flock of 40 sheep washed ashore from a Norwegian vessel wrecked off the Cumberland coast in the tenth century (Denyer 1993).

In the past, livestock of both sexes had been kept together, breeding at random. Although there would have been significant variation between the types of livestock kept in the different regions of England, it would not have been possible to define the characteristics of the animals found in particular landscapes.

In the 18th and 19th centuries, pioneer breeders like the Leicestershire farmer, Robert Bakewell (1725-1795), described and developed pedigree herds and flocks with particular qualities, specially adapted to local circumstances. Many of the downland sheep breeds that were the product of this period, such as the Dorset Horn, Hampshire Down and Southdown, are now associated with Protected Landscapes. Amongst cattle, the Beef Shorthorn, characteristic of the Northumbrian Borders and Yorkshire Dales (both areas are in NPs), has evolved over the last two centuries from Teeswater and Durham Cattle; and the Lincoln Red, once characteristic of the Lincolnshire Wolds (now an AONB), is a cross between Durham and York Shorthorns and the local large and rugged Lincolnshire draught oxen.

Some of these new pedigree breeds were so successful that they were taken well beyond their original 'home' territory. During the 19th century, sheep breeds such as the Suffolk and Cheviot sheep, and Hereford and Aberdeen Angus cattle, became widely distributed across the UK. Indeed they were introduced into the Americas and Australasia, and further adapted to local conditions. Thus regional (even national) identities began to break down.

Orchard varieties

Until the 1930s, nearly all parts of England had large areas of orchard, including many in the Protected Landscapes of today. There were also several thousand traditional English apple, pear, plum and cherry varieties suited to local conditions. Every county could boast varieties considered to be their own (although in reality many were shared with other areas under different names). Cumbria, including the Lake District, not widely known for its apple orchards, had its Hawthornden and Emperor Alexander, while Buckinghamshire had the Aylesbury Prune (plum), whose orchards once nestled at the foot of the Chiltern AONB scarp. These orchards supplied local markets with fruit and cider and, with the coming of the railway, the larger urban markets. They were also an essential element in the self-sufficiency of individual farm holdings: cider was made on virtually every farm in the country from the 1700s to 1940, and formed part of the agricultural wage.

Such orchards were once a defining characteristic of the English landscape, with their large fruit trees and grazed pasture beneath. Traditional orchard habitats can support up to 1,800 species of wild plants and vertebrate and invertebrate animals (Smart & Winnall, undated). Because of the great value of orchards for landscape, biodiversity and associated cultural values, they have recently become a focus of conservation efforts, especially within Protected Landscapes.

Loss of wild biodiversity and agrobiodiversity

Agricultural intensification has led to a massive loss of semi-natural agricultural habitats and the species that they supported. For example, 97% of lowland unimproved grassland was lost between 1930 and 1984 in England and Wales (English Nature 2004).

With these losses, the Protected Landscapes of England have become vital strongholds of nationally dwindling semi-natural habitats. Thus 40% of Dartmoor National Park, including much of its high moorland, is now covered by international nature conservation designations (Dartmoor National Park Authority 2001). Likewise, chalk grassland in the proposed South Downs National Park[10] accounts for a significant proportion of the remaining British chalk grassland resource (South Downs Joint Committee 2006).

Yet even those marginal areas which are in designated Protected Landscapes have not been immune from habitat loss. Thus over-grazing by upland sheep, ploughing up of species-rich grasslands, drainage of wetlands, excessive use of chemical inputs, and other examples of intensive farming have all impacted negatively on biodiversity that is dependent on semi-natural habitats, both in Protected Landscapes and elsewhere. And amongst the semi-natural habitats that remain, there has been a significant decline in quality as a result of inappropriate agricultural management.

Reduced wild biodiversity has been matched by falling agrobiodiversity, with many native English breeds replaced by a few larger breeds often of continental origin. While the UK has over 130 native livestock breeds (poultry, cattle, sheep, goats, pigs, horses and ponies), approximately 100 of these are now considered to be at risk (National Steering Committee for Farm Animal Genetic Resources 2006). With this loss, many of the links between breeds and their traditional localities have been broken.

Traditional orchards have suffered a similar fate. There has been a dramatic decline, from 97,900 ha across England in the 1930s to some 17,000 ha (both traditional orchards and bush varieties) across England and Wales in 2004 (Defra 2004). There are many causes for this –fruit trees were grubbed up during the Second World War to make way for crops, grants were given post-war for orchard removal, subsidies favoured other crops, fruit harvesting and packaging is labour intensive, and there has been huge competition from imported fruit. With the rapid rise in the use of air freight and chilling of fruit, cheap produce can now be brought to English shops from around the world at all times of the year, removing seasonal changes in the availability of fresh food. At the production end, many of the traditional orchard varieties were disease prone, slow to mature and difficult to harvest because of the sheer size of the trees. So not only did the area of orchards fall dramatically, but those commercial orchards that survive have almost all been converted to modern bush varieties, which are quicker to mature, more disease resistant, produce a much larger crop, and are very much easier to harvest.

To sum up, the effect of changes in food preferences and agriculture over the past 60 or so years has been a significant decline in agrobiodiversity, along with a loss of associated wild biodiversity, cultural values and traditions, and a decline in the overall quality and diversity of the English farmed landscape. The Department of Environmental, Food and Rural Affairs (Defra), the English government department responsible for agriculture as well as the environment, has put a figure on this loss: "*while agriculture generates significant environmental benefits (which studies have costed in the range £600 - £900 million per year) it also has significant negative impacts (which studies have costed at £1.15 billion per year)*".

Responses

In response to such environmental losses, successive UK governments have, for the past 20 years or so, introduced incentives, regulations and legislation to reduce, or even reverse, the rate of environmental damage caused by agricultural intensification.

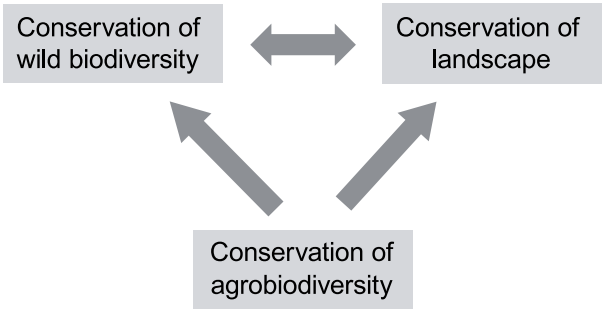
From 1987 onwards, agri-environment schemes, approved under the CAP, have provided support to environmentally sensitive farming. More dramatic changes came with the reform of the CAP, introduced in 2005, which ended agricultural production support payments. In their place came payments for keeping land in good agricultural and environmental condition. CAP also underpins a new agenda for farming in England, the main themes of which are: to re-link farming with the market; to produce safe, good quality food; and to ensure the sustainable management of land for environmental public goods. This last theme is being assisted by the introduction of a new agri-environment scheme – Environmental Stewardship.

The United Nations Convention on Biological Diversity (CBD) requires the UK to commit to conserving all aspects of biodiversity, in both its wild and domesticated forms. While there has been a strong political response in England to the conservation of wild biodiversity, the conservation of agrobiodiversity has not yet received much attention in national policy and support. The conservation of native regional and local agricultural breeds and of traditional fruit and vegetable varieties has largely depended on the work of NGOs, such as animal breed societies, the Rare Breeds Survival Trust, the National Trust and, in the case of fruit varieties, the leading work of Common Ground, backed by the enthusiastic support of local communities, parish councils and local authorities.

While no national schemes for agrobiodiversity conservation have been specifically designed for Protected Landscapes, often the criteria of such schemes particularly favour such areas. Also the heightened awareness within NPs and AONBs of the value of traditional farming systems, the presence of appropriate conservation policies, and the existence of trained staff and administrative capacity, make them very suitable places to pioneer projects that are designed to restore lost land management traditions that also support the local economy and landscape/wildlife objectives. Not surprisingly, then, many Protected Landscapes have led the way with work in this area.

Management policies and practices

There is now a growing awareness that the conservation of wild biodiversity and landscape quality to a large degree depends on the continuation of traditional agricultural practices, and often the conservation of agrobiodiversity as well (see diagram below). This is illustrated by a number of mini case studies below. These describe (i) efforts to conserve and encourage past agrobiodiversity traditions, (ii) efforts to revive them, and (iii) the potential for more such initiatives in the future.



The links between three kinds of conservation

(i) On-going traditions

New Forest Pannage Pork

One of the best examples of a strong link between landscape, the conservation of wild biodiversity, and the maintenance of a long established land management system, are the pigs of the recently established New Forest National Park. The New Forest is a Royal Hunting Forest of eleventh century origin, still largely owned by the Crown. Over the past 900 years the open heathland and ancient woodland of the Forest have been managed as common land and grazed mainly by cattle, donkeys and a local breed of pony. As a result, the Forest is the largest site in western Europe where lowland heathland, grassland, mire, and pasture woodland habitats survive together in what is a functioning ecosystem based on a continuing practice of pastoralism. Most of it is designated as a European Special Area of Conservation. The survival of the area's important ecology depends on the continuation of the grazing system.

New Forest pigs (which are traditional native breeds) play a critical part in this finely balanced management system. As part of their historic rights, commoners are entitled to put their pigs out on the Forest for the 60-day autumn 'pannage' season to forage acorns and beechmast. For centuries, these pigs have worn nose rings to prevent them uprooting vegetation which provides the food source for the other grazing commons animals.

New Forest Pigs

Photo: Forest Friendly Farming Project

Herdwick Sheep on the Lake District Fells

Photo: The National Trust

Acorns and beech mast are poisonous to other grazing animals of the Forest, so the pigs ensure the continued safe grazing of the Forest. They also prevent the development of thickets of oak and beech saplings beneath the woodland canopy, keeping open certain areas that are needed if the diverse flora of the forest floor is to survive.

In the 19th century up to 6,000 pigs were put out annually, but now the figure is nearer 200. In recognition of the pigs' vital role, the New Forest National Park Authority aims to encourage more commoners to keep traditional pig varieties, in particular by developing a high value market for New Forest 'pannage pork', as part of a wider New Forest Friendly Farming Initiative. The ham from pannage pork has a very distinct bittersweet flavour, not dissimilar to Parma ham, reflecting the animal's diet of acorns and beechmast.

Herdwick Sheep

The Lake District National Park contains England's largest lakes and highest mountains and open fell, and has been proposed as a World Heritage Cultural Landscape. The local sheep breed, the Herdwick[11], is one of the hardiest British sheep breeds, able to survive on the scantiest of herbage and in the severest of weathers. Its grazing is vital to maintaining the open fells. In a sense, it created and maintains the Lakeland landscape that captured the imagination of Wordsworth, Ruskin and Beatrix Potter. With its distinctive grey fleece, white head and sturdy white legs, the Herdwick is also a unique feature of the Lake District landscape.

Typical Lakeland farms have less than 35 ha of the lower lying, more productive land and have to rely on larger areas of common grazing on the high fells. The Herdwick is very territorial and the lambs that graze with their mothers on common land attached to their farm, known as the 'heaf' (or heft), are instilled with a life long knowledge of where they should graze. So close are these bonds between locality and individual sheep that when a Lakeland farm changes hands, the 'heafed' (or hefted) flock is sold along with the land or passed on to the incoming tenant.

In the mid 1800s, the Herdwick was found over much of Cumbria but is now confined to the central and western Lakeland fells. Its survival owes much to the children's writer Beatrix Potter whose stories were inspired by the natural history of the Lake District. In collaboration with the National Trust, she acquired farms and their associated flocks of Herdwick sheep. At her death in 1943, she left 14 farms and over 1700 ha of land to the Trust, stipulating that the sheep run on these hill farms should be pure-bred Herdwick. The Trust has honoured these wishes and now owns 91 hill farms, many of which have mainly Herdwick flocks (approximately 21,000 sheep). This represents a significant total of the remaining 120 Lake District farms running commercial Herdwick flocks - most others having switched to more commercial sheep breeds.

Changes to the CAP, introduced in 2005, led to a significant fall in support for upland farming. If these upland farms are to survive, therefore, new high value markets for Herdwick products are essential. The National Trust has sought new markets for Herdwick wool (traditionally income from wool sales paid the tenant farmers' rent). The Herdwick Breeders Association, the Friends of the Lake District, the National Trust and the Lake District National Park Authority have come together to form a direct marketing scheme for Herdwick meat (lamb and mutton) (National Trust 2006). The combination of the Herdwick's frugal moorland diet, slow growth and slow lambing rate gives the meat a distinct, gamey flavour, now increasingly prized in specialist food markets. Producers under the scheme must be members of the Herdwick Sheep Breeders Association and must be signed up to a Lake District agri-environmental scheme as evidence of their environmental commitment. The National Trust has also appointed a Herdwick Project Officer to raise the profile of Herdwick products and to help expand the businesses of individual Trust tenants.

Kentish Cobnuts

Photo: Tina Stellar (copyright: Natural England)

Lyth Valley Damsons in Blossom

Photo: Peter Burbridge (copyright Natural England)

Kentish cobnuts

The Kentish cobnut has been a long established feature of the Kent Downs AONB. Hazel (*Corylus avellana)* is a native, small multi-stem tree found throughout England in hedgerows and as part of the woodland understorey. Throughout history, it has been coppiced to provide woody stems for hurdle making and its hazelnuts have been harvested for food. Cultivation of hazelnuts from the 16th century, however, used a species from southern Europe – *Corylus maxima* – known as Filberts, which is distinguished from the native hazel by the length of its husk. Kent was already famous for its Filberts by the 1650s and three or four varieties were grown. These were displaced about two hundred years ago by an improved variety: Lambert's Filbert which (inaccurately) became known as the Kentish Cobnut.

By the early 20th century, nearly 2000 ha were under cobnut production, mainly in Kent, with the cobnuts grown in orchards, or 'platts', as 4 metre-high coppice trees planted in rows, often with grazed grassland beneath. These platts were a distinctive and attractive feature of the Kentish landscape but were already in decline by the Second World War because of the labour needed to pick and prune them by hand. Most of the platts that remain have been replanted with bush varieties that can be pruned and harvested mechanically.

Recognising the unique character and genetic importance of the traditional platts, the Kent Downs AONB Unit is working with others to raise awareness of this traditional land management system and to bring derelict platts back under management. They have developed walks around some traditional platts and support the restoration of those in private ownership.

Lyth Valley Damson

Of equally long tradition is the Lyth Valley Damson[12] which grows in profusion in just two valleys on the edge of the Lake District National Park, in the Lyth and Winster Valleys, giving both valleys a special sense of place. The damson is a member of the plum family. It is smaller than other plums and damsons grown in the UK, but has an incomparable flavour. Known locally as Witherslacks (after the name of a local village), the fruit is used in many local recipes. Traditionally, damson trees were planted as linear orchards along field boundaries, with small orchards in field corners and near farmsteads. In April the orchards and hedgerows of the two valleys are filled with white blossom which, at the height of damson growing in the 1930s, attracted people from all over Lancashire on 'Damson Sunday'. Indeed, the whole community was involved in damson picking and the nearby town of Kendal was the centre of damson marketing. A shortage of sugar and manpower in the Second World War caused its demise. Decline set in: where there were maybe 40,000 damson trees 60 years earlier, only 4,000 had survived by 1995. Local people have now formed a Westmorland Damson Association to preserve the damson orchards. With EU support, the association is reviving local outlets for damson products, such as damson jams, preserves, ice cream, gin and beer. With the support of Natural England and funds from the new Environmental Stewardship scheme, it is helping to replant the linear and field corner damson orchards as a contribution to restoring the local landscape.

(ii) Return to traditions

South Downs Lamb

The late 18th century saw the introduction of the Southdown, a new breed of sheep, bred specifically for the South Downs[13]. This was the heyday of 'New Farming' – a sheep/corn husbandry system. By day, vast shepherded flocks grazed the eastern chalk downs and other sheep walks; at night, the sheep were taken down onto lower-lying crop fields to add manure. The resulting lowered fertility of the chalk pastures favoured a herb-rich grassland of great floristic variety. Thus the land use system created areas of great biodiversity value. It also created a highly distinctive landscape with the sward (expanse of short grass) revealing every fold and undulation

South Downs sheep grazing chalk grasslands

Photo: P. Greenhalf (copyright Natural England)

Limestone country beef: Blue-Grey Breed of cattle

Photo copyright Robert Goodison

in the dramatic chalk topography, stretching for many miles, uninterrupted by hedgerows or any other form of enclosure.

Chalk grassland is one of the defining characteristics of the South Downs landscape. Yet most of it has been lost to arable production. By 2005, only 4,000 ha of semi-natural chalk grassland remained in the South Downs, largely as fragments on steeper slopes, and covering just 6% of the chalk outcrop. The draft Management Plan (South Downs Joint Committee 2006) for the South Downs has a target to revert 8,000 ha of arable land to chalk grassland over the next five years. Success will depend upon targeting agri-environment scheme payments, and on appropriate management through sheep grazing. The South Downs Joint Committee[14] is promoting a premium market for lamb raised on the chalk grasslands, in order to to provide an economic rationale for the re-creation of chalk grassland and its subsequent management, thus re-establishing the links between wild biodiversity and agrobiodiversity, and the links between landscape, breed and place. All lambs sold through the scheme must be sired by either a Southdown or Hampshire Down ram. A practical dilemma facing this and similar schemes is that the traditional grazing systems were founded on wool production, with mutton as a by-product. But the wool market has declined and most consumers now prefer lamb. So the challenge is to emulate the extensive grazing of the past, monitor and refine grazing patterns to maximise biodiversity, and produce good quality lamb for the market.

Limestone Country Beef

The limestone karst landscapes of the Yorkshire Dales National Park contain an internationally important mosaic of semi-natural habitats, especially large expanses of limestone grasslands rich in lime-loving grasses and wildflowers, and limestone pavements. A mixture of sheep and hardy upland cattle breeds used to graze these landscapes, helping to maintain the rich biodiversity of the area. Over the last 40 years there has been a change from cattle, the most suitable grazing stock for conservation management purposes, to more intensive sheep enterprises, combined with a general increase in stock numbers. This has resulted in a decline in the conservation value of the vegetation associated with karst and limestone pavements, with extensive colonisation by invasive grass species. The Limestone Country Project has been set up to counter this trend, initially with EU funding and covering 11,000 ha. The National Park Authority and Natural England are key project partners. The project aims to encourage local graziers to take on hardy traditional cattle breeds best suited to grazing regimes that help restore biodiversity: the Beef Shorthorn and Blue-Grey (which are traditional to the area) and other traditional English and Scottish breeds.

As a result, some 300 – 500 cattle from 16 farms now graze within the project area. They must spend at least one and preferably two years grazing within the project area. Grazing generally runs from July to December, after the most important plant species have flowered, though experimentation suggests that grazing throughout the winter can suppress invasive grasses. When not within the project area, the cattle are over-wintered on other pastures covered by agri-environment agreements. Following these strict requirements, the beef can be marketed as 'Limestone Country Beef', promoting its superior and distinctive taste and depth of flavour. Although not all the breeds used currently are traditionally local to the area, greater emphasis may be placed on this in the future if the project seeks European Protected Food Name Status, a designation that demands proof of the traditional nature and authenticity of the food, and promotes a strong link to locality.

Other grazing projects

Other examples of Protected Landscape projects that use traditional breeds to enhance biodiversity are: Northumberland Dune Grassland Lamb and Beef (Northumberland Coast AONB), Cotswolds Beef (grazing the limestone grasslands of the AONB), High Weald Lamb and Beef (grazing lowland heathland in the High

Weald AONB), Three Harbours Beef (taking in the coastal grazing marshes of Chichester Harbour AONB), and Wash Saltmarsh Beef (grazing salt marshes of international importance, including parts of the North Norfolk AONB). The Red Poll, a traditional cattle breed of Norfolk and Suffolk, is well suited to grazing salt marsh and wet pasture, and is being used for conservation grazing within the Norfolk and Suffolk Coast AONBs. Sussex Cattle, which are tough, all-year-round feeders, are once again grazing semi-natural pastures in the High Weald AONB and the remnant chalk grasslands of the Sussex Downs AONB.

Apple varieties

Inspired by the charity Common Ground, which is dedicated to the celebration of locality, there are now many initiatives across England exploring and celebrating England's traditional apple heritage, not least in many Protected Landscapes. Arnside and Silverdale AONB, Dorset AONB, Shropshire Hills AONB and South Devon AONB all support the conservation of local apple varieties through the development of nurseries for local varieties, grant and advice schemes to create and manage orchards, and training programmes on traditional orchard management. More recently, a not-for-profit company, Orchard Link, has been established to promote and celebrate local varieties through local festivals and 'Apple Days', to offer advice and training, to pool equipment, and to undertake group marketing of local apple varieties. The best example may be the Tamar Valley AONB in Cornwall. This area has a long tradition of market gardening and in its heyday was covered with orchards and plots growing daffodils, strawberries and cherries. Now several initiatives are underway to ensure the recording and conservation of the Tamar Valley's unique orchard varieties. This includes the development of a reference database of Tamar orchard tree varieties and the establishment, in association with the National Trust, of a 'Mother Orchard' as a permanent home for varieties specific to the Tamar Valley such as the Blackamoor Red, Breadfruit, Colloggett Pippin, Improved Keswick, Onion Redstreak, Queenie, Snell's Glass Apple and Tan Harvey.

(iii) Traditions waiting to be reawakened

There are many other local agrobiodiversity traditions that could be reawakened. Aylesbury Ducks once grazed the plum orchards at the foot of the Chilterns. Pigs were once an equally common sight, foraging fallen fruit in orchards; the Gloucestershire Old Spot pig is said to taste of apples from eating the fallen fruit. There is a surge in interest in the keeping of geese, which were traditionally grazed in orchards and fattened on autumn stubbles. The authorities that run many AONBs and NPs could take a lead in reinstating such local traditions that have the potential to help conserve agrobiodiversity and re-establish the link between farming and the conservation of valued landscape and wildlife.

Traditional Apple Orchards in South Devon
copyright Jason Mitchell

Key challenges and threats

Different objectives

As illustrated through the fruit examples above, there is now a strong effort to maintain the gene pool of traditional varieties and to recognise the unique landscape contribution of traditional orchards. With the exception of the Herdwick, which is being conserved for its own value, most Protected Landscape projects involving the conservation of animal breeds have been driven by a concern for wild biodiversity, since its conservation is often best achieved through the use of traditional cattle and sheep breeds.

The aims of breed societies are different. They wish to build up breed populations in different locations, outside their traditional range, to ensure that if one population is threatened, there are others to carry on the genetic line. The need for this was graphically illustrated by the effects of the Foot and Mouth Disease outbreak in England in 2001: the disease threatened to wipe out the Herdwick population of the Lake District, and with it the instinctive territorial behaviour of the individual farm flocks, as well as the basis of much land management within the Lake District National Park. Thus, while there is a need to conserve breeds within their traditional range, especially where they have formed a part of traditional agrobiodiversity systems over generations, it may also be necessary to ensure their survival by breeding them elsewhere.

For farmers, other issues arise. Thus the focus of agri-environment schemes on the conservation of wild biodiversity and landscape (largely ignoring agrobiodiversity) has, in a number of upland Protected Landscapes, helped to undermine farming traditions that once sustained these landscapes and their biodiversity. For example, some agri-environment schemes required the complete removal of all stock from open moorland in winter. While this allowed the recovery of overgrazed vegetation, some graziers either gave up stock rearing altogether or sold their hardy traditional cattle breeds, suited to grazing the moorland year round, and replaced them with continental breeds, which have to be kept indoors over winter. So the traditional stock was lost just when it was needed to help manage the recovering vegetation. Clearly the integration of farming with other land management objectives still has some way to go.

Changing cultural expectations

The conservation of agrobiodiversity is threatened by the disassociation of most of the British population from the source of their food. Supermarkets dominate food sales, selling a higher proportion of imported foods and ready-made meals. Gone, therefore, are the associations between people, their local environment, and the production of local food suited to local conditions. There is poor understanding of how food production influences the quality of the environment both positively and negatively. Domestic cooking skills associated with many of these unique products have been largely lost. Yet, as the case studies show, many local projects are developing new niche markets for the products of traditional breeds and varieties that can help maintain both wild biodiversity and landscape, and revive local cultural tradition. Such markets are needed to provide an economic rationale for traditional forms of production.

Success, however, depends upon overcoming poor public understanding about the importance of local foods. Therefore many projects contain strong awareness-raising campaigns, focusing on the quality of the food product and the benefits it brings for the wider environment. There are now some signs that public opinion is becoming more conscious of the importance of local food, but the message needs to be seen to be coming more from mainstream economic bodies, such as the regional development agencies.

Technical and skills issues

Centralisation and industrialisation of agriculture have led to a loss of traditional agricultural skills such as shepherding, and of the necessary support services, such as local vets and abattoirs suited to the slaughter of a relatively small number of animals at a time. In many Protected Landscapes this has become a serious concern; some national park authorities are working with other bodies to secure the future of small and medium abattoirs and similar facilities.

As the number of people engaged in agriculture declines, rural traditions, cultures and ways of life passed on from generation to generation are put at risk. In the Lake District, the National Trust faces a dilemma in seeking new tenants for their hill farms: should they favour the few sons and daughters of local families that still want to go into farming, brought up in the traditions of the place but unlikely to have gone to agricultural college? Or should they prefer newcomers with business and environmental training more relevant to the agricultural agenda of today?

Some NPs and AONBs have sought to counter this loss of local cultural traditions by the development of oral history projects. In the Tamar Valley AONB, for example, the Cornish Audio Visual Archive is creating an audio-visual history of the area that traces its horticultural past.

International changes

While systems of local food production celebrate the differences borne of local environmental conditions and the use of local genetic livestock, fruit and crops, they are challenged by the forces of world trade in food commodities that favour large scale production and standardisation. The effects of climate change may encourage the wider use of continental breeds and varieties acclimatised to warmer conditions. Yet it is important not to dismiss the genetic stock of English varieties and breeds: for example, the thick lanolin that is found in Herdwick wool helps protect this breed from the effects of wetter winters that will come with climate change.

Recommendations

In 2004, the parties to the CBD adopted Decision COP VII/3 on Agricultural Biological Diversity, which, inter alia, called on governments to "…. *consider and promote… the mainstreaming of agricultural biodiversity in their plans, programmes and strategies ….".* In response, the UK Government produced a UK National Action Plan on Farm Animal Genetic Resources (National Steering Committee for Farm Animal Genetic Resources 2006). Recommendation 20 of this Action Plan says that: *"Defra ... should identify opportunities within existing and developing national and EU legislation, ... to encourage the use of farm animal genetic resources that are fit for purpose in delivering complementary policy objectives".* An example of this would be the use of traditional breeds that deliver biodiversity conservation and landscape protection in Protected Landscapes.

This sets the scene for the recommendations that follow. Although addressed to appropriate national and local bodies in England, potentially they have wider relevance:

Different objectives

I. Design conservation projects in Protected Landscapes that focus on the links between the conservation of wild biodiversity and agrobiodiversity. Measures taken in support of landscape and wild biodiversity conservation should not jeopardise traditional farming systems on which the conservation of wild biodiversity depends.

II. Ensure that Environmental Stewardship supports the conservation of agrobiodiversity where this is clearly needed to deliver the conservation of landscape and wild biodiversity.

III. Support local foods reliant on traditional breeds and varieties that also bring clear landscape and wider environmental benefits, especially within Protected Landscapes.

IV. Support action-focused research into the connection between the conservation of agrobiodiversity and wild biodiversity.

Changing cultural expectations

V. Raise public awareness of the links between the food we eat and the landscapes we love, and especially the role of traditional agricultural practices in maintaining the English landscape.

VI. Help rekindle interest in traditional foods (strengthening the economic rationale for agrobiodiversity), especially those that bring conservation benefits but have fallen out of fashion (mutton would be a case in point).

Technical and skills issues

VII. Support the infrastructure needed to maintain traditional agrobiodiversity, especially low throughput and mobile abattoirs.

VIII. Record and celebrate the cultural traditions associated with agrobiodiversity and traditional forms of land management.

International changes

IX. Support research into the likely effects of climate change on the agrobiodiversity of England, especially the agrobiodiversity of the Protected Landscapes of England.

Conclusion

This national case study shows that the loss of local breeds and varieties reflects wider trends in society, affecting both the production and consumption of food. It shows too that the conservation of agrobiodiversity is a complex challenge with close links to the protection of landscape, wildlife and cultural traditions. While Protected Landscapes are only a part of this wider story, they offer the potential to pioneer approaches to farming and land management that favour the conservation of agrobiodiversity as part of broader conservation strategies – and hence to be models from which lessons can be drawn for application elsewhere.

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1 This case study is specific to England. No conclusions are implied for other parts of the UK.

2 Including the Broads, a wetland area with status similar to a national park.

3 One AONB is shared with Wales.

4 The Broads have an additional statutory duty for navigation.

5 Again, different arrangements apply to the Broads.

6 Natural England was set up in 2006, formed by a merger of the former English Nature, Countryside Agency and part of the Rural Development Service.

7 The Cotswolds and the Chilterns AONBs.

8 Much of the remainder of this paper draws on material collected for a major research study undertaken by Land Use Consultants (2006) for the Countryside Agency (now Natural England), looking at the relationship between locality foods and landscape character in England.

9 'Traditional' in this context refers to farming systems that have developed over many centuries, are adapted to local conditions, and are often operated at a small rather than an industrial scale.

10 Subject to the outcome of a Ministerial decision.

11 The name Herdwick is thought to derive from Old Norse herd-vik, meaning sheep farm.

12 The word damson derives from the Latin prunum damascunum, "plum of Damascus", as it was believed to have originated from near that city. It is said that the Crusaders brought back damson stones to try growing them in England, though damson trees are often found around Roman camp sites, suggesting an earlier date of arrival.

13 Today this area is already in two AONBs and is now proposed as a key part of a new South Downs National Park.

14 The management body for the two AONBs that make up the proposed South Downs National Park: the Sussex Downs AONB and the East Hampshire AONB.

Acronyms

AONB Area of Outstanding Natural Beauty
CAP Common Agricultural Policy (of the European Union)
CBD Convention on Biological Diversity
Defra Department of Environment, Food and Rural Affairs
NP National Park

Glossary of local terms

Beechmast
the seed of the beech tree
Chalk
a soft, white limestone of the Cretaceous period, found in southern and eastern England
Cider
an alcoholic drink made from apples
Cobnut
cultivated hazelnuts
Common
an area of privately or publicly owned grazing land and /or woodland where surrounding farmers/small-holders (commoners) have long established 'common rights' to graze livestock, gather firewood etc.
Coppice
a traditional form of woodland management in which understorey trees and shrubs are cut down to base on a regular 'coppice cycle' of 7–25 years and allowed to re-sprout to produce coppice poles suitable for fencing, fire wood and many other uses
Downs
hills of chalk (q.v.)
Ewe
female sheep
Fells
the hills and mountains of Northern England
Heft/heaf
An area of upland common land that is traditionally used by a particular farm, and on which the sheep of that farm instinctively remain
Mutton
the meat of a mature sheep
Pannage
the practice of turning out domestic pigs in a wood or forest to feed on fallen acorns, beechmast (q.v.), etc.
Platts
orchards of cobnuts (q.v.) or hazelnuts

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Community conservation of agrobiodiversity in and around protected areas: Experiences from western Nepal

Resham Gautam, Bimal Raj Regmi, Pitambar Shrestha, Diwakar Poudel and Pratap Shrestha

Summary

Conservation of forest and wildlife biodiversity has been the focus of the government within protected areas. The current conservation approach of biodiversity does not take account of the potential role of agricultural biodiversity. It is thus necessary to adapt landscape-level biodiversity conservation approaches to address the issues of increasing human pressure on the ecosystem and unsustainable exploitation of natural resources to meet their diverse livelihood needs. In this context, conservation is extended beyond the boundary of protected areas to cover larger landscapes with different land use systems. The role of communities in biodiversity conservation, especially in agrobiodiversity conservation, is vital. Western Terai Landscape Complex (WTLC) project has initiated community based conservation of biodiversity in protected areas, buffer zones and productive landscapes of Bardiya, Kailali and Kanchanpur districts of Western Nepal. The agrobiodiversity component of the project has focused on empowering community-based organizations to take the lead in the conservation and sustainable management of agrobiodiversity for sustained livelihoods. The experiences from this project suggest that the government should formulate policies regarding landscape-level conservation of biodiversity through collective community action.

Background

Landscape-level conservation is a new paradigm in the conservation of biodiversity and natural resource management, crafted to address the issues of increasing human pressure on the ecosystem and unsustainable exploitation of natural resources to meet their diverse livelihood needs. In this context, conservation is extended beyond the boundary of protected areas to cover larger landscapes with different land use systems.

The Western Terai Landscape Complex (WTLC) stretches from Bardia National Park in the east to Suklaphanta Wildlife Reserves in the west, covering a total area of 3,466 sq km in the three western districts (Bardia, Kailali and Kanchanpur) of the southern plain

Grassland and forest interface.

Photo: Li-Bird

area of Nepal, sharing borders with India in the south and west (See page 132). The area lies in Terai Duar Savanna Grassland Ecoregion, one of WWF's Global 200 eco-regions. The area comprises two distinct topographical zones: the lowland Terai in the south, where altitudes range from 100-300 m; and the Churia hills in the north, where the highest altitude is about 1800 m. Approximately 60% of the WTLC area is covered with tropical and sub-tropical forest, with the forests of the Churia range remaining largely undisturbed. The Churia hill range is the youngest component of the Himalayan chain and is particularly fragile and susceptible to erosion and landslides. It also harbours high biodiversity values, forms part of a habitat network of flagship species, and serves as a critical water catchments area for the lowland Terai. It also provides productive agricultural land for a population of over 1.3 million.

Slightly less than half of the total area of the WTLC is occupied by national parks, wildlife reserves and associated buffer zone areas. The two government-managed protected areas within the WTLC are: Bardia National Park and Suklaphanta Wildlife Reserve, which are classified as Category II of the IUCN classification of protected areas. However, the fact that many of these protected areas encompass landscapes with a long history of human management, including farmlands and settlements, and that management approaches are based on involving local people in conservation, indicates that at least portions of these protected areas are being managed in a manner consistent with Category V. Further, as Budhathoki has written, complex landscape-scale initiatives in Nepal, such as the WTLC, have adopted a protected landscape approach, relying on principles of inclusion, partnership and linkages in order to achieve large spatial coverage across a mosaic of land use practices (Budhathoki 2005). From the point of view of agricultural biodiversity conservation, the Churia hills in the north are highly critical. This is because continuous community management of the area's agrobiodiversity is necessary to fulfil the requirements of the ever increasing human population, and the accelerated pressure on the natural resources.

With an aim to develop replicable landscape-level management models to safeguard the biological wealth and vital ecological functions, the Western Terai Landscape Complex project was launched in August 2005. This eight-year project is being implemented in partnership with the Global Environment Facility (GEF) of the United Nations Development Programme (UNDP), Ministry of Forest and Soil Conservation (MFSC) of the Government of Nepal, Netherlands Development Organisation (SNV) Nepal, World Wide Fund for Nature (WWF), Bioversity International, Nepal Agricultural Research Council (NARC), and Local Initiatives for Biodiversity, Research and Development (LI-BIRD). The project is being implemented at the landscape-level covering three western Terai disctricts of Nepal, viz. Kanchanpur, Kailali and Bardia. The project intervention focuses on protected areas, government-managed forest and the productive landscapes (i.e. landscapes with mainly agricultural activities). LI-BIRD, in partnership with Bioversity International and NARC, is leading the agricultural biodiversity component of the project.

Key features of Western Terai Landscape Complex areas

Wildlife diversity

The Western Terai Landscape Complex is a globally significant area with regard to both its faunal and floral diversity. It is home to many threatened wildlife species, including: tiger (*Panthera tigris*), rhinoceros (*Rhinoceros unicornis*), Asian elephant (*Elephas maximus*), swamp deer (*Cervus duvaucelli*), black buck (*Antilope cervicapra*), four-horned antelope (*Teracerus quadricornis*), Indian fox (*Vulpes bengalensis*), wild dog (*Cuon alpinus*), sloth bear (*Melursus ursinus*), hispid hare (*Caprolagus hispidus*), Gangetic dolphin (*Platanista gangetica*), lesser adjutant stork (*Leptoptilos javanicus*), lesser florican (*Sypheotides indica*), mugger crocodile (*Crocodylus palustris*), gharial (*Gavialis gangeticus*), and Asiatic rock python (*Python molurus*).

Forest diversity

The Western Terai Landscape Complex has various types of forest representation: the dominant and commercially valuable *Sal* (*Shorea robusta*) forest, tropical deciduous riverine forest, tropical evergreen forest (*Terminalia* forest, *Dalbergia sisso, Acacia catechu* forest), and subtropical deciduous hill forest (*Pinus roxburghii* forest).

It is estimated that the WTLC may have about 900 species of vascular plants, out of which 455 species have been recorded. There are 96 tree species, 82 shrub species, 14 species of climbers and 263 herb species. The forest is dominated by *Sal* and *Saj* (*Terminalia alata*). Extensive grasslands are another important vegetation type found here, particularly within Bardia National Park and Suklaphanta Wildlife Reserves, dominated by *Imperata cylindrica* and *Heteropogon contortus* species. Plant species which are at different levels of threat include: *Shorea robusta, Pandanus nepalensis, Calamus acanthospathus, C. tenuis, Rauwolfia serpentina, Oroxylum indicum, Pterocarpus marsupium, Acacia catechu, Aerides multifolia,* and *Ascocentrum ampullaceum.*

Wetlands and diversity

There are 79 wetlands in the Western Terai Landscape Complex. One of the most important is Ghodaghodi lake, a network of nine lakes with an area of 138 ha. The Ghodaghodi lake, also declared as a Ramsar site, is considered internationally important as it harbours 34 species of mammals, 140 species of birds (including migratory birds), 27 species of fish and 244 plant species.

Agricultural biodiversity

More than 80% of the people in the project area are involved in agriculture. The landscape is rich in agricultural biodiversity, which is reflected in the prevalence of a wide range of food crops, vegetables, fruits and animal species and their varieties/breeds. The farming in the area is largely subsistence-oriented, characterised by small family farms, production mainly for household consumption and with little integration with the market economy, and wide use of local crop varieties/landraces and animal breeds. Locally adapted *Tilaki, Kanakjeera, Anadi* and *Shyamjeera* are popular high quality and unique rice landraces prevailing in the area. Seventeen different varieties of rice are found in the area. There are indigenous animals like dwarf pig, chicken, goats, buffalo, cow, etc. The area is also rich in wild food crop diversity and animal genetic resources (Table 1). However, population sizes of both crop species and livestock breeds are decreasing because of poor production potential, introduction of modern breeds and lack of policy and market incentives. Increased human population pressure, continuing poverty, land degradation, environmental change, and indiscriminate introduction of modern crop varieties, animal breeds and farming technologies have contributed to the erosion of genetic resources in the area.

Paddy field within the buffer zone of Bardiya National Park.

Photo: Li-Bird

Table 1

Key species and their diversity in the WTLC area

Crops	Rice: 17 local varieties of rice including wild rice (*Oryza rufipogan*) Finger Millet (3 varieties of finger millet) Pigeon Pea (2 varieties)
Vegetables	Potato, Cucurbits
Fruits	Mango, Papaya, Banana
Wild fruits	*Aegle marmelos*
Wild crops	Mushroom, Asparagus
Animals	Bampudke Sungur (Dwarf Pig), Local Chicken, Buffaloes and Cow
Medicinal Plants	Amala (*Emblica officinalis*), Harro (*Terminalia chebula)*, Barro (*Terminalia bellerica)*

Case study sites

For the purpose of this case study, Belwa (Bardia), Gadaria (Kailali), and Shankarpur (Kanchanpur) of the western Terai area were identified. The criteria for identifying the study sites (see Map) were as follows:

- Presence of protected forests, buffer zones and productive areas
- Rich agrobiodiversity and associated genetic diversity
- Proximity to corridors for forest connectivity
- Community involvement in biodiversity conservation

The site selection was jointly carried out by representatives of district-level government line agencies (DADO and DLSO) and the LI-BIRD team, with technical guidance from Biodiversity International (formerly known as International Plant Genetic Resources Institute - IPGRI). Before designing the site selection process, a joint meeting with the WTLC project personnel was held to capture other aspects of the project besides agricultural biodiversity. The team then developed a checklist for collecting relevant information on agricultural biodiversity. More specifically, the checklist included questions that would elicit information about available local crops, vegetables, animals and fruits, as well as existing community initiatives and actions taken towards biodiversity conservation.

Features of the study sites

Ethnic composition

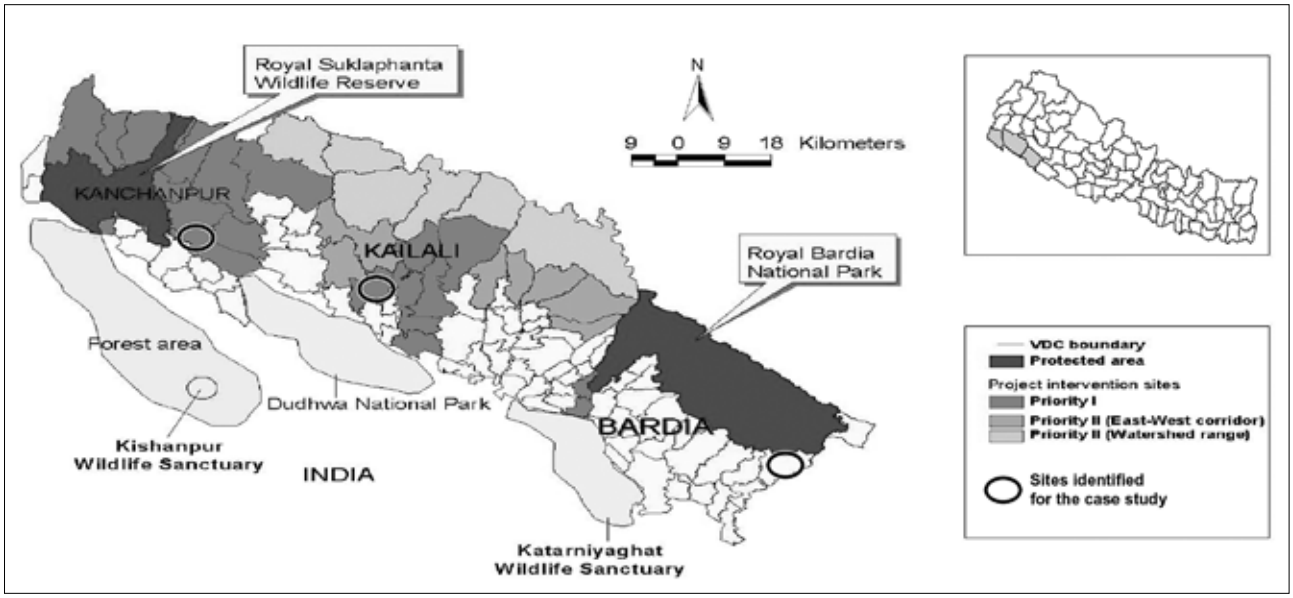
The study sites are largely dominated by the Tharu community (except in Belwa, where all the ethnic groups are more or less evenly distributed), followed by Brahmin, Chhetri, and other ethnic groups (Table 2). Tharus are

Table 2
Ethnic composition of study sites

District	VDC	Number of households by ethnicity			Total number of Households
		Tharu	Brahmin/Chhetri	Others	
Bardia	Belwa	739 (37)	635 (32)	609 (31)	1,983
Kailali	Gadariya	1,099 (95)	35 (3)	23 (2)	1,157
Kanchanpur	Shankarpur	609 (80)	76 (10)	76 (10)	761

VDC = Village Development Committee (the smallest political unit in Nepal)
Others = Bishwakarma, Kami, Damai, Sarki, Magar, Gurung, Newar, Tamang, etc.
Figures in parenthesis indicated the percentage of different ethnicities in the VDC.

Map
Biodiversity landscape in Western Terai Landscape Complex (Priority project intervention sites)



an indigenous ethnic community; they dominate in the plain areas of western Nepal, and are dependent mainly on agriculture for their livelihoods. They have a rich food culture, and therefore maintain a high diversity of crops, vegetables, fruits, and domesticated mammals and birds. The agrobiodiversity is relatively higher in Tharu-dominated areas as compared to the areas with migrant people from the hills and elsewhere.

Land holdings and land use systems

The agricultural production system in the area is largely crop-based, with different degrees of integration with livestock, forests, and other natural resources. The land is therefore regarded as the principal asset for local livelihoods. A majority of the farmers in the area, however, are smallholders with less than 1 bigha (0.66 ha) of landholding (Table 3). Because of skewed land distribution, different forms of land tenure systems (renting of cultivated land) also exist in the area. The major types of land use systems are *Khet*, *Bari*, forest land, and pasture land. The percentage of *Khet* is higher in most of the VDCs (Table 4).

Cropping patterns

Farmers grow rice, wheat, maize, potato, lentil and vegetables in combination, and have a minimum fallow period. There are different cropping patterns observed in *Khet* and *Bari* land at the study sites (Table 5).

Status of crop landraces

At all the study sites, crop landraces are still widely grown and maintained by farmers (Table 6), except in the case of wheat. The local crop varieties and landraces are well adapted to local production environments and practices. The on-farm conservation of these crops is also due to their high cultural and social values in local farming communities.

Livelihood strategies

Members of most of the households in the study area depend on agriculture for their livelihoods. Besides agriculture, engaging in wage labour in India and Nepal is a common livelihood practice in the area. Very few households are involved in business and government services (Table 7).

Since relying on agricultural production creates a food deficit, a large number of farming households are also dependent on wild foods, fruits and fodder. This is a commonly used coping mechanism in the area to tide over periods of food scarcity (Table 8).

Community actions for biodiversity conservation

The Western Terai Landscape Complex area includes protected forest areas as well as agricultural land areas that extend up to the fringes of the protected areas, known as buffer zones. The interaction of cultivated agricultural biodiversity and uncultivated forest biodiversity is highest in the buffer zone and the surrounding areas. Most of the agricultural production is confined to the private land outside the protected areas, and some is located within the buffer zones under government regulations. However, farming communities make use of the forest for resources such as fodder, fuel wood, timber and wild fruits.

Community interventions for the conservation and utilisation of agricultural biodiversity are centred on privately owned cultivated land around the protected forest areas (within the buffer zones). These areas do not fall directly under any of the IUCN-defined land use categories. The main objective of the agriculture-based interventions is to increase agricultural biodiversity on the private land, provide increased agriculture-based livelihood options, and reduce unsustainable exploitation of forest resources and other kind of pressures (grazing, encroachment) in the protected areas. In recent years, a wide range of community actions has been initiated to conserve and utilise agrobiodiversity, through agro-enterprise farmers' groups, forest users' groups, and other community-based organizations (Table 9). Building on these initiatives, LI-BIRD, in collaboration with Nepal Agricultural Research Council (NARC) and Biodiversity International, has been implementing the agrobiodiversity component of the WTLC project in the area since 2006, with funding support from GEF/ UNDP. One of the project objectives is to empower local communities to practice sustainable, biodiversity-friendly natural resource and land use management, and pursue diversified livelihoods through:

- sustainable and biodiversity-friendly management of land and natural resources, and practices to reduce pressures on wild biodiversity assets
- agrobiodiversity-oriented management of agricultural lands, and practices to maintain traditional crops and landraces
- the mainstreaming of biodiversity conservation values and practices among local communities.

A community-based biodiversity management (CBM) approach is being adopted to empower farming communities to conserve and utilise their agricultural and forest bio-resources.

Table 3
Distribution of households by land holding size in study sites

District	**VDC**	**Number of households**				
		>3 Bigha (2 ha)	**1-3 Bigha**	**<1 Bigha**	**Landless**	**Total**
Bardiya	Belwa	81	483	1,097	322	1,983
Kailali	Gadariya	63	511	578	5	1,157
Kanchanpur	Shankarpur	na	na	na	na	761
Total						**21,042**
na = data not available						

Table 4
Land use pattern in study sites

District	**VDC**	**Types of land**		
		Khet land	**Bari land**	**Forest**
Bardiya	Belwa	92%	8%	Large forest
Kailali	Gadariya	75%	25%	Large forest
Kanchanpur	Shankarpur	na	na	Large forest
na = data not available				

Table 5
Major cropping patterns in the VDC

District	**VDC**	**Major cropping pattern**	
		Khetland	**Bariland**
Bardiya	Belawa	Rice-Wheat-fallow Rice-lentil/Rape seed-fallow Rice-Potato-fallow	Maize-Rape seed/Lentil-fallow Maize-Vegetables-fallow
Kailali	Gadariya	Rice-Wheat-fallow Rice-Lentil/Rape seed-fallow Rice-Potato-fallow	Maize-Potato-fallow Maize-Vegetables-fallow
Kanchanpur	Shankarpur	Rice-Wheat-fallow Rice-Sugarcane Rice-Potato/Rape seed-fallow	Maize-Rape seed-fallow Maize-Potato/Vegetables-fallow

Table 6
Number of crop landraces grown by farmers of VDCs in the study area

		Rice	**Maize**	**Finger Millet**	**Pigeon pea**	**Black gram**	**Soy-bean**	**Pea**	**Oil seed**	**Total**
Bardiya	Belwa	9	2	2	2	-	-	1	3	**19**
Kailali	Gadariya	9	2	1	-	-	-	1	3	**16**
Kanchanpur	Shankarpur	11	2	1	1	1	1	-	1	**18**

Table 7
Distribution of households by livelihood occupation

District	VDC	Percentage of households				
		Agriculture	Wage labour in Nepal	Wage labour outside Nepal	Business	Service
Bardiya	Belwa	65	30	3	1	1
Kailali	Gadariya	80	13	3	3	1
Kanchanpur	Shankarpur	85	8	5	1	1

Table 8
Wild foods, fruits, herbs and fodder

District	VDC	Foods	Fruits	Fodder	Herbs
Bardiya	Belwa	Mushroom	na	*Saj, Jamun, Asna, Karma*, Forage *(Imperata, Saccharum)*	Asparagus
Kailali	Gadariya	Mushroom	*Kusum, Jamón (Syzizium cuminie), Amala*	*Asna, Gauja*	*Amaro, Harro, Barro,* Asparagus
Kanchanpur	Shankarpur	Mushroom, *Kudkuda, Tat (Ficus)*	*Amala, Bayar (Zuzube), Kusum*	*Asna, Gauja*	*Amaro, Harro, Barro,* Asparagus
na = data not available					

Table 9
Presence of functional Community Based Organisations (CBOs)

District	VDC	Name and scope of work
Bardiya	Belwa	Saving and credit cooperatives (5)
Kailali	Gadariya	Community forest users' groups (9), Mothers' groups, youth clubs (15)
Kanchanpur	Shankarpur	Youth clubs (5), Mothers' groups (9), Farmers' groups (9)

Community biodiversity register (CBR)

A CBR is a record of the genetic resources available in the community, including information on the community custodians, passport data, agro-ecological information, and culture and use values of the resources. This information is recorded in a register by community members. A CBR empowers the community and the local institutions to document and use information about their traditional knowledge and biodiversity, safeguards the community against bio-piracy, and helps to identify terms and conditions for benefit-sharing agreements with bio-prospectors. In all three study sites, communities have started maintaining CBRs for the above purposes.

Organisation of Diversity Fairs

To create public awareness about the value of biodiversity, a fair is regularly organised by the community in the area. Through the fair, awareness is created about local crops; the location of prime areas of diversity; identification of the key custodians of biodiversity management; the reasons for supporting conservation; the value of exchanging germplasm and associated knowledge among community members; and the value of transferring knowledge about biodiversity, its management, and its specific use value to the younger generation. The community organises the diversity fair as a cultural event with a prize-giving: the prize goes to the group that exhibits the maximum biodiversity and the highest proportion of local genetic

Many varieties of crops are offered on local markets.
Photo: Li-Bird

resources, and shares the associated knowledge and use value of the biodiversity with the largest number of fellow community members. The incentive of such social recognition encourages farmers to grow and cultivate diverse crops, and also to share their knowledge with other community members.

Participatory planning of conservation action

At each study project site, the community has formed a community biodiversity management group, chaired by an active member of the community. The community collectively identifies and assesses the biological resources available in its area through community biodiversity registration. Based on the assessment, the conservation and development activities are planned. During this process, the WTLC project staff facilitates community actions and organises a series of village-based training programmes to strengthen the capacity of community members and the community-based rural institutions. The community group actively participates in the implementation of the activity, as well as in its evaluation. The project has established a community biodiversity fund to provide incentives to the farmers so that it can support the implementation of the conservation action plans.

Utilisation of agricultural biodiversity

The WTLC project is planning to introduce the following strategies for the promotion of on-farm conservation of agricultural biodiversity in the area:

- Provide conservation incentives to the community by promoting value addition to local genetic resources (e.g. through breeding, linking with markets, awareness raising, product diversification and promotion, etc.).
- Improve the production and productivity of local genetic resources through enhancement of local genetic resources and also through development of new varieties of crops by utilising one of the local varieties as a parent. This will not only help in the conservation of local genetic resources at a gene pool level, but will also provide economic incentives for the communities.
- Linking local resource-based products with markets, thus providing direct economic incentives to the communities. For this the project has planned to build the communities' capacity for processing their products and packaging them with information on their nutritional and other values.

Key challenges and threats

Due to an ever increasing population, there has been increasing pressure on the flora and fauna of the western Terai region (WTLCP 2005). The over-extraction of forest resources has led to loss of significant biodiversity. The clearing of forests, illegal poaching and trade are the major causes of habitat destruction and decreasing wildlife populations.

The introduction of hybrid varieties has led to an excessive use of chemical fertilizers and pesticides. As a result, many local landraces are being replaced by high yielding crops. For example, the WTLC area is known for its wild paddy (*Oryza rufipogan*). Farmers know the wild rice by different names (e.g. Chingni, Chirni and Pasai), based on its morphological attributes. However, most of the government research and development activities are focused on promoting high yielding modern varieties and even hybrids. This has resulted in a sharp decline in the amount of locally adapted genetic material in the area.

There have also been increased instances of crops and houses being damaged by wildlife, and because the compensation is minimal, as compared to the damage caused, this has led to conflicts between the protected area authorities and community members in several cases. A practical and commonly agreed framework for conflict mitigation among the farmers and wildlife authorities is necessary. A number of projects have been implemented which have, to some extent, helped to raise awareness among the local communities, about the importance of protected areas. These projects have also provided some alternative livelihood options, including tourism, in the adjoining areas of the national park.

Recommendations

To promote the conservation action taken by the communities, the authors offer the following suggestions:

- Raise awareness among communities on the importance of biodiversity. Target school children by

integrating this in the academic curriculum. Similarly, raise awareness among research and development workers.
- Give emphasis on value addition of local agricultural biodiversity through breeding (adapting participatory plant breeding, enhancement of important local genotypes, etc.) and non-breeding approaches (identification and promotion of local crops by establishing market linkages).
- Build the capacity of local communities to promote value addition to local resources (in breeding as well as non-breeding approaches).
- Establish network of farmers' groups and rural institutions that are involved in conservation action, in order to institutionalise their efforts.
- Facilitate the mainstreaming of landscape-level approaches to agrobiodiversity conservation in district level planning.
- Formulate favourable government policy on agricultural biodiversity management to legalise community initiatives on biodiversity management. The project has already initiated conservation initiatives at the grassroots level. These initiatives should be legally recognised by the government.
- Conduct research to understand the links between agrobiodiversity and wild biodiversity (e.g. pollinators, pests, dispersal agents, etc.), and to strengthen such links.
- Encourage a landscape management approach, so that various elements such as forests, wetlands and agricultural systems are conserved and utilised in a holistic manner.

The government should recognise areas containing multiple governance arrangements, including government managed protected areas of Category II and VI, and community conserved areas of various categories, as Category V protected areas. Unlike forest and wildlife diversity conservation, the conservation of agriculture biodiversity (other than of wild relatives of crops and livestock) is not possible without the active involvement of human beings. It cannot therefore be achieved in strictly protected areas, such as Categories Ia, Ib and II. Therefore, it is high time for the government to identify strategies to involve the communities in direct conservation of biodiversity at the landscape-level.

Acronyms and glossary

Bari	Terraced upland area mostly without irrigation facility, not suitable for paddy cultivation
Bigha	Unit of land measurement. One bigha is equivalent to 0.66 ha.
CBO	Community Based Organisation
CBR	Community Biodiversity Register
DADO	District Agriculture Development Office/Officer
DLSO	District Livestock Development Office/Officer
GEF	Global Environment Facility
IPGRI	International Plant Genetic Resources Institute
Khet	Bunded low land area suitable for paddy cultivation with or without regular irrigation facility
LI-BIRD	Local Initiatives for Biodiversity, Research and Development
MFSC	Ministry of Forest and Soil Conservation
SNV	Netherlands Development Agency
UNDP	United Nations Development Programme
VDC	Village Development Committee
WTLC	Western Terai Landscape Complex
WWF	World Wildlife Fund for Nature

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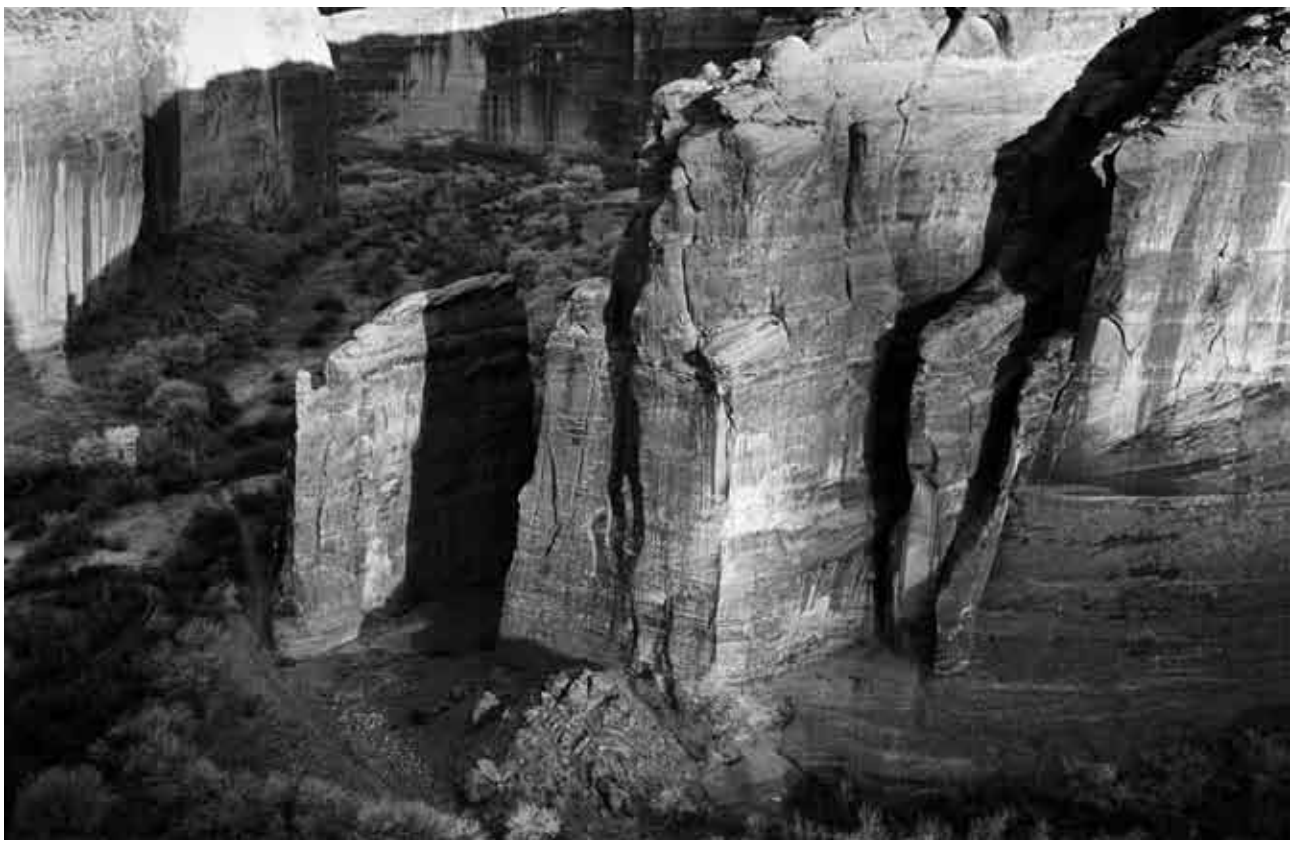
Canyon de Chelly National Monument, USA: Navajo farming traditions and agrobiodiversity

Jessica Brown, adapted from Rolf Diamant et al 2007

In Canyon de Chelly National Monument (Arizona, USA), a long history of farming by native peoples has created a rich legacy of agrobiodiversity, in particular fruit tree varieties. Native peoples – including ancestral Pueblo Indians, the Hopi, and the Navajo (Diné) – have lived in Canyon de Chelly for as long as 5,000 years. Within the steep sandstone walls of Canyon de Chelly are cliff dwellings, rock drawings, and other ancient sites that tell stories of what may be the longest continually inhabited place on the Colorado Plateau. Archeological remains and numerous pictographs illustrate and highlight a well-established livestock tradition, principally the raising of goats and sheep along with smaller numbers of cattle and horses. The ancestral Puebloan people began farming in the region 2,500 years ago. Through the centuries, native peoples cultivated a variety of fruits, some of which the Spanish introduced to the Southwest in the sixteenth and seventeenth centuries. While the agrobiodiversity values of this area have been affected by a number of factors over the past two centuries, today the Canyon de Chelly National Monument, the Navajo Nation, and other partners, are working together to restore the canyon's watersheds and other resources that support the Diné farming traditions and way of life.

Canyon de Chelly National Monument is an early example of shared stewardship and of collaborative management within the US National Park System. Established as a unit of the System in 1931, all of the monument's 83,840 acres lie within the lands of the Navajo Nation. The National Park Service and the Navajo work in partnership to manage the archeological, historical, and scientific resources and to help sustain the community of Navajo people who live and farm in the canyons today. Canyon de Chelly National Monument's management objectives and the unique qualities of this cultural landscape are in keeping with a Category V protected area.

Archeological evidence suggests that as early as the seventeenth century, the Hopi, and later the Navajo,



Canyon de Chelly National Monument (Arizona, USA) is an early example of collaborative management in which the United States National Park Service is working closely with the Navajo Nation and other partners.

Photo: Jeffrey Roberts

Planted by the Hopi, and later the Navajo people, the orchards in Canyon de Chelly include fruit tree varieties especially adapted to the conditions of the canyon valley.
Photo: Tara Travis

planted orchards in the canyons, including peach, plum, apricot and apple trees as well as grapes. The Canyon de Chelly Navajo grew and preserved peaches for food and as a trade item. At various sites, peaches were harvested by the thousands, then pitted and dried. For example, at the Standing Cow site, thousands of small pits in long mounds parallel the rock walls of the canyon, suggesting the extent of the orchards and the dried fruit trade. These fruit tree varieties are specially adapted to the conditions of a canyon valley in this area of the Colorado Plateau.

The last 150 years have seen the tumultuous destruction of the orchards, a gradual reestablishment of peach trees and, more recently, environmental deterioration and a decline in orchard productivity.

In 1864, the U.S. Cavalry removed nearly all of the Navajo from the Canyon de Chelly region in a brutal process, in which Navajo were forced to endure a 300-mile march to New Mexico. Hundreds died along the way and in the subsequent four years of Navajo incarceration. In addition, U.S. Cavalry troops destroyed the hogans, Churro sheep, and orchards that were the foundation of Diné agriculture. Army records document that approximately 4,000 fruit trees were destroyed. Four years later, in 1868, when the Navajo were finally granted sovereignty, they returned to Canyon de Chelly. They brought with them Churro sheep and replanted the orchards which have become enduring symbols of cultural survival and renewal.

Today, well over a thousand Navajo live in the canyons and farm the canyon floor, while also working in surrounding communities and providing guide services for park visitors. They tend nearly 500 heirloom fruit trees, grow corn and alfalfa, and raise cattle and Churro sheep. However, this centuries-old agriculture is endangered by widespread soil erosion, the lack of a dependable water supply, and a proliferation of exotic plants including tamarisk and Russian olive, both of which were introduced by the Soil Conservation Service in the 1930s for bank stabilization.

Two related projects, the Watershed Restoration Project and the Canyon Farm Preservation Project, are being undertaken by the Navajo Nation, Canyon de Chelly National Monument, and other partners. The aim of these projects is to revitalize canyon ecology and agriculture by addressing problems associated with exotic vegetation, wildlife and water management, and soil conservation. The long-range vision is to renew, on a more environmentally friendly and sustainable basis, traditional Navajo agricultural practices – such as Churro sheep farming and the cultivation of fruit orchards – on one of the oldest cultural landscapes in the National Park System. Over time, other opportunities may arise for activities such as agro-tourism and small scale sales of value-added products. The efforts in Canyon de Chelly, and similar work being undertaken at the Hubbell Trading Post National Historic Site (New Mexico), reflect a commitment by the National Park Service to cooperative stewardship, as summarized by ethno-historian Tara Travis:

"Considering how closely the peach trees are tied to the historical memory of the Diné at Canyon de Chelly, the National Park Service maintains a special obligation to ensure their environmental survival. These innovative projects demonstrate that efforts to document and preserve the historic farming landscape and orchards of Canyon de Chelly, can also embrace concepts that will sustain a way of life and environment well into the future." (Travis 2005).

References

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About the Author

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Protected Landscapes are a strong option for the conservation of biodiversity in landscapes and seascapes that are significantly human-influenced and inhabited. They often contain threatened or endemic species of flora and fauna, and are also critical areas for cultural sustenance. Recognized as Category V in the protected area categorization system of the IUCN, their existence is based on the interactions of people and nature over time. In many of these landscapes traditional agricultural practices sustain wild biodiversity and as well as a great range of agrobiodiversity.

The publication "Protected Landscapes and Agrobiodiversity Values" presents case studies from different parts of the world illustrating the role Protected Landscapes are playing in conserving agrobiodiversity and related knowledge and practices. A synthesis focuses on the key lessons to be learned from these case studies, analyses the strengths and weaknesses of these areas in achieving conservation goals, identifies key gaps in knowledge, and presents a glimpse of further work needed.

This publication is the first in a series on the Values of Protected Landscapes, which will explore and document the various environmental, economic, social and cultural values that Category V protected areas can provide. It is a project of the Protected Landscapes Task Force of IUCN's World Commission on Protected Areas (WCPA).

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