

## Agricultural and Settlement Frontiers in the Tropical Andes: The Páramo Belt of Northern Ecuador, 1960–1990

By María Fernanda López Sandoval. Regensburg, Germany: Regensburger Geographische Schriften, 2004. Volume 37. 180pp. €15.00. ISBN 3-88246-264-7.

This doctoral thesis addresses one of the fundamental issues and problems of many tropical mountain regions: high-altitude ecological changes and environmental degradation under the impact of expansion and intensification of agricultural activities. In the equatorial Andes of Ecuador, the ecologically sensitive herbaceous belt of the *páramos*, traditionally used for extensive pastoral activities and some field cultivation of tuber cultigens and hardy grains, has become an “active altitudinal pioneer front” (p 11).

The intensification of agricultural land use and the expansion of the agricultural and settlement frontier zone have often been attributed to rural population growth and land shortages. María Fernanda López Sandoval's research in 3 selected *páramo* regions of Northern Ecuador suggests, however, that the altitudinal frontier is not expanding in all parts of the Sierra, and that the reasons for expanding or stagnating agricultural and settlement pioneer zones are complex. The author identifies the following major factors for the altitudinal expansion of the frontiers: 1) the participation of the labor force in rural non-farm activities or as wage labor in agrarian enterprises; 2) the availability of cultivable land on former *haciendas*; 3) an expansion of the farm area for the production of cash crops; and 4) the establishment of a dwelling and/or an agricultural par-

cel to ascertain the membership of an “ethnic community” (p 143).

Whereas previous research on *páramo* environments has focused primarily on ecology and on human-induced ecological effects on these high-altitude tropical grasslands, López Sandoval's research provides new insights into these fragile environments through its focus on cultural and socioeconomic aspects and their impact on the *páramo*. The thesis is organized in 8 major chapters. An introductory chapter states the principal research and investigation targets, and introduces the northern Ecuadorian Sierra as the regional framework of the study. It also establishes the research methods and discusses basic concepts relating to the research theme. Making reference to an ample pool of scientific literature, Chapter 2 aims at providing a “state-of-the-knowledge” of the South American *páramo*, with particular attention given to the altitudinal arrangements of ecological and agropastoral zones. In Chapter 3, the 3 *páramo* research regions of El Angel, Cangahua, and West Saquisilí are introduced. Furthermore, the 2 principal field research methods are presented: 1) analysis of air photographs and remote sensing data to assess land cover and land use changes for a 3-phase period from 1956/65 to 1993; and 2) extensive fieldwork, with data collected from numerous farmer interviews and participatory field observation of farming systems.

The following major chapters examine in detail the different types of “drivers of frontier expansion” at both regional and local levels. At the regional level, the agrarian legislation and land tenure system, as well as the ensuing demographic development, are explored in a historical perspective. Among the “socioeconomic drivers” at the local level, demographic aspects, land property, and farming systems are discussed. Here, the

author proposes a 4-part typology of farming systems based on the relative emphasis of the agricultural operation on livestock and field cultivation, and of the type of cultivation practiced in the agricultural frontier zone. An additional shorter chapter addresses the spatial dimension of the agricultural and settlement frontier zone of the *páramo*. With the aid of a detailed data analysis, the 3 *páramo* study regions are compared and contrasted in their land cover and land use changes over a 30-year period. This analysis reveals that each region has different geographical and socioeconomic frameworks and driving forces, and exhibits different forms of agricultural frontiers: stagnating, contracted and expansive. The final chapters are devoted to an interpretation of the major results, particularly those relating to the land cover / land use changes, and to a general discussion of the research and general conclusions.

The thesis is complemented by 4 annexes and a glossary that includes a definition of key terms, as well as an English, German, and Spanish glossary of basic concepts. Unfortunately, the latter contains incorrect or inaccurate translations of terms into German, as well as an unacceptable number of printing or spelling mistakes. The study also includes 13 tables and the impressive number of 36 figures. The 14 multicolor supplements are of particular value: one map shows vegetation types of the Ecuadorian Sierra above 3000 m, others illustrate the development of the agricultural frontier in the 3 study areas. A model depicting the different rotation and cultivation cycles of agricultural plots in the *páramo* belt is particularly interesting. The international list of references includes 347 titles up to the publication year of 2003, featuring titles in Spanish, English, German, and French. While this is undoubtedly a laudable effort, the bibliography is not fully satisfactory, mainly because of a very inadequate

listing (only 2 titles!) of the impressive *páramo* literature in French, noticeable omissions of relevant contributions in the other languages, an incomplete list of websites, and reoccurring spelling mistakes.

Overall, this is a high-quality and innovative thesis. It is based on extensive field research on selected *páramo* regions and testifies to the author's commitment to, and enthusiasm for, these high-altitude environments and their rural livelihoods. In spite of some shortcomings and deficiencies, the book merits its wide international dissemination and recognition, as it makes a significant new contribution to the understanding of the complex ecological and socioeconomic linkages of the *páramos* of the Northern Andes over 3 decades.

**Christoph Stadel**

Department of Geography, Geology and Mineralogy, University of Salzburg, 5020 Salzburg, Austria.  
christoph.stadel@sbg.ac.at

## Managing Mountain Protected Areas: Challenges and Responses for the 21st Century

Edited by David Harmon and Graeme L. Worboys. Colledara, Italy: Andromeda Editrice, 2004. xv + 426 pp. €78.00. ISBN 88-88643-15-X.

This substantial book presents 49 papers that formed the basis of a "Mountain Protected Area Field Workshop" organized by the Mountain Biome of the World Commission on Protected Areas of The World Conservation Union (IUCN) in South Africa's uKhahlama-Drakensberg World Heritage Site in September 2003. Referring to 28 different mountain areas around the world, a collection of 49 papers is

inevitably difficult to organize into a book with consistent threads. However, the editors have made an admirable effort to group the papers into 12 broad themes, serving to highlight some of the key challenges facing mountain areas. The fact that these themes range from conservation corridors to conflict management, from cultural and spiritual values to economic benefits, from wilderness to community partnerships, is a good indication of the diverse challenges discussed.

The potential benefits of protected mountain areas to society are well articulated here and, from most of the papers, the challenges that emerge reflect a need to work across and beyond boundaries. Whether it be physical geographical boundaries, administrative and institutional boundaries, or the boundaries of knowledge, science and tradition, the collective experience in this book offers a number of responses to consider.

A broad perspective from the World Bank by Kathy MacKinnon sets out the diverse links between mountain areas and biodiversity, community development, poverty, and resource management that give rise to many of the challenges discussed, and identifies a clear rationale for society's support of mountain management in an analysis of public benefits that range from biodiversity conservation to water supply and flood control.

The opportunities of a landscape-scale approach to management are considered in 6 papers under the theme "Initiatives and issues at the landscape level." These emphasize that protected areas alone cannot deliver our full conservation needs in the long term, but that linkages between and outside protected areas are increasingly important. Looking at regions as diverse as Nepal, the Australian Alps and Alaska, these papers explore the potential in a landscape-scale approach to bring

together partnerships of communities, NGOs and government, together with the need for innovation in finding ways to manage biodiversity at a meaningful scale.

The importance of linkages is developed further in papers on the theme of "Corridors of conservation," which discuss links both in the physical landscape and with political and social institutions. Some of the conservation corridors described here—such as the Great Escarpment of Eastern Australia and the Yellowstone to Yukon initiative—stretch thousands of kilometers, across many administrative and, in some cases, national boundaries. The papers offer insights not only into the scientific basis for developing corridors, but also into the practical challenges in overlaying the boundaries of biodiversity on the boundaries of human administration. The challenges of trans-frontier cooperation are explored further in 4 papers under the theme of "Transboundary issues."

Perhaps less obvious than the physical linkages is the opportunity discussed in several papers to blur the boundaries of knowledge, particularly those between "traditional knowledge" and "science." If traditional knowledge is recognized to be not simply old, but rooted in local experience, then potential benefits to planning and management become evident. Examples of the integration of local knowledge with management are discussed in 6 papers under the theme "Partnerships for conservation and community development." From a basic recognition that public and community support is vital to the long-term success of protected areas, these go on to look at several active ways to involve local communities in management. While Thomas Cobb describes how a public consultation process influences the management plan of the Shawgunks (USA), Hernan Torres and Juan Pablo Contreras describe the recruitment of young indigenous

people as rangers in Los Flamencos National Reserve (Chile). Not only does their employment provide tangible benefits to the local community, but the rangers transmit their own understanding and knowledge of the area to their communities, building a wider network of understanding.

Another innovative approach to local involvement is described by John Peine in his paper on "Citizen Scientists." In the Appalachian Mountains of the USA, volunteers from the community and beyond can contribute to monitoring key aspects of the environment through an internet-based monitoring package. Currently being trialed on bird populations and forest health, this offers a practical way for communities to become involved in ongoing management, and to increase their awareness and understanding of key issues. Although there are many successful outcomes highlighted here, the papers give a realistic view of the challenges in breaking down boundaries with communities, and also record the occasional failure along the way.

Few challenges can be greater than working to maintain protected areas in times of political conflict, and 2 papers under the theme of "Management dealing with conflict" reflect on the impacts. Sean White describes the conflicts in Mount Elgon National Park, Uganda, following two decades of political instability when much of the area was converted to agriculture and the original boundary was no longer recognizable. Similarly, Prasad Yonzon describes the impacts of insurgency and conflict in Nepal, where protected areas are now defended by the armed forces to combat illicit felling and timber smuggling.

Many more papers explore the challenges of biodiversity conservation, cultural and spiritual values, recreation and visitor impacts, wilderness, and the economics of managing mountain protected

areas. The book does not, as the title might suggest, draw out of the papers a clear agenda of "challenges and responses for the 21st century," but to attempt a synthesis is unnecessary. The collective experience of mountain management presented here is a valuable reference of common challenges with a realistic review of some potential responses; it will undoubtedly prompt ideas in those interested and involved in managing mountains and protected areas more widely.

Silvia Benitez and Francisco Cuesta conclude their paper on the Condor Biosphere Reserve in Ecuador by resolving "not to sacrifice conservation activity for the sake of too much conservation planning." Perhaps this is one of the greatest challenges facing those managing mountain protected areas anywhere.

**Hamish Chenevix-Trench**

Cairngorms National Park Authority, 14 The Square, Grantown on Spey PH26 3HG, United Kingdom.  
HamishTrench@cairngorms.co.uk

## Cultivated Landscapes of Native Amazonia and the Andes

By William M. Denevan. New York: Oxford Geographical and Environmental Studies, Oxford University Press, 2003. Paperback edition. xxx + 396 pp. US\$60.00, £40.50. ISBN 0-19-925769-8.

In the famed tradition of the University of California's Berkeley School under the leadership of Carl O. Sauer, William M. Denevan has made, over a period of some fifty years, an outstanding contribution to the cultural geography and native "cultivated landscapes" of the tropical Andes and Amazonia. In particular, his magnificent and ground-breaking research-based and tireless field investigations on

native cultivation and its associated techniques have earned him international scholarly acclaim, and beyond that, attention and recognition from an educated society. This book is most timely and important in an age of seemingly divergent economic trends in Latin America: of profit-maximizing modern and large-scale agriculture on the one hand and, at the same time, of a search for alternative and sustainable forms of agriculture, a rediscovery of the "*saber andino*," and a return to proven traditional agricultural techniques and strategies.

The editors of the trilogy of books on cultivated landscapes, including this volume along with those by Doolittle (2001) and Whitmore and Turner (2002), must be praised for this state-of-the-art documentation and synthesis of pre-European native landscapes and traditional agricultural field systems and cultivation techniques. In Denevan's words, "we can profitably learn from the agricultural achievements of the pre-European Native Americans and their descendants" (p xv). Furthermore, the editor likes to demonstrate that native farmers "were and continue to be technologically sophisticated, diverse in field systems, ecologically knowledgeable, and substantially productive, although also capable of major environmental change" (p xv).

Denevan modestly refers to the book as being, to a large extent, a reference work, with a considerable amount of description supported by extensive references (p xv). Indeed, the reference section, listing 856 titles with contributions from many disciplines and published in 6 different languages, is wide-ranging and gives access to an invaluable store of knowledge. It includes relevant literature from the entire 20th century. However, references to research published in Portuguese and German are scarce. An extensive table on cultivated plants of South America, including their common and local names, their

botanical classification, and their locational occurrence and use, is given in the appendix and appears particularly useful. However, this book is more than a mere collection of previously published research. Some chapters include revised, expanded and updated material; others contain a synthesis of a wide range of existing literature or present new research. The book's 15 chapters are organized in 5 major parts: 1) Introduction: Fields and Associated Features; 2) Amazonian Cultivation; 3) Andean Irrigation and Terracing; 4) Raised and Drained Fields; 5) Conclusion. They are well complemented not only by the ample list of references, but also by 83 figures, 5 tables, 2 appendices, and an extensive index.

In the introduction, Denevan gives an overview of research on native cultivated landscapes in the Americas. He proposes a classification of "agricultural landforms" and field types, and discusses traditional field tools and "soft" agricultural techniques. The section on Amazonian cultivation documents the intriguing diversity of Amazonian habitats and field systems and discusses pre-European riverine and forest cultivation, with special reference made to case studies of different historic and contemporary agricultural systems. Against the background of the environmental diversity and the tradition of Andean cultivation, the part on Andean cultivated landscapes provides an in-depth presentation of different forms of Andean irrigation, which is "highly diverse, complex and innovative, reflecting sophisticated water-management skills" (p 135). Here, as in the following chapter on terraced fields, Denevan resorts to his accumulated wealth of empirical research experience in different Andean settings. In particular, the impressive prehistoric Chicame-Moche Intervally Canal in northern Peru is presented to illustrate the intricate highland-lowland water manage-

ment systems in the Andes and adjacent areas. Appropriately, in discussing terrace agriculture, Denevan portrays the spectacular terraced landscapes of the Colca Valley in southern Peru, including their origin, changing forms and abandonment, especially that of non-irrigated terraces.

In addition to Andean irrigation and terracing, indigenous traditional agriculture also relied on a variety of "raised field" and "ditched field" techniques practiced in both highlands and lowlands. Referring to these traditional cultivation methods, Denevan's research has to be considered a pioneer contribution. In the conclusion, the author discusses changing perceptions of Indian agriculture, including some of his own changing assessments over the past 40 years. This section also summarizes some of the basic related research questions and concepts, such as the persistence and even revival of Indian field technology and the abandonment or survival of cultivated landscapes; the important role of traditional knowledge; and the basic issues relating to environmental constraints, carrying capacity, degradation, and sustainability. Finally, some similarities and differences between Andean and Amazonian field systems are presented. This part would have merited a more detailed elaboration.

One of the book's central messages is that "in terms of agroecological understanding and complex management of landscapes and environmental variables, these (traditional) field systems are the equal of modern 'scientific' agriculture" (p 306). The book is a major contribution to multidisciplinary historical-cultural research on the Andes and Amazonia and, beyond that, provides a stimulating framework for successful development cooperation in Latin American agriculture and rural livelihoods. Not only is it a rich source for studying the cultural heritage of indigenous agricul-

ture and a testimony to the author's impressive research contribution; it could and should also be an incentive for continued scholarly activity on a fascinating topic.

#### REFERENCES

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#### Christoph Stadel

Department of Geography, Geology and Mineralogy, University of Salzburg, Hellbrunnerstrasse 34, 5020 Salzburg, Austria.  
 christoph.stadel@sbg.ac.at

### Plant Ecology, Herbivory and Human Impact on Nordic Mountain Birch Forests

Edited by F.E. Wielgolaski with R.S. Karlsson, S. Neuvonen and D. Thannheiser (Editorial Board). *Ecological Studies Vol. 180, Analysis and Synthesis*. Berlin, Heidelberg, New York: Springer, 2005. xxiv + 365pp + CD-ROM. €139.05. ISBN 3-540-22909-4.

Springer's Ecological Studies series provides an invaluable database and synthesis in ecology that students and researchers alike should be aware of. The series provides very useful insights into ecosystems, providing background and up-to-date information on whole ecosystems and how they function in relation to their environment. This book is no exception. However, while it stands alone, it should be seen as a complement to the book in the Man and the Biosphere series (Wielgolaski 2001). The editors of the current book must be congratulated for providing a second volume that in no way replicates the first, but rather adds a whole new dimension to it. It is rare to find so much information gathered together for one, albeit a very crucial, ecosystem. In applaud-



ing this volume we should also recall the significance of the International Biological Program (IBP) that facilitated the early work. The foresight of this program is probably more relevant today than ever, especially for those of us involved in research on the effects of pollution.

This volume addresses some of the unanswered questions from that program, benefiting from the cohesive working group that had built up among Nordic scientists in the early 1960s. In putting together the research program reported here, coverage was extended to include Scotland, where there is a good foundation of knowledge on biotic and abiotic influences on ecosystem management for sustainability. The first chapter deals with history, as it is impossible to assess the significance of short-term change in the absence of a long-term precedent.

The information is presented in 25 chapters, grouped into 5 sections. Unlike its predecessor, this volume has both a CD-ROM and many photographs and illustrations. Given that the book is trying to reach a wide audience, many of whom are unfamiliar with the landscape and conditions being described, I believe that even more photographs could have been included. To quote the old saying: "A picture is worth a thousand words!" However, the great number of landscape photographs included are very informative, even though the quality could have been sharper to truly represent the differences in vegetation type. The CD provides additional information, often in tabular form, on site details etc, which can be extremely valuable to future researchers who often have difficulty accessing such information. A small proportion of the files proved inaccessible to my PC, but, on the whole, the CD provides added value.

Section one is divided into 5 chapters on soil, vegetation, and factors influencing both survival and productivity. These chapters, written by various experts in the

field, are all both factual and readable, providing a good balance between data, tables, and graphs. They represent a good example of basic information, provided in an easily accessible form—information required before embarking on studies of ecosystem change and response to stress.

The first chapter on history and taxonomic distribution is comprehensive but well focused with a good list of recent references. The current distribution of mountain birch is presented in relation to the drivers of change, such as temperature, precipitation, grazing, and, to some extent, management. The soils chapter is very comprehensive, giving a really useful insight into potential nutrient limitations that are representative of large areas of northern Fennoscandia. The different floral communities and their associations are covered, and interesting insights are provided into why particular species thrive and are adapted to specific microhabitats. Many of the species described occur at high altitudes in Scotland, and this chapter will be of interest and relevance to many in the United Kingdom. Likewise, the chapter on productivity and grazing quality is highly relevant, providing useful references for accessing modeling parameters such as leaf area index. The table of live above-ground biomass is also valuable, and the flagging of species changes in response to increased anthropogenic nitrogen deposition is timely. Effects of temperature on growth are dealt with in a well-rounded approach which comprehensively deals with carbon balance in respect to respiration and photosynthesis—especially in winter—and effects on phenology changes.

The synthesis section in the middle of the book exemplifies the real benefits of a book like this, addressing all aspects of the ecosystem. While experts may want to dip in and out, the true value comes from reading many such chapters

which truly describe an ecosystem in the context of our changing world. Students will greatly benefit from the insight and perceptions, and being able to read about both the role and importance of the ecosystem and what makes it tick and respond to change.

Following this section, a number of detailed chapters on the role of herbivory and grazing are interesting and valuable in that they hold wider relevance for other vegetative associations. The data on browsing at Scottish sites is obviously of particular interest to readers in the United Kingdom, whereas the chapter on reindeer grazing may be less relevant. The dynamics of ecosystem response to herbivory is a fascinating read—especially as, all too often, journal articles and other scientific literature remain quite narrowly focused. Pollution, directly or indirectly, rarely causes such widespread defoliation as that caused by pests and pathogens, and yet often less is made of the devastation they cause, except in a few local incidents.

The inclusion of all factors that contribute to success and sustainability makes this book a must for ecosystem managers. The latter half of the book—dealing with natural regeneration, recreational use, the basis of maintaining a positive economy in northern birch forests—also contributes to its value for would-be managers. I would recommend this book to researchers and students alike, as the data are presented in a very accessible, clear fashion and the content can be extrapolated to many upland ecosystems in the United Kingdom.

## REFERENCE

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## Lucy Sheppard

Centre for Ecology and Hydrology, Bush Estate, Penicuik, Midlothian EH26 0QB, United Kingdom. ljs@ceh.ac.uk