INTERNATIONAL UNION
OF FOREST RESEARCH ORGANIZATIONS
Task Force on Traditional Forest Knowledge
Research Group "Forest and Woodland History"

CULTURAL HERITAGE AND SUSTAINABLE FOREST MANAGEMENT: THE ROLE OF TRADITIONAL KNOWLEDGE

Proceedings of the Conference
8–11 June, 2006, Florence, Italy

Volume 2.

WARSZAWA, 2006

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PROCEEDINGS OF THE CONFERENCE
8-11 June, 2006, Florence, Italy

Volume 2.

International Conference on Cultural Heritage and Sustainable Forest Management: the role of traditional knowledge, held on 8-11 June, 2006 in Florence, Italy

Organized by:
IUFRO Task Force on Traditional Forest Knowledge
IUFRO Research Group on Forest and Woodland History
Ministero Per le Politiche Alimentari, Agricole e Forestali – Roma

Collaborating institutions
USDA – Forest Service
Italian Academy of Forestry Science
Italian Forest State Corp
University of Florence
City of Florence
Regional Government of Tuscany
UNESCO World Heritage Centre
FAO
MCPFE Liaison Unit Warsaw

Edited by:
John Parrotta, Mauro Agnoletti & Elisabeth Johann

Published by:
Ministerial Conference on the Protection of Forests in Europe
Liaison Unit Warsaw
ul. Bitwy Warszawskiej 1920 r. nr 3
00-973 Warsaw, Poland
tel.: +48 22 331 70 31 tel./fax: +48 22 331 70 32
e-mail: liaison.unit@lu-warsaw.pl
www.mcpfe.org

Design, layout and production:
www.meander.net.pl

VOLUME 2.

ISBN 10 83-922396-4-4
ISBN 13 978-83-922396-4-2

CONTENTS

VOLUME 1.

PREFACE MCPFE Liaison Unit Warsaw 9

FOREWORD Pekka Patosaari 11

INTRODUCTION Mauro Agnoletti 13

KEYNOTE PRESENTATIONS

Traditional knowledge and the European Common Agricultural Policy (PAC): the case of the Italian National Rural Development Plan 2007-2013 Mauro Agnoletti 19

The European Landscape Convention Maguelonne Déjeant-Pons 28

Traditional Knowledge World Bank for safeguarding ecosystems Pietro Laureano 40

Bridging the gap: the IUFRO Task Force on Traditional Forest Knowledge John A. Parrotta 41

THEME 1: HISTORY OF TRADITIONAL FOREST KNOWLEDGE AND FOREST MANAGEMENT

Documentary sources for forest history and wood transportation in Veneto (15th-19th century) Giovanni Caniato 49

Traditional forest management under the influence of science and industry: the story of the alpine cultural landscapes Elisabeth Johann 50

La scomparsa dell'utilizzazione dell'erica: un esempio di cancellazione di un paesaggio culturale e dei suoi valori naturalistici
[The cessation of utilization of Erica arborea: an example of cancellation of a cultural landscape and its naturalistic values]
Tommaso La Mantia, Giuseppe Giaimi, Veca D.S. La Mela, Alberto Tomeo 58

Relationships between local communities and forest administration: The Cadore region after the napoleonic laws Antonio Lazzarini 67

Forest science and local experience in the management of the woodland: The case of Extremadura's dehesa Antonio M. Linares 71

History and refinement of TFK: an Asian perspective P.S. Ramakrishnan 80

Selection forestry between tradition and innovation: five centuries of practice in France Xavier Rochel 87

Woodland management in Bronze Age Scandinavia – evidences from rock-art sites Peter Skoglund 93

Indigenous influence on forest management on Indian reservations in the United States Ronald L. Trosper 94

Koguryo civilisation sustained by forest culture in the northern Korean peninsular and Manchuria Cheong-Ho Yi 102

THEME 2: CONFLICTS BETWEEN TRADITIONAL FOREST KNOWLEDGE AND SCIENTIFIC FORESTRY

The uses of forests and woodlands in New Spain from 16th to 18th centuries María de la Luz Ayala 111

Current status and problems with traditional forest-related knowledge in Russia
Vladimir Bocharnikov & Andrey Laletin 116

Conflicts between traditional knowledge and official applications on sustainable forest management: a case from Turkey Emre Şahin Dölarslan & Kenan Ok 122

It all began with Adam. The historical roots of the conflicts between conventional resource management and traditional local communities Jesús García Latorre & Juan García Latorre 131

Evolution of the forest landscapes and tribal practices, a case study of forest management and its impacts in southern India Sylvie Guillerme 137

Richerche sperimentali per una gestione sostenibile dei cedui di leccio: opzioni colurali a confronto Orazio La Marca 138

Cultural forest landscapes and ecological imperialism Colin Price 147

The "conflict" between traditional forest knowledge and scientific forest management in twentieth-century Finland Harri Siiskonen 155

Problems with the practical implementation of laws regarding the traditional knowledge of indigenous peoples in Russia Ludmila Zhirina 165

THEME 3: CONSERVATION OF CULTURAL LANDSCAPES

Biocultural heritage – the missing link between culture and nature? Mårten Aronsson 169

Studying land use history to support ecosystem management – a case study on forest change in the Swiss Alps Matthias Bürgi & Urs Gimmi 171

I principali sistemi di uccellagione con le reti fisse: storia, tecnica e paesaggio Paolo Casanova, Anna Memoli & Lorenzo Pini 172

The role of pine forests for shaping Korean traditional cultural landscape Young Woo Chun & Kwang Il Tak 179

Restoration of selected beech coppices Matteo Coppini & Luigi Hermanin 185

Getting to living cultural landscapes of the boreal forest through holistic forest management. The Whitefeather Forest Initiative of Pikangikum First Nation, Northwest Ontario Iain Davidson-Hunt 195

Meeting the challenges of preserving cultural character in a dynamic forest park landscape Rolf Diamant, Nora J. Mitchell, Christina Marts & Ben Machin 197

The forest landscape of transhumance in Molise, Italy P. Di Martino, P. Di Marzio, C. Giancola & M. Ottaviano 198

Scottish upland forests: History lessons for the future Kate Holl & Mike Smith 208

Working landscapes or recreational showcases – sustainable forest management and the implications of cultural knowledge loss Ian D. Rotherham 211

European landscapes and forests as representations of culture Franz Schmithuesen & Klaus Seeland 219

THEME 4: EUROPEAN INITIATIVES FOR TRADITIONAL FOREST KNOWLEDGE AND CULTURAL LANDSCAPES

Frammenti di storia forestale da ForEnCarb, progetto pilota della Regione Sardegna per la sostenibilità dello sviluppo e la pianificazione forestale. Marisa Cadoni & Roberto Scotti 229

The conservation of cultural forest landscapes: the Vallombrosa Silvomuseum Orazio Ciancio & Susanna Nocentini 239

MCPFE commitments – political framework for social and cultural dimension of SFM Marta Gaworska & Bozena Kornatowska 245

"Forest + Culture" in Austria: basic principles, objectives and ongoing projects Alfred Grieshofer 252

Linking scientists with people – the role of the volunteer in British woodlands Peter Howard 257

Hidden heritage in Dutch forests: management in practice Patrick Jansen 258

Cultural re-animation and rural development forestry: examples of a Leader + cooperation project between rural communities in Italy and Scotland Gary Servant, Nicola Gallinar & Jake Willis 262

Forest landscape cultural heritage inventory: an Estonian model Lembitu Tarang, Jürgen Kusmin, Vaike Pommer, Airi Matila & Mart Külvik 270

VOLUME 2.

THEME 5: FOREST HISTORY AND LANDSCAPE CHANGES

Consequences of the cessation of traditional forest exploitation: the example of the Dolomiti Bellunesi National Park Gianpiero Andreatta 285

Techniche e attrezza per la valorizzazione del bene forestale attraverso modelli de allevamento semibrado di suini – Techniques and equipments for the improvement of forest resources through extensive pigs breeding systems Matteo Barbari, Leonardo Conti & Francesco Sorbetti Guerri 292

Recent changes in the landscape spatial pattern of forest lands in Italy: a local assessment Anna Barbati, Geppino Carnevale, Piermaria Corona & Marco Marchetti 302

Two pines and the native tradition of burning North American landscapes Gary B. Blank 303

La memoria e l'attualità del paesaggio Ignazio Camarda 309

Mediterranean forest management, a tool to guarantee sustainability: evolution of the Catalan agrarian landscape and the forestry regulations from the 18th century to the end of the 20th century Teresa Cervera Zaragoza & Ramon Garrabou 310

Landscape history and heritage revaluation in Olzinelles valley (Montnegre, NE Spain): a socioecological approach (1851-2006) Iago Otero, Martí Boada, Anna Badia, Sara Piqueras, Geòrgia Rodoreda & Eduard Rojas 316

Landscape dynamics of the Barbialla farm (Val d'Egola, Province of Florence) in the second half of the 20th century Marco Paci, Livio Bianchi & Davide Travaglini 326

Variazioni della copertura vegetale, documentazione storica e toponomastica nel Lazio appenninico Francesco Spada & Susanna Passigli 333

From integration to abandonment. Forest management in the Mediterranean agro-ecosystems before and after the 'green revolution' (The Vallès County, Catalonia, Spain, 1860-1999) Enric Tello, Ramon Garrabou, José Ramon Olarieta & Xavier Cussó 343

THEME 6: TRADITIONS, CULTURE AND LANDSCAPE IN SUSTAINABLE FOREST MANAGEMENT

Sustainable forest management in Europe's East and West: trajectories of development and the role of traditional knowledge Per Angelstam & Marine Elbakidze 353

A new culture for the development of new forests in the modern context Enrico Calvo & Francesca Ossola 362

The use of traditional knowledge in sustainable forest management in the Kaska traditional territory in British Columbia and the Yukon David Crampton 365

Food security, fattori limitanti ambientali e strategie di gestione tradizionale delle foreste nell'Amazzonia brasiliana Peppino Stefano Disperati 374

Role of traditional villages for sustainable forest landscapes: a case study in the Ukrainian Carpathian Mountains Marine Elbakidze & Per Angelstam 375

Integrating traditional knowledge into global change analysis models. The case of Ridaura sessile oak forestland (Natural Park of Montseny, NE Spain) Francisco Javier Gómez, Martí Boada & Sònia Sànchez 385

Linking physical, economic and institutional constraints of land use change and forest conservation in the hills of Nepal Krishna Bahadur K.C. 393

THEME 7: CONSERVATION OF TRADITIONAL FOREST KNOWLEDGE

The effects of traditional and contemporary forestry understanding on drinking water: Istanbul example Sultan Bekiroblu & Omer Eker 405

Customary traditions of self-governed institutions in mountain forests of northern India –1803-2003 Minoti Chakravarty Kaul 413

Cultural heritage, sustainable forest management and property in inland Spain Cristina Montiel Molina 421

Opportunities in Turkish cultural heritage for conservation of natural values Taner Okan & Kenan Ok 428

Learning from traditional knowledge on plants uses: a field investigation in the area of Monte Ortobene (Nuoro, Sardinia) Maddalena Piredda, Piero Bruschi & Maria Adele Signorini 436

'Vayal', sacred landscape in the forest Chirakkal Ramapanikker Rajagopalan 439

A Blackfoot (Kainai) traditional land use study: preserving and protecting aboriginal traditional knowledge through natural resource education in Alberta Lorne West & Francis First Charger 441

THEME 8: PLANNING AND MONITORING FOR CONSERVATION

Multi-temporal forest spatial patterns analysis in the framework of sustainable forest management Gherardo Chirici 445

A methodology to integrate SFM standards on forest cultural heritage into meso-scale forest planning: preliminary results of the Ri.Selv.Italia 4.2 research project Laura Secco, Silvia Agnoloni, Paolo Cantiani, Isabella De Meo, Fabrizio Ferretti & Davide Pettenella 447

Analisi e valutazione degli indicatori per la caratterizzazione del paesaggio su scala locale nell'Umbria centro meridionale Andrea Sisti 455

THEME 9: CULTURE AND TRADITIONAL KNOWLEDGE

The production of pitch in Calabria in the 18th century Maurizio Gangemi 459

Russian wooden architectural heritage: century-old traditions to use forest products Margarita Kisternaya & Valery Kozlov 465

Cultural indigenous management systems as a basis for traditional community forestry in Cameroon: a case of the Ijim mountain forest area Njuakom Nchii Francis 470

Humanity and bestiality in forests, with reference to the topic "Forests, Cultures and Religions" Paolo Vicentini 471

POSTER SESSION

Tree carvings as witnesses of traditional forest use in central Sweden Rikard Andersson 481

Le pratiche agro-selvicolturali e le strutture per la caccia di selezione agli Ungulati come elementi caratterizzanti il paesaggio forestale Paolo Casanova, Lorenzo Pini & Francesco Sorbetti Guerri 489

Sugumagi –The Korean traditional forest planted near Sugu by the backgrounds of Fengshui Jang Dong-su 495

Assessment of traditional cultural landscape visual quality loss by spontaneous afforestation of abandoned lands Andrej Kobler 498

Rimboschimento ed incendi: un problema antico con un nuovo approccio
Raffaella Lovreglio, Vittorio Leone, Rossella Salvatore & Valentina Urbano 499

Temporal pattern over the last 200 years in the SCI Mt. Vigese (IT4050013). Northern Apennines (Italy)
G. Pezzi, S. Masi & C. Ferrari 507

Elementi della dendroflora sarda impiegati nella tradizione popolare di Putifigari e Villanova Monteleone (Sardegna Nord-Occidentale) Giovanni Piras 512

On the environmental history in Molise: an approach to the sources of the 19th century Emilia Sarno 521

Charcoal production in Sunart (Scotland) and Vavestino (Italy) – the legacy of traditional crafts and silvicultural systems Gary Servant, Ken Henesy, Jake Willis, Michele Capretti, Elisa Carturan & Nicola Gallinaro 524

Toponimi e distribuzione de Quercus suber L. in Italia
B. Schirone, F. Spada, S. Passigli, E. Agrillo & L. Casella 528

Knowledge from 1832 cadastral maps: a source of information for present woodland management
Jim van Laar 535

STUDY TOUR

Study tour: the landscape park project at Moscheta, Mugello Valley (Florence)
guided by Prof. Mauro Agnoletti 539

CONFERENCE PARTICIPANTS AND LEAD AUTHORS 543

Theme 5.
FOREST HISTORY AND LANDSCAPE CHANGES

Consequences of the cessation of traditional forest exploitation: the example of the Dolomiti Bellunesi National Park

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Abstract

The 31,512-hectare Dolomiti Bellunesi National Park lies in the province of Belluno, Veneto region, north-eastern Italy. The forest populations of silvicultural interest are essentially the beech-woods (approx. 4,700 ha). These woodlands were intensively exploited by coppicing in the past. This began in mediaeval times and continued until the 1960s, when lengthening rotations followed by total abandonment resulted in an increase of the woody mass in the vegetation, with a notable growth in size (diameter and height) of the individual trees. A consequence of the cessation of traditional forest exploitation – after some years of silvicultural interventions for conversion to tall trees – has been the appearance of problems of mechanical instability in the form of falling beech trees – isolated or in small groups – and the falling of scattered specimens of red fir growing in young beech-woods. the uprooting of wider-diameter beech trees and the red firs topping the beech-wood canopy is caused by poor anchorage of the root apparatus. Three possible silvicultural operations can be suggested to improve this situation: in the short-term, maintaining the coppicing where possible; in the medium-term intervening to initiate processes of natural renewal as soon as problems of mechanical instability begin to appear; in the long-term, improving soil properties through the distribution of necrosed forest biomass in order to guarantee better anchoring conditions for the roots.

1. Introduction

A careful analysis of the man-woodland relationship throughout history demonstrates how, through traditional knowledge, very often based on extremely localised territorial situations, an equilibrium would have been reached in the management of forestry resources. This equilibrium has in many cases remained stable for centuries (Andreatta 2003). In the past, the traditional management of the forests forming part of what is now the Dolomiti Bellunesi National Park was based on coppicing to satisfy the local populations' requirements for woody materials (firewood and charcoal). In recent decades, in common with the majority of italian mountain areas, changing social and economic conditions have led to a changed approach to silviculture and its implementation: in many cases techniques that were applied for centuries have now been abandoned to make way for operations that follow rules more akin to forest ecology.

This transition, at times very abrupt, does not always present only positive aspects. In the mainly beech woodlands of the Park, the discontinuation of coppicing and consequent transformation to forms that are evolving towards tall trees has led to problems of mechanical instability that must be considered in future forest management plans. This paper discusses the problems that have emerged following the abandoning of centuries-old forest exploitation through a comparison between the historical cutting methods and current silvicultural practices. the difficulties linked to mechanical instability should be taken into account when planning and carrying out future silvicultural operations, which must necessarily be aimed at remedying the situation. Possible technical solutions to this are also proposed.

2. The study area

2.1. Physical features, geology and soils

The Dolomiti Bellunesi National Park, designated by Ministerial Decree on 20 april 1990, extends over approximately 31,152 hectares in the province of Belluno, Veneto region, north-eastern Italy. It covers the mountain areas from the Vette Feltrine in the west to Cadore in the east, which include the Monti del Sole, Schiara-Pelf and Talvena mountain groups. The protected area varies in altitude from 400 m a.s.l. in the valleys up to 2,565 m a.s.l. on Schiara, the mountain with the highest summit. The existing woodlands represent the various forest types encompassing the sub-alpine belt to the treeline (Del Favero & Lasen 1993).

The geological substrate is principally rocks of sedimentary origin, in particular Triassic dolomite rocks. The valleys of the torrents that criss-cross the territory are mainly covered by quaternary deposits. The most significant geomorphological features in the area are glacial and karstic phenomena. The orographical features of the territory are therefore strongly marked by the recurrence of these geomorphological processes and erosion, which have resulted in an inaccessible geographical context, in which plateaux, "*buse*" and "*van*" of glacial origin alternate with very steep mountainsides – where the wooded formations of silvicultural interest grow – and narrow valleys.

The deepest and best soils, potentially better evolved and more fertile, are those originating from the calcareous substrate. They are marly and/or terrigenous, and are to be found in the areas with gentler morphology, where the traditional mountain pastures lie. The soils in the north-eastern sector of the Park (Cajada and Val del Grisol), where the more stable and evolved forest formations are sited, also come into this category. primitive shallow soils have formed on the very steep mountainsides, which are very gravelly and often have rocky outcrops. These soils are subject to run-off and suffer from alternating very wet and arid conditions (Andrich 2005). The pedogenetic processes of the soils on the steep slopes have been strongly affected, in the negative sense, by the intense – and prolonged – exploitation (mostly simple coppicing), which has had the inevitable consequence of a notable impoverishment of the soil. This impoverishment has also been accentuated by the processes of erosion on soil laid bare by frequent and repeated tree felling on the often steep slopes (Sief 1998) and the recurrent fires, often of catastrophic proportions, of which records exist going back even earlier than the period of venetian domination (Posocco 1970).

2.2. The forests

The forests in the protected area cover approximately 15,734 ha – almost half the total surface area of the Dolomiti Bellunesi National Park – and, with the exception of the dwarf mountain pines and rare riparian communities in the valleys, grow almost exclusively on the steep slopes of the valleys that deeply furrow the territory.

The sequence of altitudinal belts, following the Pignatti chart (1980), is not easy to define because of the complex mountain and microclimatic conditions that effect the vegetation cover. However, the following are represented: a) the central-european belt, on an area of approximately 3,230 ha, which rises from the valleys up to 1,000 (1,200) m on south-facing slopes and up to 700 (800) m a.s.l. on the cooler mountainsides, with environments often strongly transformed by man and characterised by broadleaved woodlands, usually hornbeam and manna ash-hornbeam, only locally sycamore-ash that are confined almost exclusively to ravine environments; b) the sub-oceanic belt, from 600-700 up to 1,600 (1,700) m a.s.l., which is very extensive and covered

by forests with a net prevalence of beech (*Fagus sylvatica* L.), sometimes mixed with conifers (in the Cajada forest, silver fir (*Abies alba* Miller) forms tree communities of immense value). The various types of beech-woods cover an area of just over 4,700 ha, thus representing around one third of the woodlands present in the Park. the most common types are primitive beech-woods (1,723 ha), sub-montane beech-woods (1,143 ha), typical mountain beech-woods (1,295 ha) and high-mountain beech-woods (545 ha). There are a further 360 ha approximately, where beech grows in association with other species, and all the other areas where the plant is sporadic in the vegetation (Andrich 2005); c) the boreal belt, with a surface area of approximately 3,980 ha, normally from 1,500 – in particular conditions also from 1,200-1,300 m a.s.l. – to the treeline, where the vegetation is often characterised by scattered red fir (*Picea excelsa* Link), frequently in larch woodlands, and at the highest altitudes dwarf mountain pines. Although of no significant silvicultural value, mention has to be made of the alpine belt, as it is the one of greatest botanical interest, being characterised by vast primary grasslands where many rare endemic species of high phyto-sociological value grow (Argenti & Lasen 2000).

3. Forest management in the past

In the past, the forests forming part of what is now the Dolomiti Bellunesi National Park were subjected to strong human pressure (Hofmann 1991, Sief 1998). As early as neolithic times the ancient veneti peoples had occupied the Val Belluna and all the major internal valleys. The Romans provided a stimulus to the settlements by building a robust network of roads, whereas during the period of the barbarian invasions the mountain area was more or less ignored by the colonisation process and thus remained almost wholly in a natural state. In mediaeval times the human presence in the area began to increase, with the consequent clear-felling of the lower parts of the hillsides, and not always equilibrated tree cutting on the higher stretches.

The truly intensive exploitation of the territory began under the domination of the Venetian Republic, when massive amounts of wood and charcoal were necessary for the mining industry and wide spaces for livestock grazing, especially sheep, for their sought-after production of wool: almost all the beech-woods were subjected to intense coppicing. in the 1700s, demographic growth and the strong demand for firewood and charcoal for industrial uses entailed, as well as coppicing, also the clear felling, with the signs still visible today, of many of the higher slopes (Posocco 1970). Intensive beech coppicing also continued during the 19th century, as testified to by the numerous charcoal burning groves still to be seen in the woodlands.

Between the 1950s and 1960s, a time of crisis for the italian mountains, the Government Authority for State Forests, pursuing its institutional aims, began purchasing large areas of land covered by pastures and forests along the southern belt of the Dolomites, so that by the beginning of the 1970s the State Forestry Administration was managing approximately 22,000 ha of land in the middle stretches of the River Piave and in Val Belluna. Between 1971 and 1975, these areas, given their high environmental value, were classified as a "Nature Reserve", and they later came to form more than half the territory of the Dolomiti Bellunesi National Park.

From the 1960s onwards, in both the state and privately-owned woodlands, initially with the lengthening of the rotations and subsequently by the abandoning of the mountain areas due to economic and social reasons, coppicing practices reduced dramatically until, in many cases, they ceased altogether. So, during recent decades, woodland vegetation that had been heavily degraded and strongly impoverished has regained vigour, increasing its woody mass and nearing a more natural state. At the same time, the woodland has slowly begun to heal the wounds caused by intense human

exploitation, expanding and re-colonising areas from which it had been forcibly removed in the past. Since the mid-1990s, first of all under the management of the ex-Government Authority for State Forests and subsequently under the auspices of the National Park, interventions by forestry technicians have begun in the state woodlands to convert the beech vegetation into forests of tall trees (Sief 1998).

4. Consequences of the cessation of traditional forest exploitation

The cessation of traditional forest exploitation does not only have positive consequences (increased woody biomass, almost natural composition, evolution towards formations of tall trees), but also negative ones. In the different types of beech-woods, unusual problems of mechanical instability have recently been appearing. Unlike the normally occurring falls of trees in the Alpine forest populations, which are due to exceptionally harsh weather, the problems of mechanical instability of beech vegetation in the Dolomiti Bellunesi National Park are a consequence of weather factors (snow and wind) that entirely within the normal course of events. two quite distinct types can be identified, which represent, with all the transitional forms, the "typical situation" that can be observed in forest communities.

The first type is represented by what occurs in the pure beech stands, which, as mentioned above, were at one time all coppiced. From direct observations it emerges that, within the woodlands – that are at a stage of vigorous growth and still far from reaching maturity – individual trees are quite frequently blown down by the wind or fall beneath the weight of snow. The other trees in the population (except any directly involved in the fall), even if only a few metres from the fallen tree and with similar biometrical characteristics, suffer no damage. This situation is widespread in almost all the pure stands of aged beech, whether or not they have been subjected to cuts for the establishment of tall trees. The characteristic that unites all the isolated plants which fall to the ground is that they are always those of largest diameter growing in the beech-woods. The diameter size, used as a parameter directly correlated to the dendrometric volume, which the plants reach before falling, varies according to the different cases and sites, indicating that a critical threshold exists that depends on the volumetric dimensions of the plant and the capacity of the root apparatus to support this biomass. A shallow gravelly soil, and often steeply sloping, can only provide a sturdy anchorage until the plant reaches that critical point determining mechanical instability. Trees most often fall down on windy days during the summer months, especially after heavy rainfall events that have the twin effect of making the crown heavier and the ground less compact and stable. Fewer trees fall in autumn, with these being caused by the first snowfalls of the season that may surprise the beeches with a still-dense crown as they have not yet started to shed their leaves. the extent of the phenomenon varies greatly, with areas where dozens of plants per hectare have fallen to the ground, others where there are only a few fallen trees and yet others where there is no damage at all.

The second type is linked to the presence of red fir in the beech-woods. Over the years red fir has made a comeback, by natural spread, in the sites with the poorest soil where the beech-wood is scattered, with a number of specimens that can vary up to a few dozen per hectare. Red fir growth proceeds regularly in the beech-woods until the conifer crowns rise some metres above the beech-wood canopy, and it is the wind that causes the uprooting of plants, also in this case still at the growing stage and well short of maturity. red fir has a notoriously shallow root apparatus (Gellini 1970), so they frequently fall down in the above-described situation of soil and slope. Field observations have shown that the majority of plants of red fir fall in the winter and early spring, when the beech-wood is bare of leaves and the action of the wind, both above and below the canopy, becomes more powerful. This phenomenon is also rather variable, with areas where there are dozens of fallen specimens per hectare, areas with only a few uprooted trees and others untouched.

Figure 1.
Uprooted beech tree
Source: Corpo Forestale dello Stato archive

It should be stressed that these problems of mechanical instability did not exist in times past, when coppicing of the beech woodlands was practiced and when there were no red firs in the vegetation. This can still be seen today in some contexts used as coppice and where red fir is not present. The stumps of the coppiced beech-woods form a vegetation that is renewed at relatively brief intervals of time, of a lower height than the tall trees and, more importantly, with a much lower dendrometric mass per tree stump than that of an individual tree a few dozen metres tall and with a diameter that can exceed 50 centimetres. in the case of coppiced woodland, the root apparatus can therefore guarantee solid anchoring to the ground, but it cannot for tall trees. Furthermore, the presence of red fir within beech populations was much rarer in the past than nowadays, if it was not entirely absent. On the one hand, red fir had great difficulty growing in coppiced beech woodland, which quickly suffocated it with the vigorous growth of shoots, and on the other, it was very often eliminated by the woodman's axe, as it is a less prized species for the supply of firewood and/or charcoal.

5. Possible silvicultural interventions

The problems of mechanical instability described above inevitably reflect on the silvicultural operations to be carried out in the forests. The interventions differ substantially from those usually implemented in the alpine woodlands where, in cases of mechanical instability, the aim is essentially to regulate the vegetation density with appropriate alternating cuts to reduce the value of the coefficient of form (height-diameter ratio) of the trees to render them less slender and consequently more resistant to the mechanical stresses imposed by the weight of snow and force of the wind (Mazzucchi 1983, La Marca 1983, Piussi 1986, Mazzucchi & Casagrande 1986, La Marca 1986, Mazzucchi 1998). The silvicultural operations should therefore be aimed at giving priority to the mechanical stability of the forests, with direct and indirect actions to tackle and/or remove the causes of uprooting of the trees.

A first, very topical, intervention in areas of the forest populations that might potentially present problems of mechanical instability and which are still coppiced, would be to maintain this form of management – where conditions allow and the estovers are positive. This could even just be temporary, until the stability conditions of the vegetation improve. Moreover, the maintenance of coppiced sections within the Dolomiti Bellunesi National Park, even if partly for other reasons, is also included in some management proposals drawn up by Forestry Technicians (Andrich 2005). Much more difficult, if not purely theoretical, is the hypothesis of a return to coppicing of the forests, or wide areas of them that are more subject to phenomena of mechanical instability. However, this solution on the one hand clashes with the laws that do not allow conversion from tall forest to coppiced woodland (with greater reason in a protected area like a National Park), and on the other, with the practical difficulty of maintaining coppicing in forest populations which, given their location and the resulting difficulties of logging, are decidedly negative for estovers.

A second possibility, in the short-term, consists of maintaining the model of conversion to tall trees, but with suitable interventions for a tall forest. The forest population, of pure beech or mixed with red fir, would be monitored constantly to check when, at the different sites, the dendrometric volume is reached (well represented by the diameter at breast height) that is the critical threshold beyond which problems of mechanical instability begin to appear. Once the woodland has reached that stage – whether or not it has reached maturity – it would be necessary to take silvicultural measures to begin processes of natural renewal, applying rotations based on the critical dimension threshold alone. If red firs are growing in the beech communities, given the fact that the problems of mechanical instability usually appear in the conifer before the broadleaf, an intervention hypothesis could be to fell only the plants of red fir that might potentially present problems of uprooting, leaving the beech population to a more prolonged growth.

A third intervention, planned for the medium– and long-term, would be to improve the soil conditions by favouring the pedogenic processes to render their properties more suitable for guaranteeing a solid anchorage for the plants. The aspect on which to intervene is that of increasing the soil depth: confirmation of this is provided by situations that have been observed, either punctiform or in small areas where, with deep soil, no gravel and in the absence of rocky outcrops, very large beech trees are flourishing (with much greater diameters and heights than the trees apt to fall) and show no problems of stability. To obtain an increase in the soil depth it is necessary to take action on the accumulation of organic matter. As regards this, according to recent studies on the important role of dead wood within forest ecosystems (Mason 2002, 2003, Tagliapietra 2003), the contribution of leaf biomass alone is not considered sufficient. If it is wished to encourage a more rapid process of soil improvement the contribution of dead wood of notable dimensions is also necessary.

6. Conclusions

As a consequence of the abandoning of traditional coppicing, the forests of silvicultural interest, mainly beech-woods, growing in the Dolomiti Bellunesi National Park present unusual problems of mechanical instability. Unlike what usually occurs in alpine forests, in this case treefalls are caused by harsh, but entirely normal, weather conditions (snowfalls and wind), with only single beech trees or red firs being affected in vegetation at the stage of vigorous growth. the uprooting is facilitated by the shallow soil that does not provide a solid anchorage for the roots. Given the fact that the problem of natural treefalls currently affects "young" forests, it cannot be ruled out that that future mechanical instability will no longer be restricted to isolated trees, but rather to groups of trees or entire areas of woodland.

The silvicultural operations that are proposed in this paper consider different types of interventions that involve both the vegetation and the soil. Therefore, although it is no longer possible for various reasons to re-introduce coppicing for all beech woodlands, it is equally advisable to temporarily retain this management form where conditions allow and problems of instability require it. Felling should also be tested that aims, independently of the growth stages of the population, to eliminate the unstable vegetation and best guarantee favourable conditions for natural regeneration, plus interspersed felling to encourage the establishment of tall trees, which leaves behind an adequate amount of dead wood that is indispensable for improving the soil depth conditions, with the distribution of organic matter that can offer a more solid anchorage for root systems. In this way, by means of farsighted forestry operations, many of the causes of mechanical instability linked to very shallow soils can eventually be removed, allowing the woodlands to grow and develop more in line with the laws of forest ecology, reducing the impacts and effects of past human activities on the vegetation to a minimum and optimising the many functions that forests have to offer.

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Techniche e attrezza per la valorizzazione del bene forestale attraverso modelli de allevamento semibrado di suini

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Abstract

In the last decades, our understanding of the principles regarding the relationship between the man and the rural world has undergone significant changes. Innovative ideas for the evaluation of material and non-material forest resource values and sustainable forest management are reminiscent of traditional forest resource management practices and values. For example, forests with little or no economic value for wood production can find new functions through the use of secondary forest products. Forest fruits, specifically acorns and chestnuts, can increase the value of livestock breeding systems (in particular for pigs) in order to improve animal nutrition and livestock quality as well as to reduce the environmental impacts associated with their production, particularly their impact on forest ecosystems. Italian and foreign experiences have been used to define common principles, techniques and simple breeding structures (with reduced environmental impact) suitable for extensive pig breeding. These techniques can gain be highly profitable in high forest areas (for example in oak woods), which will have new, important, economic functions of enhanced aesthetic and landscape value.

1. Introduzione

Secondo il Sereni (1962) col termine "paesaggio agrario" si deve intendere "*quella forma che l'uomo, nel corso ed ai fini delle sue attività produttive agricole, coscientemente e sistematicamente imprime al paesaggio naturale*". In Italia, già prima della colonizzazione greca e della nascita delle città etrusche, i popoli indigeni della penisola avevano iniziato a interagire, seppur sporadicamente e localmente, con gli ambienti naturali dando inizio a quel processo di modellamento del paesaggio che, nel corso di fasi storiche diverse, avrebbe portato ad una serie di trasformazioni permanenti del territorio fino agli attuali assetti dello stesso.

Nel corso dei secoli l'interesse per l'utilizzazione rurale del territorio ha prodotto sia un rilevante incremento delle terre messe a coltura, principalmente a scapito dei territori a foresta, che una profonda trasformazione di questi ultimi attraverso utilizzazioni economiche di vario tipo che hanno accompagnato l'evolversi delle diverse civiltà e che hanno determinato il succedersi di forme di assetto territoriale diverse.

Le aree forestali hanno rappresentato, nei tempi storici, una fonte essenziale di prodotti di varia natura e, fondamentalmente, di prodotti materiali: *in primis* di legname ma anche di altre sostanze di più disparata natura: i cosiddetti *prodotti secondari del bosco*, indispensabili alla vita delle comunità rurali (selvaggina, frutti, erbe, secreti delle piante, ecc.).

Fra questi hanno sempre assunto un ruolo fondamentale i prodotti utili per l'allevamento del bestiame domestico (ghiande, castagne, faggiole, corniole, erbe, fogliame, radici, tuberi, ecc.) sia come prodotti da asportare e da adoperare alla stalla che, e principalmente, come materiali utilizzabili direttamente da parte degli animali attraverso il pascolamento del bosco, per integrare le spesso insufficienti risorse foraggiere delle unità agricole.

Il pascolo del bestiame nei boschi è un argomento di antichissima memoria e di stretta attinenza con la gestione delle foreste. A tal proposto il Di Berenger (1859) nel trattare questo argomento nel suo trattato "Studii di archeologia forestale" ricorda:

"Or quale relazione, dirà taluno, può avere tutto ciò (la pastorizia n.d.a.) con quest'opera di Storia ed Archeologia forestale? Noi francamente risponderemo: grande e strettissima. Premettasi il fatto che presso gli antichi Greci e Romani la voce pascolo e bosco erano usate come sinonimi, ed in senso economico inseparabili; al modo medesimo, che per noi pascolo e monte, non risguardano nel monte, o nella montagna, che un pascolo estivo; d'onde il verbo monticare, per mandar gli animali ai pascoli montani …. Lo stesso vocabolo bosco (che altri vorrebbe mal a proposito trarre dal tedesco Busch, cespuglio, macchia) proviene dal greco equisono βόσχω (bosco); e fino al XII secolo, chi diceva pascolo, esprimeva un ceduo concedente diritto di pascolo; non già una selva (silva), nome generico di luogo boschivo."

Anche il Pianigiani (1907), autore di uno dei più famosi vocabolari etimologici italiani, fra le altre radici ricorda, concordando col predetto Autore, il possibile collegamento fra il termine "pascolo" e il termine "bosco".

Figura 1.
Nell'affresco che rappresenta gli effetti del Buon Governo un quadro delle attività rurali illustra anche un contadino che riporta dal pascolo un suino di razza Cinta senese (da A. Lorenzetti)

E in certe epoche storiche, coincidenti con fasi di ripresa dell'economia pastorale, si è assistito a grande diffusione del paesaggio del *saltus, "paesaggio"*, a dirla con il Sereni (1962), *"informe "ubi silvae et pastiones sunt", cioè di selve e pascoli: solo interrotto, semmai, da qualche piccolo appezzamento a coltura, ad uso dei pastori e dei guardiani"*.

Occorre ricordare però che la diffusa abitudine a condurre il pascolo nei boschi ha rappresentato, per molti secoli, anche uno dei più grossi problemi per la salvaguardia degli stessi e per la messa in pratica di una efficace gestione forestale. Ricorda il Gabbrielli (1980), che *"In Maremma, come del resto in tutta la Toscana, il bosco era una delle principali fonti di pascolo per ogni genere di animali"* e, citando documenti storici[1] che danno informazioni sui boschi maremmani del '700, mette in evidenza le basse provvigioni di dette foreste e ne imputa le cause a due fattori: *"i tagli intensi e devastatori, protrattisi ininterrottamente dal 1740 ad oltre il'70 in tutta la Maremma, e la vitale necessità di conservare*

[1] *Ristretto della qualità e quantità prossimamente delle piante da costruzione e da carbone che si ritrovano nelle boscaglie situate negli infrascritti territori e che superano la grossezza di mezzo braccio di diametro colla estensione e misura parimenti prossima, del suolo occupato da dette boscaglie tralasciando gli spazi di macchia bassa ove non esistono dette piante* (A.S.F. Miscell. Finanze 539 in Gabbrielli, 1980

a pascolo per ogni genere di animali vastissime estensioni di macchie e boscaglie" … "Così la dogana[2] *del Tallone in territorio di Manciano "bosco di cerri con poche farnie" era in grado di ricevere in tempo di ghianda dai 16 ai 17 mila maiali. Si calcolava che si trovassero sottoposte a dogana "36 mila moggia di terreno (circa 108 mila ettari) nella Maremma … e si aveva un carico di 3043 vacche, 1085 cavalli, 10.046 porci, 73.246 fra pecore e capre, una cosa come 350 mila zoccoli fra piccoli e grandi. E altrettanti pascolavano nelle bandite.*

In tutte le epoche le vicende della storia forestale italiana sono state quindi caratterizzate da dibattiti incentrati sulle relazioni fra il patrimonio boschivo e il pascolo; nel corso dei secoli numerosi autori hanno affrontato, in modo ricorrente, questo tema mettendo in evidenza i danni che il pascolo indiscriminato può produrre al bene forestale, altre volte evidenziando i benefici economici che possono derivare da tale pratica. In questo ultimo caso si è spesso insistito sul valore aggiunto che il pascolo può attribuire al bene forestale, sia in termini monetari diretti che in termini di interesse alla conservazione e alla tutela dello stesso. Ma in tutte le epoche, comunque, norme specifiche hanno cercato di regolare il pascolo del bestiame nel bosco, a testimonianza di quanto sia stata sempre viva l'attenzione nei confronti di tale pratica.

E, per quanto riguarda il bosco, spesso le idee innovative che mirano alla rivalutazione dei beni materiali e immateriali nell'ottica di una gestione forestale sostenibile, riportano a schemi e a modelli antichi, a prodotti e funzioni da tempo dimenticati.

Così, oggi, boschi con scarse o nulle potenzialità economiche per quanto riguarda la produzione legnosa possono trovare valorizzazione attraverso l'esaltazione di nuove funzioni biologiche, sociali, economiche, ecc. Fra queste ultime pare utile ricordare, ad esempio, l'utilizzazione di prodotti forestali secondari come ghiande e frutti del sottobosco idonei a valorizzare modelli di allevamento zootecnico (in particolare suini) che tendano sempre più alla salvaguardia del benessere animale, alla riduzione dell'impatto ambientale, a fornire produzioni di alto pregio ottenute nel completo rispetto delle prescrizioni igienico-sanitarie. E ciò, se condotto attraverso pratiche razionali, potrebbe contribuire anche a fornire nuovi valori al bene forestale.

Negli ultimi decenni, sull'onda della profonda trasformazione sociale ed economica che ha investito il nostro Paese, anche i principi che avevano ispirato per un lungo periodo i rapporti dell'uomo col mondo agricolo e forestale hanno subito cambiamenti significativi. Dopo un primo e non breve periodo di disorientamento che aveva determinato una profonda crisi di identità nell'assetto del territorio, si sta finalmente assistendo allo svilupparsi di una nuova visione delle funzioni del mondo rurale specialmente nei comprensori più marginali e meno produttivi come sono, in Italia, le aree collinari e montane dell'Appennino.

Una più matura consapevolezza dell'esigenza di salvaguardia del bene ambientale, un sempre più diffuso riconoscimento della necessità di difendere e ampliare la biodiversità, la maggiore attenzione agli aspetti legati alle produzioni "naturali", "di nicchia", "biologiche", ecc. l'accettazione del principio della multifunzionalità del bene forestale, assieme a innumerevoli altre considerazioni, hanno contribuito a definire nuovi obbiettivi, finalità e funzioni del mondo rurale e forestale.

[2] boschi di proprietà del Granduca venivano definiti Dogane e in Maremma erano in mano al Magistrato dei Paschi di Siena. Queste potevano essere affittata a privati o data *per fida* ai forestieri, mentre non era previsto alcun pagamento per gli abitanti del luogo. I boschi delle Comunità o dei privati erano detti Bandite e potevano essere *per usi* quando i proprietari ivi residenti potevano far pascolare il bestiame gratuitamente nell'ambito del loro terreno, mentre si chiamavano *per fida* quando erano per uso della comunità. I comunisti, ovvero i titolari di diritti della comunità, potevano far pascere il loro bestiame pagando una tassa proporzionale al numero dei capi.

2. L'allevamento dei suini all'aperto

Quando si parla di allevamento suinicolo all'aperto è necessario precisare a quale tipologia si fa riferimento. Sono infatti numerose le forme di conduzione possibili. Le modalità di allevamento di suini all'aperto in Italia possono essere distinte in:

- allevamento intensivo all'aperto *("en plein air")*;
- allevamento semibrado;
- allevamento brado.

L'allevamento *intensivo all'aperto* (o allevamento "*en plein air*") è una forma di allevamento indicata soprattutto laddove si disponga di terreni non particolarmente produttivi dal punto di vista agronomico, e quindi non utilizzabili per altre coltivazioni, e non si disponga, invece, di ampie aree da destinare al libero pascolo degli animali e comunque si voglia praticare un allevamento di tipo intensivo. Per tali motivi i suini sono tenuti in recinti all'aperto ma il loro allevamento, che prevede densità elevate, ricalca le tecniche di conduzione previste negli allevamenti intensivi al chiuso.

L'allevamento *semibrado* si presenta come un insieme diversificato di soluzioni intermedie fra l'intensivo e il brado e viene praticato, in Italia, in quelle aziende dove sono presenti superfici agrarie idonee al pascolo di modeste dimensioni ma anche superfici forestali adeguate per estensione, specie arboree presenti, forme di governo e di trattamento a fornire alimento di pregio in talune fasi di allevamento. Solo i soggetti all'ingrasso, nella fase di finissaggio, usufruiscono infatti del pascolo in bosco nel periodo della caduta di ghiande e castagne mentre, a volte, le scrofe in gestazione vengono fatte pascolare su erbai.

Il breve periodo di pascolo in bosco, condotto quando sono presenti abbondanti frutti, e l'adozione di accorgimenti specifici consente di minimizzare l'impatto sull'ambiente forestale ed è in genere sufficiente a garantire un notevole miglioramento delle caratteristiche organolettiche delle carni e, quindi, a favorire la valorizzazione economica dei prodotti.

L'allevamento *brado*, al contrario, viene condotto in bosco o in terreni non attrezzati nei quali gli animali sono liberi di svolgere tutte le funzioni vitali senza rilevanti interventi gestionali da parte dell'uomo e senza apporti alimentari sistematici.

Questo sistema richiede la disponibilità di estese superfici boschive e pascolive in grado di fornire produzioni di alimento in tutte le fasi dell'anno.

L'allevamento brado nel senso più stretto comprende tutte le fasi del ciclo produttivo, ma nella realtà italiana si riscontra solo in aree geografiche molto particolari e circoscritte (Sardegna e Sicilia).

Sia l'allevamento semibrado che quello brado si rivolgono principalmente a razze rustiche autoctone o a incroci fra queste e suini bianchi, per la particolare robustezza, resistenza alle malattie e attitudine di questi animali a vivere allo stato libero e ad alimentarsi in modo naturale al pascolo.

Nell'ultimo decennio il sistema di allevamento all'aperto dei suini ha avuto una diffusione crescente in Europa; per esempio, in Inghilterra è allevato, con questa tecnica, il 20-25% del patrimonio nazionale di riproduttori suini, mentre in Francia tale quota è arrivata in alcune annate a circa il 10%. Attualmente l'allevamento dei suini all'aperto è praticato in misura variabile in molti altri Paesi europei ed extraeuropei.

In Italia a partire dall'inizio degli anni'90 hanno cominciato a svilupparsi diverse forme di allevamento all'aperto, con tutta la gamma di differenti tipologie descritte. L'allevamento all'aperto, che

all'inizio ha riguardato principalmente i riproduttori, oggi è esteso anche alla fase d'ingrasso, con particolare riferimento al finissaggio, per la produzione di suini di qualità superiore. Gli eventuali maggiori costi per l'ingrasso dei suini all'aperto possono essere compensati da una maggiore remunerazione alla vendita, attuabile nell'ambito di produzioni di qualità quali marchi individuali o collettivi, sistemi qualità (DOP, IGP, *Label rouge*), produzioni biologiche, ecc.

Figura 2.
Suini al pascolo nei boschi della Montagnola senese
(F. Sorbetti Guerri)

In Italia il numero di allevamenti all'aperto è ancora esiguo rispetto a quello degli allevamenti intensivi al chiuso; tuttavia nell'ultimo decennio i primi hanno avuto una diffusione crescente sia nell'ambito delle produzioni biologiche sia per l'allevamento di suini di razze autoctone destinati alla produzione di alimenti tipici di alta qualità.

Tra le realtà di allevamento brado o semibrado più rappresentative in Italia sono da citare quelle del centro e sud Italia (Cinta Senese e, in misura minore, Romagnola, Calabrese e Casertana) e quella della Sicilia (Nero Siciliano).

3. Possibilità e limiti del pascolo suino in bosco

Oggi le possibilità di pascolo degli animali di interesse zootecnico e faunistico sono regolamentate da leggi forestali. In Toscana la normativa forestale (LR 39 del 21/03/2000) consente il pascolo nei boschi attribuendo al regolamento forestale, e alle competenze di Province e Comunità montane, la sua disciplina.

In particolare, per quanto riguarda il pascolo suino, il Regolamento forestale della Toscana prevede la possibilità di allevamento in aree recintate con l'immissione al pascolo di un numero di animali e l'adozione di modalità di pascolo "commisurati alla effettiva possibilità di pascolo ed in modo da evitare danni ai boschi, ai pascoli ed ai suoli" (art. 86). A tali fini lo stesso regolamento esclude la possibilità di pascolo in presenza di talune forme di trattamento del bosco, in certe fasi di accrescimento del soprassuolo, nei boschi percorsi da incendio o qualora si verifichino o siano prevedibili danni rilevanti ai boschi, ai pascoli o ai suoli per pascolo disordinato o eccessivo.

In questa regione è inoltre presente un vastissimo patrimonio forestale che risulta idoneo alla produzione di alimenti necessari per l'allevamento suino (querceti e castagneti in particolare). Per tale motivo in questi ultimi anni si sta notevolmente diffondendo, come si è detto sopra, l'utilizzazione del bosco come terreno di pascolo. Ma ciò avviene spesso senza porre in pratica quelle attenzioni che devono essere adottate per rendere razionali le tecniche di allevamento e sostenibile lo sfruttamento delle risorse naturali.

4. Tecnologie e attrezzature

Una razionale gestione dell'allevamento suino semibrado prevede:

- l'adozione di adeguati criteri e tecniche di controllo per la turnazione del pascolo,
- l'adozione di accorgimenti di limitazione del grufolamento e la realizzazione di recinzioni per consentire la protezione del bosco e la salvaguardia sanitaria degli animali,
- la realizzazione di strutture di allevamento di basso impatto ambientale.

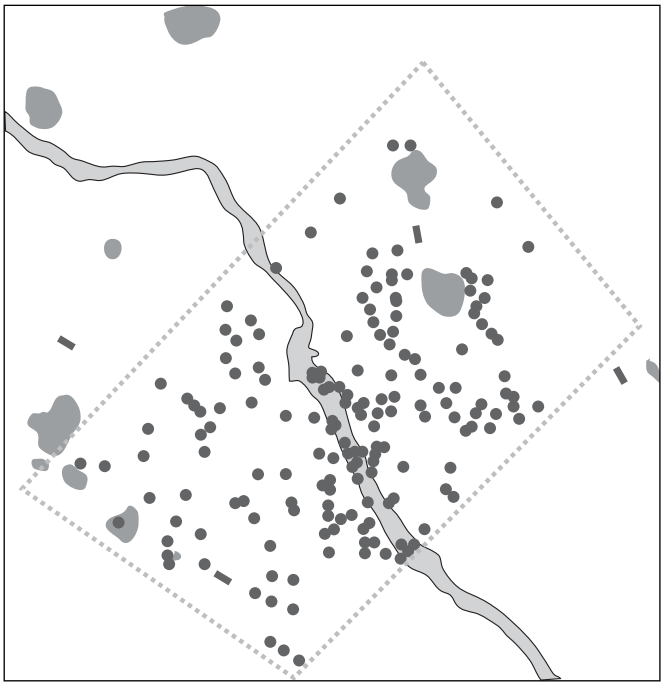

Figura 3.
Monitoraggio del pascolamento con metodologie GPS ed elaborazione in ambiente GIS (L. Conti)

4.1. Criteri e tecniche di controllo

Nello studio delle dinamiche di distribuzione degli animali sul territorio, la bibliografia in materia mostra come negli anni si sia passati dalla semplice indagine visiva, all'utilizzo di strumentazioni più adeguate che hanno permesso di passare da osservazioni sporadiche a valutazioni dettagliate dei movimenti giornalieri e dell'uso dell'*habitat* da parte degli animali (Rodgers *et al.*, 1996).

La continua evoluzione delle apparecchiature che utilizzano sistemi di posizionamento satellitare (GPS) ha permesso lo sviluppo di studi sugli spostamenti e sulla intensità di frequentazione di aree diverse degli animali al pascolo, al fine di favorire e razionalizzare sistemi di allevamento estensivi.

I dati di posizionamento GPS rilevati possono essere gestiti, con altri dati informativi territoriali, in Sistemi Informativi Geografici (GIS) con lo scopo di analizzare e valutare le effettive caratteristiche comportamentali degli animali e il diverso grado di utilizzazione delle realtà pascolive considerate (Fig. 3.).

Ciò può consentire di prevedere e gestire una corretta turnazione dei pascoli massimizzando la loro produttività e limitando eventuali danni da sovrapascolamento.

4.2. Metodi e attrezzature per la protezione del bosco

Figura 4.
Doppia recinzione elettrificata per la gestione del pascolo suino (M.Barbari)

La limitazione dei danni da pascolamento dei suini può essere oggi facilmente conseguita sia applicando anelli nasali antigrufolamento (che sono in grado di impedire i ben noti fenomeni di scalzamento del terreno tipici dei suini) sia frazionando le zone di pascolo. In tali aree la realizzazione di adeguate recinzioni può consentire o precludere l'attività di pascolamento laddove si siano esaurite le risorse alimentari costituite dai frutti caduti dagli alberi. La realizzazione di opportune recinzioni rappresenta quindi l'esigenza di base per organizzare l'allevamento dei suini all'aperto. La soluzione tecnica più semplice è rappresentata dalle recinzioni elettrificate, di tipo analogo a quelle utilizzate per il pascolo di altri animali domestici (bovini, ovini, equini) (Fig. 4.).

Figura 5.
Semplice sistema di protezione del fusto di una quercia all'intero di un recinto di concentrazione di suini. (F. Sorbetti Guerri)

Questo tipo di recinzione permette, con costi accettabili, di confinare gli animali in aree di dimensioni adeguate ed organizzate in base alle diverse fasi di allevamento e alle specifiche esigenze gestionali. Vengono comunemente usate però anche recinzioni in rete di tipo tradizionale. Lungo il perimetro dell'allevamento è sempre opportuno prevedere un'adeguata recinzione in rete per limitare il rischio di intrusione di animali selvatici dall'esterno. La soluzione migliore consiste in una recinzione fissa in pali di castagno piantati nel terreno a una profondità non inferiore a 0,5 m e con un interasse di 1,5-2 m; sui pali sono fissati una robusta rete elettrosaldata in acciaio zincato, a maglia quadrata o a maglia esagonale, dell'altezza di 1,5 m e, a volte, almeno tre ordini di filo spinato, di cui uno installato lungo il bordo superiore e gli altri due fissati lungo il bordo inferiore in prossimità del terreno. Contro l'ingresso di cinghiali di grossa taglia

la recinzione fissa deve essere installata prevedendo l'interramento di parte della rete metallica fino alla profondità di 0,3-0,5 m. Recinzioni di questo tipo possono essere utilizzate anche per la partizione interna dei recinti. Risulta sempre e comunque indispensabile prevedere doppie recinzioni principalmente per motivi di protezione sanitaria dei suini allevati.

Nelle zone di pascolo maggiormente frequentate da parte degli animali, nelle aree di concentrazione degli stessi, vicino alle attrezzature di alimentazione e abbeveraggio, la parte basale del tronco delle piante di maggiori dimensioni situate all'interno dei recinti deve essere protetta con reti o altri materiali in modo da impedire lo scortecciamento dei fusti (Fig. 5.).

4.3. Strutture di allevamento

Figura 6.
Capannina-parto in legno progettata dagli autori pronta per l'effettuazione di prove comparative (L.Conti)

Per ottenere un miglioramento in termini di prestazioni produttive dei suini allevati allo stato semibrado si deve, innanzitutto puntare a ottimizzare la gestione della fase parto e allattamento. A tale scopo occorre raggiungere l'obbiettivo di ridurre le perdite di suinetti dopo il parto, minimizzando il numero delle perdite per schiacciamento e riducendo i rischi di attacchi da parte di predatori, quali volpi, lupi, cani, ecc.

Alla luce di tali considerazioni risulta importante prevedere l'utilizzo di semplici manufatti, quali capannine mobili, ben dimensionate, dotate di accorgimenti atti a ridurre le perdite di suinetti per schiacciamento, a consentire una adeguata protezione dei suinetti e costituire un ambiente climaticamente confortevole per la scrofa allattante e la sua nidiata. Varie tipologie di strutture possono essere reperiti sul mercato ma, anche per rispondere in modo adeguato ad esigenze economiche e di corretto inserimento ambientale, potrebbe essere opportuno far ricorso alla costruzione in azienda delle stesse utilizzando materiali il più possibile "ecologici", facilmente lavorabili e in grado di offrire prestazioni funzionali ottimali al manufatto stesso.

A tal riguardo, presso il Dipartimento di Ingegneria agraria e forestale dell'Università di Firenze sono stati progettati e realizzati due diversi modelli di capannine parto. Il primo modello (Fig. 6.) a pianta rettangolare (1,20x2,30 m) presenta sezione trasversale ad "A", ed è interamente costruito con pali e tavole di legno non trattato e di produzione locale. La capannina è attrezzata in basso con elementi laterali antischiacciamento in legno tondo, posti all'altezza di 0,25 m da terra e presenta un cupolino mobile in lamiera di rame per migliorare la ventilazione e una finestra regolabile sul lato opposto a quello in cui è ricavata la porta di ingresso.

La capannina è priva di pavimento e viene collocata a terra, avendo cura di predisporre una basamento sopraelevato e quindi sempre asciutto da ricoprire con paglia.

Il secondo modello (Fig. 7), a forma di arco, è costituito da una struttura di copertura in rete metallica elettrosaldata, collegata mediante saldatura a un telaio di base in tubolare di acciaio; la struttura è tamponata con presse di paglia rettangolari collocate sulla copertura e sui lati anteriore e posteriore. Le dimensioni sono di 2,20 m di lunghezza, 2,70 m di larghezza e 1,25 m di altezza. Anteriormente è predisposta una porta di accesso di 0,70 m di larghezza e 0,90 m di altezza, mentre sul lato opposto è ricavata un'apertura per la ventilazione.

Queste capannine sono state testate, assieme ad altri modelli commerciali, per oltre tre anni presso varie aziende della Toscana ed hanno dimostrato un'ottima risposta alle esigenze di allevamento, sia nel periodo estivo che in quello invernale, e un particolare gradimento da parte degli animali.

Fra i principali pregi di tali strutture si evidenziano la semplicità di realizzazione, il modestissimo costo dei materiali occorrenti, il gradevole inserimento ambientale e, soprattutto, la facilità di gestione a fine ciclo, dei materiali con cui sono realizzate.

Nel caso della capannina in legno la durata di vita è ovviamente maggiore (fino a 10 anni senza interventi considerevoli di manutenzione) e comunque il legno, non trattato con preservanti, può essere facilmente riciclato.

Nel caso della capannina in paglia risulta semplicissima la rimozione e lo smaltimento delle vecchie presse (quando si sono deteriorate) e la loro sostituzione con altre nuove.

Figura 7.
Capannina in paglia in fase di realizzazione
(F. Sorbetti Guerri)

5. Conclusioni

L'antica pratica del pascolo degli animali domestici nei boschi ha creato innumerevoli problemi alla selvicoltura di tutte le epoche ma ha anche contribuito a permettere a molte civiltà di superare i momenti più critici delle propria storia. Crediamo che sia sostenibile oggi proporre ancora il pascolo nel bosco e riscoprire in chiave moderna questa antica pratica dal momento che la nostra cultura e la nostra società attribuiscono un valore fondamentale alla salvaguardia dell'ambiente e possono essere quindi in grado di attivare strumenti di controllo in altri tempi impensabili.

Esperienze italiane e straniere dimostrano che un corretto e attento pascolo del bosco, limitato nelle stagioni dell'anno e nel carico ammesso, può attribuire nuove funzioni e nuovi valori al bene forestale e può essere attività che si confà con certe forme selvicolturali che privilegiano la presenza nei soprassuoli di un numero elevato di piante in grado di produrre abbondanti fruttificazioni. Forme

di pascolamento che potremmo definire "leggere", come quelle limitate alla sola fase di finissaggio dei suini, sono tuttavia sufficienti a conferire particolari caratteristiche organolettiche e particolare valore ai prodotti. Il pascolo dei suini in bosco non richiede quindi oggi uno sfruttamento continuato di questo ambiente ma presuppone il solo uso limitato di certi suoi frutti. Queste forme di allevamento non richiedono inoltre la realizzazione di strutture fisse e impattanti, ma al contrario soluzioni mobili e leggere che potrebbero rappresentare le nuove proposte costruttive conformi ad una gestione zootecnica sostenibile del bene forestale.

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Recent changes in the landscape spatial pattern of forest lands in Italy: a local assessment

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Abstract

Most European landscapes result from a long-lasting land use history. In Italy, starting from the Roman time, extensive tracts of forest lands were cleared and accommodated to human use for agriculture, which created cultural landscapes with unique land use mosaics. Different historical stages with varying technical, cultural and socio-economical conditions overlaid with time, creating present day cultural landscapes. Forests are an important component of land use mosaics. In uplands forestland appears as the dominant land cover type, with non-forest patches interspersed within (agricultural, scrubland, grassland, urban, etc.); as the land quality for non-forest uses increases, the cultural footprint on forest landscape pattern becomes increasingly evident, with forest found interspersed in agricultural mosaics. Socio-economic and technological changes in agriculture, urbanization and forest fires are the main drivers of changes in the landscape pattern of forest land in Italy: e.g. urbanization often fragments intact forest tracts near urban areas, farmland abandonment adjacent to existing forest patches favours the natural expansion of forestland, forest fires open new successional processes. Land cover maps are a key tool for monitoring and quantifying these changes in a given territory, as they provide geo-referenced information on the distribution of ecosystems and land use by human activities. In Europe, notably, the Corine Land Cover (CLC) database is available for the years 1990 and 2000 providing comparable and consistent pictures of the spatial arrangement of forest in the context of the surrounding landscape, at a fairly detailed scale for a national application (1:100.000). In Italy, for selected geographical areas of central and southern and central Italy, a CLC database for the year 1980 has been also produced. Based on the available CLC 1980 and 2000 coverage, the paper investigates how the use of land for human activities (e.g. extension of settlement areas and infrastructures, intensification of agriculture) or conversely land abandonment (e.g. withdrawal of farming in rural areas) has affected in the past twenty years the spatial pattern of forest land. Local changes in forest landscape pattern are also quantified by means of landscape spatial metrics applied to CLC maps (class area, number of patches, Mean Patch Size, Mean Nearest Neighbour).

Two Pines and the Native Tradition of Burning North American Landscapes

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Abstract

Pinus echinata and *P. palustris* (Shortleaf and Longleaf) both occupy landscapes that evolved since the last glacial cover retreated from eastern North America. Both species have characteristics that allow them to tolerate fire at low intensity, whether ground fires are ignited naturally or by humans. Millennia of fire management in the landscape of North America created vast areas where these species occurred in pure and mixed forest stands. Changes in burning practice brought about by population and related land use changes, especially federal emphasis on fire suppression in the 20th century, have reduced the forest area where these two pine species compete effectively with other species. Changes in land use pattern toward residential and commercial development make the potential for reinstating landscape scale fire regimes problematic. Efforts toward long term conservation and future site restoration that include these species must consider that their fire dependency poses an impediment.

1. Introduction

Since retreat of the most recent glacial cover from eastern North America, forests have altered in response to changes in climate and in human habitation of landscapes (Dickinson 2000). Primeval forest development in the landscape of southeastern North America occurred in the presence of repeated and extensive but usually low-intensity fires. In fact, as Frost (1998) illustrates convincingly, fire-modified landscapes existed throughout the 48 contiguous United States. Intense Indian manipulation of North American landscapes until the natives' demise in the 17th to 19th centuries is finally being appreciated (Mann 2005).

Two pine species, *Pinus echinata* and *P. palustris* (Shortleaf and Longleaf) benefited enormously from this prevalence of fire. Conversely, populations of both species have been profoundly, detrimentally affected by diminution of fire frequency and extent. Following European settlement in the landscape, subsequent agriculture practices, modern forestry preferences, and current residential development trends have imposed substantial constraints on the natural landscapes that these two species would otherwise occupy. This paper examines relationships among their habitats, their characteristics and their prospects for persisting in a modern world of markedly different land use and vegetation management practices.

2. Fire Effects on Two Southern Pines

Effects on our two pine species as they evolved in fire prevalent regions are important. In fact, presence of these two species across large portions of North America gives strong evidence that Indians burned widely and frequently. For when fire ceases to occur in the forest, both of these species eventually disappear. We recently documented decline of longleaf recruitment on one North Carolina site over several decades (Blank 2004).

Fire-adaptive mechanisms of *P. echinata* and *P. palustris* are similar in some respects but different in others. When mature, both trees have thick lower bark that protects cambium from heat of ground fires. In developing stands, both species readily lose lower branches as crowns grow, preventing ground fires from climbing into canopies. *P. echinata*, able to sprout after fire at young ages and tolerant of moderate fire when mature, competes with hardwoods, persisting as fire-coppices and in mixed stands over the long term on dry upland sites. Mature longleaf, with its abundant needle production and annual shedding of old needles, creates a fire-prone condition that limits existence of its competition. Meanwhile, longleaf seedlings endure a "grass stage" during which they develop deep tap roots and buds that withstand low intensity fire though it chars their needles.

That fires occurred across landscapes of North America in prehistory and even since the arrival of Europeans is now known (Frost 1993, 1998; Mann 2005). Smoke from this burning was remarked by early explorers sailing along the eastern coast of North America, and effects on vegetation structure were observed by those who later penetrated the Southeastern interior. Indians burned to maintain open canopy hunting grounds where herbivorous mammals and bird species could forage. They burned to favor natural nutritional plants for their consumption, and they opened areas to maize, squash and other crop cultivation. They burned to afford greater visibility and protection from marauding enemies.

To understand the implications of this burning, we have to consider the concept of fire compartments: areas of the landscape where climate (humidity and heat) and terrain features (generally flat to rolling) combine to allow fires from random ignitions to spread until they encounter natural barriers. Barriers could be zones too wet to burn (inundated or moist riparian zones) or abrupt downward terrain changes. The barriers must be downward slopes because upward terrain changes enhance fire mobility as heat rises. Clearly in rugged terrain fire compartments are smaller than in flatter terrain, but on the Great Plains compartments are huge. In the range of both longleaf and shortleaf fire compartment size varies widely.

3. Historic Range

P. echinata occurs across a range of 1.14 million km^2 (Table 1.), while the range of *P. palustris* includes only 444,600 km^2 (Mattoon 1915). Both species naturally occurred in mixed and pure stands across their range, depending on site conditions. Estimates of area occupied by *P. palustris* stands within its range exceed 24 million hectares (Means, 1996, Frost, 1993). Although Mattoon (1915) notes that the commercial range of *P. echinata* was smaller than the total range, he does not provide a figure for area dominated by the species. Together, *P. echinata* and P. *palustris* in the landscape bracketed nutritionally richer sites typically dominated by deciduous forests, though *P. echinata* was usually a component in hardwood forests as well (Mattoon 1915).

Observations about the appearance of the forests at various points make it clear that they were very different from most forests we have today. Fire would have reduced competition and favored the older and better established trees able to withstand both intermittent and frequent burning. Even in the foothills, broadly open stands of trees were prevalent. Regarding the Coastal Plain, some people now talk about longleaf pines being the keystone component of a pyro-climax community across large areas of southern North America. Hence, the model of forest succession toward closed canopy deciduous forest seems largely inapplicable wherever fire prevailed in the distant past.

Table 1. Comparative Distribution of Eight Pine Species in the U.S. (from Mattoon 1915)

Species	Ar Area of Distribution (km^2)	States Represented
Shortleaf	1,144,000	24
White pine	990,600	23
Pitch pine	936,000	19
Western yellow pine	910,000	14
Scrub pine	824,200	14
Red pine	780,000	14
Loblolly pine	767,000	13
L Longleaf pine	444,600	10

4. Traditional and Changing Land Use Practices

We are limited in what we can say precisely about early Indians' burning frequency at any particular location. Moreover, relatively little documentation exists concerning practices at particular places by settlers who moved into lands abandoned by Indians. Yet, evidence from various explorers' accounts as mentioned above and extrapolations of historic vegetation studies provide convincing arguments of Indian use of fire on a broad scale. We also know burning to maintain grazing forage persisted in the central and southern Appalachian Mountains until the early 20th century and was a major focus of federal fire control policy directed toward the states. Wahlenberg (1946) mistakenly decried frequent understory burning as detrimental to longleaf as late as the mid 20th century. So even long after European colonization, woodland grazing and low intensity burning worked to the advantage of shortleaf and longleaf pines in certain places.

But the major change in burning practices occurred as a result of catastrophic declines in native populations plagued by introduced diseases. When native populations dwindled, their ancient tradition of wholesale landscape management suffered from neglect in a downward spiral of reduced manpower, reduced resource demand, and eventual abandonment of large territories previously under conscious management to meet game forage and human nutritional requirements (Mann 2005). The replacement regimes, colonists' enclosure of pastures and conversion of land to plantation agriculture followed by later settlers carving out farms on the frontier, had pervasive effects. Burning became more sporadic or ceased altogether. However, local conditions and ownership patterns varied considerably, with large plantation and small yeoman farm holders implementing different land use patterns with respect to land clearance and grazing.

One of the biggest overall changes was that Europeans extracted timber for building and to fuel proto-industrial processes brought with them from the old world. The characteristics and qualities of these species as mature trees made them likely to be extracted from mixed forests for domestic use and commercial products during earliest landscape transformation. Selectively felling pines that could be hewn and sawn into building material, colonists also began to change forest regeneration. Harvesting of both species for timber was widespread and, after 1720, *P. palustris* extraction for tar and turpentine production endured for two centuries. Shortleaf in mixed forests persisted to the extent they were periodically disturbed and openings created could regenerate with some pine. In contrast, growth habits of longleaf pine pose disadvantages in mixed stands. Sporadic seed production compared to shortleaf and loblolly pine (*P. taeda*) and the long duration of seedling establishment, or "grass stage" of longleaf cedes growing space to competition. On relatively good

sites, other pines and hardwoods both get a better start and then maintain their advantage. Absent fire or other release from competition, these competitors overwhelm longleaf seedlings and lead to suppression of longleaf trees in the under story, possibly for many years, as we have seen on the Harris Research Tract (Blank 2004).

Land clearance for agriculture and pasturage changed dynamics of tree species interaction even more significantly, but the temporal scale was important. As Trimble (1974) demonstrates, scales of agricultural production varied across the Piedmont both by region and timeframe. Thus, the general trends that disfavored our two pine species might be mitigated in certain locations for longer periods. Substantial land clearing through colonial and antebellum periods was followed by considerable farmland abandonment in the post-Civil War era. Christensen (1989) says "there is no doubt that shortleaf pine was a more successful invader in fields abandoned during the nineteenth century than in those abandoned after 1930" (p.122). Fields abandoned in the 1800s lacked lime and nitrogen and phosphate fertilizers so "were probably considerably more sterile than their twentieth-century counterparts". Shortleaf stands in parts of the Piedmont landscape were mature enough to harvest on considerable acreages by the early twentieth century.

Considering the landscape in 1915 and the position of shortleaf pine, as what Mattoon identifies as the only commercial conifer on 29.5 million hectares, gives us some idea of its impending fate. Harvest of mature shortleaf pine in this period occurred when regeneration by a variety of other species was possible. Moreover, in the early 20th century, imposition of federal policy to reduce fires tipped the balance against shortleaf and longleaf. Intentional ignitions were controlled and discouraged and accidental ignitions were extinguished as quickly as possible.

As early as 1915 Mattoon notes that "in the upper portions of the Atlantic coastal plain [shortleaf] is to a considerable extent being replaced by loblolly pine on abandoned fields. The early clearing for agriculture of the lighter and better drained soils greatly decreased the shortleaf trees and correspondingly increased the relative proportion of loblolly seed trees, which were left growing along the watercourses and on low heavy soils" (p.3). He also notes that "by the thinning or removal of the valuable shortleaf pine, opportunity [was] afforded for the more rapid reproduction of tolerant hardwoods already on the ground. Thus some territory formerly dominated by shortleaf in mixture is now held almost exclusively by hardwoods" (Mattoon 1915).

5. Current Status and Implications

Regarding these two pine species, we can see that growth habits and changes in uses of landscapes conflicted. Characteristic adaptations that fostered survival in fire–prevalent landscapes were less advantageous when forest management policy suppressed fire. Both species now appear peripherally important as commercial pines in forests of the Southeast United States. Less conducive conditions for regeneration and persistence of both species throughout their historic ranges was the inevitable result of the focus on commercial management and protection of the forest resource.

South and Buckner (2003) estimated a 40 percent reduction in southern acreage of shortleaf pine stands between 1953 and 1997 (1.25 million hectares) coupled with a loss of 526, 315 hectares (36%) of northern mixed pine stands that included shortleaf. In 1986, Smalley observed that "the acreage of shortleaf pine plantations established on old-fields [was] declining. Little agricultural land [was] being abandoned, and practically none [was] being planted to shortleaf. Owners [were] replanting harvested acres with the faster growing loblolly pine" (132). Smalley did note that on national forests thousands of acres of shortleaf were being planted, especially the Ouachita and Ozark National Forests. Through the 1990s, though, less than two percent of southern pines planted were shortleaf

(South and Buckner 2003). Apparently, susceptibility to little leaf disease and predation by Nantucket pine tip moth have been influential reasons for foresters to avoid planting shortleaf (Smalley 1986).

The marginal status of both species has gained attention of foresters and other conservation minded people (Landers et al. 1995, Means 1996, South and Buckner 2003). A state meeting of North Carolina foresters in 2005 and an upcoming national meeting in Missouri in November 2006 demonstrate increasing concern over the situation facing shortleaf pine. Means (1996) and many others have been beating a drum for longleaf for over a decade. But large scale conservation and restoration of these two species in the modern landscape face serious obstacles. Probably the biggest impediment is that so much of the landscape in which these trees occur is now inhabited by people not especially interested in having nearby forest land burned for any reason. Alternative mechanical practices to maintain these trees in mixed stands are prohibitively expensive. Chemical treatments to control deciduous competition do not work against loblolly pine, now the main competitor on most sites where shortleaf and longleaf grow. Preference for short commercial pine rotations also works against these species.

Landers et al. (1995) suggest several reasons why longleaf pine should be valued as a timber species, and shortleaf would be a good choice if larger diameter, high quality logs from selectively managed stands were the target. But timber markets in the United States will have to change considerably to pay the premium for logs from longer rotations. Yet, considering primary attributes of these two pines, we might expect that one factor – their drought tolerance – might make them attractive species in a changing world where a hotter and dryer Southeast United States is predicted from global warming. We will see what happens.

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La memoria e l'attualità del paesaggio

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Abstract

I toponimi rappresentano un elemento peculiare del rapporto uomo-territorio, in quanto danno una lettura molto appropriata delle caratteristiche dell'ambiente naturale, degli eventi storici, dell'occupazione del suolo e delle attività economiche in senso lato. I nomi di luogo persistono, spesso, anche dopo radicali trasformazioni, a evidenziare la storia naturale e umana di un territorio. I toponimi della Sardegna desunti dalle carte I.G.M. 1:25.000 e dell'Ufficio Catastale dei terreni (Paulis, 1987) sono circa 90.000 e la loro analisi dei toponimi ha consentito di evidenziare che circa il 20% del totale si riferiscono a singole specie botaniche e formazioni vegetali o aspetti che richiamano comunque attività legate al mondo delle piante. Tuttavia, il numero dei toponimi e, conseguentemente anche quelli legati alle piante, è senza dubbio superiore a quanto riportato sia dalle carte dell'I.G.M., sia da quelle catastali, in quanto la necessità delle popolazioni locali di identificazione dei luoghi è, spesso, di gran lunga maggiore di quanto richiesto per gli aspetti amministrativi da parte degli enti pubblici. Indagini svolte nei comuni da esperti locali mostrano un incremento notevole di dati. Così, nel paese di Dorgali, in provincia di Nuoro, si ha un aumento in percentuale di oltre il 30% (Camarda, 1990), e nel paese di Abbasanta (Arca, 2003) in provincia di Oristano, si ha addirittura un incremento da 29 a 65 fitonimi, pari al 105%. Nel complesso si può verosimilmente ipotizzare che esistano oltre 30.000 nomi legati alle piante, che danno un'idea molto precisa e di dettaglio delle condizioni ambientali e del paesaggio vegetale della Regione. Considerato che la superficie della Sardegna è di circa 24.000 kmq, risulta che in ogni Kmq esiste mediamente più di un toponimo legato ad una specie. Il valore assoluto dei fitotoponimi differisce in modo significativo da paese a paese e, di norma, dipende dall'estensione del territorio, ma il quadro della densità nella loro distribuzione varia sensibilmente quando si considera il rapporto tra estensione del territorio di ogni paese e numero assoluto. La fito-toponomastica sarda è stata, altresì, messa in luce da diverse indagini (Camarda, 1984; Camarda e Cossu, 1989; Baccetta, 2000). Variazioni significative si riscontrano anche dal punto di vista linguistico. I fito-toponimi, inoltre, forniscono un quadro di particolare interesse sia per la definizione delle unità del paesaggio vegetale, ma anche per la ricostruzione della sua storia. La prima analisi di carattere generale su questo tema è stata fatta per lo studio dei Piani Paesistici della Sardegna per definire i tipi di paesaggio vegetale (Camarda, 1989) e riproposto come elemento identitario nella recente stesura del Piano Paesaggistico Regionale ai sensi della legge 42/2004.

Keywords: fitotoponomastica, paesaggio, Sardegna.

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Mediterranean forest management, a tool to guarantee sustainability: evolution of the Catalan agrarian landscape and the forestry regulations from the 18th century to the end of the 20th century

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Abstract

The present state of Catalan forests, mainly Mediterranean, with a total forest area of 1,8 million hectares (of which 1 million are tree-covered) is the result of the different stages and transitions passed through by the agrarian landscape over time. Sustainable forest management, from an economic, ecological and social multifunctional perspective, has not evolved until the end of the 20th century. The most important change in the agrarian landscape took place during the 18th century, triggered by a high demographic growth (mean annual growth of 1%) and the need to maximise benefits in order to achieve a higher economic growth. During this period, and until the end of the 19th century, wood resources were progressively reduced and, although some legal restrictions arose, these were ephemeral and only led to the conservation of particular forest stands with very specific conservation objectives. Forestry regulations began to expand and since the 18th century more than 500 regulations appeared to regulate resource use in accordance to the current needs. Based on these regulations and other specific studies on the Catalan agrarian landscape, the two clearly defined stages that forests have passed through from the 18th century onwards are analysed. In the first stage, from the 18th century towards the end of the 19th century, agriculture reached its maximum area, due to the value of vineyards and olive trees, and thus forest area (forests and grasslands) was reduced. During this period, public and private ownership were in conflict to guarantee forest capitalisation either through the inclusion of forests into the public domain, or through the disentitlement processes. Despite this, the private land, which is dominant in Catalonia, remained more or less stable. When the German forestry science was introduced by the forest engineers (mid 19th century), people realised the importance attaining an equilibrium, between forest resource growth and its exploitation. Later on, the need to increase forest area also appeared, leading to a wide implementation of forest reforestation projects. In a second stage, from the 20th century on, while the agrarian sector remained profitable, the previously mentioned conservation ideas materialised and silvicultural guidelines appeared together with some forest management planning and hydrological interventions. A higher control of forest exploitation and land use changes resulted in an increase in forest area and tree-covered area. This change was accelerated by an increase in the exploitation costs, the arrival of new energy resources and rural migration, leading to a 34% increase in tree-covered area between 1969 and 2001. The forest management gap and the abandonment of agriculture land enhanced biomass accumulation which created conditions that favoured large forest fires. The present study shows the existing relation between landscape changes and profitability of resource exploitation as well as with the present need to recover forest management in a sustainable way through adequate guidelines and regulations. The need to achieve the economic sustainability of agrarian and forest resources with an adequate space structure is highlighted, in order to create a new agrarian landscape that guarantees Mediterranean forest biodiversity.

1. Introduction

Catalonia is a region of Spain with 3.199.011 hectares. The present state of Catalan forests, mainly the Mediterranean ones, with a forest surface of 1,8 M hectares (of which 1M are tree covered) and 80% of the forest land of private ownership, is the result of the different stages and transition steps passed through by the agrarian landscape over time, evolving in accordance to space structure, agriculture, grassland and forest , and natural resource use, wood and grass (V. Clement, 1993), mainly during the last three centuries.

Sustainable forest management, from an economic, ecological and social multifunctional perspective, does not evolve until the end of the 20th century. At this time, the agrarian sector profitability and the management of forests are reduced, leading to a biomass increment and an abandon of agriculture and grasslands, enabling the easier advance of large forest fires. It is in this latest stage that the need to attain again the old forest management level within the frame of forest sustainability is proclaimed to guarantee resource use for the future generations.

The forest area as well as the tree-covered area have been to disposal of the agricultural requirement, in the face of the development of the explotation according to the demographic variations and the economic growth, and other factors how the type of ownership, of the technology, the commercialization of some products towards other, the adaptation of the different uses to more mountainous zones and the social demand from the multifunctionality of the forests.

During the period of study, of the 18th century until XX, we can analyze the evolution of the Catalan agricultural landscape in function of the exploitation of the natural resources and the tools that the company has used in its preservation for the generations future.

2. Methods

From an evolutive hypothesis of land uses (Figure1) this study analyses the forest evolution and its tree-covered area from the 18th to 20th centuries (until 1975), based on:

- the light of the agricultural sector and the population growth,
- the regulations, in this period more than 500 regulations appear intending to rule resource use in accordance with the existing needs at every particular moment,
- other specific studies on the Catalan agrarian landscape.

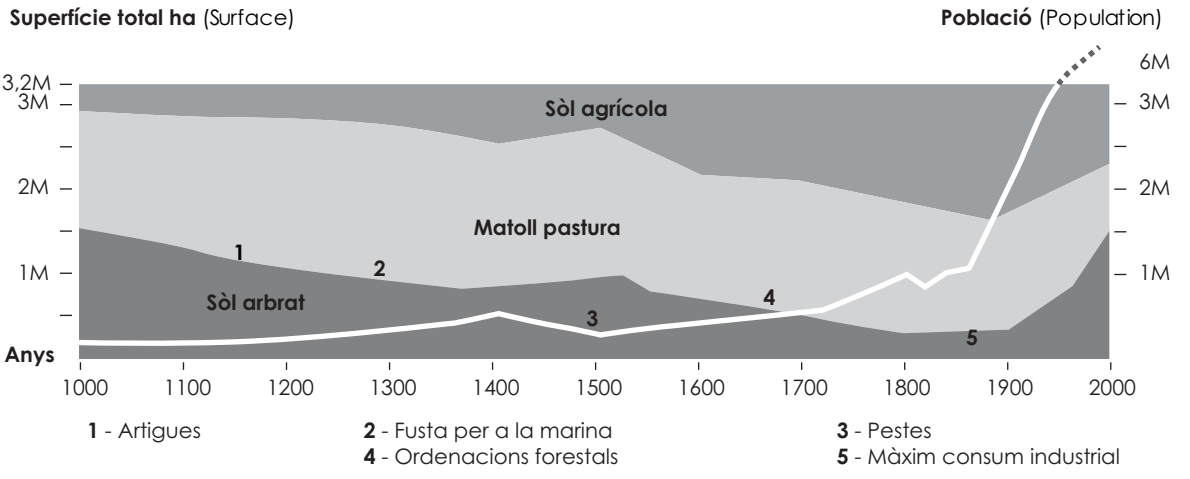

Figure 1. Evolutive hypothesis of land uses and population evolution. Foc Verd II, DARP 1999. Forest in green, grasslands in yellow and agrarian use in orange color

3. Results and discussion

3.1. Evolution of the Catalan agrarian landscape from the early 18th century to the end 20th century

Some studies about population evolution highlight that the highest demographic growth begins in the 18th century, with a mean annual growth near of 1% (Table1). Consequently, an important change in the agrarian landscape begins to take place.

Table 1. Demographic growth of Catalonia

Years	Population	Annual growth %
1717	508.000	-
1787	899.531	0,82
1857	1.661.291	0,88
1910	2.084.868	0,43
1975	5.663.125	1,55

In this period, from 18th to 20th, it is possible to define two important stages that forest have passed through: the first stage, from the 18th century towards the end of the 19th century, is characterised by wood resources reduction and agriculture land increase, and the second stage, from the 20th century onwards, with an important recovering of the tree-cover especially from the second half of the century.

3.1.1. First stage, from the 18th century towards the end of the 19th century

This first phase is characterized by:

- A high demographic growth that brings the need to increase the profits.
- Agriculture reaches its maximum area, due to the value of vineyards and olive trees.
- Forest area, forests and grasslands, decrease while land use changes increase.
- The tree-covered area is reduced as a result of intensive exploitation, mainly for naval uses, energy, construction and other domestic uses.
- Although some legal restrictions arise, these are ephemera and only lead to the conservati on of particular forest stands with very specific conservation objectives.
- Public and private ownership are in an intense fight to guarantee forest capitalisation either through the inclusion of forests in the public catalogue, (in 1855 and 1862) or through processes of disentitlement (in 1837 and 1855). Finally private land remains more or less stable.
- German Dasonomic science is brought onto the scene by the forest engineers (mid 19th century) and the people realise the importance of getting the forest stand equilibrium, between resource growth and its exploitation.
- Some ideas appear regarding the recuperation of the tree-covered area, leading to a wide implementation of forest reforestation projects.

3.1.2. Second stage, from the 20th century onwards

The second phase is characterized by:

- At the beginning of the century the vineyards withdraw because of the *filoxera* and a process of natural recovering and reforestation starts.
- While the agrarian sector stays profitable, the conservation ideas are materialised and silvicultural guidelines appear together with some forest management planning and hydrological projects (Figure 2.).

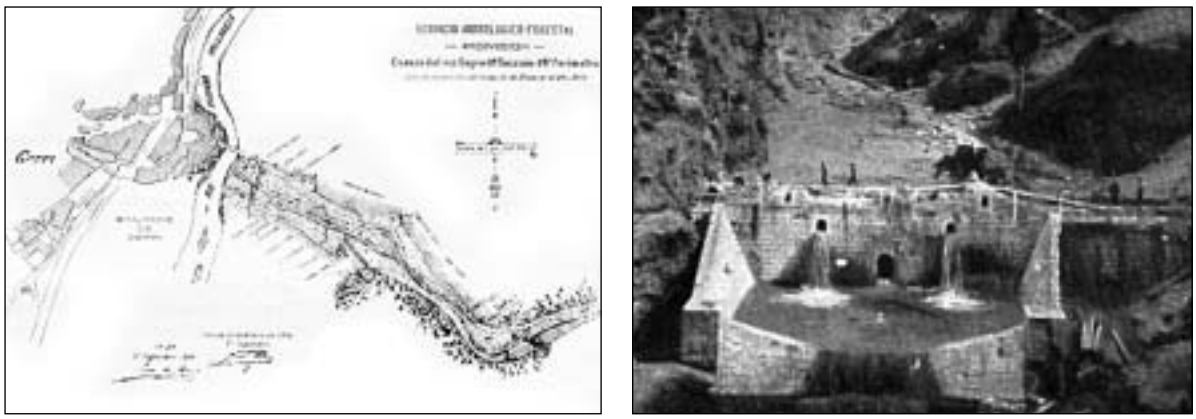

Figure 2 . Hydrological project in Catalonia, 1901 (DMAiH)

- higher control of forest exploitation and land use changes brings an increase of forest area. There are more regulations and protection campaigns.
- low agrarian profitability brings rural migration, mainly in the middle of the 20th century, and the agriculture and grassland management are progressively reduced.
- Wood exploitation is reduced due to the introduction of other energy sources and management decreases because of the high cost of exploitation.
- In the 20th century the forest land and the tree-covered land is recovered (Figure 3.).
- During the 1969-2001 period, the tree-covered area increases by 34%.
- The forest management gap and the abandoning of agriculture land enhance biomass accumulation which brings the origin of large forest fires.

Figure 3. Evolution agrarian landscape during the 20th century: private forest in Espinelves, Catalonia, 1916 and 2003 (Mas Joan, 1916 & DMAiH, 2003)

3.2. Some tools to preserve the biodiversity and the tree-covered land for three centuries

During the period from the 18th to 20th century, different tools were implemented to preserve the forest surface and the tree-covered area. They were the following:

- The genuine mechanisms of protection of the 17th century community exploitation, together with low rates of demographic growth.
- The techniques of marking for wood-cutting and immediate plantation during the 18th century.
- The German Dasonomic techniques based on technological or financial turns and a forest planning searching for the balance between forest exploitation and forest growth, at the end of 19th century.
- The disentitlement processes of the 19th century are considered a tool through which the private property can preserve its resources.
- The public management is seen as a guarantee for the maintenance of the resources of long capitalization.
- The hydrological-forestry projects at the beginning of the 20th century for environmental unctions, either in public or private land.
- The forest law that rules the wood-cutting authorizations and allows its monitoring has an important role in the first third of the 20th century.

4. Conclusions

- During the 18th to the 20th century period, we can clearly identify two stages: the first one characterised by wood resources reduction and agriculture land increase, and the second one, starting in the 20th century, with an important recovering of the tree-cover especially from the second half of the century.
- During the 18th century and even at first of the 19th century, the forest exploitation does not follow any environmental guideline and the extractions depend on the needs of the moment without guaranteeing the preservation of the resources for the following generations.
- At the end of the 19th century is introduced an accurate vision of the equilibrium of the nature and the possibility of the forest through the dasonòmic science, through the forest engineers, and a change fixes in the formality of the forests keeping at all times the regeneration natural or artificial of the masses.
- During the first half of the 20th century the tree-covered area is retrieved, the primary sector still keeps viable and also the forest manegement. The loss of the agrarian sector profitability, from half of century XX, with the progressive abandonment of the crops and pastures, entails an acceleration in the growth of the tree-cover and the forest surface, that it drives in some parts of the territory to a structural imbalance and to the creation of continuous masses that at the end of 20th century increases the advance of forest fires.
- Landscape changes are related to the profitability of the exploitation but neither the rules nor the increase of the profits are by themselves the guarantee for sustainability.

- We agree with the FAO's statement (Roma, 17th March 2005) which sustains the hypothesis that forestry planning and management, bearing the environmental and social aspects, requires economic sustainability.
- Mediterranean forests need to have an adequate agrarian frame in order to achieve a good space structure and to guarantee the biodiversity of the landscape to face the large forest fires.

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Landscape history and heritage revaluation in Olzinelles valley (Montnegre, NE Spain): a socioecological approach (1851-2006)

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Abstract

One of the features of the new scientific framework that is emerging as a response to global environmental crises is the attempt to dissolve classical nature and culture separation and to overcome excessive specialization in unconnected fields. In this context, disciplines as geography, agroecology, landscape ecology and environmental history try to integrate social science and natural science to obtain a better understanding of environmental problems and to find appropriate solutions. Land use and land cover change, one of the most relevant components of global change in terrestrial ecosystems, can be studied at a local and regional level through an environmental history analysis, which is specially useful considering temporal and spatial scale dependency of such phenomena. In this communication we report the first results of an interdisciplinary research on landscape changes and heritage revaluation that is being carried out in Olzinelles valley (Montnegre, NE Spain), considering the period 1851-2006. We use the concept of socioecological heritage to describe a selection of evidences of historical evolution of landscape, and we applied it to the study area, where we have detected 263 elements. We report an important depopulation process with a loss of 85% of the population of 1924 in 2006. Future research will try to correlate demographic evolution of the twentieth century to changes in land use and land cover.

1. Introduction

The need to understand environmental problems and find suitable solutions, one of the biggest challenges that society faces nowadays, has driven science to new methodological and epistemological approaches aimed at overcoming the classical nature/culture separation, integrating parcelled knowledge into interdisciplinary views and taking into account the importance of those forms of knowledge that are not based in scientific method. This new conceptual paradigm has appeared in different moments and in different fields of knowledge, following an opposite trend to contemporary science, which tends to increase specialization in unconnected fields (Toledo, 1998). Nature and culture separation is being criticized by the Colombian philosopher Augusto Ángel, who stands that the deep change in conceptual relation between man and nature that meant platonic split or dualism would be the cultural basis of current environmental crisis (Ángel, 2001). The platonic division between sensitive world (body and nature) and real world (soul) would have been incorporated by Christianity into its dogma, and would have arrived to modernity under the forms of object and subject (Noguera, 2004), separated nature and culture. The critic to the "ontology of split", as it has been named, is the departure point for the construction of a new environmental philosophy whose main objective is to recover the lost unity between these two domains. As Noguera (2004) points out, the construction of this environmental thought can be compared with a rizomatic growth that breaks with linearity and Cartesian order and that integrates unknown actors for anthropocentric modernity.

Nature and culture separation divides clearly the fields of study to undertake by scientific knowledge (Boada & Saurí, 2002), and may lead to a subordination of social sciences to natural sciences (Wynne, 1994) in global change studies. Besides this clear division we see, as pointed out before, a big specialization of knowledge in unconnected fields, which has been named as "Neo-obscurantism" by Naredo (Toledo, 1998). According to Edgar Morin, the main limitation of the predominant style of doing research is the "simplifier paradigm", a way to organize knowledge that eludes the increasing complexity of contemporary reality (Toledo, 2005). In this context, hybrid disciplines are different proposals to integrate knowledge into interdisciplinary views. Among them we find agroecology, environmental history and landscape ecology. Agroecology considers agriculture as a coevolution between social systems and ecological systems, and as information comprised in local cultures. While agronomists develop new technologies based in scientific knowledge to modernize traditional agriculture, agroecologists study traditional technologies of peasants and indigenous people to obtain modern scientific knowledge (Norgaard, 1985). The role played by traditional primary activities in maintaining landscape structure and biodiversity is taken into account by landscape ecology, whose principles can be applied to ecosystem management and conservation practices. Not considering or even forgetting the role of traditional management has been a distinctive feature of the responsible staff in charge of protected areas in the province of Barcelona (Otero & Boada, 2006), as well as in any other protected areas worldwide.

Environmental history, born at the beginning of the seventies when environmental crisis was perceived by scientific international community and when the first ecologist movements appeared (Worster, 1988; González de Molina, 1993), is another hybrid discipline. It provides an appropriate framework to analyse regional consequences of global change (Otero, 2005), specially regional and local land use and land cover changes. Geography, which is recovering the lost environmentalist tradition after a period of dualism strengthening, makes important contributions to the study of these changes through the application of the systemic approach into the international research programme LUCC (Boada & Saurí, 2002). Changes in land use and land cover are the main component of global change in terrestrial ecosystems (Turner, 1990), and its effects may be more important than those associated with potential climate change (IGBP, 2004). So a deeper understanding of this phenomenon is needed to inform society about consequences of its socioeconomic activity and to design adequate mitigation and adaptation strategies.

2. Objectives and methodology

Regional consequences of global change have been demonstrated in some Mediterranean regions of Catalonia by different studies. Peñuelas *et al.* (2002) have provided evidence of altered life cycles for some of the most abundant Mediterranean plants and birds, and one butterfly species for the period 1952-2000 in Cardedéu (Catalonia, NE Spain), as a consequence of an increase in temperature. Because of the different responses of the species, these climate-driven changes may lead to a decoupling of species interactions and alter the structure and functioning of communities (Peñuelas *et al.*, 2002; Peñuelas & Filella, 2001). Peñuelas & Boada (2003) reported a progressive replacement of cold-temperate ecosystems by Mediterranean ecosystems in Montseny mountains (Catalonia, NE Spain), where beech (*Fagus sylvatica*) forest has shifted altitudinally upwards by ca. 70 m at the highest latitudes (1600-1700 m) and is being replaced by holm oak (*Quercus ilex*) forest at medium altitudes (800-1400 m), as a consequence of warmer conditions complemented by the land use changes. A logical hypothesis emerges when analysing global change-induced cover shifts in Mediterranean mountains of Catalonia: forest appropriation, cultivation and farming have strongly decreased in last 50 years and this would lead to an increase in forest area and forest density. The landscape homogenization may have produced a decrease of open habitat and ecotonic species and

may have increased forest vulnerability to severe forest fires, in a complex process where increase in mean temperature affects both causes and consequences of land cover change.

The area under study has an extension of 1.130 hectares and is mainly occupied by Olzinelles valley, located in Montnegre Mountain (province of Barcelona, NE Spain), which is part of the Catalan Coastal mountain range. A 94% of the area is covered by forests, mainly cork oak (*Quercus suber*), holm oak (*Q. ilex*) or mixed forest (holm oak with cork oak or holm oak with *Q. humilis*), while only 3% is covered by active fields. The population, 27 inhabitants, is scattered in *masos*, the traditional cultivation and farming unit of Catalan countryside. Land tenure is private in all the area and 60% of it belongs to properties bigger than 95 hectares (38% of study area belongs to one property). Since 1989, 74% of the area is included in the Montnegre-Corredor Natural Park. Olzinelles used to be an independent municipality since 1927, when it was annexed to Sant Celoni municipality. The ongoing project is being carried out with support from its city council, in an attempt to revalue a rich heritage that is being "buried" by forest. The objectives of the project are to analyse land use and land cover change in an environmental history approach (1851-2006); to compile and revalue the socioecological heritage of traditional activities, to compile traditional agrosilvopastoral knowledge and to use oral sources for the historical analysis. Methodology is based on generating a map of current land use and land cover by means of different cartographic sources; inventorying fauna and flora and studying its relation to different vegetation units; making an analysis of the evolution of population and landscape based on historical documents (1851-2006); combining information from photointerpretation of aerial photographs of 1956 and 2004 using GIS tools; inventorying elements of the socioecological heritage of traditional activities and compiling traditional knowledge by means of personal interviews and the creation of an audio file collection.

3. Results and discussion

3.1. Land use and land cover, flora and fauna

To create a current vegetation map we have used the cartographic information supplied by existing forest management plans of private properties[1], which account for 71% of the study area, and a vegetation map of Montnegre-Corredor Natural Park[2]. The basic cartography is topographic maps and orthophotoimages of 2004 (scale 1:5.000). Field work has been carried out to check source validity and to unify criteria in mapping land covers/uses[3]. Olzinelles valley is mainly occupied by forests: 30% of coppiced cork oak (*Quercus suber*), 22% of coppiced holm oak (*Q. ilex*) and 31% of mixed forests (holm oak with cork oak or holm oak with *Q. humilis*). Another relevant forest cover is European alder (*Alnus glutinosa*) forest along streams (3%). Coniferous cover (*Pinus pinea, P. radiata* and *P. pinaster*) accounts for 5% of the total area, while 3% is occupied by active fields and 2% by plantations of plane trees (*Platanus* sp.). Finally, quarries account for 1% of the area. To inventor the fauna we have conducted a bibliographical review of species cited in the study area and we have used direct or indirect observation in field work. The results, in number of species, are: 9 amphibians and 10 reptiles (31% and 16% of the species in Spain according to

[1] *Plans Tècnics de Gestió i Millora Forestal*. They provide a map with the vegetation and management units of the property (scale 1:5.000). These documents are usually made by forest engineers and approved by Forest Property Centre, a body of the Catalan Government in charge of private forest planning and management. Plans used (8) were drafted between 1998 and 2003.

[2] Supplied by Natural Park technical staff (scale 1.10.000). It was made using fotointerpretation and field work in 1997.

[3] According to Turner *et al.* (1995) land cover "is the biophysical state of the earth's surface and immediate subsurface" and land use "involves both the manner in which biophysical attributes of the land are manipulated and the intent underlying that manipulation", that is the purpose for which the land is used. We realised that, as in other land use and land cover change studies, distinguishing use from cover is not easy and it may not be even fruitful.

Pleguezuelos et al., 2002[4]), 4 fishes, 72 birds (3 of which are considered threatened in Catalonia according to Estrada et al., 2004) and 23 mammals[5] .

3.2. Socioecological heritage: a piece of history

Next step has been to study the heritage, to which it has been given a new conceptualization to overcome the nature/culture division. The separation mentioned in the introduction is also present in heritage conceptions and studies (natural vs. cultural heritage), and socioecological heritage tries to integrate them into a broad category that could be defined as a selection of evidences of historical evolution of landscape, or as environmental legacy. Elements of socioecological heritage have been georeferenced, described in a catalogue, classified in a database and represented in maps. The results show a large number of elements with a positive relation with the sampling effort: the more the researcher walks along the paths, through the forest or along the edge of the fields, the more amount of socioecological heritage he will find. Landscape in Olzinelles is very rich in environmental legacy, it incorporates history in its own structure. Table 1. shows the results and classifies the elements of socioecological heritage into eight categories.

Table 1. Elements and categories of socioecological heritage in Olzinelles valley

Category	N° of elements	Subcategories
Architectural and archeological elements	190	*Masos** (conserved and in ruins), water management infrastructures, constructions related to agrosilvopastoral activities, rural industries, constructions and ways related to transport and mobility, religious buildings
Ancient and remarkable trees	49	Ancient trees, remarkable trees and singular trees
Disappeared elements	9	*Masos*, others
Habitats of interest	8	European interest, local and regional interest
Legends and stories	7	Legends, stories and anecdotes
Species of interest**	?	European interest, local and regional interest
Genetic varieties of cultivated species***	—	Fruit trees, grapevine, vegetables
Tools[3]	—	Primary industries, domestic, others

Source: Field work, oral sources and review of local studies.
* *Mas* (or *masia*), in the sense used here, is the traditional familiar house of the Catalan countryside.
** The criteria to consider a species of interest (European and local/regional) is still being discussed.
*** Results not available.

Some explanation has to be given to the fact that we consider all categories in Table 1. as "socioecological", that is, having a double nature. The existence of one type of habitat, an active field for example, is the consequence of an interaction between biophysical and socioeconomic factors, and its conservation depends on the maintenance of both driving forces. In the case of species, flora and fauna have also an important cultural and socioeconomic dimension. For example, even though wild boars (*Sus scrofa*) haven't biological adaptations to the night, they have adopted nocturnal habits in order to avoid contact with human beings, the big predator that has hunted them along centuries. The age and the form of an ancient or remarkable tree depend on biological specific factors, but also on forestry practices. Similar arguments could be given for the other categories. Local knowledge can be considered part of socioecological heritage, but it will be treated separately.

[4] This percentages may have changed due to the description of the new endemic species of brook newt *Calotriton arnoldi* in the Montseny mountains (Catalonia, NE Spain) by Carranza & Amat (2005).
[5] new one may be added if the sampling campaign of micromammal *Arvicola sapidus*, which has to be done along the river in recent future, confirms the suspicions about its return to the valley (see 4. *Provisional conclusions and next steps*).

3.3. Changes in landscape and demographic evolution (1851-2006): first results

3.3.1. Changes in landscape between 1851 and 1862

To study the changes in landscape between 1852 and 1862 we have used the *amillaramiento*[6] of Olzinelles municipality of 1862, as well as the interpretation that Nadal & Urteaga (1997[7]) made of the *amillaramientos* of 24 municipalities of the Montnegre-Corredor region, including Olzinelles, from 1852 to 1862[8]. According to these authors, two key factors were influencing changes in landscape of Montnegre-Corredor region from the middle of the nineteenth century. Arrival and expansion of railway from 1848 onwards were going to drive urban and industrial growth in the region, and the expansion of pest *Oidium tuckeri* in 1852 destroyed more than half of the vineyards in ten years, causing a decrease in agrarian area of about 11%. So the increase in agrarian area that took place in Catalonia during the nineteenth century didn't follow a linear trend and was not homogeneously distributed throughout the country. Another distinctive aspect of landscape of Montnegre-Corredor region was the existence of large extension of woods. In 1862 the percentage of agricultural area was the lowest of the Coastal region in Catalonia, but the predominance of cereals and vineyards in the cultivated land was a common feature, reflecting a quite high level of agrarian specialization linked with trading of products as wine (Nadal & Urteaga, op. cit.). According to these authors, the municipality of Olzinelles[9] had the lowest population density in the region in 1860 (13 h/km^2 compared to a mean of 120 h/km^2) and a lower percentage of agricultural area in 1862 (11.8% compared to a mean of 26.7%). In the period 1851-1862 the agricultural area decreased a 6.8% and the relative importance of vineyards decreased (from 64.9% to 56.5% of cultivated land), while cereals gained relative importance (from 33.7% to 41.2% of cultivated land), probably as a consequence of the pest. In 1862 there were 119 ha of vineyards less than in 1851, but with the available data we can't say whether they evolved to forest or they were replanted with new grapevines.

3.3.2. Demographic evolution between 1924 and 2006

Population growth is considered a basic driving force of global change, and increase in population can be associated with changes in land use and land cover (Turner *et al.*, 1995). In the case of the opposite trend, depopulation in rural areas, it has been stated in a polemical article published in *Science*, that it has allowed ecosystem recovery in Latin America, and that conservation policies should focus on preparing rural migrants for an urban environment and should promote ecosystem recovery in the lands that are abandoned (Aide & Grau, 2004). In Mediterranean forest ecosystems, however, it has been pointed out that rural depopulation is causing environmental degradation (Boada & Saurí, 2002) or loss of biodiversity (Boada, 2002), but it also has permitted an important recovery of the forest area and cover.

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[6] The *Amillaramiento* is documentation derived from the fiscal reform of the Spanish government in 1845, which established a tax on the product of properties, cultivations and livestock. It consists of a list of the land owners of the municipality and its properties, specifying the area, the type of use (cereal, vineyard, forest, etc.) and the amount to pay for each parcel. The fact that it is documentation about taxes may lead to the conclusion that they are not reliable due to a potentially high level of property hiding, but in the province of Barcelona and in Montnegre-Corredor region it has been proved to be a reliable historiographical source (Source: see note 8).

[7] Nadal, F., Urteaga, L., 1997. L'evolució del paisatge a les Serres del Montnegre i el Corredor (segles XVIII-XIX). Unpublished. Library of Montnegre-Corredor Natural Park. Municipality of Sant Celoni.

[8] Data for Olzinelles municipality refer to the *Amillaramiento* of 1851.

[9] The area of the municipality of Olzinelles in this period is 2.350 ha, about twice the study area. So the trends reported here don't refer exactly to study area but can be used to understand how landscape was changing and why.

We analysed demographic evolution in study area using administrative registers that range from 1924 to 2006. Figure 1. shows the quantitative evolution of population in Olzinelles valley, where the 179 inhabitants of 1924 have decreased to 27 in year 2006. New data from the seventies may confirm our suspicion that the demographic minimum of the analysed period took place in this decade.

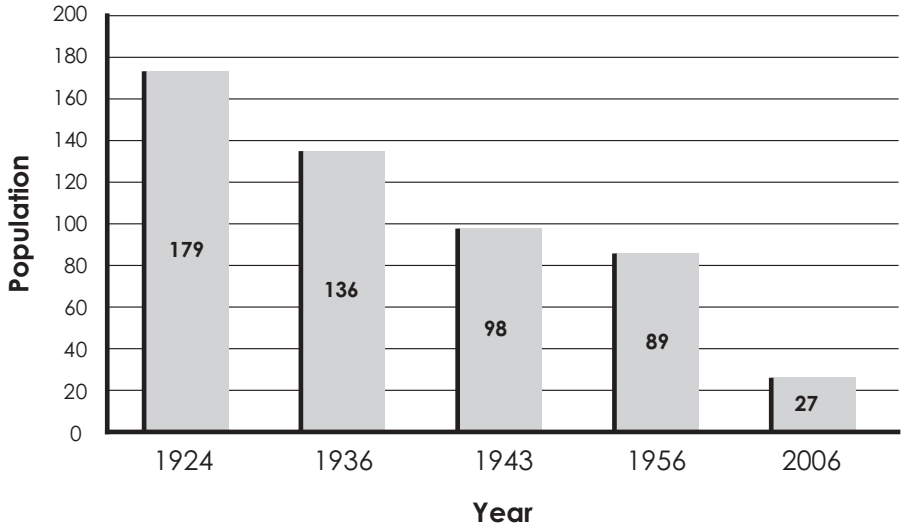

Figure 1. Evolution of population in Olzinelles valley in number of inhabitants (1924-2006).
Source: Census of Olzinelles municipality, 1924; Census of Sant Celoni municipality, 1936; Book of Status *animarum* (Olzinelles parish), 1943-1956; Census of Sant Celoni municipality, 2006, and search in current inhabitants.

We find also a decrease in the number of inhabited houses (31, 29, 20, 18 and 10 for years 1924, 1936, 1943, 1956 and 2006), in a clear process of abandonment of *masos* and its related traditional management practices. In the field work eight *masos* in ruins have been found. In 1924 and 1936 a third of the population older than 10 years had occupations related to primary intervention (peasants, shepherds, etc.), but this is underestimated due to the consideration of all women occupation as "domestic labours", even though they may had an important role in cultivation and farming[10]. Current analysis of the evolution of forest utilization in the second half of the twentieth century and future fotointerpretation exercise (see 4. *Provisional conclusions and next steps*) will try to correlate observed demographic evolution to changes in landscape, in order to demonstrate the initial hypothesis. As pointed out by Ninyerola *et al.* (2004), future distribution of land covers in Montnegre-Corredor Natural Park may be affected by increases in mean temperature and precipitation due to climate change, so scenarios about evolution of land use and land cover will have to take this into account.

3.4. Integrating traditional knowledge and oral sources into the "scientific" study

Traditional knowledge has been compiled by means of personal interviews to a sample of 8 people that is living or used to live in Olzinelles and that used to work on primary activities (timber and firewood felling, charcoal production, cultivation and farming) or on feminine domestic labours on *masos*[11] (taking care of children, cooking, washing clothes), often forgotten in studies about traditional knowledge. Interviews were semi-conducted and interviewer used a simple

[10] In addition, the sources of 1924 and 1936 (see Figure 2.) have allowed us to calculate the level of illiteracy in the population older than 10 years: 26.3% and 19.6% respectively.
[11] See first note in Table 1. for the meaning of this word.

and even mimetic language, without technical terms, in an informal and friendly conversation. Information to be obtained was previously organized in different categories and subcategories, i.e.: 1. Management and utilization of natural resources: 1.1 Charcoal, 1.1.1 Process of production of charcoal, 1.1.2 Transport and trading of charcoal; 1.2 Timber and firewood, 1.2.1 Species used and felling technique, 1.2.2 Number of workers and length of campaign, etc. The interviews have been completed with other visits, conversations and field work with people of the sample, in a participative research that has increased amount and quality of information supplied and enriched researcher's view of socioecological reality.

Interviews have been recorded with a digital recorder that has allowed introducing data to the PC, where the different audio files of the interviews have been organized in folders. The total time recorded is more than 9 hours. First of all the interviews have been listened and the information contrasted and integrated into the socioecological heritage catalogue (see *2. Socioecological heritage: a piece of history*) and into the historical analysis. Secondly, we are starting the literal transcription of the interviews, which will allow the analysis of information from a hermeneutical standpoint and further integration in the study. The collection of interviews, with its transcriptions and data associated, will be placed in a library of Sant Celoni, where it will be able for future research and for citizens and schools interested in using the information for different purposes.

4. Provisional conclusions and next steps

Global environmental crises drives science to reconsider its own bases, in a process of change that is not only a scientific response. Capra (1998) generalises Kuhn's concept of *scientific paradigm* to social paradigm, and stands that we are living a change of *social paradigm*, a transformation similar to the big cultural change that Ángel (2001, 2001b) is asking for from a philosophical standpoint. The challenge for environmental science regards to the application of interdisciplinarity principles into concrete methodologies without falling in a non rigorous or wrong analysis. Analysis of land use and land cover change in agricultural and forest landscapes in Mediterranean areas offers the possibility to apply new methodologies that contribute to global change understanding from a local and regional level study. Environmental history, although it may reflect some of the existing tensions between social and natural science in global change research (Boada & Saurí, 2002), can be fruitful to analyse socioecological land use and land cover changes in an attempt to dissolve nature and culture in history.

The concept of socioecological heritage has been used to apply the conceptual framework into the study and to revaluate the heritage in Olzinelles valley, where a rich environmental legacy has been detected. Even though we need further ontological discussion about what is and what can be considered as socioecological heritage, we are already applying the concept to other studies[12] related to nature conservation. The first historical results for the second half of the nineteenth century show the importance of regional and local studies of land use and land cover change, in so far as these changes are scale dependant. As it has been pointed out by Nadal & Urteaga (1997[13]), agricultural expansion in Catalonia during the nineteenth century needs to be clarified and studied in detail at different spatial and temporal scales. With regard to the twentieth century, the impacts of rural depopulation (a loss of 85% of population since 1924) in land use and land cover distribution will be studied in immediate future.

[12] Badia, A.; Boada, M.; Estany, G.; Maneja, R. i Otero, I., 2006. Diagnosi dels usos del sòl i qualitat ambiental del Tet – Mont-rodon. Institut de Ciència i Tecnologia Ambientals, Universitat Autònoma de Barcelona (unpublished).
[13] See note 8.

Rural depopulation in Olzinelles valley puts an end to traditional knowledge and its related management practices, meaning a loss of information that reduces the management options and decreases conservation possibilities from the landscape ecology point of view. Science hasn't taken into account the "other forms of knowledge" (Funtowicz & Ravetz, 2000), and in the study area these haven't been studied neither from anthropology. In the Fourth Ministerial Conference on the Protection of Forests in Europe, held in Vienna in 2003, the Signatory States and the European Community committed themselves to raise awareness of the contribution of traditional knowledge and practices in sustainable forest management for the protection of landscapes, the conservation of biological diversity as well as for protection against natural hazards (MCPFE, 2003). Although some anthropologists are working on an interesting *symmetric co-production* of knowledge between lay and expert views (Delgado, 2005), we have tested a methodology to compile traditional knowledge and integrate the information supplied by oral sources into the study, in an attempt to gather some of the huge amount of information that is being lost rapidly in the last decades. This methodology is being adapted and improved for the project "Memòries d'una feixa. Matadepera 1931-1983"[14], which is going to make an analysis of the postwar period of dictatorship and the transition to democracy in the town of Matadepera (province of Barcelona), in an environmental history approach based on oral sources. Disappearance of local culture from the ecosystem dynamics is already having negative effects for the system from the sustainable development perspective. Rural culture is substituted by urban culture, which begins a new relation with forest resources, related to leisure time and nature conservation in the new Natural Park framework. The transition from a historical primary land use to a tertiary one would lead most probably land cover to Braun-Blanquet's climax, questioned by some ecologists[15], and would increase vulnerability to severe forest fires as main alteration factor. Other potential changes to be proved with further research are landscape homogenization and loss of ecotonic and open space species.

We are starting the combination of the aerial photograph of 1956 with that of 2004[16], to quantify the changes in land use and land cover that have taken place. As we have seen, from the second half of the nineteenth century Olzinelles valley has been a much forested area, but changes in forests and fields still have to be studied in detail. The evolution of timber and firewood felling is already being studied by means of the administrative registers of the forest authority (1956-2006), a detailed documentation that may be used in future studies. A photographic diachronic analysis will be used to complete the information obtained in the fotointerpretation. Considering that the micromammal *Arvicola sapidus* may have returned to Olzinelles stream after two or three decades of absence, and that it is a potential bioindicator species[17], we will evaluate its role to monitor the socioecological changes reported in the study. It will be done by sampling the potential population with Sherman traps in selected areas along the stream and by reconstructing the evolution of the species with oral sources. Finally, we will study the environmental impacts observed in Olzinelles valley and make a proposal of environmental management of the area. The publication of a book for the general public with the results of the research will contribute to the revaluation of an unknown socioecological heritage and to a better understanding of socioecological changes in Olzinelles.

[14] Ruiz, V. & Otero, I. (coord.): Methodology has been already designed, initial sample of interviewed people has been decided and research team is being formed.

[15] See Bazzaz, F., Sipe, T.W., 1987. Physiological ecology, disturbance and ecosystem recovery. In: Schulze, Wölfer, H. (Ed.) Potentials and Limitations of Ecosystem Analyses. Springer-Verlag, Berlin.

[16] The photograph of 1956 (scale 1:32.000) comes from the flight of the Army and the one of 2004 (scale 1:5.000) has been displayed from ICC (Cartographic Institute of Catalonia).

[17] Personal communication of J. Ventura, from the Department of Animal Biology, Vegetal Biology and Ecology of the Universitat Autònoma de Barcelona (2005).

5. Acknowledgements

The authors would like to thank the following individuals for their assistance: Josep Travessa, Josep Oms, Ramon Lleget, Angelina Pujol, Josep Bonamussa, Pere Amfrons, Maria Oms, Josep Oms, Antoni Soler, Maria José Navarro, Marta Miralles, Josep Maria Abril, Maite Martínez, Marta Bayona, Luís Urtega.

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Landscape dynamics of the Barbialla farm (Val d'Egola, Province of Florence) in the second half of the 20th century

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Abstract

The evolution of the landscape of Barbialla farm (Val d'Egola, province of Florence) in the second half of the 20th century was studied in a portion of the larger originally studied in a previous research project developed to establish a monitoring system for Tuscan landscape directed by Prof. Mauro Agnoletti. The analysis was accomplished both at landscape and patch level. A large spatial scale study has been necessary to define the variation of different land use types (pasture, forest, shrub, agricultural, poplar plantations). The analysis of the landscape has been carried out by means of documents (aerial photo surveys) that allowed a comparison of the present landscape with the one of 1954, in a portion of the previous one, that was studied also for 1832. The comparison made possible to interpret the directions of modifications. A field study, at a lower spatial scale, has been necessary to highlight the factors influencing secondary successions in abandoned fields, pastures and woods. Index of dominance of Shannon and Weaver (calculated on the proportion of coverage of different land use types) has been used in the study at large scale. Between 1954 and 1996, in the portion of the previous area where this study has been carried out, growth of forest and shrubland cover (due to natural afforestation of old fields) is observed, as well as landscape enrichment as a consequence of (1) introduction of poplar for wood production, and (2) tillage aimed to the creation of pastures. Both global landscape diversity and ecosystem diversity (due to secondary successions in old fields) increased in the investigated period. Finally, loss of cultural heritage is underlined. Cultural landscape of Barbialla survives both in some land uses (*Pinus pinea stands*) and in some buildings (drying rooms for tobacco). The management of Barbialla farm is a complex problem that must take into consideration naturalistic, economic, cultural and aesthetic aspects.

Keywords: forest management, landscape, secondary successions.

1. Introduction

Landscape evolution is a consequence of relations between the included ecosystems: the relations concern both abiotics and biotics factors. Landscape is usually the result of interactions between man's activities and environment factors: the interactions change according both to physical environment and to socio-economic characteristics of the historical period (Sereni 1961), also in relation with cultural and psychological factors.

The most important landscape modifications observed in Italy since the postwar period are imputable to the depopulation of countryside and mountain areas: the phenomenon is expressed, in time, by wood colonization of abandoned fields and pastures (Vos and Stortelder 1992; Agnoletti and Paci 1998). Important landscape modifications of the age we live in are also imputable to afforestation (Chirici *et al.*, 1999; Agnoletti 2002) as well as to abandonment of woods: the interruption of silviculture activities is related to a mentality change towards forest heritage but also to the costs of the forest management, a crucial problem on account of the Italian wood surface property, wich belongs for more than 50% to private owners.

The object of this study is to define the landscape evolution of part of Barbialla estate *(Barbialla Vecchia)* in the second half of the 20th century, imputable both to natural afforestation of abandoned fields and to the introduction of plantations for wood production. These changes are strictly related to social and economic factors which had a strong influence on the structure and dynamics of forest and rural landscape. Barbialla is one of the study areas analyzed during the research project developed to establish a monitoring system for Tuscan landscape, organized in 13 study areas analyzed from 1832 to 2000 (Agnoletti 2002), now also included in the regular monitoring of the environment carried out by the regional government of Tuscany,. In the present study a smaller portion of the area compared to the original one has been analyzed for the years 1954 and 2001.

2. Historical aspects

Barbialla estate was a property of the counts Rasponi Dalle Teste since the 19th century until the 1980s. In 1987 "SRL Agricola Barbialla" was set up (property of Rasponi heirs). In 1988 the SRL was bought from Montedison, included in "Gruppo Ferruzzi", whose crisis, in 1994, caused the sale of the estate, bought in 1996 from the present owner (Malay nationality).

Barbialla was the first Italian estate, at the beginning of the 20th century, to get from the Italian State the authorization for tobacco cultivation. In 1962 the estate surface was spread over 1200 ha (54 farms); in this year the estate was divided into two parts (respectively called *Barbialla vecchia and Barbialla nuova*), corresponding to the same number of heirs. In sixties Barbialla was used to produce mainly tobacco, wheat and game (wine and olive oil were additional products); nevertheless the hunting, ever since that age, was a very important activity. A crucial year for the modifications of *Barbialla vecchia* landscape was 1987, when poplar plantations deeply changed the landscape of valley floor, till then characterized by traditional cultures (maize, wheat, tobacco). In 2001, the total area of *Barbialla vecchia* (818 ha) included 94 ha of poplar plantations, 316 ha of woods, 183 ha of cultivated land (mainly sown fields, but also olive groves and vineyards), 53 ha of abandoned fields in "naturalization", and 172 ha of pastures. The woods are very important for the estate balance: wood production, however, is less profitable than game production: the main economic activity of the estate is, nowadays, hunting. In 2003 poplar plantations have been removed and the valley floor of Barbialla has recovered its traditional physiognomy.

3. Methods (including site description)

Barbialla vecchia estate (Val d'Egola, Tuscany, province of Florence) is included in an altitude belt from 30 to 170 m above sea level. The geological substratum is characterized by two layers: Pliocene sands are based on ashen-grays and azure-clays. In addition, the slopes are often very steep. The result is the high frequency of unstable slides. The area is characterized by hill-mediterranean climate, with two dry summer months. According to Pavari (1916) phytoclimatic classification, the area is included in the middle and cold zone of *Lauretum*-II type. Forest vegetation is attributable to the following types: evergreen oak maquis mixed with pubescent oak; mixed coppices with standards, composed by evergreen oak, pubescent oak, turkey oak and with flowering ash; pinewoods of umbrella pine, mixed with maritime pine.

3.1. Large scale surveys

Aerial photos dated 1954 were compared with digital aerial photographs acquired in 1996. Land use map both for 1954 and 1996 was produced by means of photointerpretation (scale 1:10000) on GIS environment. A map of land use modifications in the observed period was produced too.

In order to interpret the modifications of *Barbialla vecchia* territory from 1954 to 1996, the *cross-tabulation* method was applied: cross tabulation allows an analysis of subsequent images of land use type and cover.

As for the statistical processing, modifications were expressed by means of indexes of landscape analysis:
- Share (% of surface) of land use types.
- Number and average surface of landscape patches (tessera of landscape mosaic).
- Dominance index of Shannon and Weaver (ID), calculated on the proportion of land use types for year (O' Neill et al. 1988).

It is necessary to underline that data of 1996 are not actual, because in 2003 the poplar plantations were removed, and most of the pastures converted to sowable fields. If large scale comparisons are referred to 1996, some considerations about recent modifications are proposed.

3.2. Ecosystem surveys (small scale surveys)

In order to interpret landscape dynamics, partly connected to secondary successions in abandoned fields and pastures, partly connected to plantations, large scale approach was supported by ecosystem surveys, carried out in 2001. Detailed surveys concern eight zones, each corresponding to specific landscape dynamic.

Small scale investigation (woods and olive groves abandoned in different times) used sampling plots 30 to 80 m long and 10 m wide. For each individual tree or shrub, species and height were considered; also cover degree was determined. The diversity of woody species at ecosystem scale was calculated by means of Shannon index.

4. Results

4.1. Large scale modifications

The landscape modifications in *Barbialla vecchia* farm, from 1954 to 1996, can be summarized as follows (Figure 1.):
- remarkable increase of pasture (expansion in the sixties, aimed to cattle breeding) and shrub-surface at a loss of cultivations must be emphasized (Table 1.): these modifications, in addition to the poplar introduction in 1987, produced a substantial reduction of agrarian land, followed by the abandonment of buildings (paysant homes, buildings for tobacco drying etcetera).
- light increase of wood surface, imputable to secondary successions in abandoned fields, is registered (Table 2.).
- In 1954 the landscape was dominated by two land uses: woods and cultivated fields. In 1996 the reduction of cultivated fields is joined to the entry of a new land use type (poplar planta tion) and to the increase of pastures and shrubs (Figure 2.). So, increase of land use types is joined to more balanced surfaces of use type distribution. The consequence is that Dominance index ID, that increases when the landscape is dominated by a less number of land use types and when the distribution of land use types is not balanced, decreased from 0.85 to 0.41.
- Both abandonment and transformation of cultivated fields produced an higher fragmentation of agrarian land, whose *patch* nowadays occupy, on average, much lower surfaces in comparison with the past ones. The average surface of shrub patches, on the contrary, is constant in the observed period, even though number of *patches* increased; at last a remarkable increase of the average surface was registered for woody patches (Table 3.).

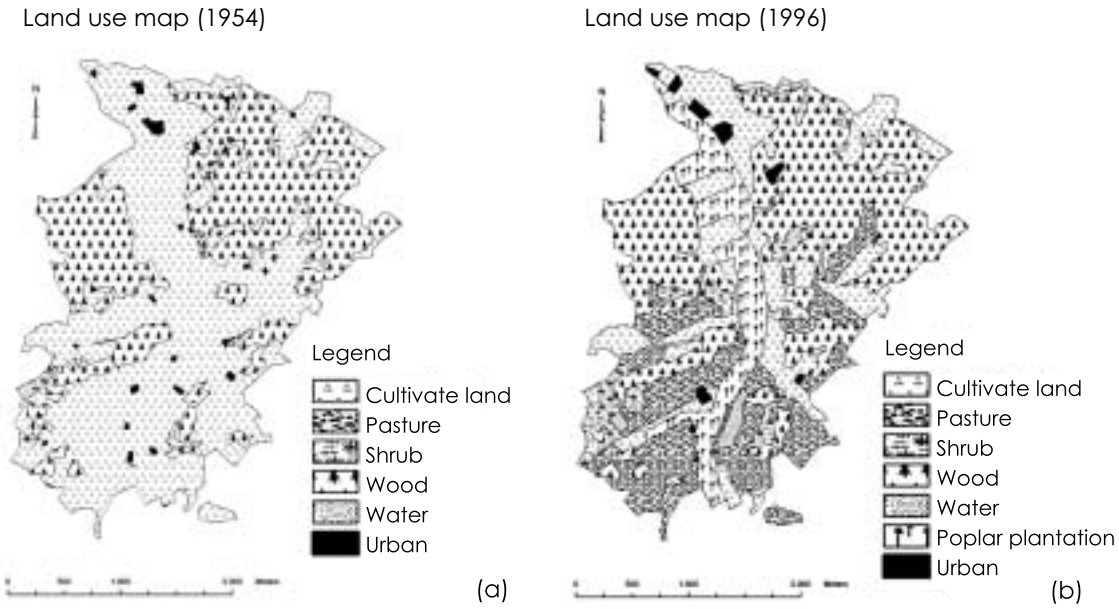

Figure 1. Land use maps of the *Barbialla vecchia* estate, in 1956 (a) and 1996 (b)
(Graphics of G. Chirici and D. Travaglini)

Table 1. Surface of land use classes (expressed both in hectares and as percentage of total surface), respectively in 1954 and 1996

Land use classes	Area in 1954		Area I n 1996	
	[ha]	[%]	[ha]	[%]
Cultivated land	519.6	62.3	182.7	21.9
Pastures	1.7	0.2	172.4	20.7
Shrubs	5.5	0.7	53.5	6.4
Woods	298.1	35.7	316.2	37.9
Water	0.0	0.0	7.9	0.9
Poplar plantations	0.0	0.0	93.6	11.2
Urban	9.4	1.1	8.0	1.0
Total	834.3	100.0	834.3	100.0

Table 2. *Cross tabulation*. Lines: land use types as in 1996; columns: land use types as in 1954. Referring to a land use type in 1996 (line), the composition of the same class in 1954 and its surface in ha is shown within columns. Referring to a land use type in 1954 (column), the modifications of the class in the period 1954-1996 are shown in rows

		1954					
		Cul. land	Pastures	Shrubs	Woods	Urban	Total 1996
		[ha]	[ha]	[ha]	[ha]	[ha]	[ha]
1996	Cultivated land	174.2	0.9	0.0	5.4	2.2	182.7
	Pastures	161.7	0.0	1.2	8.5	1.0	172.4
	Shrubs	37.5	0.0	4.1	11.0	0.9	53.5
	Woods	41.3	0.8	0.2	272.5	1.4	316.2
	Water	7.6	0.0	0.0	0.1	0.2	7.9
	Poplar plantations	92.3	0.0	0.0	0.6	0.7	93.6
	Urban	5.0	0.0	0.0	0.0	3.0	8.0
	Total 1954	519.6	1.7	5.5	298.1	9.4	834.3

Table 3. Number of the landscape *patches*, calculated for each land use class, both for 1954 and 1996, with average surface areas and standard deviations of means (SD)

Land use classes	1954			1996		
	Patch num.	Average area	SD	Patch num.	Average area	SD
	[n]	[ha]	[ha]	[n]	[ha]	[ha]
Cultivated land	11	47.2	145.0	21	8.7	10.3
Pastures	3	0.6	0.7	13	13.3	13.8
Shrubs	2	2.8	1.0	19	2.8	0.5
Woods	18	16.6	41.7	14	22.6	50.0
Water	-	-	-	3	2.6	3.0
Poplar plantations	-	-	-	8	11.7	30.6
Urban	36	0.3	0.3	10	0.8	0.7
Total	70	-	-	88	-	-

4.2. Small scale modifications

Secondary successions mostly concern, in addition to pinewoods and aged coppices, abandoned olive groves and vineyards. Growth of structural diversity inside patches was observed: colonization occurring in old fields is quite irregular, and structure is evolving towards a more complex pattern also in aged coppice and pinewoods.

Two patterns of vegetation dynamic have been observed in fields: 1. Direct evolution towards forest vegetation, which is the consequence of progressive colonization by evergreen and pubescent oaks: in this case, the physiognomy of the ancient culture is unrecognizable; 2. (more frequent) Evolution towards shrub vegetation, both uniform and linear. As a matter of the fact, often the main culture has been abandoned on the edge of the terraces, but cultivation of fodder for the game kept on in their central part: this gave rise to post cultivation hedges, as a consequence of natural afforestation of the tree cultivated line. The main woody species involved in the process are: *Quercus pubescens, Fraxinus ornus, Ulmus campestre, Prunus spinosa, Rubus spp., and Cornus sanguinea.*

(a)

(b)

Figure 2. Landscape evolution in *Barbialla vecchia* estate: comparison between 1954 (a) and 1996 (b). The poplar plantations (carried out in 1987) deeply change the physiognomy of valley floor, traditionally cultivated with tobacco and wheat (vineyards on the border of the fields). The arrow in the 1996 landscape shows a post cultivation hedge characterized by the dominance of Acer campestre, developed since 1973, when the row of vineyard was abandoned

As regards the woods, under the canopy of conifer stands broadleaved coming is evident (vegetation dynamics is towards the mixed "hill-mediterranean" broadleaved wood). The secondary successions are, all the same, frequently hindered from the bites of wild ungulates (fallow deer and wild boar): in the estate, the ungulate density is largely above the one compatible with a correct silviculture activity.

5. Discussion

In opposition to the general trend observed in the Tuscan landscape in the second half of the 20th century (Vos and Stortelder 1992, Farina 1998, Agnoletti 2002), the depopulation of *Barbialla* vecchia land produced, since the end of sixties, both an increase of land use types and a more balanced distribution of the surfaces of use types. This has been observed also for other areas, however, the number of land uses shows a general reduction from 1832 in the wider area previously studied. Nevertheless, the landscape enrichment doesn't mean an increase of landscape "quality": the introduction of poplars and the high expansion of pastures didn't compensate for the loss of traditional uses and for the building (farm houses, dryers for tobacco) abandonment. The landscape mosaic, in addition, is nowadays more fine-grained than one of 1954, and this is another exception to the general trend observed in the most of the Italian landscapes, where woodland usually plays a connective role among the patches of the ancient landscape mosaic, reducing global landscape diversity.

An increase of diversity (both floristic and structural) has been observed also at the ecosystem level: in abandoned fields, this is the consequence of the enrichment of artificial monocultures, that in time turned into stands expressing the natural dynamic of vegetation.

The modifications must be emphasized, in particular, referring to the consequences on the fauna. Post cultivation hedges and thickets of thorn bushes play a crucial role for the wildlife: they are *habitat* suitable for cover, feeding and reproduction of birds and mammals, important from the hunting point of view. In particular, the hedges, as ecological corridors, foster the biological fluxes, and mean a resource for biodiversity (Taylor *et al.* 1993; Farina 1998).

As regards the diversity of land use types (richness of landscape mosaic), this parameter is positively correlated with the richness of both sedentary and migratory fauna. Actually, more than richness of land use types, the alternation of open and woody spaces (many birds prefer the former for feeding and the latter for refuge) plays a crucial role. Really, the landscape modifications causing the disappearance of open spaces (forest colonization of pastures and cultivations) are a factor limiting the animal biodiversity. In the case of *Barbialla vecchia* estate – all the more reason why poplars were removed in the valley floor – the presence of open spaces is, nowadays, not compromised: as a matter of the fact, the spread of forest and shrub vegetation occurred in a fragmentary way, at a loss of fewer abandoned cultivated fields (Paci *et al.* 2005).

6. Conclusions

Some considerations about the management of *Barbialla vecchia* landscape are proposed.

Sustainability of landscape management must take into consideration aesthetics aspects of some modifications, as well as psychological consequences of the changes (Sheppard and Harshow 2001, Paci 2002). In the last fifty years, the country abandonment gave rise to disagreeable modifications, as irregular invasion of shrub vegetation in abandoned fields, once a time in an orderly way cultivated. Besides, the interruption of silviculture produced similar effects in woods, abandoned to their evolution. Loss of local practices and traditions, and loss of the skill to use small scale resources must be emphasized too. If landscapes are memory containers, the management should be, in some cases, directed towards the conservation of cultural heritages (Agnoletti 2002).

In the case of Barbialla vecchia estate, the management points to highlight are:

- As a consequence of the variability of forest types, a multiple function forestry is needed. In fact, in the territory are spread coppices for wood production (soft slopes), protection woods (in the

steepest slopes), landscape woods (pinewoods surrounding the owner's castle), coppices to con vert to high forest (where wild pigeon, bird avoiding frequent canopy gaps and dense undergrowth demanding, is more frequent).

- Conservation of the main traditional characteristics of the estate, i. e. alternation of open and woody spaces. The presence of thorn thickets, suitable for the game, should be respected.
- Conservation and/or renovation of main historical buildings (over all the ones for tobacco drying, called "tabaccaie") and recovery of traditional paths, nowadays invaded by intrusive vegetation.

In the final analysis, landscape, production (wood and game) and protection requirements of Barbialla vecchia territory suggest a flexible management, according to the priorities of the case, with respect to the traditional features of the estate.

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Variazioni della copertura vegetale, documentazione storica e toponomastica nel Lazio appenninico

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Abstract

We describe some cases of fluctuation in distribution areas of some arboreal species within the Monti Simbruini district (central Italy), deducible from historical documentation, textual and cartographical. The object of this research is the analysis of toponyms, terms and expressions relative to the arboreal vegetation, found in a section of monastery of Santa Scolatica in Subiaco territory, between the XIV and XIX century. This analysis is consistently compared with the biogeographic reality of the area. The ultimate purpose is an attempt for a realistic reconstruction of the role of geographic names in the local perception, as well as the present species in the area, also, any possible transformation of their distribution during the study period until the present day. Some problematic elements induce us to improve the interpretation methodology of the sources, avoiding over simplified and anachronistic connections between place names and vegetative landscape. In particular, we describe the case of the phytotoponyms, which date back to a relatively recent period because of neolatin origine and in harmony with the dynamism of humanized vegetation. The comparative method between the actual vegetation and the historical documentation in the toponym research allows to attribute absolute dating to definite events of vegetation dynamism. The problem is not only to establish a coherent relationship between the proper name and the real species to which it can be referred to, but also to fix the topomastic evidence in the chronological and local context, so that this can acquire a real documentary value.

Le relazioni fra meccanismi di fissazione di un toponimo e le testimonianze della presenza reale di una specie botanica o di un aggregato di specie, forniscono dati preziosi su fenomeni di trasformazione della copertura vegetale di un determinato territorio nel corso del tempo. La microtoponomastica derivata da fitonimi può infatti validamente contribuire alla ricostruzione del dinamismo delle trasformazioni determinate dall'intervento umano (come nel caso degli effetti del taglio selettivo sulla composizione floristica di formazioni forestali), ma anche delle trasformazioni della copertura vegetale attribuibili esclusivamente a fenomeni della successione naturale. Ma una disamina congiunta di tipo storico e di tipo naturalistico è quanto mai necessaria per evitare insidie legate a generalizzazioni, assonanze o incongruenze nella interpretazione di presunti fitotoponimi. Si considerino gli esempi di Abeto e Aveto, toponimi a vasta distribuzione appenninica che nulla hanno a che fare con *Abies*, così come Carpìno (torrente) e Carpinone (borgo rupestre sovrastante) in Molise (Isernia) che non sembrano riferibili a *Carpinus sp*. ma piuttosto a termini di sostrato derivati da una base *CAR, 'roccia'[1]. Cfr. Carapello, fiume (Campobasso) e Carpello, fiume e borgo *(Sora)*. Una volta chiarita la necessità di interpretare in modo etimologicamente convincente sia un nome locale derivato da nomi vegetali, sia un termine relativo all'uso del suolo, si può arrivare a distinguere in modo più analitico la funzione dei due tipi di testimonianza, sottoponendoli successivamente al confronto critico sia della documentazione storica scritta, che della contestualizzazione naturalistica.

[1]Spada, Passigli, in corso di stampa.

L'indagine interdisciplinare può rispondere ad una serie di interrogativi, fra cui il perché della scelta dei diversi termini reperibili nella documentazione testuale *(silva, querquetum, sterparium, castagnetum, terra cum quercubus)* e, soprattutto, decodificare il meccanismo delle trasformazioni da una fase di scenario vegetale ancora "naturale", precolturale a quella di paesaggio vegetale di tipo ormai decisamente umanizzato.La ricerca qui presentata, riguarda un distretto esteso alla porzione occidentale del versante tirrenico dei monti Simbruini, nel Lazio centrale. Sul fronte storico, essa si fonda sulla documentazione scritta e cartografica relativa alle comunità del comprensorio conservata presso l'Archivio del monastero di Santa Scolastica di Subiaco[2]. Sono stati presi in considerazione i contratti notarili di compra-vendita e affitto risalenti ai secoli XIV-XV, gli inventari dei beni monastici redatti nei secoli XV, XVI e XVII (*Inventario antico* del 1476-1477 e *Registrum maximum* del 1570), il Catasto Gregoriano dello Stato Pontificio del 1820 con mappe in scala 1: 2000 e con i relativi brogliardi descrittivi e infine gli statuti rurali delle comunità risalenti ai secoli XVIII-XIX. La terminologia relativa all'uso del suolo nelle singole parcelle dei catasti, fa riferimento di norma sia alla componente vegetale (spontanea o coltivata) sia al relativo uso produttivo nel determinato momento della stesura del documento. Su fronte naturalistico la base documentaria è legata a conoscenze di matrice geobotanica sulla flora, sulla composizione e distribuzione delle comunità vegetali, desunte da documenti di cartografia della vegetazione editi ed inediti e da campagne di censimento in atto da parte degli scriventi.

Il paesaggio attuale rappresenta una tappa di un processo di trasformazione recentissimo che ha avuto inizio a partire dagli anni Cinquanta del secolo XX, in conseguenza del massiccio esodo rurale dell' ultimo Dopoguerra. Abbandonati gli appezzamenti agricoli in quota, le lunette, i terrazzamenti, i ciglionamenti, le attività agricole si sono concentrate in piccole zone intorno ai centri della valle dell'Aniene. Le aree abbandonate dall'agricoltura sono state in parte riconquistate dal bosco e in parte trasformate in pascoli. Quest'ultima forma di utilizzazione a carattere estensivo, può oggi localmente rivelarsi disfunzionale, in quanto, un eccessivo numero di capi viene inevitabilmente concentrato in determinate aree non tanto in base alle disponibilità della risorsa stessa, quanto piuttosto in funzione della viabilità moderna esistente (trasferimento autotrasportato dei capi), che nulla ha a che fare con la tradizionale utilizzazione dei pascoli e rischia per questo di apportare modifiche pericolose per la stabilità dei versanti (erosione concentrata).

Inoltre i vincoli di tutela stabiliti a partire dal 1985, anno di istituzione del Parco Regionale del Monti Simbruini, hanno comportato un sensibile incremento della superficie boscata rispetto a quella di un passato preindustriale, capovolgendo verosimilmente rapporti areali pregressi e ormai consolidati fra diverse forme locali di uso del suolo, struttura peraltro già scardinata dalle trasformazioni socioeconomiche e demografiche del Dopoguerra. Va comunque sottolineato il fatto che tali norme di tutela dei valori naturalistici locali, valori identificati all'atto dei censimenti eseguiti sui resti di vegetazione naturale del territorio regionale (in concomitanza con quelli nazionali ed europei, vedi Natura 2000) comporteranno in prospettiva un graduale recupero della integrità originaria in senso ecosistemico (con carattere di vero e proprio restauro ambientale "autogeno") di tutta la maglia della vegetazione naturale, frammentata e degradata da millenni di uso intensissimo. Seppur differenziato, sofisticato, "acculturato", questo uso è stato solo apparentemente in equilibrio (come vorrebbe una prospettiva "etnografica") con la capacità di carico del sistema naturale, avendo ormai da secoli la pressione antropica in tutta la penisola superato di gran lunga quasi ovunque tale limite.

A un aumento subrecente della superficie boscata ha contribuito anche la realizzazione nel periodo interbellico e in quello immediatamente successivo, di vasti rimboschimenti, prevalentementi a *Pinus nigra*, specie estranea alla flora locale ma pur sempre autoctona sui vicini Monti della Marsica e lì accantonata in stazioni a circa 50 km in linea d'aria (anfiteatro della Camosciara e Villetta Barrea).

[2] Per una descrizione accurata delle diverse fonti, si rinvia a Passigli, in corso di stampa

Al progressivo abbandono della ceduazione a turno breve (dodici anni circa) si è accompagnata inoltre una significativa diffusione del pascolo in bosco (comunque regolato da norme istituzionalizzate: vedi Legge Forestale della Regione Lazio, edizione 2001), condizione verosimilmente ancestrale al di là di interpretazioni meccanicistiche[3], in quanto propria di stadi iniziali di tutta la colonizzazione agro-silvo-pastorale appenninica e di età variabilissima secondo i distretti (dal Neolitico al secolo XIX).

Tali eventi hanno portato comunque oggi all'affermazione nel comprensorio di un rapporto fra superficie agraria e superficie forestale addirittura ribaltato rispetto a quello di un secolo fa[4].

Un consumo lento, progressivo e continuo della copertura forestale, che ha preso origine già all'epoca dei castellieri preistorici, poi attraverso la costruzione della struttura territoriale attuata su iniziativa del potere abbaziale sublacense nel X-XI e in seguito nel XIII secolo, si è protratto sostanzialmente fino all'inizio del XX secolo[5]. Il secolo XIX è stato uno dei periodi di massima espansione della colonizzazione del territorio. Alla fine di questo e all'inizio del successivo, la documentazione fotografica d'epoca presenta un paesaggio sublacense completamente deforestato[6]. Toponimi difficilmente databili quali Tagliata, Cesa, Cesa Cotta documentano comunque una consolidata pratica di utilizzazione forestale, soprattutto attraverso il governo a ceduo.

Vengono qui di seguito presentati esempi di contestualizzazione dei dati delle descrizioni catastali, alla luce delle conoscenze della fitogeografia, dei processi successionali della vegetazione delle caratteristiche della topografia e uso del suolo di epoca preindustriale.

L'analisi condotta nella documentazione sublacense induce a riflettere, in primo luogo, sull'impiego di termini di tipo collettivo relativi a formazioni forestali non specificate, quali ad esempio *silva, foresta*, macchia, bosco. Essi sembrano mirati da un lato a suggerire la funzione produttiva e la struttura dei soprassuoli e da un altro a mettere in evidenza in modo esplicito alcune specie vegetali costitutive. La localizzazione e l'analisi del contesto vegetale attuale delle selve menzionate nella documentazione fanno riferimento a siti fra i 300 e gli 800 metri, ubicati su topografie ed esposizioni le più varie, siti che, dal punto di vista edafico e climatico rientrerebbero nel dominio del bosco misto di latifoglie decidue. Tale indagine, insieme all'analisi delle trasformazioni d'uso del suolo evidenziate attraverso il confronto diacronico fra le diverse fonti a disposizione per una stessa località, permette di individuare, secondo i casi, le specie dominanti nel corso del tempo nei vari lembi di bosco nominati dal catasto.

Queste testimonianze sottintendono tanto la volontà di definire una specie in particolare, quanto le caratteristiche o le potenzialità produttive in generale dell'appezzamento in questione (selva, foresta, macchia, bosco). In altri casi, l'attribuzione del nome ha fatto ricorso ad altro tipo di nomenclatura, come castagneto o querceto, termini di tipo qualitativo più precisi in senso composizio nale, "floristico" quasi, ambedue ampiamente rappresentati anche altrove nel periodo studiato. E' inoltre da tenere presente il diverso criterio di impiego dei termini nelle diverse fonti. Se il termine selva figura ripetutamente nei registri di possessi e negli statuti rurali più antichi, la fonte catastale ottocentesca sceglie di prediligere il nome *bosco*, al quale vengono riferite le specifiche qualità[7]. Non è per altro da escludere un certo margine di casualità all'interno della documentazione di tipo quoti-

[3] Cannata, 2001, pp.260 ss. e 270 ss. sui sistemi produttivi agricoli e le attività forestali.
[4] Cannata, 2001, pp.113-117.
[5] Sull'insediamento preistorico appenninico, Guidi et. al., 1982; per il medioevo, Delogu, 1979, dove viene dato risalto all'aspetto organizzato della campagna in terreni, agricoli, case sparse e chiese rurali, ritratto nell'affresco raffigurante il primo miracolo di San Benedetto nella campagna affilana duecentesca. Sulle trasformazioni del paesaggio vegetale, Spada, Passigli, in corso di stampa.
[6] Amore, in corso di stampa.
[7] Le principali categorie di uso del suolo boschivo nel Catasto Gregoriano risultano: *boschina dolce e forte, bosco, bosco ceduo, bosco da frutto, bosco di alto fusto, bosco di Faggi, di Querce, etc., bosco dolce, forte, misto, castagneto da taglio, castagneto domestico (Regolamento sulla misura dei terreni e formazione delle mappe del Catasto Generale dello Stato Ecclesiastico ordinato dall'art.191 del Motu Proprio della Sa. Me. Papa Pio VII,* Roma 1816, pp. 90 ss.).

diano. Una vera e propria forma di suddivisione per categorie è pertinente solo alla documentazione catastale, che proprio per questo può irrigidire le testimonianze creando confusioni[8]. Ne risulta comunque un quadro quanto mai vario che vede faggio, roverella, farnia (nelle zone più basse), quali specie costitutive della zonazione altitudinale di oggi, interagire e interscambiarsi a seguito delle trasformazioni documentate, indotte dal rimaneggiamento umano, pur sempre in base alle leggi, note alla geobotanica, di un dinamismo stazionale naturale.

Per definire l'accezione locale del termine *silva*, risulta illuminante una memoria settecentesca relativa al territorio di Ienne[9]. In uno stesso testo si esprime a chiare note e quasi strumentalmente la diversa percezione di selva, bosco e macchia laddove, con il primo termine, è indicata la formazione vegetale fruttifera (produttrice di ghiande, castagne, noci, nocciole), ben *ripulita* (nel sottobosco) e governata, mentre le definizioni di bosco, spineto e macchia vengono attribuite allo stato degradato della formazione stessa dal punto di vista produttivo, alla presenza cioè di quelle specie spontanee non fruttifere che, cresciute fra le essenze originarie ed economicamente più utili, in seguito all'abbandono del governo forestale, lo hanno reso meno attrattivo e suscettibile di riconversione in senso agricolo. Le successive testimonianze qui di seguito riportate lasciano intuire l'attuazione di una continua serie di piccoli interventi su singole parcelle e, contemporaneamente, una tendenza tutto sommato conservativa del disordinato assetto registrato in precedenza.

Il problema da affrontare riguarda la gestione della selva di Pietranera. L'evidente stato di abbandono rende ormai quasi indispensabile avvalersi del fuoco per poter poi *cesare* la Macchia della Comunità al fine di ottenere terreno seminativo, ma in questo modo potrebbero prendere fuoco le piante da lasciare in piedi. Inoltre il terreno è in pendenza e le acque lo spoglierebbero in mancanza di alberi. La selva in questione era composta di cerri e quercia *(Q. pubescens)*, ma *per la fortezza degli alberi e degli spini e altri legni salvaticini è divenuta un bosco e uno spineto con spini, carpini, aceri, ornelli e per tal motivo non produce ianda, tanto che da molti anni non si affitta più*. L'amministrazione della Comunità è quindi giunta alla determinazione di cesare e seminare, ma conservando gli alberi di cerro alla giusta distanza "e ciò per ridurre la detta macchia veramente ad uso di selva fruttifera", nel termine di dieci anni. Il secondo memoriale documenta l'utilità di cesare un terreno in località Pietranera entro sei anni e *cesando di ridurre detto terreno a uso di vera macchia o vera selva. Cesare* in questo caso enfatizza l'intervento di ripulitura dalle specie infruttuose, mentre altrove rinvia al dissodamento per la messa a coltura.

Contribuisce a chiarire questa pratica un'altra memoria del 1803 che ricorda una concessione in affitto nel 1798 per sei anni del *cesamento* della selva di Pietranera: trenta *cesaroli* vi lavorano assiduamente ma il risultato è un raccolto modesto, costituito solo da *sei coppe* di grano. Per questo motivo i lavoranti si rifiutano di proseguire il lavoro e l'affittuario è costretto a rinunciare alla rendita dell'affitto. Viene così provata la sterilità del terreno. Lo Statuto di Ienne del 1874 infine elenca le specie esistenti nella selva di Pietranera: cerri, *cerque, molazza* (verosimilmente *Acer pseudoplanus in armonia con il contesto vegetazionale*)[10] e i frutti protetti: ghianda, mela, pera, *coronali (Cornus mas e C. sanguinea)*[11].

[8] Cevasco, 2002, pp. 195-214.
[9] Gli interventi sulla selva di Pietranera risalgono rispettivamente al 1792 e al 1796, in Archivio di Stato di Roma, Buon Governo, Ienne, s. II, b. 1999.
[10] Per un confronto, si veda il termine "mollàcera" in Abruzzo, in Penzig, 1924.
[11] Archivio di Stato di Roma, n. 450/5, Statuto di Ienne del 1874.

I termini collettivi generici relativi al bosco: *silva*

Denominazioni del sito nelle diverse fonti	Uso del suolo e paesaggio vegetale
1477, *Inventario antico* *San Leonardo*, localitŕ e chiesa rurale (Ienne)	*Terra cum arboribus,* presso la chiesa di San Leonardo e il fiume, localitŕ ubicata presso il Colle delle Vigne
1570, *Registrum maximum* *Santo Lonardo* (ecclesia diruta)	*Pratum cum arboribus nucuum, cum obaco sylvariccio cum culto et inculto*
1820, Catasto Gregoriano *San Leonardo – Colle Vigna – Monte Lea*	*Bosco, Pascolo cespugliato, Mezzagna boscata, Pascolo boscato*
1950, tavoletta IGM Chiesa di San Leonardo, pendici settentrionali del Colle Lea	quota 600 Vegetazione arborea rada (bosco a roverella e ornello)
1436 Inventario antico *Tufo de Sardu*, localitŕ (Toccianello, Subiaco)	*Silva in qua fuit castagnetum*
1820, Catasto Gregoriano *Tuffo del Sardo* (Toccianello, Subiaco)	*Sasso boscato forte (proprietŕ Santa Scolastica), Seminativo vitato, Bosco di castagni*
1950, tavoletta IGM Antera (Toccianello, Subiaco)	quota 550 Bosco ceduo (bosco di roverella, cerro e raro castagno)
1570, Registrum maximum *Ponticelli*, localitŕ (Subiaco)	*Sylvotta cum canneto*
1820, Catasto Gregoriano *Ponticello* (San Lorenzo, Subiaco)	*Seminativo, Vigneto alberato, Pascolo olivato, Bosco da frutto, Pascolo olivato*
1950, tavoletta IGM Localitŕ senza toponimo	quota 500 Bosco ceduo e vigneto
1570, *Registrum maximum* *Campo de Arco, Rivo d'Arco*	*Canapina cum silva a capite, due* *Canapina cum parva macchia a capite*
1820, Catasto Gregoriano *Campo d'Arco* (San Lorenzo, Subiaco)	*Seminativo, Seminativo vitato, Vigneto alberato, Pascolo olivato, Bosco da frutto, Pascolo olivato*
1950, tavoletta IGM Localitŕ senza toponimo presso il fiume Aniene	quota 370 Oliveto

Per quanto riguarda le specie dell'orizzonte collinare, la quercia e il cerro (*Q.cerris*), gli aspetti sui quali si è interrogata la documentazione e in particolare il patrimonio toponomastico, riguardano in primo luogo la presenza reale delle specie citate e la corrispondenza della loro localizzazione con gli ambienti di elezione indicati (quota, esposizione). Altro caposaldo interpretativo riguarda la diversa diffusione e la diversa percezione che nel passato sembra essere aver distinto le formazioni pure da quelle miste. Le menzioni di querceto e di selva sembrano infatti scemare dopo il XVI secolo (a fronte di una crescente diffusione nell'Ottocento dei toponimi da *Carpinus e Ornus*), tanto che, ormai diventato raro il *cerqueto puro*, il giudizio di *selva migliore* nel Settecento figura riservato alle *selve fruttifere di cerri e roverelle*, mentre il bosco, o spineto (formato da spini, carpini, aceri, ornelli), o macchia che non produce ghianda, è relegato a categoria non produttiva[12]. E' interessante notare come questa percezione si ponga in netto contrasto con quanto sembra oggi affermarsi in sede di gestione forestale, riguardo alle potenzialità produttive del carpino nero per la sua massa legnosa.

A dispetto di una discreta quantità di testimonianze catastali di querceti, stupisce che questa realtà vegetale e produttiva abbia lasciato così modesta traccia di sé nella toponomastica delle località studiate (solo il caso di Cercito, testimoniato a partire dal Cinquecento)[13]. Dalla tabella riportata emerge inoltre che l'inventario del 1570 non conservi alcun querceto né alcun termine collettivo

[12] Memorie del 1792 e del 1796 in Archivio di Stato di Roma, Buon Governo, Ienne, s. II, b. 1999.

[13] principali toponimi base derivanti dalla quercia a foglie caduche sono stati rilevati per il medioevo laziale da Toubert, 1973, vol. I, p. 173, in particolare secondo lo studioso essi sono relativi a formazioni primarie in via di regressione o a elementi residui di un paesaggio vegetale scomparso da tempo, ma dotati di forte capacità di evocazione. Essi derivano principalmente da cerro: *Cerretum (Quercus cerris)*, farnia: *Farnetum (Quercus pedunculata)*, roverella: *Quercetum, Cerquetum (Quercus pubescens)*, la quercia per eccellenza, per questo motivo lasciata senza altra specificazione nel lessico notarile, infine rovere: *Roboretum (Quercus robur)* solo dove le sue esigenze ecologiche le permettono di essere presente in formazioni omogenee, mentre, sempre secondo l'autore, la sughera *(Quercus suber)* ha lasciato pochissima traccia di sé nella microtoponomastica e la coccifera vi è del tutto assente perché nel Lazio figura solo come cespuglio.

relativo a formazione arborea: ad eccezione di una sola *silva quercuum* (in territorio di Serrone, anche essa compresa in una *possessio* caratterizzata da alberi di melo, ciliegio, noce e da canneto), figurano infatti solo *possessiones* con alberi di quercia (dei quali spesso si fornisce il numero, che va dall'individuo singolo ai quattro individui), spesso insieme ad altri alberi da frutto (pero, ciliegio, melo, noce). In altri tre casi figurano selve o selvotte, nel territorio di Subiaco annesse ad appezzamenti di olivo a canapaia. Per il resto la menzione di querce è assai diffusa, soprattutto per quanto riguarda il territorio di Subiaco, ma essa è limitata a singoli individui attestati nei terreni seminativi e nelle vigne. E' verosimile quindi che la sua frequenza nel paesaggio vegetale, che tende a permanere anche all' interno delle maglie di un sistema completamente agricolo, fosse stata tale da render *Q. pubescens* scarsamente identificativa di siti e luoghi.

– Roverella *(Q. pubescens)*

Denominazioni del sito nelle diverse fonti	Uso del suolo e paesaggio vegetale
1436, 1477, *Inventario antico* *Marciani*, localitŕ (Affile)	*Querquetum*, due *Terra cum quercubus*
1570, *Registrum maximum* *Cignali*, localitŕ finitima (Affile)	*Possessio cum arbore quercus*
1820, Catasto Gregoriano *Cignali*, localitŕ finitima (Affile)	*Seminativo vitato e olivato, Bosco ceduo, Pascolo sterposo*
1950, tavoletta IGM Marciani	quota 550-600 Vigneto, oliveto, a valle (versante nord) della Montagna di Roiate
1436, 1477, *Inventario antico* *Le Morre* localitŕ (Affile)	*Querquetum*
1820, Catasto Gregoriano *Le More, Strada della Mora*, da Scrima verso est (Affile)	*Pascolo fra macigni, Seminativo vitato*
1950, tavoletta IGM La Morra	quota 550-600
1436, 1477, *Inventario antico* *Poliano*, localitŕ (Affile)	*Querquetum* *Querquetum et arbores quercus*
1820, Catasto Gregoriano *Puiano* (Affile)	*Pascolo sterposo*
1950, tavoletta IGM Costa Poiano (al di lŕ del confine, nel comune di Roiate)	quota 986 Bosco ceduo
1436, 1477, *Inventario antico* *La Scrima*, localitŕ (Affile)	*Querquetum* *Querquetum et terrula cum quercubus*
1765, Catasto Tranquilli *La Scrima* (Affile)	*Terreno vignato e lavorativo*
1820, Catasto Gregoriano *Scrima* (Affile)	*Seminativo olivato, Seminativo vitato e olivato*
1950, tavoletta IGM Ciolerano	quota 600 pendio con alberi radi, presso altura a bosco ceduo
1477, *Inventario antico* *Forma Pocerano*, localitŕ (Subiaco)	*Querquetum*, due
1820, Catasto Gregoriano *Forma Focerata* (Lucinette, Subiaco)	*Seminativo vitato con olivi*
1950, tavoletta IGM Forma Focerale, idrotoponimo	quota 500-600 Oliveto, vigneto, sul pendio quercia e olmo
1436, *Inventario antico* *Valle delli Camuri*, localitŕ (Subiaco)	*Arbores quercuum*

1820, Catasto Gregoriano *Le Camere* (Subiaco)	*Bosco forte, Pascolo con piante di querce, Seminativo fra macigni, con olivi, Pascolo fra macigni, Seminativo vitato*
1950, tavoletta IGM Cammore, Fosso delle Cammore	quota 560 Pozzi, oliveto, vigneto

1436, *Inventario antico* *Valle Ia. Todino*, localitŕ (Toccianello, Subiaco)	*Cesa cum cerciolis et castagnolis*

1570, *Registrum maximum* *Cercito*, localitŕ (Ienne)	*Possessio cum culto et inculto*
1820, Catasto Gregoriano *Cerceto* (Monte Preclaro)	*Pascolo cespugliato*
1950, tavoletta IGM Cercito, pendio fra il Colle dei Santi e Piedienne	quota fra 1000 1200 Vegetazione rada di quercia e olmo

Questa assenza non sembra dunque attribuibile agli esiti di una radicale eliminazione delle essenze tipiche del piano collinare, anche se la tendenza generale del periodo cinque e seicentesco è orientata verso importanti forme di messa a coltura. Se da una parte ciò va imputato al diverso formulario utilizzato dal redattore cinquecentesco, il quale ricorre regolarmente al termine *possessio* che, seppure spesso dotato di qualificativi, tende tuttavia alla genericità, il confronto con il settecentesco Catasto Tranquilli sembra confermare un progressivo calo di testimonianze dell'antico querceto puro. Questo infatti non è più attestato fra i possessi sublacensi di Affile, Arcinazzo, Ienne e Subiaco. Ne rimangono tracce solo nei comuni di Civitella (Bellegra), Rocca Santo Stefano, Canterano, Gerano e Cerreto e anche in questi casi si tratta per lo più di terreni lavorativi con alberi di quercia, raramente di boschi misti all'interno dei quali è presente la roverella, ancor più raramente di veri e propri *cerqueti*, per altro caratterizzati da una superficie assai esigua[14]. Del tutto assenti sono i microtoponimi derivati dalla denominazione dialettale dell'essenza. Le associazioni con le altre specie forestali contribuiscono a confermare uno scenario produttivo del bosco misto caducifoglie nell'orizzonte collinare appenninico, rappresentato dalla selva fruttifera di alto fusto (secondo la definizione che è stata delineata poco sopra). Le componenti descritte nel catasto settecentesco escludono infatti la presenza di specie "non fruttifere": le formazioni arboree di proprietà del monastero sublacense sono poche, di modesta superficie e integrate con le colture estensive e intensive o comunque ad esse fortemente intercalate. Ma esse, pure appartenenti allo stesso orizzonte, non comprendono alberi come carpini, aceri e ornelli, che sarebbero indice di una alterazione della produttività.

Questo assetto è chiaramente messo in evidenza dalla testimonianza statutaria, una fonte privilegiata per ciò che concerne la funzione delle specie e quindi la percezione che di esse si aveva. Dal XVI al XIX secolo, i boschi di alto fusto delle comunità del comprensorio sublacense sono tutelati contro il taglio e contro il pascolo, per permettere la ricrescita dei germogli nel periodo che va dal 1° ottobre alla fine di dicembre: multe sono infatti previste per il taglio di *querqueolae culte et reservate pro silva faciendo*, per chi sale sugli alberi o raccoglie a terra le castagne e le ghiande cadute dalle querce, dai lecci e dai cerri, per chi taglia *cerri, cerque, elci*[15]. La ghianda di roverella non si può *battere* e portare via, in particolare nella Macchia del Castellaccio di Paliano, poiché questa è riservata sia per il pascolo dell'erba sia di quello della ghianda.

[14] Subiaco, Archivio di Santa Scolastica, Catasto Tranquilli. Le testimonianze sulla presenza di *Quercus pubescens* sono le seguenti: "terreno ad uso di cerqueto", località *Sant'Eleuterio* (Civitella, c. 269), "macchia antica di cerri, cerque, castagni, alberi fruttiferi, vigne e lavorativo", *Tenuta di Monte Casale*, Capello e Valle Cupia Vecchia (Civitella, c. 273), "lavorativo con alberi di cerque", località *Remajure ora Roje del Canale* (Rocca Santo Stefano, c.381), "cerqueto", *località Colle Verta o Campo* (Canterano, c. 555), "macchia di castagne, cerque, fargne e faggi", località *Chia* (Gerano, c. 671), "macchia di cerri, cerque, fargne", località *Costamiro* (Gerano, c. 683), "terreno con cerque", località *Fontanelle* (Cerreto, c. 705), "lavorativo con cerque", località *Colle* (Cerreto, c. 721), "albereto, lavorativo e cerque", località *Caprano* (Rocca Canterano, c. 799), "albereto, oliveto, cerque e prato", località Valle *Ceraso* (Rocca canterano, c. 877).

[15] Archivio di Stato di Roma, Biblioteca, n. 805/6, Statuto di Paliano del 1531; n. 804/2, Statuto di Cervara del 1852; n. 450/5, Statuto di Ienne del 1874

Riguardo alla specie *Q. cerris*, ci si domanda come mai nell'area di studio siano così frequenti i toponimi legati al cerro. Una spiegazione plausibile può essere che tali toponimi si riferiscano a un'ondata di colonizzazione recente (medievale) di ambienti forestali fino ad allora poco disturbati dalla colonizzazione umana. Una formazione "pura" di cerri, impoverita cioè rispetto alla composizione "mista" che competerebbe in natura al cerro, può essere infatti rinvenuta su accantonamenti rupestri, adatti all'insediamento umano di altura, in uno dei tanti episodi più recenti di incastellamento degli abitati appenninici.

Al contrario del caso precedente, questa specie quercina nelle fonti più antiche considerate è tramandata esclusivamente attraverso i toponimi. E' già stato rilevato che i toponimi da cerro risultino fra i più ricorrenti del piano submontano, collinare e planiziare della Ciociaria (fra i 450 e i 1400 metri). Nella medesima regione, finitima all'area di studio, solo il 18% dei luoghi designati con questo toponimo è ancora ricoperto di vegetazione forestale[16]. La parziale scomparsa dei boschi di cerro non sembra da attribuirsi tanto all'eccessivo sfruttamento (come nel caso della farnia), quanto al taglio selettivo a vantaggio di altre specie più attrattive a esso originariamente associate in alcune aree, come il castagno. I microtoponimi che si riferiscono al cerro si trovano anche in zone dove sono attestati dissodamenti risalenti ai secoli XI-XII[17], rivelandone una tendenza alla conservazione nei pressi degli insediamenti.

E' ipotizzabile che anche in questo caso i toponimi conservati indichino una presenza antica, e forse già non più attuale, dell'essenza in questione, in quanto le località caratterizzate dal toponimo nel periodo quattro e cinquecentesco non riportano alcuna attestazione di cerro, né di alberi di quercia. E' da ritenere, tuttavia, che la specie possa aver conosciuto una flessione a seguito del degrado antropico di precedenti foreste miste, a vantaggio di roverella, . poiché la fonte cinquecentesca è di norma molto fedele nel rilevare la presenza di singoli alberi.

Le formazioni caratterizzate dall'essenza ricompaiono prima nel settecentesco Catasto Tranquilli, in associazione con roverella, castagno e faggio[18], mentre *piante forti di alto fusto* riappaiono nell'Ottocento nelle medesime località individuate dagli antichi toponimi derivati da cerro. Ciò trova conferma negli interventi di tutela contenuti negli statuti, a vantaggio di cerri e *cerque* (roverelle): le due essenze risultano sempre insieme a comporre le selve fruttifere[19], mentre estremamente rare sono le menzioni del solo cerro. Queste ultime riguardano il territorio di Piglio: il taglio dei cerri di una selva in località Arcinazzo è oggetto di una lite fra le comunità di Ponza e Piglio nel 1765[20] e per il taglio di questa essenza nella selva comunitativa è previsto il pagamento di una multa doppia rispetto a quanto stabilito per tutti gli altri alberi infruttiferi, secondo lo Statuto del 1820.

Le testimonianze qui riprodotte inducono a riflettere inoltre su eventuali forme di "uso multiplo". Nel caso dei terreni nella contrada Cerreto, esse vanno interpretate come una fase transitoria del bosco che viene man mano conquistato dalle colture, nel quale valesse la pena la conservazione di *Quercus* "fruttifere", creando forme di uso promiscuo.

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[16] Ricci, 1994.

[17] Toubert, 1973. Tuttavia l'uso che della pianta si faceva per la legna da ardere e per il carbone giustifica una testimonianza conservata per il territorio di Filettino, nel 1331, secondo la quale il locatario di una parcella con alberi di cerro era tenuto a *mantenere et de novo colere alias arbores existentes in loco predicto,* in Passigli, in corso di stampa.

[18] Subiaco, Archivio di Santa Scolastica, Catasto Tranquilli. Le testimonianze sulla presenza di *Quercus cerris* sono le seguenti: "macchia di cerque e cerri", località *Isamini* (Civitella, c. 257), "macchia di cerri e castagne", località *Morre o Pantana* (Rocca Santo Stefano, c. 387), "macchia di castagne, cerri e faggi", località *L'Antera o sia Castellone* (Gerano, c. 655), "macchia di cerri, cerque e fargne", località *Costamiro* (Gerano, c. 683), "selva di castagne e cerri", località *Colle Pecchio o Castellone* e località *Costa Ansueta* o Corparato (Rocca Canterano, c. 849 e c. 851).

[19] Archivio di Stato di Roma, Biblioteca, n. 804/2, Statuto di Cervara del 1852; n. 450/5, Statuto di Ienne del 1874, memoria già citata riguardante Ienne del 1792.

[20] Archivio di Stato di Roma, Buon Governo, s. II, Ponza, b. 3701.

Secondo quanto emerge sin qui a proposito della roverella e del cerro, il querceto puro, ossia la selva fruttifera di roverella o di roverella e cerro, considerata la formazione forestale più pregiata ancora nel XIX secolo, costituisce un genere di appezzamento che si va progressivamente rarefacendo nell'assetto produttivo del territorio sublacense a partire dalla seconda metà del XV secolo. A seguito di operazioni volontarie, come il taglio selettivo a favore del castagno o come l'integrazione degli alberi con altre forme produttive all'interno del bosco, come il pascolo e la crealicoltura povera e la stessa viticoltura, il parcellario forestale risulta sempre più frammentario e i vuoti creati dal diradamento delle specie di alto fusto vengono rioccupati da alberi e arbusti di carpino e ornello.

Denominazioni del sito nelle diverse fonti	Uso del suolo e paesaggio vegetale
1284, atto notarile *Ceretum,* località (Arcinazzo)	*Terra*
1436, 1476, *Inventario antico* *Li Cerri della Civita, Lo Cerrito, Lu Cerrito, Le Cerreta*, località (Arcinazzo)	*Terra* *Castagnetum* *Arbor castanee* *Terre*, due
1765 Catasto Tranquilli *Quarto delle Cerreta,* località (Arcinazzo)	Terreno in parte lavorativo
1820, Catasto Gregoriano *Cerreta* località finitima (Affile)	*Seminativo, Pascolo cespugliato, Mezzagna, Sasso cespugliato con piante forti di alto fusto*
1950, tavoletta IGM Le Cerreta	quota 900 Alberi radi
1378, atto notarile *Pedi lu Ceretu*, località (Ienne)	*Canapina*, confinante con il fiume
1318, atto notarile *Colle della Cerra*, località (Subiaco)	*Terra*
1436, *Inventario antico* *Cerrito*, località (Toccianello, Subiaco)	*Canapina, terra cum cesa, terra, prato, stirparium*

Questa tendenza sembra inversamente proporzionale allo sviluppo del castagneto puro, che rappresenta un tipo di bosco dotato di forte continuità, fin dal primo medioevo e lungo tutto il periodo studiato. La sua scomparsa, per altro quasi totale, risale ad epoca relativamente recente; una prima fase di abbandono dei castagneti da frutto è attestata nella prima metà del XIX secolo dal Catasto Gregoriano che registra la loro riconversione in castagneti da taglio.

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From integration to abandonment. Forest management in the Mediterranean agro-ecosystems before and after the "green revolution" (The Vallès County, Catalonia, Spain, 1860-1999)

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Abstract

We are seeking to analyze the role played by forest and territorial management in the economic and ecological functioning of the agrarian ecosystem in a West-Mediterranean advanced organic economy towards 1860, and compare it with the one prevailing at the end of the 20th century. In order to highlight the link between energy and land use, we have reconstructed the agrarian energy balances in five Catalan municipalities towards 1860 and at present, to relate them with the landscape evolution of this territory reconstructed by GIS from cadastral maps and aerial photographs. Working together with landscape ecologists we have applied to these land-use maps some indices of eco-landscape structure and connectivity to understand their ecological functioning. We have found that in 1860 the energy return on energy input was 1.67, despite its unavoidable dependence on the inefficient livestock bioconversion to obtain manure and traction. In 1999, on the contrary, the return was only 0.21, meaning a consumption of five energy units for each one offered to the consumer society. A key feature that allowed to maintain the high energy performance in the 1860 agrarian system was its *territorial efficiency*, mainly achieved trough a sound integrated management of agricultural, pasture and forest land. The energy inefficiency of the agrarian system brought about by the so-called green revolution mainly owes its existence to the unsound disconnection between livestock breeding, crop production and forest management.

1. Research approach

Using the Energy and Material Flow Analysis (EFA, MFA) we are studying the agrarian landscape as an ecological footprint of the social metabolism that any society maintains with the natural systems that sustain them. Our approach combines the study of this energy balances of different agrarian systems with the land mosaics they produce, through a GIS analysis of land cover patterns. In order to understand this Land Cover-Land Use Change (LUCC), we consider that social metabolism is the main driving force behind the long term changes in land uses. Working together with forest and landscape ecologists, we have applied some Landscape Ecology Indices of ecological structure and connectivity to measure the environmental impact of those territorial changes.

Energy flow analysis may help to highlight some key features that lay in the historical anatomy of cultural landscapes. Most of this cultural landscapes were shaped by agrarian economies that attained high population densities while remaining organic. According to Ester Boserup, 64 inhabit./Km^2 or 1.5 hectares per person seems to have been an upper frontier (Boserup, 1981). When an organic agrarian system achieved such a high density, rural societies had to face and solve two main problems related with energy efficiency: 1) The big energy losses through the conversion into manure, draught power, and cattle products of biomass eaten by livestock as pasture or fodder; and 2)

The decreasing availability of firewood and other forestry products when cultivated land increased its share within the useful agrarian area. In past organic rural economies the only way to maintain a high energy performance in a high intensive land use system was to keep a sound integrated territorial management of the three main sides of the agro-ecosystem: cultivated, pasture and forest lands. The creativity we can now discover in many territorial features of these cultural landscapes can be seen as innovative responses to this challenge.

2. Study area

Our case study comprises five Catalan municipalities of the Vallès county with a common extent of 13,488 hectares: Castellar del Vallès, Caldes de Montbui, Palau-Solità i Plegamans, Polinyà and Sentmenat. They are located in a small plain situated in a tectonic basin between Catalonia's littoral and pre-littoral mountain ranges, whose diversity of geological substrata have led to the development of a considerable variety of soils. Both the surface streams and groundwater springs are relatively more abundant in the fault zone between the tectonic basin and the mountains, where the oldest nucleated settlements were located. Although the poorest share of population used to live in those small towns or villages, the most apparent feature of human settlement in that mid-northeast of Catalonia was a network of scattered poly-cultural farms, called *masies* in Catalan, structured into compact units around an isolated rural dwelling. Starting from the end of the late medieval agrarian struggles, the landowners who held the *masies*, gradually gained control of the rights of access to land, over a complex and conflictive transition from feudalism to agrarian capitalism (Garrabou, Planas and Saguer, 2000; Garrabou and Tello, 2004).

The closeness to Barcelona –between 5 to 12 hours on horseback according to a timetable map of 1808-1809– meant that the Vallès was connected very early on with the commercial dynamics of Catalonia's demographic and urban centre of gravity. Population growth, increasing peasant inequality, and market incentives increase the extension of cultivated lands, mainly through the plantation of vineyards in former woodland areas. Vines were planted in poor soils, and no manure was applied on them except at the time of initial planting. This meant that a partial wine-growing specialisation allowed the poly-cultural owners of the *masies* to concentrate the scarce manure on the better soils devoted to vegetable gardens, cereals, legumes or hemp. Vineyard pruning and green shoots even went towards fertilising other crops, either directly as compost or indirectly as fodder

Table 1. Population density in the Catalan study area (inhabitants/km^2 1718-1999)

	1718	*1787*	*1860*	*1900*	*1930*	*1960*	*1999*
Vallčs Study Area	20.8	29.4	65.8	71.0	91.7	110.7	278.0
mean in Catalonia	13.7	29.7	54.5	64.1	92.6	132.1	194.7

Available hectares per inhabitant in the Catalan study area (1718-1999)

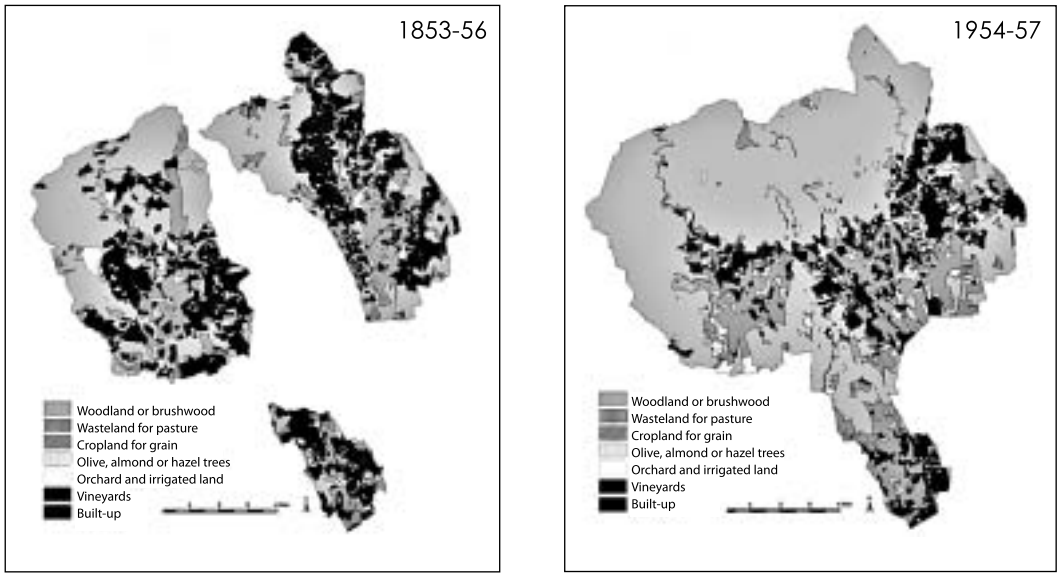
	number of inhabitants	*total available land in hectares per inhabitant*	*arable available land in hectares per inhabitant*	*available land apt to cereal sowing in hects. per inhabitant*
1718	2,804	4.83	3.74	3.12
1787	3,972	3.41	2.64	2.20
1860	8,880	1.53	1.18	0.99
1900	9,575	1.41	1.10	0.91
1930	12,375	1.09	0.85	0.71
1990	14,933	0.91	0.70	0.59
1999	37,504	0.36	0.28	0.23

Source: Garrabou and Tello, 2004.

and manure. All of these were responses to the challenge of feeding a population that had tripled between 1787 and 1860, and attained 66 inhabitants/Km^2. This meant that only 1,5 hectares per person were available to feed the local population with an organically-based intensive agriculture in a Mediterranean bioregion subject to water stress, where keeping livestock and obtaining fertilisers became severely limiting factors (Wrigley, 2004).

Several waves of increases in the relative prices of wine encouraged vineyard planting, from the 17th to the beginning of the 18th century, added to the oidium plague in 1840-50. The result was the cultural landscape mosaic shown in Map 2, that in 1853-56 still combined different Mediterranean crops.

Map 2. Land use cover in the Catalan study area (Vallès county) in 1853-56 and 1954-57



Source: made with GIS by Oscar Miralles, from the cadastral maps in the historical archive of the Institut Cartogràfic de Catalunya (ICC), and the Spanish Provincial Cadastral Office, for our research project SEC03-08449-C04. We thank the ICC for giving us permission to publish this 1853-56 maps.

A very different wave of vine planting started in 1867 when the phylloxera plague hit French vineyards, causing relative prices for Catalan wine to soar. This grapevine fever suddenly displaced polycultivation, provoking the first episode of environmental and economic globalisation that linked the fate of that area to the international value of a single export product. This ended suddenly with the arrival of the disease to the Vallès in 1883. By 1890 it had killed all vines, and the region's agriculture swung towards the production of fresh milk, vegetables, potatoes and legumes for daily delivery to the nearby cities. The new model was consolidated circa 1930, when the available land had been reduced to a single agrarian hectare per inhabitant. In spite of the abandonment of many terraces previously planted with vines, and the growing of woodland in sloping soils, at least in the Vallès tectonic plane the agrarian landscape remained in 1954-57 a poly-cultural one, with a mosaic of diverse patches (Map 2). But after the 1960s the fast spreading of the so called "green revolution" put a sudden end to the old rural culture and society.

3. Energy efficiency trough territorial efficiency

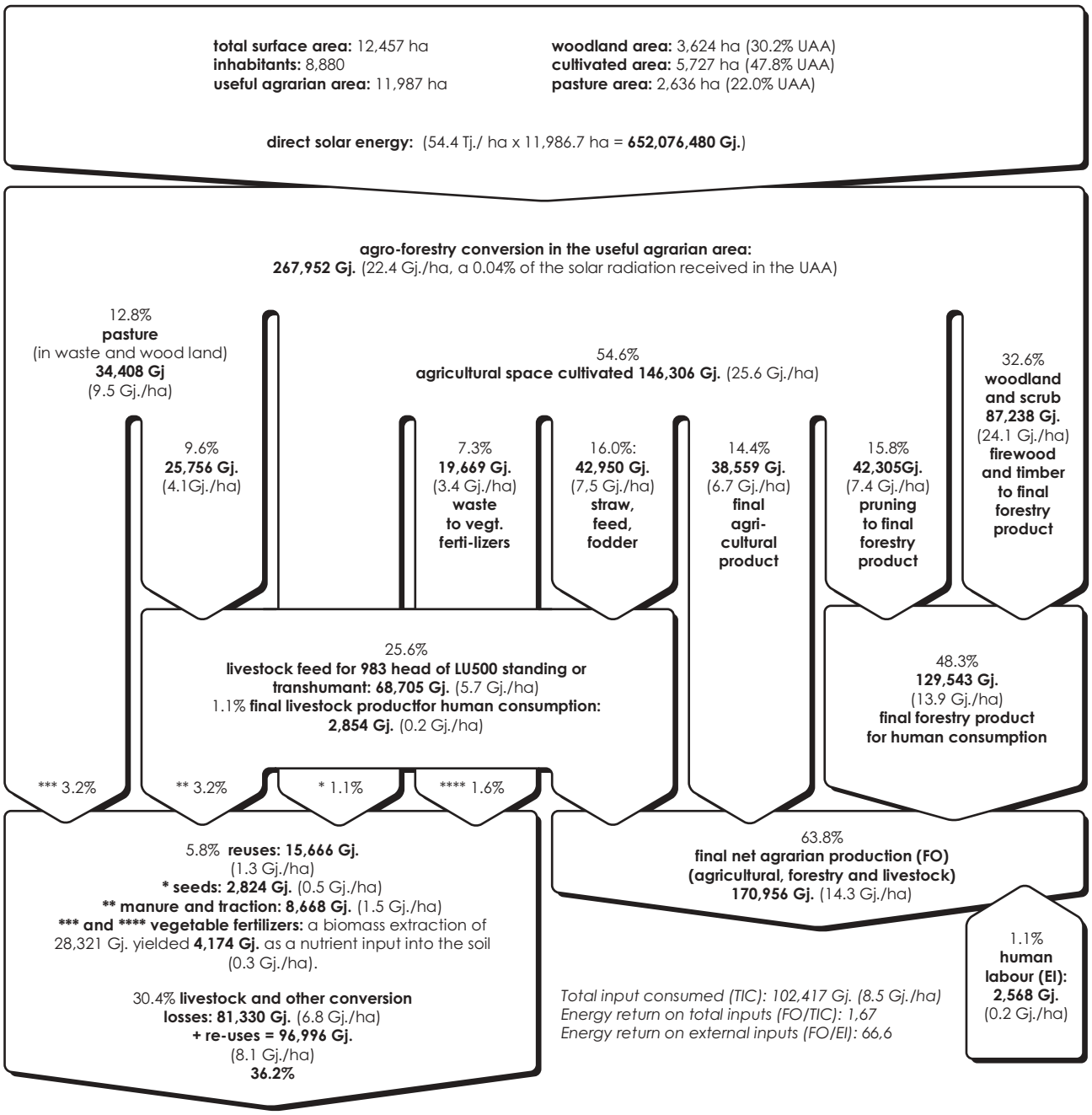
Despite the high intensive Mediterranean organic agriculture then practiced, the energy balance of the prevailing agrarian system in the study area towards 1860 reveals that the energy return on energy input (EROI) was 1.67. The energy content of the final net agrarian output amounted to 64% of the primary solar energy fixed by photosynthesis, while conversion losses were only 36%. The key feature to attain such a high energy performance was a close integration between the three main agrarian spaces: cultivated, pasture and wood lands. The existing unavoidable dependence on livestock bioconversion, in order to obtain manure and traction, was highly inefficient: 26% of the available vegetable biomass was transformed by livestock into traction power, manure and cattle products, while the final livestock output only accounted for 1% of that primary energy derived towards animal bio-converters. This supposed a big problem for any traditional organic agrarian system. But the integration between cropping, livestock feeding and forestry offered an efficient response to that challenge. Together with an intense reuse of almost any biomass by-product, that meant a negligible amount of external inputs other than human labour, it explains why the energy content of the final agrarian product still represented 64% of the primary solar energy (Table 3.).

The intensive cropping caused lack of wood, a big challenge that was faced with an innovative response: the *cropping of trees and shrubs*. Due to the high proportion of cropped land, the availability of wood and firewood was only 1.8 Kg. per inhabitant a day, or 9.8 Gj./inhab./year (less than the mean consumption in the Mediterranean Europe towards 1750-1850 according to Malamina, 2001). Vine and olive tree pruning or shoots became a partial substitute for firewood or charcoal when they became increasingly scarce as a consequence of turning woods and brushwood into vineyards or other woody crops. In that sense, as the Spanish landscape ecologist Fernando González Bernáldez stressed, shrubbery or woody crops became in the Mediterranean a sort of "forestry transition" between natural and cultivated rings or patches. It also meant a sound solution to the dilemma between exploitation and conservation, locating in the space an intermediate degree of agro-ecosystem maturity (González Bernáldez, 1995). Thanks to that "forestry transition" cropped lands filled the fuel gap with the pruning of vineyards and olive or almond trees, that raised the available firewood to 14.6 Gj./inhab./year (2.7 Kg. per head a day).

4. Landscape results of an unhinged social metabolism

The energy inefficiency of the present agrarian system, brought about by the so-called green revolution could mainly be caused by the unsound disconnection between livestock breeding, crop production and forest management. In 1999 the agrarian return on total inputs was only 0.21, meaning a consumption of five energy units for each one obtained. Cropped land holds only 32% of the useful agrarian area, and captures 47% of solar energy, due to the doubling of the energy output in each cropped hectare. Forests fill a 61% of land, but most of them remain abandoned and wasted. Livestock weight is 22 times the existing one in 1860. It is fed with imported fodder and remains disconnected from the surrounding territory except for the polluting dung. The old agrarian mosaic has disappeared and a lot of the best agricultural soils have been built-up. The main energy flows of this unhinged social metabolism go across the territory as if it were only an inert base. Once again energy inefficiency is closely related to an inefficient and unsound land use that entails unsustainable ecological consequences (Map 4 and Table 5.).

Table 3. Annual flows in five Catalan municipalities towards 1860 (Spain)

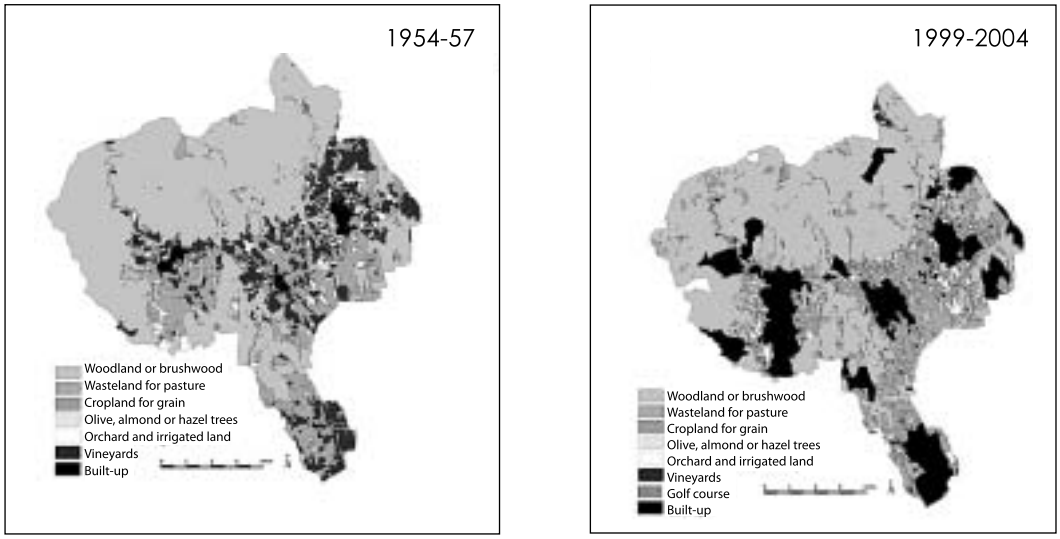


Source: made with GIS by Oscar Miralles, from the Spanish Provincial Cadastral Office, for our research project SEC03-08449-C04.

The end of this old Mediterranean agrarian mosaic has impoverished the ecological structure of landscape, and its biodiversity. A team of ecologists have applied to our land use historical maps two landscape ecology indices based on theoretical grounds and field work expertise (Marull, Pino, Tello, Mallarach, 2006). The Landscape Structure Index evaluates through GIS analysis the territorial capacity to shelter different organisms and ecological processes, according to the intensity of human land uses. The Ecological Connectivity Index is based on a computerized model of travel cost distances between different classes of ecologically functional areas, and the impedance effects of different soil uses or anthropogenic barriers. The indices adopt values between 1 and 10, and the maps do show a clear impoverishment of the ecologically functional areas and its ecological connectivity (Map 6.).

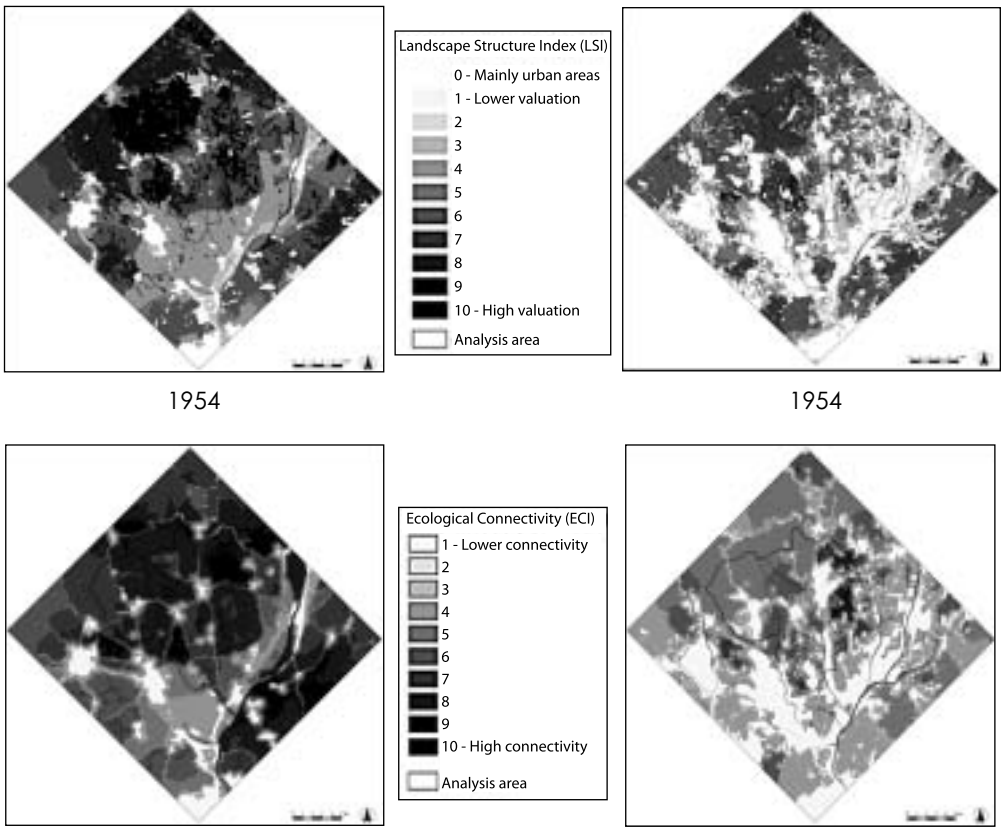
Past organic economies maintained an integrated management of territory not on account of its ecological virtues, but because the prevailing energy poverty made it necessary. Later the consumption of fossil fuels rendered the integrated use of land no longer *necessary*. But had the end of a necessity borne the end of its ecological *virtues*? The answer is important, because now we need the overcome the dysfunctional and ecologically unsound land use that is causing serious environmental pathologies.

Map 4. Land use cover in the Catalan study area in 1954-57 and 1999-2004



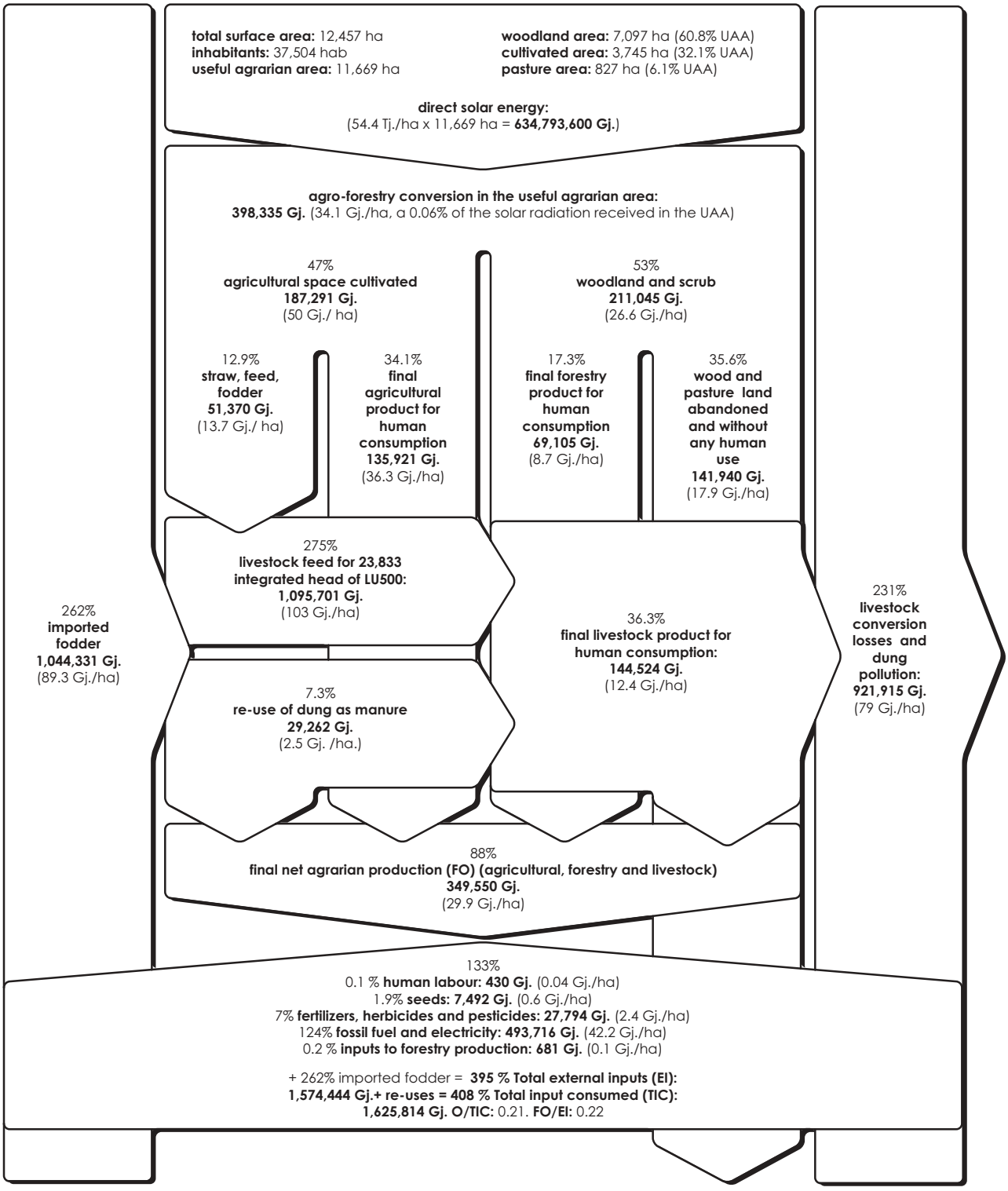
Source: Marull, Pino, Tello, Mallarach, 2006.

Map 6. Landscape Structure and Connectivity Indices of the Catalan study area (Vallès county) in 1954-57 and 1999-2004



Source: Marull, Pino, Tello, Mallarach, 2006.

Table 5. Annual flows in the same Catalan municipalities in 1999 (Spain)



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Theme 6.
TRADITIONS, CULTURE AND LANDSCAPE IN SUSTAINABLE FOREST MANAGEMENT

Sustainable forest management in Europe's East and West: trajectories of development and the role of traditional knowledge

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Abstract

The contribution Traditional Knowledge (TK) to Sustainable Forest Management (SFM) varies in time and space. Based on interviews with actors at multiple levels of governance, and official statistics, we describe trajectories of SFM development, and discuss the role of the TK possessed by different actors for SFM in three European landscapes. Troitsko-Pechorsk in Russia has been subject to a dramatic boom and bust development, which started just after World War 2. When Soviet Union ceased to exist, long-distance transport became a formidable obstacle for wood export, reducing the annual harvest volumes by 2 orders of magnitude. Today, local populations either emigrate, or depend on self-subsistence land uses. In Ukrainian Skole a village system, with a clear zonation from gardens, fields and meadows to pastures and grazed forests, was maintained for centuries. The economical crisis after the collapse of the Soviet Union has revived traditional knowledge as an important tool for rural development, the maintenance of biodiversity and cultural landscape values. In Swedish Vilhelmina, initially based on a village system, numerous frontiers of natural resource exploitation have occurred during the past 150 years. Continuous cover forestry and Sámi reindeer herding are two traditional land uses. Even if the economic gains of forestry are locally limited, still, a national welfare system supports local populations. We conclude that TK can support SFM locally and regionally, but to satisfy actors at national and international levels also other measures are needed, ranging from sustained yield forestry to set-aside of protected areas that maintain natural and cultural forest structures.

1. Introduction

Sustainable forest management (SFM) is a concept in continuous development, the interpretation of which varies over time, as well as among countries, regions and even local landscapes in Europe. As a consequence, the knowledge required to realise SFM is heterogeneous, and dependent on sets of values with different spatial and temporal scale dimensions. The development of the Pan-European forest policy process reflects this. Moving into the post-industrial society, ecological dimensions became included in the definition of SFM in the 1990s (Angelstam et al. 2004a). More recently also the role of the social and cultural aspects of SFM in the overall goal of sustainable development, including the role of traditional forest-related knowledge have been highlighted (MCPFE 2003).

Implementing SFM policies requires a combination of practical experience, engineering and science. The relative roles of these dimensions vary with the types forest and woodland goods and services, and among regions. Forests and woodlands have been shaped by people's traditional knowledge long before the development of scientific forestry. A significant proportion of the world's forests and woodlands is still managed by local and indigenous communities (Stevens 1997). The term traditional knowledge (TK) refers to the knowledge, innovations and practices of indigenous and local

communities, gained over long time and adapted to the local culture and environment. TK helps to sustain production of multiple goods and services providing livelihoods security and quality of life, as well as contributes to characteristic natural and cultural heritage.

Cultural heritage and traditional knowledge have been recognised and promoted at a global level in a number of international agreements, processes and programmes. At the European level the political commitments on increasing awareness of the role of traditional knowledge and practices in SFM in the protection of landscapes and the protection of biological diversity have been highlighted (MCPFE 2003, Rametsteiner and Mayer 2003). Similarly, the EU Forest Action Plan (EU 2006) acknowledged cultural landscapes, traditional practices and other cultural values of forests, as some of the ways of achieving local and regional sustainable development. Such landscape values are also included in the new Common Agricultural Policy (CAP), and the European Landscape Convention. However, traditional cultural landscapes are threatened by socio-economic and technological changes in agriculture, forestry and by some nature conservation strategies (Angelstam in press). As noted by MCPFE (2003) applied research on the social and cultural aspects of SFM to support the development of solutions to these challenges requires multidisciplinary approaches were human and natural science approaches are used. This is a major challenge both to donors supporting research and development, and researchers.

We argue that Europe's diverse forest and woodland landscapes is a valuable "landscape laboratory", which can be used to better understand the perceptions of SFM among actors at different levels of governance and role of traditional knowledge for sustainable landscapes. The historical development of forest use within a region usually goes through more or less distinct phases. According to Björklund (1984) and Angelstam et al. (2004a) these include (1) local use, (2) exploitation of naturally dynamic forest ecosystems, (3) development of sustained yield forestry, and (4) efforts to satisfy ecological and socio-cultural dimensions. However, at a given clock time, because different regions are located in different phases in this development, one can "travel in time" and both learn from past and future phases of development. As TK is rapidly disappearing in many parts of the world, along with local cultures and landscapes where this knowledge lives, it is an urgent task to document the role of traditional knowledge for sustainable forest management.

In this paper, we employ a multiple landscape case study approach to describe trajectories of SFM development, and discuss the role of the TK possessed by different actors for SFM in three landscapes in Europe's economic periphery. Finally, we discuss the challenge of doing sustainability science in support of the implementation of locally adapted sustainable forest management practices.

2. Methods

This study relies on mixed qualitative and quantitative methods. We made expert interviews at multiple levels of governance from local and regional to national and international, and collected quantitative data to describe the status and trends of economic, ecological and socio-cultural dimensions of sustainability (for details, see Elbakidze and Angelstam, this volume).

Within our ongoing multiple case study approach, focusing on Europe's East and West, we summarise the situation in three European local administrative units representing peripheral regions of economic development (Whyte 1998) in the Russian Federation's Ural Mountains, Ukraine's Carpathian Mountains and Sweden's Scandinavian Mountains. All landscapes were forest-dominated and located in the uppermost parts of large watersheds (Troitsko-Pechorsk in the Pechora river, Skole in the Dnister river, and Vilhelmina in the Ångermanälven river). Mountain forests are azonal and therefore similar social-ecological systems even in located far apart.

The history of local forest use in the Russian Troitsko-Pechorsk region case study, located in the south-easternmost corner of the Komi Republic, is relatively recent. Logging for export of wood was for a long time confined to high grading of large valuable trees close to rivers (Galashev 1961). Industrial forestry commenced only after WW2. The area hosts Europe's largest strictly protected area, the Pechora-Ilych state reserve.

The Skole district in Ukraine's Carpathian Mountains has a very long and complex colonisation history (Elbakidze and Angelstam, this volume). From the late Medieval the upland areas was populated by Boiko people, who depended completely on the maintenance of an ecologically balanced environment with minimal use of outside resources and energy almost until the 20th century. The agricultural and forestry practices of that time were to a certain extent a prototype of local sustainable use of natural resources.

The Vilhelmina area in NW Sweden was settled from the mountains towards the lowlands by reindeer herding Sámi people several hundred years ago, and starting in the late 18th century by farmers from the coast and lowlands towards the mountains. This historical development means that today there are several types of indigenous and local communities, all claiming that their traditional knowledge supports SFM.

3. Results and discussion

3.1. Trajectories of development of Sustainable Forest Management

The perception of SFM is related to contemporary societal values and is therefore not static. Before the advent of industrial forestry, use of natural resources was largely a local and regional activity in all the three case studies. To illustrate the trajectories of development regarding the relative focus on the three pillars of sustainability, with its ecological, economic and socio-cultural dimensions, we use a graphic presentation (Figure 1.).

Still being part of Europe's last ecologically intact forest landscapes (Yaroshenko et al. 2001) the trajectory of development in the Troitsko-Pechorsk area started in the ecological corner (Figure 1a.). In Komi the harvested wood volumes increased from 5 millions m^3 annually before the World War 2 to more than 25 in 1990. This was followed by a reduction to 6 millions m^3 today, a 75% decline, which is deemed sustainable with today's transport infrastructure. In the Troitsko-Pechorsk region the decline was more than 90%, and in one of the three forest management units in this region forest harvesting for export has virtually ceased, with annual harvest levels dropping from 1.5 million m^3 annually to only 6000. As a consequence the emigration rates are high, and people who stay in remote areas depend on self-subsistence gardening and pensions.

In the Ukrainian Skole district the starting point for the trajectory of development is the village, an informal institution supporting local sustainable landscapes (Elbakidze and Angelstam, this volume). During the Soviet time land use became more focused on large-scale economic production. Then, as a result of rapid deep political and economic changes in Ukraine, traditional villages have been re-appearing as a way for local people to survive. Nowadays they are key components to protect cultural diversity and social stability of the region, an example of sustainable co-existence between man and nature and playing an ecological, economic and social role for regional sustainable development. At the same time there are some negative trends in regional economic development and conflicts between the needs of local people and limitations on use of forest resources which belong to the state. Other threats are cultural and economic globalisation, and disrespectful attitude from society and governmental organisations.

In Swedish Vilhelmina numerous frontiers of natural resource use have occurred during the past 150 years. Sámi reindeer herding was the first, and together with Swedish small-scale farming based on small-scale agriculture and forestry, these are two traditional land uses. Continuous cover forestry methods in mountain forests and reindeer husbandry are two traditional types of land use. Even if the economic gains of forestry are limited in the area, still, a national welfare system supports the local population. To deal with competing landscape using, and to encourage businesses based on value-added wood products and non-tangible landscape values Vilhelmina became a Model Forest (see Svensson et al. 2004, Jougda et al. 2006, Angelstam et al in press).

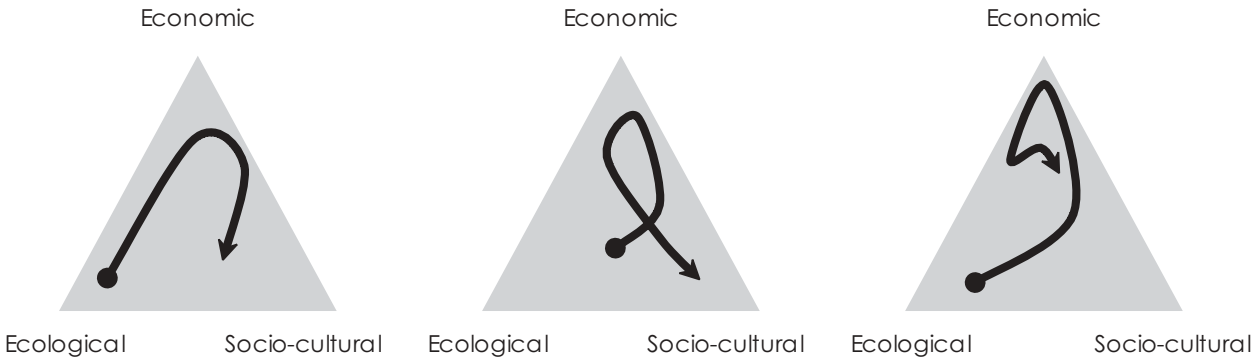

Figure 1. Illustration of the trajectories of development of sustainable forest management during the past 150 years in Russian Troitsko-Pechorsk (left), Ukrainian Skole (centre) and Swedish Vilhelmina (right) in a three-dimensional space representing the three pillars of sustainability

3.2. Emerging clefts among actors at multiple levels?

The results from interviews at different levels in the three landscape case studies clearly indicate that Sustainable Forest Management appears like beauty – it lies in the eyes of the beholder. The three case studies have distinct profiles of forest use at different levels of governance (Table 1.).

Table 1. Preliminary characterisation of actors' needs in terms of wood and non-wood products and ecosystems services at different levels of forest governance

	Troitsko-Pechorsk	Skole	Vilhelmina
Local	Self-subsistence	Self-subsistence	Landscape values, non-wood goods, wood
Regional	Self-subsistence	Tourism and wood production	Landscape values, non-wood goods, wood
National	Attempts to develop tourism, mining and oil and gas	Tourism, wood and biodiversity conservation	Wood production, biodiversity conservation
International	Conservation of intact forest landscapes	Biodiversity conservation	Maintenance of Sámi First Nations,

The transition from planned towards market economy that takes place in remote Komi's Troitsko-Pechorsk region has made transportation costs prohibitively high, and the interest in investing in value added production very low. The social consequences of the societal changes are immense. Securing Europe's last large intact forest areas is another challenge. Taken together, a holistic approach is needed to develop sustainable forest management where continued industrial development, ensured local livelihoods, and post-modern forestry based on marketing landscape values for tourism and recreation are needed.

In Skole there is insight among several key actors that different forest users have to combine their approaches in the whole landscape. This requires, however, that the Ukrainian forest-related policies need to be adapted to different regions according to their nature and history. In addition the policy process needs to include dialogue between policy, science and practise. A conclusion is that there is a need to define different among zones that specialise on economic wood production, maintenance and restoration of ecological functions, and to maintain social functions. Regarding tourism, dependent on the landscape values maintained by villages, there is the risk that those making money on tourism are not sufficiently aware of the need to maintain the traditional culture in terms of landscape and buildings.

Finally, in Vilhelmina there are signs of a shift towards more local businesses based on landscape values. But, does the declining paradigm (industrial forestry) compete with a new paradigm (multiple use, reindeer herding, tourism). This also raises the issue of scale in an economic sense. At what spatial and temporal scale is traditional forestry for wood production beneficial (national – yes indeed; regional – yes; local – well it depends). An important challenge is that of comparing the outcomes of actors' desires at different levels of governance. It is difficult to compare traditional full time employment jobs provided by large enterprises, with good statistics, with self-employed entrepreneurs and part time jobs, for which there is poor statistics (Camilla Tedebro pers. comm.).

To develop sustainable forest management locally and regionally iterated use of both top-down and bottom-up approaches for governance are needed (Campbell and Sayer 2003, Sayer and Campbell 2004). As discussed in detail by Angelstam (1997) and Vos and Meekes (1999), an inclusive holistic approach is needed. To understand landscapes in this way requires interaction among different actors in society. This applies to policy-makers, institutions and the actual actors within one sector affecting landscapes on the one hand, and among the different sectors acting at all levels with the chosen landscape on the other. Within a given sector or policy area there are several levels (Primdahl and Brandt 1997).

First, at the international policy level, the Convention on Biological Diversity's 'Ecosystem approach' can be used as one starting point. The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Application of the ecosystem approach will help to reach a balance of the ecological, economic and socio-cultural objectives of the Convention. The approach should be based on the application of appropriate scientific methodologies focused on levels of biological organisation, which encompass the essential processes, functions and interactions among organisms and their environment. It recognises that humans, with their cultural diversity, are an integral component of ecosystems. For forests, sustainable forest management as defined by Rametsteiner and Mayer (2004) can be interpreted as an example of an ecosystem approach (Angelstam et al. 2004a).

Second, at the national level, policy instruments are then gradually developed, and may include legislation, information, subsidies, monitoring, vocational training etc. However, the maintenance of natural and cultural biodiversity is usually not maintained by institutions, but rather by local people acting in different formal and informal governance systems. Consequently, several policy areas with their respective planning traditions coincide: forestry, agriculture, transport infrastructure and the energy sector, as well as regional and urban planning (Angelstam in press). There are many unresolved challenges related to the integration of ecological, economic and socio-cultural dimensions of sustainable forest and woodland landscapes.

We argue that the viability of landscapes can best be maintained with local and regional territorial approaches that target multiple complementary sectors in the economy. There is also a need to establish arenas where people representing practice and policy can interact both bottom-up and top-down. Model Forest, Biosphere Reserve, national and regional parks, ecoregion planning and watershed management are examples of international concepts for integrated natural resource management using the landscape as an arena for partnerships among owners, managers and other stakeholders. However, their effectiveness in delivering sustainability needs to be evaluated (Axelsson and Angelstam in press).

3.3. Landscape as concept and tool for sustainability science

Individual landscapes can be viewed as units that offer a sense of place to stakeholders, thus representing a wide range of issues of concern and solutions. Working with a complex concept such as sustainability requires special emphasis on finding a common platform for communication among different elements (representing ecological, economic, socio-cultural values, including related disciplines and actors), as well as from policy to practice, and back again. The landscape concept is useful to achieve this integration. Landscape is an important concept within humanities (history), social sciences (human geography) as well as in natural sciences (ecology and geography). The landscape concept can thus be used as an interface for improving communication between social and natural sciences, between policy and users to increase the understanding of the dependencies between social and ecological systems.

In the European Landscape Convention "landscape" is defined as a zone or area as perceived by local people or visitors, where the visual features and characters of the landscape are the result of the action of natural and/or cultural factors. This definition reflects the idea that landscapes evolve through time. The landscape concept also reflects the need to expand the spatial scale of management, i.e. to move from smaller spatial units or objects to the scale of landscapes and regions, i.e. include micro, meso and macro levels. Additionally, all social organisational scales must be considered, from individual, household or family, to community, county, nation and global. To study and improve resource management we must view natural and socio-cultural resources in a temporally and spatially expanded context, and one less restricted by administrative and political boundaries. Thus, a landscape forms a whole entity, where natural and cultural components are intermingled, and cannot be viewed as separate entities or processes, i.e. it represents a social-ecological system that includes both tangible and intangible variables representing values from all dimensions of SD.

In an increasingly globalised world, it is essential to understand how factors at local, regional, national and international levels affect the future development of sustainable forest management that satisfies ecological, economic and socio-cultural dimensions at different levels in society. An in-depth multiple landscape case study approach satisfies this need.

3.4. European landscapes as a laboratory

Implementation of sustainable development, both as a mean and an end, in a given landscape is highly dependent on the type of ecoregion and economic history, and the systems for government and governance, both of which to a great extent determine the socioeconomic status and trends. With its diversity the European continent can be viewed as a unique "landscape laboratory" for the development of Integrated Natural Resource Management (INRM). Firstly, there are steep gradients from centers for economic development to peripheral regions. This is clearly related to the pattern of gradual expansion of the EU, with countries like Georgia and, partly, Ukraine at

the fringe, showing a great interest in integration with the EU. Secondly, there is a wide range of regionally evolved practices for natural forest and cultural woodland planning and management in different ecoregions, which are adapted to the local natural conditions and patterns of land ownership and tenure. Experiences from a suite of European landscape level management units as case studies representing different starting points and trajectories towards sustainable rural landscapes in these dimensions is an important resource for mutual learning among stakeholders from business, authorities, general public and academia.

Ideally a network of transdisciplinary case studies on INRM approaches towards sustainable landscapes should be established in a suite of landscapes with diverse natural conditions and different settings of socio-economic development (Angelstam et al. 2004b). This network should focus on synthesis and development based on exchanging experiences among existing landscape management units with long experience of INRM using both bottom-up and top-down approaches. The expected outcome of the study is a development of common toolboxes for comprehensive and flexible INRM in different natural and socio-economic environments throughout Europe.

Internationalisation is a good tool to improve the mutual understanding among scientific disciplines, societal sectors and institutions, as well as different cultures and countries. The gradients between civilizations (sensu Huntingdon 1997) and economic history development in different dimensions of sustainability formed by the Fennoscandian countries, the new EU member states and non-EU post-Soviet states is a grand resource for improved understanding of how to understand sustainability and how it can be implemented (Krott et al. 2000, Angelstam et al. 2005, see Table 2.).

Table 2. To explore the regional variation in the perception of the Sustainable Forest Management concept, a suite of case studies can be used as a landscape laboratory (cf. Angelstam and Törnblom 2004, Angelstam and Elbakidze, this volume). Governance system and economic history are two dimensions of paramount importance. Here we stratify a suite of existing development projects such Model Forest (1), Biosphere Reserve (2), National Park (3), Experimental forest (4), Zapovednik (5) and local ENGO (6) in geographical Europe's East and West using the civilisation concept of Huntingdon (1997) (columns) and the history of economic development (e.g. Gunst 1989) (rows).

	Western civilization	Intermediate	Orthodox civilization
Short history of economic development	Vilhelmina (1), NW Sweden	Skole (3), Ukraine	Troitsko-Pechorsk (5), southeast Komi
Intermediate history of economic development	Bergslagen (1), central Sweden	Polesia (3), Ukraine/Belarus	Pskov Model Forest (1), W Russia
Centre of economic development	Kristianstad Vattenrike (2), south Sweden	Poltava (4), Ukraine	Lori Eco Club (6), north Armenia

4. Acknowledgements

We thank interviewees at multiple levels of governance representing our three study landscapes for sharing their views. The Marcus and Amalia Wallenberg foundation and the Swedish Institute provided economic support for this study in particular, and the multiple case study approach in general. We also thank Mauro Agnoletti at the University of Florence for supporting the first author's participation in the conference.

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A new culture for the development of new forests in the modern context

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1. The forests in the Pianura Padana

In Roman times the Pianura Padana was entirely covered by forests. From 1000 AD the diffusion of the Benedictine monachism in the plain developped the reclamation of the territory and its conversion to agriculture. Forests progressively disappeared and the woody areas (hedges, rows, tree-plantations) assumed a productive and landscape function strictly linked to the agricultural activity in the course of ages:

Reclamation = Bonifica = Bonum facere = To make good

Today the covering of the forests in Lombardy is restricted to few residual areas (7%): according to many authors this percentage is below the minimum value fixed for a territory with an ecological sustainability.The Pianura Padana, today, at the beginning of the third millennium, even if it is still a prevalently agricultural territory, is subjected to very strong pressures due to the urban, industrial and infrastructural development which compete for the use of soil. This development, created in a confused way and following economic and organization criteria has produced, especially in the areas near the urban expansion, a "casual", less attractive, and not much ecologically balanced landscape, often without identity and specific function. At the same time in the areas of Pianura Padana with a great rural tradition, the landscape has often preserved its most traditional features, but it had to adapt itself to the needs of one of the most modern industrial and productive agriculture of Europe. So that in many cases it had to sacrifice the arboreal elements to productive efficiency, with a great damage for landscape and the environment.

2. A new reclamation

From the beginning of 80's the provocation of some fields of the scientific community and environmental movements and the sharing of some public administrations has progressively identified new and urgent needs of society to which was necessary to give an answer:

- Life quality
- Protection of the natural and environmental resources
- Rural landscape preservation
- Recreation, culture, education

So we changed from the realization of spontaneous and episodical initiatives, to the promotion of strategic choices whose aim is to improve life and environment quality and the landscape and natural resources protection through the realization of new forests and "green systems" in the plain. So we passed from "The Forest in the city" created on the initiative of Italia Nostra (movement for the environment protection) in the 80's in Milan, to the Lombardy Region Programme for the realization of 10 big forests in the plain in 2000, which has allowed the making of the first 8 forests on a surface of about 250 HA at a price of about 16.000.000 €, and to the Lombardy Region New Programme for the realization of 10.000 HA of green systems in the plain for an amount of 200.000.000 €.

In this new context the forests in the plain gain today a different value: they have passed from productive and economic resource to satisfy the concrete and basic needs of the rural and urban

communities, to multifunctional resource which answers to more complex and often immaterial needs, typical of a modern society. So the forest, the victim of the original reclamation, is today the instrument for reclaming the territory. But is it meaningful today to talk about "New reclamation", that is to say "to make good" the territory?

3. A new culture

Is it possible to build the development of new forests upon a culture which: eliminated the forest from daily experience, no longer has roots in a rural forestal context, and has the traditional management knowledge? Which kind of culture can support this "new reclamation"?

A new reclamation needs a *new culture* to support the creation and to sustain the management of these new models. The *new culture* must be based upon four dimensions: ethical dimension, planning dimension, management dimension, and social dimension.

3.1. The ethical dimension

- The relationship of man with "nature" is vital, but it depends from its balance.
- Forests are a property of whole humanity, they play an essential role in the modern societies sustainable development and create a new landscape of living as expression of a society which wants to live better.

3.2. The planning dimension

- To plan "where" to make the new forests so that they can be ecologically coherent and in harmony with the territory in which they are inserted.
- To plan the new forests with a wide and deep view being conscious that they are investments for the future.
- To plan the new forests following ecologic criteria so that they can be the authentic expression of the ecosystem and they could help to keep and improve biodiversity and native species
- To plan the new forests following multifunctional criteria in order to answer to different mains (recreational, ecological, cultural, educational…) but without changing their essence of natural elements.
- To plan not only woods and forests but also green systems that could re-create a quality environment, an attractive territory and a new and harmonious landscape.
- To plan together: with local communities, with different sciences experts, with the owners and the future managers.

3.3. The management dimension

- To create new schemes of sustainable management both public and private which can guarantee to the new forests a lasting development.
- To create new knowledges which can integrate the traditional ones, linked to the forestal technique, with the several competences necessary to better carry out the new and different functions of the forests.
- To involve in a definite way agriculture and farmers who will be the main actors of this scenery.

3.4. The social dimension

To create within the whole society and not only in its single components the awareness that a sustainable development can't be separated from a healthy and balanced relationship with naturethat this investment has a cost that everyone has to be ready to pay and that the future has to be built on the basis of the past, but to be positive the change has to be planned and managed.

4. Conclusion

This new culture has necessarily to be developed with the contribution of many professional men, with different competences and points of view and has to try to express itself even at an operative level. We think that these important functions can be carried out in an effective way by those, forest experts and agronomists firstly– first of all, who have the knowledge, the competences and the keys of reading which allow an olistic and multifunctional approach to the problems of the rural territory, warranting at the same time a rigorous technical and scientific interpretation. All this because our main interests are the wood, the forest, the agricultural and forestal ecosystems which are "living systems", but also the rural territory itself which is a space of society and humanity. Respect, passion, knowledge of the biological mechanisms and of the human culture even in this case are the instruments to promote a new culture, necessary to make the investments ethically sustainable and lasting in the long run.

Modern society has destroyed forests; future society will plant them again (E. Sereni, 1865)

The use of traditional knowledge in sustainable forest management in the Kaska traditional territory in British Columbia & the Yukon

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Abstract

The Kaska Dena are a First Nations people situated in western Canada. The Kaska traditional territory is about 24 million hectares (93,000 square miles). It spans three provinces and territories (British Columbia, the Yukon and the Northwest Territories) and constitutes fully 25% of the Yukon Territory, and 10% of the entire land area of British Columbia. The majestic northern boreal forest regions of interior British Columbia and the Yukon have some of the continent's most expansive and impressive wilderness areas, with a great diversity of terrestrial and aquatic ecosystems. Pristine boreal forest watersheds are framed by extensive mountain ranges and wild rivers. Large free ranging populations of woodland caribou, moose, Dall's sheep, Elk, Stone sheep, a full suite of large carnivores, and hundreds of thousands of migrating neo-tropical songbirds and waterfowl make their home in these diverse boreal landscapes. Only a few roads cross this region, one of the wildest landscapes on the North American continent. The Kaska traditional territory represents one of the largest remaining forests of the northern interior of British Columbia and southeastern Yukon that has not been exploited for commercial use. The opportunity for managing the forest resources in the traditional territory in an ecologically sustainable and socially equitable manner remains intact. The Kaska are in a powerful position as custodians of a huge and still mostly intact landscape but they also face enormous challenges. The Kaska communities have unemployment rates often in excess of 80%. All of the social ills associated with that level of unemployment are present. Especially significant are very high suicide rates, and diabetes and heart disease rates up to eight times the national average. While there are external forces to accede to massive development, there is also internal pressure to fix these chronic social problems. The constant pressure on Kaska leaders to make these different and conflicting choices, often in the absence of sufficient resources, cannot be overstated. The management approach of the Kaska reflects the philosophy that has been developed through centuries of producing food, shelter, medicine, and clothing from forest resources while sustaining the resources from which these materials are derived.

To accomplish the objective of balancing the traditional uses of the forest while providing an economic framework for sustainable Kaska communities a cooperative approach has been taken by the Kaska. Initially, the Kaska established relationships with industry and Governments through a series of protocols and agreements driven by Supreme Court of Canada decisions pertaining to Consultation and Accommodation of aboriginal interests. Planning in the Kaska traditional territory is the application of traditional knowledge as a unique layer of information combined later with scientific information. The scientific information is used to substantiate Kaska land use decisions made through the lens of traditional knowledge. It is a key requirement for each forest planning process that traditional knowledge and community values be used to guide land use decisions. Each Kaska community has identified local Traditional Knowledge Coordinators, a Traditional Knowledge GIS analyst, an Elder's Oversight Committee, and Land Stewards. The Land Stewards and Elder's Oversight Committee are structured on family hunting and gathering areas. Information collected through the Land Stewards and Elders is provided to two Kaska Natural Resource Agencies. Each Kaska Natural Resource Agency is composed of a Board of Directors representing Kaska communities. The Agencies are responsible for integrating the Land Stewards and Elders knowledge into

strategic as well as operational planning decisions. The Agencies are the linkage to industry and Government on natural resource management issues and planning in their area. As well, the Agencies hold forest tenures for the Kaska Dena. The outcomes are plans and management strategies for forestry and other resource uses that are used to direct the management of natural resource industries, and other forest users.

In this model of ecosystem-based forest management, all resources, including ecological and Kaska traditional values, are given an equal weight in the planning process and appropriate measures are taken to ensure that natural resources are managed in an ecologically sustainable manner. This Traditional Ecological Knowledge has not only sustained the populations of First Nations for thousands of years, it has become the gift of First Nations to modern land use decisions. What was once a paternalistic exercise in allowing First Nations to collect their traditional knowledge prior to resource development occurring in their landscape is gradually being seen by resource managers as information that is critical to their decision making.

1. First Nations Jurisprudence

In British Columbia and the Yukon Territory, First Nations are in a unique place historically to influence the manner in which the knowledge held in trust by the people will be used in formulating land use decisions. Unique, because most of the province and territory is engaged in a modern treaty making process that came about because the Government of Canada lost momentum in extracting treaties from First Nations when they crossed the Rocky Mountains. However, the Government of Canada remains constitutionally bound to complete treaties with the First Nations of British Columbia and the Yukon. As a result, a vast array of ideas about what constitutes a treaty in the modern world and what constitutes the rights and title to the land in the respective Traditional Territories is forging a new form of self-governance for First Nations.

Aboriginal title and rights are protected under section 35 (1) of Canada's Constitution. Aboriginal law in Canada is dynamic, evolving, and uncertain and the actual extent of aboriginal title and rights are the subject of on-going discussions and negotiations with the federal, provincial, and territorial governments and other parties through a wide range of discussions and negotiations

A number of precedent setting Supreme Court cases, including *Delgamuukw*, have increasingly defined the title and rights of First Nations in Canada. Recently, the Supreme Court of Canada released two important aboriginal law decisions pertaining to Consultation and Accommodation. The *Haida Nation and Taku River Tlingit* decisions provide a framework for consultation on activities related to potential infringements of aboriginal rights caused by land and resource development activities. As well, the decisions state that accommodation requires that aboriginal concerns be balanced reasonably with the potential impact of the particular land and resource development decisions and with competing societal concerns. These decisions have provided the First Nations of British Columbia and the Yukon with the ability to transform the manner in which natural resources are managed.

For example, the Kaska enjoy considerable political power as evidenced by the recently signed bilateral agreement between the Yukon Government and the Kaska Nation. The bilateral agreement gives the Kaska a veto over development in their territory in the Yukon for a period of two years. This has been a key opportunity to affect the policy and legislative framework for resource management in the Yukon. From the Kaska perspective, the Bilateral Agreement will provide for longer-term co-management arrangements that would enable the Kaska to have some decision-making authority over land and resource allocation in the Yukon portion of Kaska territory and benefit from developments that do occur.

The first agreement to flow from the Bilateral is the Agreement in Principle for Forestry that provides 100% of all Yukon Government royalties derived from forest harvesting to the Kaska, 50% of all revenues generated from the sale of forest products, 50% of all forestry related work, and 50% of the directors of the company that will manage the forest resources in the southeast Yukon. This joint venture follows an earlier agreement that constituted a Kaska Forest Resource Stewardship Council with responsibilities for utilising Kaska traditional knowledge, amongst other things, in regional land use plans for the Kaska traditional territory in the south east Yukon.

2. Biophysical Attributes of the Traditional Territory of the Kaska Dena

The Kaska Dena traditional territory is about 24 million hectares (93,000 square miles). It spans three provinces and territories (British Columbia, the Yukon and the Northwest Territories) and constitutes fully 25% of the Yukon Territory, and 10% of the entire land area of British Columbia (Figure 1.).

Figure 1.
Kaska Traditional Territory

In British Columbia, the traditional territory encompasses the Cassiar Mountains in the west, the Rocky Mountains in the east, and continues down the Rocky Mountain Trench south, to the Akie River. The territory is characterized in the south by the large, flat valley of the Rocky Mountain Trench enclosed by rugged mountains and smaller valleys to the east and west. The landscape of the northern portion of the territory opens up north of Sifton Pass to the Yukon Territory into vast plateaus dissected by river systems.

In the Yukon, the traditional territory is a diverse region that includes the rugged Northwest Territories boundary peaks, the Pelly and Cassiar Mountains, and large interior plateaus. The Kaska traditional territory in the Yukon includes the entire Liard River basin, which in turn encompasses most of Southeast Yukon. The Kaska territory also stretches north along the Northwest Territories border and within the Selwyn Mountains to include tributaries of the Yukon River basin, such as the Ross River and Pelly Rivers.

The northern boreal forest regions of interior British Columbia and the Yukon have some of the continent's most varied and intact wilderness areas that have produced a large biological diver-

sity unique to the worlds boreal ecosystems. Large free ranging populations of woodland caribou, moose, Dall's sheep, Elk, Stone sheep, a variety of large carnivores, and hundreds of thousands of migrating neo-tropical songbirds and waterfowl make their home in these diverse boreal landscapes. Only a few roads cross this region, creating one of the wildest landscapes on the North American continent.

3. A conservation ethic

First Nations began their encounters with newcomers in commercial relations, usually in the fur trade, in which the interactions between the indigenous and immigrant were generally co-operative, and frequently beneficial as well. Although monetary interests drove this relationship, the ability of the First Nation trappers and hunters to manage a sustainable food source for their families, and often for the immigrants, as well as produce commercial pelts, reflects the conservation ethic that is deeply rooted in aboriginal culture. The Kaska conservation ethic is derived from their capacity as hunters, gatherers, and trappers and evolved to sustain their families from the time the first Kaska peoples established themselves in their present homeland. Kaska hunters and gatherers harvesting success is therefore inextricably linked to their knowledge of the animals and plants, and in predicting where the animal or plant will be found in different seasons as well as in climates that have changed through the millennia. As a result, the conservation ethic of the Kaska reflects a philosophy that has been developed through centuries of producing food, shelter, medicine, and clothing from boreal forest resources while sustaining the resources from which these materials are derived. This traditional ecological knowledge has not only sustained the populations of First Nations for thousands of years, it has become the gift of First Nations to modern land use decisions.

Currently land use decisions are made for very large landscapes based on the best knowledge that science can provide. Science has been very successful at providing inferential data that is intensively collected for short periods at a number of observation points in the landscape (Kimmerer, 2000). For example, Caribou movement patterns have been studied from a scientific perspective by radio collaring a few animals over a relatively short time span and then developing models to determine the movement of a Caribou herd for management purposes. Recently, traditional ecological knowledge has been used to corroborate the scientific data as well as provide observational data that substantiates movement patterns over long time periods including climatic changes that have occurred during the last millennium. An example from the Kaska Nation experience demonstrated the power of these long term observations in a series of video documentations that related the stories of elders and the Caribou (Elders comm. 2005). The elders' stories and personnel observations provided the correlation between seasonality, climate change, and Caribou movement patterns that were later described scientifically by biologists in modeling exercises for Caribou management. As a result, what was once a paternalistic and superficial exercise of allowing First Nations to collect their traditional knowledge prior to and during resource extraction in their landscape is gradually being seen by resource managers as information that is critical to Land Use decisions. Traditional knowledge is now being incorporated into planning processes that will guide resource development. In this way, the stewardship of the traditional territories is being influenced by the conservation ethic that first guided First Nations in the use of forest resources in their territories.

4. Kaska Ecosystem-based Forest Management Program

The Kaska traditional territory represents one of the largest remaining forests of the northern interior of British Columbia and southeastern Yukon that has not been exploited for commercial use.

The opportunity for managing the forest resources in the traditional territory in an ecologically sustainable and socially equitable manner remains intact.

British Columbia has had an ecosystem classification in place for forty years. The Biogeoclimatic Classification System (Krajina, 1965) provides resource users, and in particular forest managers, with a substantial tool for integrating ecological principles into a wide range of forest management activities. The primary goal of ecosystem-based management is fully functioning forests. The objective is to sustain a diversity of ecosystem services, for humans, fish and wildlife populations and their associated habitat, across the forest landscape at multiple temporal and spatial scales. A core theme of the Kaska philosophy is that maintaining biologically diverse forests supports diversified communities and their associated economies, and posits that these economies are a part of human societies that are in turn a component of ecosystems.

To accomplish the task of balancing the traditional uses of the forest while providing an economic framework for sustaining Kaska communities and ensuring available habitat for existing species, an inclusive approach has been taken by the Kaska.

In this model of ecosystem-based forest management, all resources, including ecological and Kaska traditional values, are given an equal weight in the planning process including appropriate measures to ensure that natural resources are managed in an ecologically sustainable manner. In addition, this model of forest management equally incorporates the traditional knowledge of the Kaska Dena to inform the planning process as well as the resulting resource management regulatory process.

By maintaining, restoring, and conserving key features of the ecosystems within the Kaska Nation's traditional territory based on the Kaska conservation ethic, they are in turn sustaining the Kaska Nation that depends on these ecosystems.

The Kaska have begun, through the Kaska Natural Resource Agencies, to collect and map the scientific information as well as the traditional knowledge required for ecosystem-based decisions for inclusion into their forest management plans. Research into a variety of silvicultural systems has also provided operational tools to achieve the objectives expressed in their plans that include the maintenance of biological diversity amongst other things (Mitchell et al, 2002).

5. The Kaska Communities

During the last three generations the Kaska have gradually moved from nomadic family units of ten to twenty individuals who hunted, fished, and gathered over vast areas, to the sedentary lifestyles associated with the present day communities. At the turn of the century the Hudson's Bay Company established a number of small "Posts" that bought firs from Kaska hunters and trappers and traded foodstuffs, hardware and clothing to the Kaska in return. The Kaska communities developed by incorporating the Hudson Bay Posts into their midst to provide both a source of income and materials available only in urban centres. The five Kaska communities include most of the families that traditionally utilized the landscapes surrounding the Hudson Bay Posts. Four smaller, dispersed settlements represent the remaining Kaska who were less inclined to congregate in communities (Elders communication, Elias, 1985, 1986).

The communities range in size from 200 to 1,500 persons. As well, there are a number of members that live in towns and cities who continue to have contact with the communities.

To facilitate the sale of furs to the Hudson Bay Posts, the Province of British Columbia and the Yukon Territory established family based trap areas that each family would trap and hunt for firs

and meat. These large trap areas are presently represented by family decision makers recently called Land Stewards. The 24 million hectare Kaska traditional territory is the area of traditional use represented by the family trapping, hunting, and gathering areas, the five communities and four settlements.

6. Land Use Planning in the Kaska Traditional Territory

The Kaska traditional territory includes the jurisdictions of provincial and territorial Governments as well as two forest regions and three forest districts in British Columbia. Land use planning follows the jurisdictional lines described by the territorial and provincial Governments, but has little in common with the biophysical attributes of the landscape, and even less with the territorial boundaries of the Kaska. As a result, the Kaska have been and remain involved in a variety of land use planning exercises.

Finding a common mechanism for the Kaska to represent their values throughout their territory has proved difficult. The pressures that arise from economic adversity, industrial expansion into their traditional territory and maintenance of their traditional values require a new vision of forest management that includes the Kaska conservation ethic as well as economic opportunities for their communities. Ecosystem based planning provides the mechanism that unites the Kaska vision of forest management.

6.1. Forest Planning

Planning in the Kaska traditional territory is the application of traditional knowledge as a unique layer of information combined later with scientific information. Traditional knowledge represents the accumulated knowledge that thousands of years of successful habitation in the boreal landscape has provided the Kaska Dena. Scientific information is used to substantiate Kaska land use decisions made through the lens of traditional knowledge. For example, science facilitates the incorporation of traditional knowledge into modern land use decisions regarding Annual Allowable Cut, road and bridge locations, the timing of harvests, and the types of silvicultural systems to be used.

An acknowledgement of the importance of traditional knowledge was given to the Kaska through the recognition of the Province of British Columbia's planning authority – the Integrated Land Management Bureau. The Bureau now carries out resource management planning in the Kaska traditional territory exclusively with the Kaska that includes plans for forestry, wildlife, oil and gas, mining, tourism, backcountry recreation, and access management. The catalyst for this new opportunity comes from the Supreme Court of Canada decisions noted in the introduction and a British Columbia Government document entitled the "New Relationship". Both initiatives empower First Nations with new Government to Government relationships that ensure meaningful involvement of First Nations in natural resource management.

As traditional knowledge is the source of Kaska national and community values, traditional knowledge is the key requirement of all planning processes that involve the Kaska Dena. To that end, each Kaska community has identified local Traditional Knowledge Coordinators, a Traditional Knowledge Geographic Information Systems analyst, an Elder's Oversight Committee, and Land Stewards (Table 1.).

Table 1.

Traditional Knowledge Coordinators (Kaska Nation Perspective)
Elders Oversight Committee (History, Traditional Values, and Stories)
Land Stewards (Community and Family Perspectives)
Geographic Information Systems Analyst (Integration and Protection of Traditional Knowledge)

6.1.1. Traditional Knowledge Coordinators

Two Traditional Knowledge Coordinators were selected by the communities located in the Yukon and in British Columbia. One represents British Columbia and one represents the Yukon. The selection process acknowledges the two political jurisdictions while maintaining the cross boundary linkages that continue to exist between the Kaska communities. The Kaska negotiate treaties, land use agreements, treaty interim measures, and alliances with industry assuming no boundaries exist.

The responsibility of the Coordinators is to provide an integration of traditional knowledge throughout the traditional territory and ensure that the traditional knowledge remains the property of the Kaska. The Kaska achieve this through having industry, Government, and any party requiring traditional knowledge sign a Traditional Knowledge Protocol Agreement. The purpose of the Protocol is to provide access and use of Kaska traditional knowledge in a manner which confirms the obligations of the interested organisations with respect to the ownership, collection and use of the traditional knowledge. The Protocol also provides recognition of the rights to ownership, protection and custody of Kaska traditional knowledge.

6.1.2. Elder's Oversight Committee

The Elder's Oversight Committee is structured on family hunting and gathering areas, providing elders representation from each of the family areas. The elders are the source of Kaska history in the Boreal landscape as well as providing values told through stories and legends. The elders are also the main source for the conveyance of the conservation ethic that represents the Kaska values in the relationship between the people and their economic livelihood.. The Kaska have recently begun to collect these stories on video as many of the elders are dying and with them, a great deal of valuable information is being lost. The Information collected from the Elders by the Traditional Knowledge Coordinators and Land Stewards is provided to two Kaska Natural Resource Agencies for protection and distribution to the communities.

6.1.3. Land Stewards

The Land Stewards represent the family hunting and gathering areas. Normally, the Land Stewards, who are members of the family groups, are actively engaged in hunting and trapping activities. Their knowledge represents the most recent information regarding wildlife and the impacts of any development or climatic change. As well, the Land Stewards repre-

sent a living embodiment of the values that the elders have passed on to younger leaders in the community. The Land Stewards are employees of the Kaska Natural Resource Agencies which ensures that these resource management bodies have direct access to local traditional knowledge for planning and management purposes.

6.1.4. Geographic Information Systems (GIS) Analyst

Traditional knowledge is managed by the GIS analyst. As traditional knowledge is proprietary information, there are protocol agreements in place with all users of the knowledge and the GIS analyst has the authority to provide the information as needed. GIS is used to enable rapid processing of traditional knowledge onto maps that provide the Kaska Natural Resource Agencies with the means to update their plans. Importantly, the Analysts also provide a linkage from the community to the Kaska Nation by ensuring that all of the information kept on maps is available to all members of all the Kaska communities.

6.2. Integrating Traditional Knowledge with Forest Management

The step of taking the values and traditional ecological knowledge from the Coordinators, Land Stewards and Elders and integrating them into plans and management practices differs between the Yukon and British Columbia.

The Yukon resource planning process involves the full participation of the Kaska in a technical working group, a recommendations body, and a high-level steering committee. Under a protocol developed by the Kaska, Kaska traditional knowledge must inform the disposition process. It is intended that this planning process will be blended with the forestry planning process created under a Memorandum of Understanding on Forest Stewardship.

In British Columbia, the Kaska have incorporated two Kaska owned companies – the Kwadacha Natural Resources Agency in the south and Gut Cho Natural Resources Agency in the north. Each Natural Resource Agency is composed of a Board of Directors representing Kaska communities. The Agencies are the linkage to industry and Government on natural resource management issues and planning in their area. These Agencies direct resource planning, hold forest licences, ensure that ecosystem based management principles are maintained, and provide a communications opportunity for all community members in the planning process. Broad based communications ensure that community vision and goals drive the planning and disposition processes. As well, the Agencies are responsible for integrating Land Stewards and Elders knowledge into strategic and operational planning decisions.

7. Empowerment and Capacity

The Kaska Dena intend to be at the center of natural resource decision making and be capable of participating in the economic opportunities that derive from those decisions in their traditional territory. The Kaska are in a powerful position as custodians of a huge and still mostly intact landscape but they also face enormous challenges. The Kaska Dena communities have unemployment rates often in excess of 80%. All of the social ills associated with that level of unemployment are present. Especially significant are very high suicide rates, and diabetes and heart disease rates up to eight times the national average. While there are external forces to accede to massive development, there is also internal pressure to fix these chronic social problems. The constant pressure on Kaska leaders to make these different and conflicting choices, often in the absence of sufficient resources, cannot be overstated.

The Kaska Dena have achieved a number of advances through Interim Measures Agreements, Economic Measures Agreements, the Bilateral Agreement, and Treaty Related Measures prior to the settlement of a Treaty. These agreements have produced a high level of capacity and engagement for a number of Kaska in the decision making processes. The Agreements have made the Kaska Dena pivotal in allowing the Governments of the Yukon and British Columbia any success in the development of resources held in the Kaska Traditional Territory.

As well, the Kaska have negotiated protocol agreements with environmental organisations that stipulate the manner in which these organisations operate in the Traditional Territory, and how they cooperate with the Kaska to achieve agreed upon conservation goals.

Ultimately it is the gift of Kaska values to the management of the boreal ecosystems in their traditional territory that will provide a deeper connection to the land that is missing in most of the non-indigenous communities of North America. In fact, these values will be useful in providing a countermeasure to the globalization of resources in British Columbia and the Yukon that is reducing the conservation ethic to sustainable development.

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Food security, fattori limitanti ambientali e strategie di gestione tradizionale delle foreste nell'Amazzonia brasiliana

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Abstract

Le foreste rappresentano il secondo bioma mondiale, dopo le aree pastorali, in termini di estensione ed il primo in termini di biomassa e biodiversità (State of forest, 2005). L'area globale coperta da foreste è stimata in 3.869.455.000 ha distribuiti tra Africa (649.866.000 ha), Asia (547.793.000 ha), Europa (1.039.251.000 ha), America settentrionale e centrale (549.304.000 ha), Oceania (197.623.000 ha) e America Latina (885.618.000 ha). Nelle foreste tropicali vivono circa 300 milioni di persone (FAO 2005)che per la propria Food Security dipendono dall'integrazione tra agricoltura tradizionale, pesca, caccia, scambi ed accesso economico ai beni alimentari. Sul tema dello sviluppo sostenibile e della Food Security della popolazione nella foresta tropicale amazzonica esistono in letteratura (Freitas et.al., 2004, Murrieta et. Al., 1999, Eve and Eve, 1998, Caviglia, J. 2001, Franceschi and Kahn, 2003) indagini sullo stato della Food Security delle popolazioni locali. La densità di popolazione in Amazzonia è di circa un abitante per ogni sette chilometri quadrati e molti studi sottolineano come il bioma più ricco del mondo ospita un numero esiguo di persone. Questo fenomeno è stato osservato antropologicamente e spiegato con il concetto di "environmental limitation" (Meggers 1954, 1971, Ferdon, 1959) allo sviluppo delle culture.

Questo studio indaga sull'esistenza di fattori limitanti esprimibili come soglie assolute e sulle conoscenze tradizionali di gestione di questi vincoli ambientali. I fattori limitanti sono anche considerati in relazione alle loro caratteristiche di interdipendenza con fenomeni ambientali, sociali ed economici, al fine di comprendere quali componenti agiscono come variabili guida nei comportamenti di adattamento delle comunità locali. La riserva denominata Xixuaù-Xiparinà è una riserva estrattiva situata sul lato occidentale del fiume Jauperì che segna il confine tra gli stati brasiliani di Roraima, a cui l'area appartiene, ed Amazonas. L'area si estende per 172.000 ha ed è l'unica riserva naturale privata di questo tipo nell'Amazzonia brasiliana. Il lavoro sul campo ha previsto campionamenti ed analisi di suolo (tessitura, pH in acqua e KCl, azoto scambiabile, fosforo scambiabile, CSC, sostanza organica, calcio, sodio, magnesio, rapporto C/N) in 15 siti gestiti agronomicamente con pratiche tradizionali identificati attraverso un approccio partecipativo insieme alla popolazione locale. I dati sono stati inseriti in un GIS ed integrati con immagini telerilevate Landsat ETM+ con risoluzione spaziale di 30 metri. Per definire le abiotudini alimentari e le tecniche di gestione tradizioanle sono state effettuate interviste semi-strutturate presso le 126 famiglie che vivono nell'area.

I risultati delle analisi dimostrano che il suolo campionato nella riserva è un Latosolo Amarelo distrofico secondo la classificazione brasiliana del 1972, detto anche Latosolo Amarelo distrofico tipico (classificazione EMBRAPA, 1999), Haplic ferralsols (classificazione FAO), Oxisol (classificazione USDA). In Brasile i Latosuoli coprono un'area di circa 331.637.200 ha pari al 39 % dell'area del Paese. Dall'analisi dei dati è evidente la funzione di organo di riserva svolto dal carbonio organico, specialmente per elementi nutritivi come potassio e fosforo, ed il ruolo chiave che gioca nella conservazione della fertilità fisica e chimica del suolo. Nelle aree indagate coesistono pratiche agricole a diversi stadi temporali. In terreni forestali o al principio del ciclo colturale le concentrazioni di fosforo sono generalmente superiori ai 200 mg/kg ma in terreni coltivati da tre a quattro anni le concentrazioni decrescono da uno a due ordini di grandezza, arrivando ad una media 15 mg/kg per lo strato superficiale e 4 mg/kg per lo strato profondo. La gestione tradizionale di questo fattore limitante della fertilità fisica si basa su una combinazione di rotazioni forzate e sistemi di allevamento basati su principi agroforestali.

Role of traditional villages for sustainable forest landscapes: a case study in the Ukrainian Carpathian Mountains

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Abstract

To implement sustainability policies within actual landscapes, the needs, interests, and impacts of different land users as well as their interactions need to be understood at multiple levels. Rural populations play a major role in forest landscapes for different dimensions of sustainability in many countries. In Europe's post-socialist East this interdependence between traditional knowledge and ecosystems has become increasingly vital during the transition period from central-planned to market economy with limited societal support. According to international resolutions and regional programs for sustainable land use, cultural heritage and traditional knowledge should be maintained in Ukraine. The Skole district in the NE Carpathian Mountains was chosen as a case study focusing on two issues. What does sustainable co-existence between man and nature mean in such forest and woodland landscapes? Does traditional land use practices lead to sustainable landscapes? To evaluate the level of sustainability we studied local land use in villages using qualitative and quantitative methods. Local people were still using their traditional knowledge as a base for maintaining a distinctive local culture. Livelihoods of local communities depended directly on traditional knowledge regarding whole landscapes included in traditional village systems, once common throughout Europe. At the same time local people are not able to protect their unique culture from a rapid chaotic market economic development, which is financed by the state and private businesses. Support of traditional village land use systems should be a milestone in a regional program of Sustainable Forest Management, and village intactness would be a good indicator of success.

1. Introduction

According to numerous international resolutions and regional programs for sustainable land use, cultural heritage and traditional knowledge should be maintained. To promote sustainability on national as well as regional and local levels Ukraine has joined the process of developing forest management ideas and principles oriented towards sustainable yield forestry, maintenance of forest biodiversity and socio-cultural values (Balashenko et al. 2005). The Carpathian Mountain ecoregion which is represented in the south-western part of Ukraine is a good example (Turnock 2002). While the Ukrainian Carpathians covers only 3.5% of Ukraine's area and 10.3% of total area of the Carpathian Mountains, nevertheless, this region has forest resources of high economic value; has retained exceptional level of biodiversity and many of European's last great wilderness areas. The ecoregion is also home to several ethnographic groups of Ukrainians – Lemko, Boiko and Hutzul – who have been shaping mountain landscapes for centuries and have created rich cultural heritage (Hajda 1998, Anon. 1983).

Nowadays people in many parts of the Ukrainian Carpathians experience decreased standards of living due to disintegration of the planned economy developed during socialism and ongoing tran-

sition to market economy under acute political and economic crisis in the country. The picture is, however, very complex, especially as most of the Carpathian ecoregion has been part of Austria-Hungary, Poland and the Soviet Union during the past centuries. On the one hand the Carpathian ecoregion is under severe threat from unsustainable logging methods, past replacement of natural tree species with introduced Norway spruce (Picea abies), habitat destruction/fragmentation from changing land use practices and infrastructure development (Gensiruk 1964, Trokhimchuk 1968). On the other hand, due to economic reasons and the need to develop local livelihoods, local people have to come back to their traditional land use practices. These were commonly practised before socialism and played an important role for maintenance of biodiversity and cultural heritage, and thus rural development in the Ukrainian Carpathians. The recent privatisation of land that began after the collapse of the socialist system in 1991 has led to a revival of the social and cultural value of forests in Western Ukraine, which often were a unbroken part of families' cultural and natural heritage for generations (Huntingdon 1996).

The aim of this study is to evaluate traditional villages as a resource to identify ways of integration of best practices of traditional land use into rural economic development for developing social stability, protection of cultural diversity and maintenance of biodiversity in the region. We collected quantitative data describing economic, ecological and socio-cultural dimensions of landscape sustainability and made interviews with different actors to understand the role of traditional villages for sustainable development of forest landscapes in the Ukrainian Carpathians. The study is part of a transdisciplinary research network using multiple case studies located in regions with different biophysical conditions, economic history and systems of governance in Europe's East and West (Angelstam and Törnblom 2004, Angelstam and Elbakidze in press). In our study we focus on two issues. What does sustainable co-existence man and nature mean in forest and woodland landscapes? Could traditional land use practice and traditional villages be an example of sustainability?

2. Methods

The Skole district in the Ukrainian Carpathians was chosen as a case study landscape. It represents: (1) forest management units with characteristic ecological, economic and social problems for the Carpathian region in particular, and countries in transition in general, (2) one of the most forested areas in Ukraine with a rural population directly dependent on using natural resources, (3) an integral part of Boiko people's ethnographic area with traditional villages, and land use closely connected to forest and woodland ecosystems.

To understand different dimensions of sustainable landscapes there is need to: (1) map policies and all the landscape's actors, (2) analyse actors' needs and interests as well as their land use practices, (3) identify interactions among actors in time and space concerning use of natural resources, (4) analyse the environmental history, especially historical development of rural land, and (5) gather data describing economic, ecological and socio-cultural dimensions of sustainability. Hence, both quantitative and qualitative methods were employed.

The compliance with the Pan-European Sustainable Forest Management discourse (Rametsteiner and Mayer 2004) was evaluated by analysis of the national forest legislation, and the regional program for rural development and forestry in the Ukrainian Carpathians. Analyses of published statistical data and recent original statistics from the Skole district were used to quantify the state and trends of economic and socio-cultural development of the region. To understand the real life of villages, expert interviews were made with local land users in five villages. A standardised interview manual was used that contained several groups of questions including personal data of the

respondents, data about household economy, sources of income, expenses, use of natural resources, farming, public work and meetings, traditions and mobility.

The Skole district is situated on the north-eastern side of Eastern Carpathian Mountains in the upper part of the Dnister river basin. At present time of the total district area (147,100 ha) forests occupy 71%, agricultural land 25%, and urban areas 2%. The number of inhabitants in the case study area is 49,438, and with 13% of urban and 87% of rural population. The average population density is 33 person/km^2 (Anon. 2005). There are 56 settlements with 55 villages and 1 town in the Skole district. The oldest village was founded in 1100 and the youngest one was created in 1842. Villages are located at altitudes from 400 to 1000 m above the sea level.

3. Results

3.1. Historical development of the rural landscape

The Skole district has a long land use history. Continuous external political, economic and social influences have had a great impact on land use practices conducted by local people. In the pre-agricultural period until the 13th century, the Skole area was populated predominantly by Slavic tribes, which were engaged in hunting, fishing and gathering since the mid-Neolithic period (Portenko 1958). In the times of the Kyivan Rus (10-11th cc.) and the Halych-Volyn' Principality (13-14th cc), the agricultural activity in Skole was small scale. It was centred on the fortified towns and monasteries, which appeared along the trade routes that went through the Stryj-San Highland. During that time, 8 villages, or 13% of total number of villages in Skole, were founded (Anon 1983, Hrushevsky 1995a, 1995b, Trokhimchuk 1968).

An era of profound human influence on the landscape started in the fifteenth century when Boikos – an ethnographic group of Ukrainian highlanders who inhabit both slopes of the middle Carpathians – began to settle. They have since then shaped landscapes for the last 500 – 600 years. They introduced their own traditions into land cultivation (Anon. 1983). Agricultural land development went side by side with the appearance of new permanent settlements. From the 15th to the end of 18th century 44 villages, 80% of the total number, were founded. The traditional land use practice of that time conducted by local people was to a certain extent a prototype of a sustainable use of natural resources. It depended completely on the availability of local natural resources and on the maintenance of an ecologically balanced environment with minimal use of outside resources and energy. Chief characteristics of the land use were: (1) using a two-field rotation system; (2) combining tillage and livestock production within one farmstead; (3) dividing land into interchangeable plots and sowing by shifts; (4) using mechanical devices to cultivate the land and to exterminate weeds; (5) protecting the soil from erosion by means of special plowing methods.

The character and intensity of the use of natural resources in Skole began to change in the 19th century. One of the main reasons for this was the emancipation of serfs in 1848, which in its turn led to the development of capitalism in the Halychyna. The agricultural cultivation of land intensified and became more widespread (Trokhimchuk 1968, Hajda 1998. Anon. 1983). The role of livestock production increased, especially meat, milk and hide and sheep fur production, since these products were in high demand on the Austrian market. The intensive use of meadows and deforested areas for pastures led to the loss from their structure of valuable legumes and cereal grains.

As a result of high demand for wood in Western Europe, forest industry began to develop during the 19th century. Forests were cleared mostly to export wood. Only a small quantity of wood was

processed at the same place where it was cut down (Anon. 1966). The demand for spruce timber on the world market and the rapid decrease of its supplies prompted the owners of the forests to replace the deciduous forests with the spruce forests. In 1882, this tendency was legalised by the Austrian government, which passed a resolution to replace beech, silver fir and other native forests with Norway spruce forests (Gensiruk 1964). Thus, during this period there has been a significant increase in the use of natural resources in human activity, but the majority of the population in the Skole continued to use traditional methods of agriculture. Only 3 villages (or 5% of the total number of villages) were created during the 19th century (Anon. 2005).

A complete change of political, social and economic relations that had a profound influence on the ways in which natural resources were used was initiated in 1939 when the Western regions of Ukraine became part of the Soviet Union. The Soviet regime (1939-1991) had an especially disastrous impact on the local people's traditional way of life and use of land. Private land property was expropriated, people were forced to emigrate, arable lands increased at the expense of wooded grasslands, and forestry became more intensive (Trokhimchuk 1968). The structure of land and forest properties was changed. Forests were now owned by state, private plots of land were joined into collective farms (kolkhozes). Collectivisation and mechanisation left limited space for the traditional way of life (Trokhimchuk 1968). The use of natural resources was thus shifted towards industrial use of forests with spruce reforestation, which was caused by the growing importance of forestry in the Carpathians in general, and within the Skole district in particular. This was accompanied by increased harvesting and reforestation rates.

Since 1991, when Ukraine became an independent state, the economical crisis during the last decade has made local people's livelihoods directly depend on the local use of natural resources. They have had to come back to their traditional agricultural land use practices due to economic reasons. Non-wood forest products (NWFP) such as mushrooms, berries, honey, medicinal herbs, floral greenery, birch sap, resin and wild game began again a part of the social fabric and livelihood of Ukrainian culture (Bihun 2005), especially in forest-dependent communities, like the Skole district.

We define several five phases of cultural landscape development in Skole district which are the results of integration different types of a land use activity, interaction in space and time various groups of actors under the different governmental and governance systems. These are: (1) pre-agricultural period (till the end of 13th century); (2) period of traditional extensive land use (14-18th centuries); (3) period of intensified traditional land use (19-early 20th centuries); (4) intensive (socialism) land use period (mid to end 20th century); (5) period of extensive land use (present time) (Table 1.).

Table 1. Historical development of cultural landscape in Skole district in the Ukrainian Carpathian Mountains

	Type of land use activity						
	Hunting	Fishing	Gathering of NWP	Animal husbandry	Plant growing	Extensive Forestry	Intensive forestry
Phases of development	Pre-Agricultural Period						
	Period of Traditional extensive land use (14-18th Cc.)						
	Period of Intensified Traditional Land Use (19-Early 20 Cc)						
	Period of Intensive (Socialist) Land Use						
	Extensive present land use						

3.2. Comparing quantitative and qualitative data

The most common statement of local land users was "Our grand parents land and houses are becoming empty". The field observations in the Skole district show that marginal lands of former collective farms, which are not used any more for grazing and crop production are being covered by forests due to natural succession dynamic. Decreasing amounts of open land after the collapse of collective farms is a natural result of transition from intensive agriculture during the socialism time to the extensive land use practice conducted by local farmers at present time. Privatisation of arable land by local people began after the collapse of the socialist system. However, the "new" agricultural land distributed between local people after 1991 has not taken into account pre-Soviet ownership patterns. This past legacy is of exceptionally high significance for people in the Western part of Ukraine where the old generation still has strong feelings of ownership and memories about unjust political and social events, which brought them to ruin. This is still the main subject of conversion when meeting the old generation in the villages. However, at present time it is not profitable for the local people to manage their land, they are escaping abroad to find jobs. The abandoned land is thus tending to become an increasingly widespread present phenomenon in the Skole district. According to official statistic data (Anon. 2005) the numbers of seasonal and empty houses have increased during the last decade. In 2005, 9.6% of villages in the district have empty houses and 36.5% of villages have seasonal houses. Although the total numbers of empty (585, or 5% of total number of houses in the district) and seasonal (55, or 0.5% of total number) are still quite low, local people perceive this trend in villages' development as very painful. The total number of villages has not changed during the last 200 years. However analysis of official statistic data for the last 50 years shows that the size of villages according to the number of inhabitants has varied considerably during that time. Groups of villages with inhabitants less the 100, 100-199 and 200-499 people were the most stable. Their numbers have only slightly changed (less then 2%) since 1959. The most noticeable changes happened with the groups of villages having 200-499 (positive dynamic, 11% more in comparison with1959) and 1000-1999 inhabitants (negative dynamic, 9% less in comparison with their number in 1959), respectively.

The second common statement was "Young people are escaping to abroad. It is so hard for us to take care of our land...". Analysis the official statistic data shows that the total number of inhabitants has been permanently decreasing (15% less) since 1970 (the socialism period) to 2005 (the transition period). At the same time a comparison of the dynamic of urban and rural population shows two opposite trends. The size of the urban population has been growing since 1970 (16% more in 2005 then in 1970), and the rural population has been decreasing during that period (19% less in 2005 then in 1970). According to the data of age class distribution in the population the largest groups are people in work-able age (28-53 year) (35% of total number of people) and pension age (more than 55 year) (27% of total). In reality, however, the number of people in work-able age is considerably lower. The reason is that while all people have permanent residence registrations in their home settlements, at the same time many of them are working abroad.

The third prevalent statement of local people was "The government forgot about us – no jobs, no market for our farming products, high prices for wood; without financial support from children abroad we would die". The number of employed people in the district is 17,600 (66% of people in work-able age and 49% of total population), including 6,043 employees of state enterprises (22.8% of those in work-able age or 12.4% of the total population) (Anon. 2005). The main individual employers are educational foundations (6.5% employed people from total number in workable age), forestry sector (3.6%) and health service (3.2%). The main sources of income for local people are pension/salary, financial support of relatives from abroad. The very low income comes from farming activity (mostly selling meat) and private business.

4. Discussion

4.1. Carpathian villages in an European context

The Ukrainian Carpathians is a good example of the complex historical development of Europe's rural landscapes. We understand traditional villages as settlements where the majority of local people have been maintaining traditional land use practice inherited from their ancestry. Important characteristics of traditional land use are that (1) different types of natural resources are used by local people, (2) traditional types of land use activity are employed, and (3) the main goods and services are produced by local land users (Klokov 1997, Yamskov 2000). Here the village with its characteristic zones of different land use from the centre to the periphery is, still, a basic unit of the cultural landscape. However, loss of the authentic pre-industrial village structure characterised by a fine-grained structure of arable land and wooded grasslands is a threat to both cultural heritage and biodiversity in many rural landscapes (e.g., Ramakrishna 2001, Angelstam in press).

The expansion of European Union (EU) to the western border of Ukraine could bring advantages as well as disadvantages to the Ukrainian Carpathian ecoregion, now bordering three new members of the EU, namely Poland, Slovakia and Hungary. Closer integration into the EU's Common Market and some EU policies and funding will be leading to the intensification of a number of threats to the natural values and long-term sustainability of the Carpathian ecoregion as a whole. This includes development of mass tourism facilities, transportation infrastructure, and agricultural intensification as well as abandonment of traditionally farmed areas (Anon. 2006). At the same time, however, increasing EU integration is also driving forward adoption and implementation of a number of progressive EU laws and policies. Even if Ukraine has not been presented with the perspective of future membership in the EU, still, the country has been aligning its national laws and policies to important pieces of the EU legislation. This harmonisation process presents potentially powerful tools for nature conservation and sustainable development (Anon. 2006).

Comparing the development of cultural landscapes in the Western European countries and in the Ukrainian Carpathians shows that there are many similarities and considerable differences in rural development. In the past in the Western European countries, traditional low-intensity agriculture was the norm (Vos and Meekes 1999) and the maintenance of biodiversity was an unplanned by-product (von Haaren 2002). This phase is comparable with phases 1, 2 and 3 in cultural landscape development defined for the Skole district (Table 1.). Then followed a transition from primary to secondary economics in the West, and industrialised agriculture led to loss of biodiversity and other values (Höll and Nilsson 1999). This is similar to the period of intensive land use during socialism (phase 4), which had a destructive impact on cultural landscapes in our case study landscape. However the political and socio-economic systems for that phase were completely different in the West and the East, and created opposite initial conditions for the next phase of rural development. For example, intensification of natural resources use and disappearing cultural landscapes in the West were the result of developing of democratic societies with increased economic welfare. By contrast, in Ukraine the consequences of economic and political development during the socialism time was linked to deep political and economic crises, collapse of economy and undeveloped civil society. The present post-industrial society of the Western European countries represents a third phase – a desire to maintain 'the grandparents' landscape' (Angelstam in press) which seems like a luxury for developed nations. At present time rural development in remote areas in Ukraine like the Carpathian region restoring and maintaining of "the grandparents" landscapes are an "absolute necessity" for local villages and ways to survive during the transition period from planned socialism to market economy.

4.2. Main features of traditional villages and their role for sustainable landscapes

Are there traditional villages or not? Is it possible to restore traditional land use after long time of socialism political and economic pressure aiming to destroy traditional culture and mentality in the Western part of Ukraine? There are many discussions concerning what traditional land use is, and what the role of traditional land use in rural development is (Klokov 1997, Korytnyy et al. 2004, Syroechkovskyy 1974, Yamskov 2000, Ramakrishna 2001), especially in the countries with first nations. We agree that important characteristics of traditional land use are that (1) different types of natural resources are used by local people, (2) traditional types of land use activity are employed, and (3) the main goods and services are produced by local land users (Yamskov 2000).

To understand if present land use practices in the Skole district could be named as a traditional we compared main characteristics of land use activity during the period of extensive traditional land use (phases 2,3) (Table 1.) with those at present time (Table 2.). Analysis of Table 2. clearly indicates that the present type of land use activity is similar to the traditional with some reductions in diversity of all characteristics, which is a result of evolutionary process in land use practices.

Table 2. Comparison main components of traditional land use activity in the part and at the present time in the Skole district (the Ukrainian Carpathians)

Main components of land use	In the past	At present time
Type of natural resources in use	Arable land, meadows, non-wood products, wood, wildlife	Arable land, meadows, non-wood products, wood
Type of land use activity	Animal husbandry, plant growing, useful arts, forestry	Animal husbandry, plant growing
Tools of land use activity	Hands, oxen, horse, plough, scythe, axe, pitchfork	Hands, horse, plough, scythe, axe, pitchfork
Main products of farming	Meat, milk, meal, cheese, vegetables, potato, wool, cloth	Meat, milk, cheese, vegetables, potato

We thus argue that there are at least two main features of traditional villages that can be used as simple proxies for assessing sustainability (1) the traditional land use associated with cultural landscapes; and (2) traditional spatial village's structure.

The first feature is consistent with the development of different categories of cultural landscapes adopted by the World Heritage Committee in 1992, and included in the associated Operational Guidelines (UNESCO 1997). We consider that cultural landscapes associated with traditional land use in the Skole district belongs to the second category of cultural landscapes – the organically evolved landscape. This "results from an initial social, economic, administrative, and/or religious imperative and has developed its present form by association with and in response to its natural environment. Such landscapes reflect that process of evolution in their form and component features" (UNESCO 1997). They fall into two sub-categories: (1) A relict (or fossil) landscape is one in which an evolutionary process came to an end at some time in the past, either abruptly or over a period. Its significant distinguishing features are however, still visible in material form. (2) A continuing landscape is one which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process in still in progress. At the same time, it exhibits significant material evidence of this evolution over time.

These two sub-categories could be defined in the countries that have been developing without deep cataclysms in their evolution. In the post-socialism countries, like Ukraine, rapid and fundamental changes in political and socio-economic spheres happened in the end of 20th century. This has resulted appearing a new type of rural landscapes that we propose to name as a "revived cultural landscape". A revived cultural landscape is one which resumes an active social role in

contemporary society which still keeping alive their traditional knowledge in spite of political cataclysms and in which the evolutionary process is unpredictable due to unstable land use activity. The revived landscape could be a third sub-category of an organically evolved landscape.

The second feature of a traditional village is a spatial village's structure. Traditionally, the following traditional spatial zones are distinguished: (1) built-up area, (2) fields, (3) meadows and (4) forests and pastures (see picture 1). There is thus a characteristic zonation from the centre to the periphery in a village with different kinds of economic use of renewable natural resources ranging from gardens and fields to pastures and forest (Mikusinski et al. 2003; Bender et al., 2005). This spatial structure, as well as its degradation, can be monitored using remote sensing data (Angelstam et al. 2003).

For several reasons the maintenance of traditional villages in the Ukrainian Carpathians is a very important and urgent task: (1) the existence of traditional villages is a fundament for preservation of cultural heritage and diversity, (2) traditional land use is a unique ecological culture of a nation, (3) in most cases traditional villages are an example of sustainable co-existence man and nature. The landscape configuration and farming models that most Europeans understand as a part of their history is the everyday reality for the people in this part of the world. This landscape is characteristic not only in parts of the Carpathian Mountains, and further to the southeast in the Balkan and Rodopi Mountains, but was common in many other European regions in the past (Angelstam in press, Sporrong 1998, Vos and Meekes 1999).

5. Conclusions

As a result of rapid deep political and economic changes in Ukraine traditional villages have been reappearing in the Ukrainian Carpathians as a way for local people to survive. Nowadays they are key components to protect cultural diversity and social stability of the region, an example of sustainable co-existence man and nature and playing an ecological, economic and social role for regional sustainable development. At the same time there are some negative trends in regional economic development and conflicts between the needs of local people and limitations on use of forest resources which belong to the state. Other threats are cultural and economic globalisation, and disrespectful attitude from society and governmental organisations. Local people are not able to protect their unique culture from a rapid chaotic economic development, which is financed by the state and private business. Therefore the support of traditional Boiko's land use, which is closely connected to forests, should be a milestone in a regional program of Sustainable Forest Management.

6. Acknowledgements

We thank local people for sharing their views about life in the Skole district. The Marcus and Amalia Wallenberg foundation provided economic support for this study. Finally we thank Mauro Agnoletti at the University of Florence for supporting the first author's participation in the conference.

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Integrating traditional knowledge into global change analysis models The case of Ridaura sessile oak forestland (Natural Park of Montseny, NE Spain)

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Abstract

Ridaura sessile oak forestland, located at Montseny Mountains (Barcelona) declared Natural Park (1987) and UNESCO's Biosphere Reserve (1978), presents outstanding socioenvironmental elements for the manifestations of Global Change processes analysis. Firstly, biogeographically it is an ecotonic border between Mediterranean biome and Eurosiberian biome, an especially sensible space to land cover changes, like biome replacement processes. Secondly, the Ridaura's socioeconomic dynamics in second half of the 20th century has determined land use changes related to mountain economies crisis and the progressive abandon of farming and forestry activities. In this study case, oral sources of information of different social actors related to Ridaura (actual and former landowners, forest workers and merchants, and Natural Park land managers) were integrated into the analysis model. Interviews were administrated for to recover Traditional Knowledge and Cultural Heritage (including vestige rural architectonic heritage that still remains today such as charcoal places and waves, stone walls from croplands, etc.) and to reconstruct the sessile oak forestland Environmental History like an outstanding information input for to analyze land use and land cover changes occurred.

Keywords: cultural heritage, environmental history, global change, land use and land cover change, traditional knowledge.

1. Introduction

Relations between humans and environment had been characterized since the origins of mankind by the transformation, especially since the Neolithic period and the first agrarian works (González Bernáldez, in Turner II *et al.* 1995); other authors located the origin of marked environmental changes in the connection between Europe and America (Gómez Sal, in Turner II *et al.* 1995). Nevertheless, the historic episode identified like the beginning of deep environmental changes linked to human activity was the Industrial Revolution. In this period biophysical factors' importance decreased in relation to socioeconomic elements (demographic trends, technological changes, etc.) like key elements in global change processes.

Through the history, different interpretations of environmental changes have been succeeding, essentially characterized by three classic models of society-environment relation's contexts: Biocentrism (XVIIIth-XIXth centuries), based on a supernatural providence belief where an "supreme entity" rules natural and social rhythms; Neodeterminism, based on Hippocratic currents recovered in XIXth century, where environmental conditions are responsible of human society evolution and of the apparition and support of certain cultural manifestations; and Technocratic point of view (or Positive Anthropocentrism), where the society rules environmental rhythms and humans are the dominators of the Earth through science and technological means.

Since consumption model's generalization and consolidation initiated by the Industrial Revolution thinking currents that reported first environmental alterations signs arose; an example was

Rachel Carson's "*Silent Spring*" (1962), one critic to development model in force from the analysis of pesticide hazard. In this scenario of global environmental crisis, where humans have exceeded their environmental transformation capacity (an underlying critic since thirties that reached its climax during 1973 and 1974s energy crisis), the Negative Anthropocentric point of view of understanding society and environment relations, where technocratic (Positive Anthropocentrism) arguments were considered erroneous and humans were pointed out like planet's problems reason, became important. The denunciation of *Exceptionalist Paradigm's* (called *Human Exemptionalist Paradigm* later) fragility, where humans controlled environmental elements, supposed the replace of the three classic approaches and the transition to the *New Ecological Paradigm* (Catton & Dunlap, 1978), where humans, considered as an exceptional specie, were dependents of a global system, produced environmental consequences and kept landscapes beyond their carrying capacity.

Related to this change of paradigm, ethic positions that emphasize value of nature *per se* and ecological laws of human rights and morals arose too. Some examples were the Egocentric Environmentalism (Eckersley, 1992) and other points of view where humans, like industrial society actors, were the cause of environmental disorders and without them new natural and harmonic orders could be possible, like *Deep Ecology* ideas (Devall & Sessions, 1985; Naess, 1989; Sessions, 1995). The validity of this image of virgin landscapes *(Wilderness)* and without humans has been criticized by some authors and called *The Green Fantasy* (Stavrakakis, 1999). Usually, in the basis of these nature-without-humans visions, some classic ecology theories based on balance like the "*superorganism*" stability proposed by Clements or the *Gaia* theory by Lovelock can be found. Sometimes, these approaches has stepped out certain topics that have influenced in the conception of landscape by the society; examples of these topics are that northern landscapes are best valuated than southern landscapes and that cultural landscapes (modified by human activity) are less valuated than "natural" ones. Nevertheless, this "untouched" environmental scenario is an invalid postulate, rather idealized. In fact, the limit between cultural complex and ecological systems is one of the human knowledge limitations. Classic visions of balance and lineal order have been replaced by complex approaches, like net models (i.e. Bruno Latour's *Actor-Network* theory, 1996) and interdisciplinary focusing (i.e. Victor Toledo's *Hybrid Disciplines*, 1998). Actually, we can't separate nature and society; for this reason, nowadays the study of environmental changes requires the integration of ecological and social criteria so as to unravel landscape dynamics complexity. In this line, analytic studies based on hybrid methodologies that take into account the importance of Traditional Knowledge and Cultural Heritage are basic tools to interpret these changes.

2. Methods

2.1. Study area

Natural Park of Montseny (30120.10 hectares) is situated in NE of Spain. In the massif there are located three biogeographic regions: Mediterranean biome, the most extensive one, Eurosiberian biome and Boreoalpine biome, low-extended region in the summit areas of the Montseny (up to 1600 meters). Montseny is catalogued like protected area under different figures (UNESCO's Biosphere Reserve, Natural Park), factor that doesn't entail an untouchable status of landscape. The effective protection integrates the compatibility between safeguard and traditional farming and forestry uses, with the exception of areas catalogued like *Qualified Natural Reserve*.

The demographic trend of the 18 municipalities integrated into Park's extension is, on the whole, of population increase. Between 1983 and 2002, population grown from 26.049 to 39.743 inhabitants; in the year 2004 population arrived to 42.678 inhabitants. Nevertheless, general trend is not

the same for all the municipalities: low-altitude municipalities (the area called "Baix Montseny") increase their population meanwhile high-altitude municipalities, characterized by primary sector economies and dispersed households, undergo rural exodus processes (Boada, 2002).

In the SE sector of the massif, between 800 and 1000 meters of altitude, there is located an atlantic influenced area that presents a sessile oak *(Quercus petraea)* forestland called Ridaura sessile oak forestland *(Teucrio-Quercetum petraeae)*, place name related to the *mas de Ridaura* where it is included (the *mas* is the name of the traditional catalan countryside unity conformed by different primary sector activities linked to a household). The study area integrates public ownership (County Council) and private ownership. The effective protection of the area doesn't exclude traditional primary sector activities.

2.2. Methodology

The methodology applied was based on the analysis of social-economic and biophysical driving forces, similar to IGBP-IHDP's LUCC project *(Land Use and Land Cover Change)*. This balance through the 20th century, especially since second half, determined land use and land cover changes, key indicators to understand past and present landscape changes and possible future scenarios. For to analyze these temporal stages, there has been posed a diachronic model and a synchronic model.

2.2.1. Diachronic model

The diachronic model has analyzed landscape changes until year 2005, land use changes approximately since the decade of thirties and land cover changes since year 1956. Different documentary archives references about human activities were consulted for the land use changes analysis: County Council's archive, village of Granollers' historic archive, Fidel Fita historic archive and private archives like old Montseny forest workers' tree felling cut rights collections. Oral sources of information were included into model for to recover Ridaura sessile oak forestland's Environmental History. Traditional Knowledge of old men and woman linked to Ridaura (and to massif of Montseny, too) has contributed to identify and to characterize main land uses and their changes from information inputs of social and ecological landscape dynamics. For to recover this knowledge, interviews were administrated to different social actors: actual Ridaura sessile oak forestland landowners (private landowners and Natural Park land managers), former owners and forest workers, former wood and charcoal merchants, etc.

Also, vestige rural architectonic heritage (part of the Ridaura's cultural heritage) related to former land uses (that still remains today in the Ridaura sessile oak forestland, such as charcoal places and waves, stone walls from croplands, etc.) has been catalogued. In fact, oral sources of information were key tools to document these old architectonic vestiges.

For the land cover change analysis, past studies about Ridaura's botanic were consulted: Guy Lapraz's "*Recherches phytosociologiques en Catalogne*" of 1966 and Oriol de Bolòs' "*La vegetació del Montseny*" of 1983. For to compare changes in sessile oak forestland flora composition in last 50 years, the catalogue of taxons has been actualized by the 2005 checklist of plants. Too, aerial photographs of 1956 and 2003 have been analyzed by GIS to characterize land covers and to monitor their spatial changes in this period.

2.2.2. Synchronic model

The synchronic model has analyzed actual Ridaura sessile oak forestland mass' ecological dynamics. For this objective, 12 experimental plots were distributed at different altitudes

(between 800 and 1000 meters) into sessile oak forestland area; half of the plots were located into areas that presented sessile oak forestland cover in 1957 and a half outside them. In each plot, number and diameter (at 1.3 meters) of sessile oak and holm oak (live and dead trees) and number and age of seedlings of both species were measured. Data obtained in experimental plots has been structured and analyzed by statistical analysis.

3. Results and discussion

3.1. Land use changes

In the 20th century, agrarian works were actives in Ridaura up to the end of the decade of 1980s. The traditional products included wheat and potatoes, cultivated on alternative years in terraces near the main house. Nowadays, these abandoned agrarian structures are still visible, especially stonewalls; the general characteristic of these vestiges is the presence of vegetation poured out onto terraces and stonewalls.

Documented farming activity of the *mas* was less significant than agrarian works. It consisted in few cows devoted to produce milk and other small farm animals devoted to self-consumption. Farming finished at the same time than agriculture. Related to neighbours' farming activity linked to Ridaura, only goat flocks (varying through the years during the second half of the 20th century between 300 and 700 heads of cattle) occasionally grazed part of the sessile oak forested area until the beginning of 1980s. Nowadays, *Can Ridaura* hasn't farm activity but landowners hand over remaining meadows to neighbour's herd on summer.

Forestry in Ridaura included wood (of sessile oak, mainly) and firewood (of holm oak) extraction. Oldest oral references of sessile oak wood extraction in Ridaura explained the use of this material for railways construction works at the beginning of the 20th century; nevertheless, this use surely was former, because the railway expansion in Barcelona began at the half of XVIIIth century and the development was very fast: at 1860 railway arrived until Sant Celoni and Riells i Viabrea, two villages of Baix Montseny. Even, the cultural footprint of this work had been gathered in Baix Montseny's language background like a reprimand to children *("We'll send you to Ridaura to make crosspieces!")*. Too, sessile oak wood was used to produce joists (until year 1940, approximately), pieces of furniture and cartwheels, product that underwent an outstanding demand peak during First World War (1914-18).

Holm oak extraction destined to firewood remained active until the second half of the decade of 1980s, with less recurrent intervention shifts than in the first half of the century, when were approximately every five years. After the end of firewood extraction in Ridaura there weren't any interventions over sessile oaks and holm oaks forest masses.

Another destination of Ridaura sessile oak forestland biomass was the elaboration of charcoal. Since the end of XIXth century, the elaboration of charcoal in the massif of Montseny reached activity peaks, especially after Spanish Civil War years (1936-39). During the decades of 1950s and 1960s, charcoal's demand dropped, an effect linked to the spread of fossil fuels; this fact conditioned the crisis of charcoal and firewood and the progressive abandon of these forest works during the decade of 1970s. In Ridaura, charcoal production was especially active during the decade of 1950s and ended at the beginning of the decade of 1970s. Nowadays, there are some vestiges of charcoal activity through Ridaura sessile oak forestland that indicate this former land use. One outstanding group of these vestiges are the old waves where charcoal workers elaborated a kind of less quality charcoal, the "*carbonet*" (catalan name, this kind of charcoal is called

and in spanish, "*cisco*"), from vegetable rests of forest clean and cut down activity and destined to domestic tasks like cooking and heating. The most productive period of this product was the decade of 1950s, when emigrants came to the massif of Montseny to work in charcoal activity (the origin of these workers was Almería, Andalucía, South of Spain). Activity decreased since the decade of 1960s and ended at the half of the decade of 1970s. Nowadays, still remain 21 vestige charcoal waves (sometimes with little charcoal pieces scattered at the bottom of the wave and mixed with leaves and humus); these structures have been catalogued and mapped.

3.2. Land cover changes

Diachronic analysis model based on the comparison between aerial photograph of 1956 and orthophotomap of 2003 showed quantitative and qualitative land cover changes. These processes were identified like an outstanding increase of forestland cover and a decrease of agriculture and farming land covers.

Related to forestland, land cover has increased and modification processes have occurred. In 1956 sessile oak forestland areas were only two isolated strips and a little zone near the home, with an extension of 2.0 hectares, approximately. At the same time, the rest of the study area, excluding agrarian and farming land covers, presented a typical morphology of scrubland. On the other hand, the cartography of the year 2003 showed a continuous forest land cover of 11.5 hectares extended onto the major part of study area. The conversion of all the agrarian land cover and the partial modification of farming area have occurred; since 1956 until 2003, 0.4 hectares of farming land cover have been turned into scrubland, 1.1 hectares have been turned into forestland and 0.4 hectares have been fragmented but still remained active like meadows.

The diachronic analysis model also analyzed qualitative land cover changes in study area, especially in sessile oak forestland zones. Human intervention over ecosystem's dynamics recently made that scientist reconsider the role of biotope transition areas in land cover processes until to recognize the indicator capacity of ecotonic borders in front of environmental changes (Hansen & Di Castri, 1992; Fagan *et al.*, 2003; Peñuelas & Boada, 2003). Changes observed between flora checklists of 1966 and 2005 showed two kinds of land cover changes. Firstly, in terms of vegetation structure, the main trend was the reduction of open spaces and the increase of vertical barked biomass, in the line of the quantitative forestland area increase observed by the GIS analysis. Secondly, in terms of community composition, the relative abundance of eurosiberian chorology taxons like *Teucrium scorodonia* remained similar, but an increase near to 5% of characteristic mediterranean chorology taxons like *Arbutus unedo* has been documented; at the same time, in open spaces between 1966's checklist and 2005's checklist eurosiberian species have been replaced by mediterranean and pluriregional species.

Synchronic analysis model showed that in terms of basal area (total amount of trunks' wood circular area measured at 1.30 meters) the predominance was by sessile oaks, maybe there were some thick trees (diameter>30 cm.); in terms of tree density, holm oaks were more abundant than sessile oaks, approximately in 2:1 ratio. In the case of sessile oaks diameters, there weren't statistical meaningful differences between areas covered by sessile oak forestland in 1956 and didn't ones (Mann-Whitney test, $Z = -0.548$, $p = 0.584$), but in the case of holm oaks there were statistical meaningful differences (T-Student test; $t = 2.945$; $p = 0.0035$): holm oaks located in 1956's not-forested areas presented wide diameters than holm oaks located in 1956's forested ones, fitting with charcoal activity's most worked areas since the decade of 1940s. In fact, human intervention could be the one of the causes of major 1956s forested holm oaks individuals' vigour; in fact, former studies of Montseny's holm oak forestland linked human intervention (clearing ups) with an increase of holm oaks' fitness and vigour (Retana et al., 1992; Mayor & Rodà, 1993).

Related to mortality, sessile oaks had higher rate than holm oaks, especially in young trees. This situation could be linked to competition relations (for resources like water, light, space, nutrients) between holm oaks and sessile oaks, and between sessile oaks themselves. In fact, competition relations are one of the cited determining factors in flora communities' alteration (species composition, phenology changes, etc.) (Bazzaz, 1996).

In the case of seedlings, number of sessile oak seedlings per hectare was higher than holm oak seedlings, approximately in 14:1 ratio. Nevertheless, survival rate of these seedlings was lower than holm oak seedling survival rate. On the assumption that it could be differences between plots forested and not forested in 1956 by sessile oak forestland and sessile oak and holm oak seedlings, statistical analysis didn't show meaningful differences (Mann-Whitney test for sessile oak and holm oak seedlings data: $Z= 0.480$; $p= 0.631$ and $Z= -1.121$; $p= 0.262$, respectively).

4. Conclusions

It's difficult to interpret the actual Ridaura landscape exclusively from botanical arguments according to observed land use and land cover changes. Changes in forest landscapes, both land cover changes and land use changes, aren't only linked to a single cause. In this line, only one disciplinary point of view results insufficient to analyze environmental changes' complexity and for this reason the integration of disciplines for to analyze the landscape changes is necessary to take into account the complex dynamics of biophysical and social-economical driving forces. For the methodology of these kinds of driving forces-based models, traditional knowledge and cultural heritage are outstanding resources. Their role is not only like complementary information sources (sometimes there are incomplete or non-existent), but like active inputs and key criteria for to recover the environmental history and to understand the environmental changes in our forest landscapes.

Related to this study case, three key driving forces that are inter-linked have been identified: *demographic trends, political decisions and economic dynamics.*

The *mas* of Ridaura has underwent demographic and ownership changes that can be translated into changes of social actors and their wishes and needs. Basic changes in wishes and needs of Ridaura's social actors were related to the role of tenants and landowners of the recent history's different stages. Since second last 50 years, the *mas* of Ridaura has underwent the transition from rural traditional way of life, based on primary sector activities oriented to self-consumption and land custody by catalan traditional rent lifestyle (*masoveria*), to a model based only in residential land use (usually second households) carried out by the landowners (a trend similar to other Alt Montseny's villages and *masos* that were uninhabited during second half of the 20th century), and based in the role of a public entity characterized by non-intervention politics.

The political decision of to declare the massif of Montseny like a protected area and the existence of public ownership surface determined landscape management in Ridaura. Taken into account the relative brevity of County Council ownership (since year 1991), problems related to official organization troubles (slowness, lack of budget, etc.) have determined that there weren't any intervention in the public ownership area land cover.

At the same time, although traditional land uses are allowed, there weren't agrarian, farming or forestry intervention over landscape. Regional and global agrarian and farming dynamics, especially since the decade of 1960s, cornered to subsistence primary economies in terms of activities' cost-benefit, like in Ridaura study case. These dynamics, combined with other circumstances like hilly

orography or modest familiar economies that difficult the access to items like mechanization, forced the decrease of agrarian and farming works. In similar circumstances, forestry and charcoal activity went into crisis as a result of fossil fuels expansion during the decade of 1960s. Barcelona's influence area reduced the demand and forced the abandon of these activities in the massif of Montseny, including Ridaura, main supplier of these raw materials. This land use change, characterized by the abandon of primary sector activities and the replacement by residential use, represented the transition from an agrarian model (characterized by self-consumption agrarian and farming works and firewood and charcoal use) to a post-industrial model (characterized by third-sector society); in this study case, the transition between global change general clusters was direct and without signs of the industrial model, considered intermediate to two cited ones, and characterized by the increase of primary sector activity inputs (chemistry and technology) and fossil fuel use.

The decrease and abandon of primary sector activities was a key factor in Ridaura's vegetation dynamics. The reduction of human appropriation that determined in the past a clearer landscape structure than actual land cover, facilitated that these areas were settled by vegetation, a process called *secondary succession* (Bazzaz, 1996). As a result there were land cover changes based on the increase of forestland surface by the afforestation of scrublands and, mainly, of agrarian and farming areas, and on the increase of vertical barked biomass.

Related to biophysical driving forces, the most influential effects were not only linked with the increase of temperature, process that usually has been identified like the main climate change consequence. In fact, the temperature increase (determined in 1.2-1.4º C during the second half of the 20th century in the massif of Montseny; Peñuelas & Boada, 2003) plus the absences of meaningful rainfall regime's changes determined an arider climate scenario. In these conditions esclerophyl species were favoured in front of atlantic species, determining a biome replacement phenomenon based in the flora taxons' shift to favourable environmental conditions. In this study case, the biome replacement process is between mediterranean land covers over eurosiberian ones, a situation called *mediterranization*, effect already documented in the massif of Montseny (Peñuelas & Boada, 2003). This trend was difficult to set in synchronic analysis models due to the complex nature of change process, determined by a broad group of biotic (predation, pests, etc.) and abiotic conditions (light, temperatures, etc.) that couldn't be 100% monitored at the same concision level. Even so, results obtained like the increase of mediterranean chorology taxons between 1966 and 2005 and the survival troubles observed in young sessile oak trees and seedlings suggested some uncertainties for the future: at mid-term and long term it could be possible a scenario where young sessile oaks low fitness linked to competence (with holm oaks and with themselves), the death of old sessile oaks, the decrease of sessile oak seedlings and the increase of mediterranean taxons (including holm oak seedlings) definitely determine the biome replacement process and the land cover shift

5. Acknowledgements

J. Barber (Natural Park of Montseny-County Council), A. Pèlachs (Geography Department– UAB), J. Peñuelas, M. Eugenio (CREAF-UAB), E. Prat, N. Kosoy (ICTA-UAB); and especially thanks to the "*walking libraries*", our wise old men & women: J.M. Pons i Guri (†) (Fidel Fita historic archives, Arenys de Mar), Jaume (Can Bordoi), Pere & Ana (Can Fèlix), Lola (Can Grau), Pep (Can Pla), P. Arenes & J. Sibina (Sant Celoni) and Jordi & Adelaida (Can Ridaura).

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Linking physical, economic and institutional constraints of land use change and forest conservation in the hills of Nepal

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Abstract

This paper analyses the changes in spatial patterns of agricultural land use during the 1976–2000 period along the altitudinal gradients in a watershed in Nepal. Using information of land use derived from satellite images from 1976, 1990 and 2000, we examine the land change pattern. During the 1976–2000 period, agricultural land use increased by 35% at the cost of loss of forestland. Agricultural expansion was most conspicuous at higher elevations (1150–2000 m). About 36%, 18% and 6% of forestlands were converted into agricultural activities from higher, middle and lower elevation respectively in 1990-00 period. Results of spatial distribution of living standard parameters including farm family income, food availability, obtained from family survey, shows the decreasing trend as the elevation increases whereas percentage of food bought shows increasing trend. In this way it was found that, forests lost were smaller that were located around high-income areas with good quality of agricultural land and near by administrative centre compared to areas located around low-income areas with low quality of agricultural land and far from the administrative centre. Additionally, regression model is constructed, for linking the socioeconomic variables with the conversion of forestland into agricultural activities, breaking the study area into smaller zones. The spatial trajectories of these zones are then contrasted, with particular attention to the socioeconomic condition and institutional arrangements governing access to land resources. Study finds that while overall land change patterns in the region are largely explained by elevation and socioeconomic condition of people living adjacent to the forestland, more specific, sub regional, trajectories reflect the signatures of institutions governing access to land. As sustainability of watershed is dependent on forests, continued depletion of forest resources will result in poor economic returns from agriculture to local people together with loss of ecosystem services.

1. Introduction

Forestlands have important functions from an ecological perspective and provide services that are essential to maintain the life-support system. The forests of mountains not only supports of residents in the regions but also much more people residing downhill side (Rao and Pant, 2001). However, expansions of agricultural land at the cost of lost of forestland are common phenomenon in the mountain zones of developing countries. Many studies have been conducted to demonstrate the land use change in the mountains e.g. (Tekle and Hedlund, 2000; Gibson et al. 2000; Gautam et al, 2002 and 2004). This study aims at analyses the changes in spatial patterns of agricultural land use during the 1976–2000 periods along the altitudinal gradients in a watershed in Nepal. The quantitative evidences of land use land cover changes observed provide important insights into the change that occurred in forest area and other major land uses of Galaudu watershed in between 1976 and 2000 (see K.C., 2005). For complete understanding of land use changes, such studies need to be supplemented by investigations of factors causing the changes and their effects (ESCAP, 1997).

Ecological factors are constraints in the ability to manage forest resources, while socioeconomic, demographic and institutional factors play important roles in changing the resource use patterns.

This paper addresses this concern by analyzing spatial relationships between overtime changes in land uses and some major ecological and economic factors, and institutional policies that are expected to have influence on changes in the watershed land use during the period.

2. Methods

2.1. Study Area

The study area constitutes a mountainous watershed named Galaudu watershed situated in Dhading district of Nepal. Most part of the watershed is the mountainous region under hill forest and upland cultivation. The soils of the watershed are loam, sandy loam, clay loam, silt loam and sandy clay loam. Agricultural lands in the valleys are under intensive management with multiple cropping systems and are mostly irrigated (ICIMOD, 1994). This high variability in the ecological and economic conditions makes the watershed an appropriate site to study land use dynamics and factors associated with it.

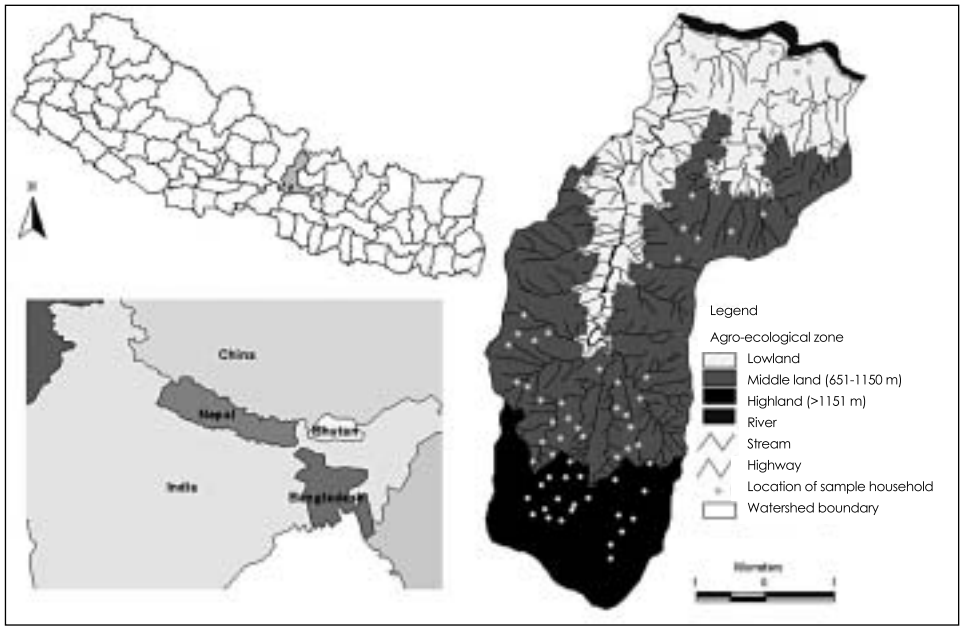

Figure 1.
Location of study area

2.2. Database development and analysis

Land use map of 1976, 1990 and 2000 was obtained by performing supervised digital image processing for satellite images of respected year over the study area from Landsat. Land use change pattern was examined using information of land use derived from satellite images from 1976, 1990 and 2000. The approach adopted here in order to analyze the spatial relationships between overtime changes in land uses and some major ecological and economic factors, and institutional policies that are expected to have influence on changes in the watershed land use is to begin by examining the degree to which patterns of agricultural conversion can be attributed to a set of factors that have been identified as significant at broader scales in Nepal and elsewhere, namely topography, prior land use patterns, socioeconomic condition and institution governing access to land (Gautam et al., 2004; K.C., 2005; K.C. and Doppler, 2004).

Socioeconomic indicators were obtained conducting the family survey by diving the watershed into three zones: lowland, middle land and highland based on their characteristic. 90 families, 30 from each sub study zone were randomly selected and information were gathered conducting family interview with the help of structured standardize questionnaires. GIS techniques were

used to obtain the spatial characteristics of socioeconomic data from randomly selected farm household survey data as well as to establish the linkage between the socioeconomic data to the location specific biophysical condition. During the family survey, the geographical position of each sample household was recorded using the global position system (GPS). Since the survey data was available at point level for the sampled household only, the regionalization and spatial representation required the creation of surfaces from the sample points. Based on the randomly selected family's location in the area, the spatial distribution of aggregated socioeconomic parameter such as subsistence food availability and food from the market, farm and family income were prepared (see K.C. 2005 for detail).

The land use polygon themes for 1976 and 2000 generated from the land use assessment were overlaid in Arc View GIS Version 3.2 (ESRI, 1997) and location and extent of land use change were mapped and area of changes computed. The polygon theme of changes generated by overlaying the two land use themes (1976 and 2000) was then overlaid with the following GIS layers one at a time to see the spatial relationships between land use change and the respective factors including: i) elevation zones, ii) slope steepness, iii) 2500 m interval road buffers, iv) local economy, v) forest governance arrangements, and vi) socioeconomic condition. Finally, a regression model is constructed, for linking the socioeconomic condition with the conversion of forestland into agricultural activities, breaking the study area into smaller zones.

3. Results

3.1. Land use land covers dynamics

Land uses have changed in the past. During ten year periods from 1990 to 2000 forestland declined by 10.6 % while agricultural land increased. The annual rate of forest loss in the study area was about 1.06 percent. Land uses change may be attributed to the change in spatial location of land. The change of land use along altitudinal gradients in determining the type of forest vegetation that occurs at different physiographic regions across Nepal has been widely documented (e.g. Jackson, 1994 and 1998; BPP, 1995). Little is known, however, about the association of altitudinal gradients with over time changes in forest cover. The conversion of forestland to agricultural activities was not similar through out the watershed (Figure 2.). In the highlands zone more forestland were converted to agricultural land as compared to lower elevation area. The results of this study, obtained by overlaying a polygon theme of sub study zones with polygon theme of land use changes during 1990-00 showed that higher elevation forests were more dynamic compared to lower elevations. Rate of forestland converted to agricultural activities were at least two-times higher compared to located at lower elevation (lowland) areas (Table 1.). Around 36 percent of the forest area in 1990 within higher elevation zone (highland) was converted into agricultural land where as about 18 percent forest area from middle altitude and only 6 percent forest area from lower elevation (lowland) was converted in to the agricultural land in the same period.

Table 1. Change in land use by elevation range in between 1976-2000

Elevation range (m.)	Forest (ha)		Lowland agriculture (ha)		Upland agriculture (ha)	
	1976-00	1990-00	1976-00	1990-00	1976-00	1990-00
< 650	-158.7	-24.0	+187.7	-4.8	-36.1	+19.0
651-1150	-345.7	-122.3	+212.4	+7.9	+130.8	+114.2
> 1150	-130.1	-140.2	-3.1	+16.9	+134.1	+123.3

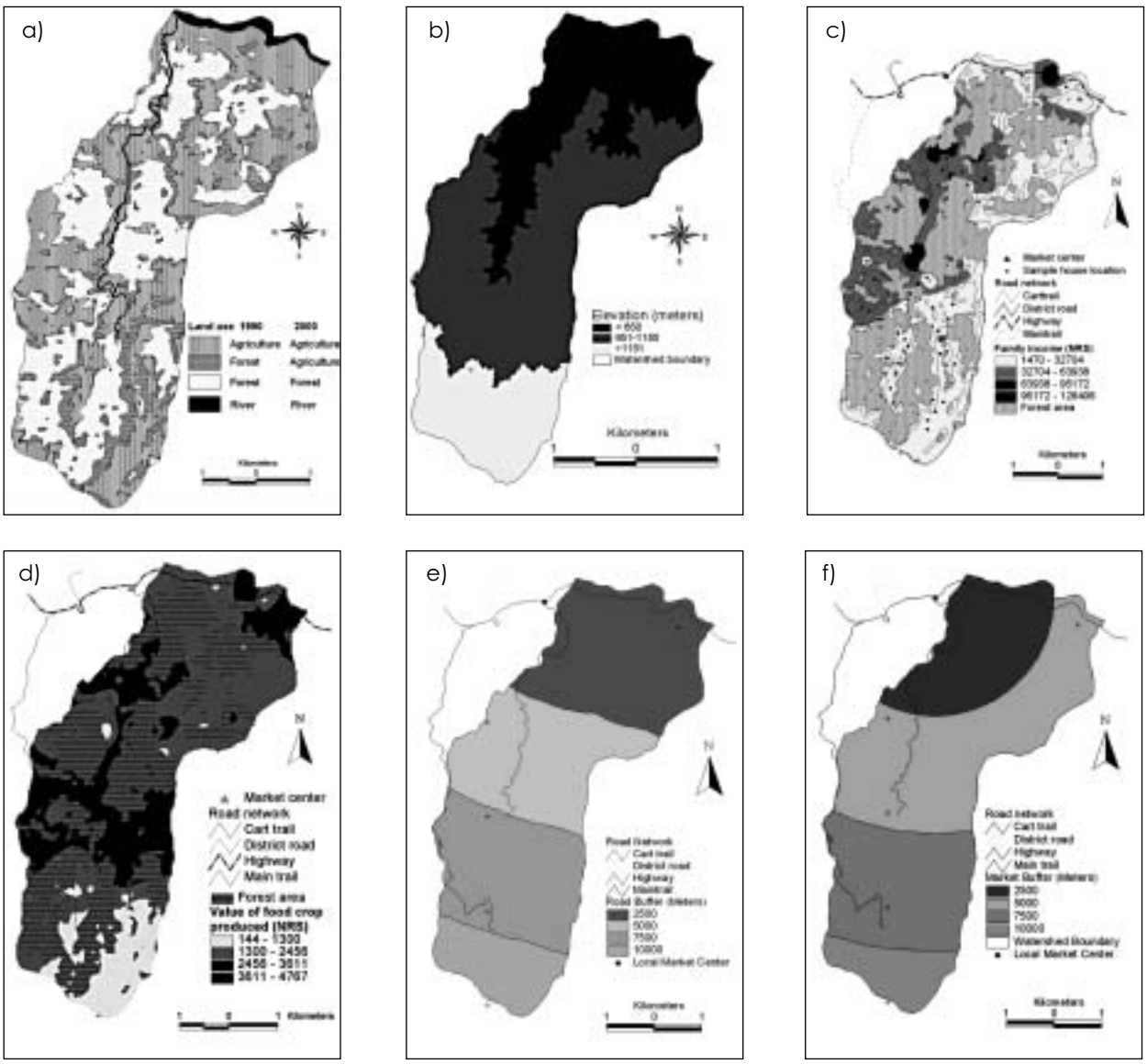

Figure 2. Biophysical and socioeconomic layer in 2003 (a) Land use change in 1990-2000 period (b) Altitudinal gradients (c) Spatial distribution of family income (d) Spatial distribution of value of food crop production (e) 2500m Road buffer (f) 2500m Market buffer

3.2. Linking land use dynamics to economical, ecological and institution factors

3.2.1. Relationships between lands use dynamics and altitudinal gradients

Conversion of forestland to agricultural activities was not similar through out the watershed. Higher amount of forestland from the higher elevation area (>1150m) were converted to agricultural land as compared to lower elevation (low land) area. The results of this study, obtained by overlaying a polygon theme of elevation zones with polygon theme of land use changes during 1976-00 showed that higher elevation forests were more dynamic compared to lower elevations. Rate of forestland converted to agricultural activities were at least two-times higher compared to located at lower elevation (<650m) areas (Table 1.). Around 34 and 36 percent of the forest area in 1976 and 1990 within higher elevation zone (>1150 m.) was converted into agricultural land where as about 37 and 18 percent forest area from middle altitude (651-1150m.) and only 29 and 6 percent forest area from lower elevation (< 650m) was converted in to the agricultural land in the same period (Table 1.).

Two reasons may explain higher amount of forest loss in higher elevation areas. A lower amount of forest loss in lower elevation zones suggests that forest conservation efforts by the local communities and concerned agencies played important roles by bringing positive outcomes in the balance of forestry land use in the watershed. The same could not happen at higher elevations (highland) because of the inability of community-based forest management programs to cover those areas and virtually non-existent forest monitoring by the forest department thereby leading to an open access condition of the high altitude forests. The existing model of community forestry systems was unable to bring high elevation forests under management (Gautam et al., 2004).

3.2.2. Relationships between lands use dynamics and slope

The results show that among the six categories, highest level of forest loss occurred in slopes of >30 percent and least in slopes of <5 percent. Due to the highest percentage of forest area were losses from higher slope areas both upland and lowland agricultural activities were expanded in those marginal slope areas (Table 2.). Lower level of forest losses in lower level of slopes might be due to smaller percentages of forest areas in the smaller slope classes and the location of these areas near to the road and local administrative centre due to which monitoring was at significant level and the communities' involvement in forest protection and management could be another reason.

Table 2. Change in land use by slope in between 1976-2000

Slope class	Forest (ha)			Upland agriculture (ha)			Lowland agriculture (ha)		
	1976	2000	Change	1976	2000	Change	1976	2000	Change
0-5	32.4	11.5	-20.9	33.4	60.3	+26.9	20.4	13.9	-6.5
5-10	19.8	10.5	-9.3	14.9	23.4	+8.5	7.7	10.6	+2.9
10-20	65.3	34.5	-30.8	45.4	66.8	+21.4	33.4	37.3	+3.9
20-30	128.6	85.7	-42.9	63.3	96.3	+33.0	57.1	74.2	+17.1
30-50	611.7	388.8	-223.9	161.8	289.7	+127.9	203.0	281.7	+78.7
>50	965.6	657.7	-307.9	124.4	305.2	+180.8	120.8	255.3	+134.5

3.2.3. Relationships between land use dynamics and accessibility

The effect of accessibility on the changes in forest area reflected increasing trend of conversion of forest area into agricultural activities with the increase distance from roads. 70% forest area in 1976 within 2500m distance from roads remained unchanged until 2000, whereas only 44% forest areas located 5000m far from roads were unchanged during the same period (Table 3.). Proportionately lower amount of forest loss in areas of better accessibility, however, is generally an unexpected trend in natural condition. Higher concentration of forest management activities in locations closer to the roads might be a reason. Likewise effective monitoring of the community forests by local user groups could be another reason for improved forest condition in relatively accessible areas (Gautam et al., 2004).

Table 3. Change in land use by accessibility in between 1976-2000

Road buffer (m.)	Forest (ha)		Lowland agriculture (ha)		Upland agriculture (ha)	
	1976-00	1990-00	1976-00	1990-00	1976-00	1990-00
< 2500	-194.0	-38.1	+193.2	-3.5	-5.6	+41.0
2500-5000	-124.0	-30.3	+95.5	+9.6	+26.6	+19.8
5000-7500	-253.0	-146.0	+124.0	+11.6	+129.3	+134.6
> 7500	-64.4	-73.3	-15.2	+11.6	+79.4	+61.6

3.2.4. Land use dynamics and local economy

Forestry requirements and forest management objectives of semi-urban residents' area are different from those of rural people in most part of the watershed. Urban areas can thus be characterized as having market-oriented economy, where forest management objectives are mainly for watershed protection (Doppler, 1998). An overlay of polygon theme prepared by creating a 2500-m buffer from local market centre with the land use polygon theme of changes in forest area during 1976-00 revealed that higher forest area were converted from forestland to agricultural activities those were located at rural area than that of located in suburban economy (Table 4.) in between 1976 and 2000. Less deterioration and loss of forest areas were observed at suburban economy whereas high deterioration and loss of forestland were observed at rural areas having subsistence economy to the rest of the watershed.

Table 4. Change in land use by local economy in between 1976-2000

Local economy	Forest (ha)		Lowland agriculture (ha)		Upland agriculture (ha)	
	1976-00	1990-00	1976-00	1990-00	1976-00	1990-00
1	-89.6	-98.5	-15.6	11.6	105.9	87.0
2	-246.0	-126.0	137.7	15.2	106.8	110.6
3	-225.0	-63.0	185.5	13.7	35.9	48.0
4	-73.7	-0.3	89.8	-11.1	-18.9	11.4

Note: 1 = Market oriented; 2 = Moderately market oriented; 3 = Less market oriented; 4 = Rural area

3.2.5. Land use dynamics and institutions

According to Gautam et al., 2002 VDCs with formalized community forests had significantly higher shrub lands-to-forest conversion during 1978-92 compared to the VDCs without formal community forests. The fact that proportionately less amount of forest lost and degraded those were managed with the involvement of local forest user groups supports the argument that legal transfer of resource ownership is an important precondition for successful collective outcomes at the local level. One of the distinct differences between community forests and government forests in this watershed is the involvement of local communities in forest conservation in the former case. From this point of view, the findings of this study indicate that a joint investment by local forest users and local agencies may improve the prospects for successful forest conservation at local level (Gautam et al., 2004). Conversations with local forestry staff and local people revealed that the forested areas under the government control are virtually in "open access" condition as the district forestry staffs are mostly engaged in community forestry activities after the implementation of community forestry program. So the relatively high loss of forest area under state control can be explained by their condition of open access.

3.2.6. Linking land use change to socioeconomic variables

Besides the biophysical condition and institutional framework for the management of forestlands, socio-economic condition of people, especially food crop production and food security situation, living adjacent to forest land was presumed to affect the conversion of forest to agricultural activities. This is because in some of the locations of the watershed only a certain type of upland crop can produced due to the poor potential capacity and low or negligible land management practices which ultimately gives low level of food crop production this then leads to the higher level of food insecurity of the people especially at higher elevation areas, this could forced them to extending their agricultural lands towards the forest areas.

Forest lost is not continuous variables like crop production, forest lost were detected as smaller scattered patches from previous forestland across the watershed. So, to model the forest lost from socioeconomic variables, study area is divided into 10 smaller zones base don the elevation and the percentages of forest losses and value of crop production from the respective zones were summarized using the arc view GIS then information was exported into spreadsheet then to SPSS then correlation between the crop production and the percent forest losses were observed. Result shows that there was a significantly high correlation between crop productions to the forest lost. Thus, a regression model was constructed by taking percentage forest loss as dependent variable and value of crop production as explanatory variable for the percent forest loss at zone level.

Table 5. Effect of food production on the conversion of forestland into agriculture

Variables	Coefficient	S.E	T Stat	Sig.
Intercept	58.155	10.551	5.512	0.001
Value of food production (NRS)	-0.0171	0.005	-3.724	0.006

R-Square = 0.634 F (test) = 13.871 Sig. = 0.006

The result shows that there is a very strong relationship between expansions of agricultural land and the food crop production. About 63% of the percent expansion of agricultural land at zone level can be explained by food crop production scenarios of the farmers (Table 5.). Food crop productions have strong negative effects on the conversion of forestland into agricultural activities. This is comparable to the actual situation because poor quality of agricultural land gives low return, which is not sufficient for full fill the farmer's food requirement so they have to extent their agricultural land towards the forest area.

The analysis demonstrates the high need of the improvement of food supply situation in the area which would helps to protect remaining forest area in the watershed for achieving the objective of integrated watershed development including both people and resources by improving the quality of upland agricultural fields through the soil and water conservation activities together with other rural development activities in the watershed. Results of spatial distribution of living standard parameters including farm family income, food availability, obtained from family survey, shows the decreasing trend as the elevation increases whereas percentage of food bought shows increasing trend.

4. Conclusions

The GIS-based investigation of the spatial relationships between land use and ecological, economic factors and institutional policies revealed that more pronounced changes within the forest area of the watershed in between 1976 and 2000 took place in high-elevation, high slope inclination that are far from the roads. Of the two governance types that were in existence in 2000, proportionately less forest loss took place in forest managed with the involvement of the local forest user groups. Forest area under direct government control and without any local collective action occurred relatively higher amount of forest loss.

In this study land use change (expansion of agricultural area at the cost of lost of forest land) was found direct negative correlation with the food crop production. However, more still need to be done because there are some limitation for example in this study point level socio-economic data were collected from micro survey and continuous thematic socio-economic layers were developed

by assuming each and every pixel of watershed has some socio-economic information. But if it can be distinguished only for the agricultural land and see the impact will be more meaningful. Similarly, due to the difficulties and still unavailability of modeling and simulating the possibility of a changing land use pattern in a grid cell basis. This study used the aggregating information at elevation zone level and relations were observed. So further research is necessary to develop the methodology that really can assess probability of land use and change pattern at grid cell level using socio-economic information will greatly help to the research community and achieving the goals of both sustainable natural resources management and people livelihood together.

This study also demonstrated the complexity and interrelationships involved in forest governance and management. The findings indicate that a joint effort by the government and the forest user groups improves the prospects for successful forest conservation at local level. The study has been able to provide information on the influence of some major factors in bringing over time changes in land use land cover. Such studies, supplemented with more location specific in-depth studies, would greatly help to refine our understanding of the association between land use dynamics and community-based institutions.

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Theme 7.
CONSERVATION OF TRADITIONAL FOREST KNOWLEDGE

The Effects of Traditional and Contemporary Forestry Understanding on Drinking Water: Istanbul Example

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Abstract

Istanbul, located between Asia and Europe, has always been a strategically important city. Due to its geographical location a rapidly increasing population has historically caused Istanbul to experience water shortages. The level of demand for water has always been higher than the supply. For this reason there are evidences of water and forest arrangements by various civilizations in order to protect, improve and arrange the utility of water resources. In the earlier civilizations' time (Roman, Byzantine and the Ottoman Empire) the need for water was met by small dams, which were built in the forest. However, inadequate drinking water levels in the city also created a need to transfer water from neighbouring watersheds through waterways. To protect the waterways and water resources from any damage settlement in the forestlands was also prohibited. In this study, water, one of the important outputs of forest resources, and water regulation during the Ottoman and contemporary periods were presented. Then the increasing importance of water production within the multiple use contexts of the forest was explained by showing its significance in the designing of forest management plans. As a result, within the traditional and contemporary regulations and arrangements context contradictions about water resources were examined and discussed. Changes in the understanding of water management in history and the effects of these changes in water protection and improvement were described. The results of recognizing water in the boundaries of forests as a part of forest output were also explained using Istanbul as an example.

Keywords: Drinking water production, Forestry, Relation between forestry and water production in Istanbul.

1. Introduction

Water is one of our most important and vital natural resources. It is a finite resource, which means that the total amount of water is limited. Human beings are the most threatening factor for water resources. The increase of human population in cities makes clean water a critical problem. A large proportion of freshwater is provided from the mountainous areas where the vegetation cover is forest. Therefore protection of forestlands and watersheds has a special importance. However, because the land in and near cities can be allocated to more profitable uses, watersheds and forests are under major threat.

Turkey, with a population of 72 million (DIE, 2006), is considerably limited in water resources. Utilizable water potential is about 200 billion m^3 (DPT, 2001). Having a high population, limitations in terms of preventing soil and water pollution and less precipitation than the average of world in general require authorities and people to pay more attention to available water resources in Turkey.

Besides the rapid population increase, a huge migration from villages to towns is also being experienced in Turkey. Among the cities Istanbul has the highest migration rate with 400 000 persons every year (DIE, 2006). Its social, cultural, economic, historical and politic status presents a great

attraction and various opportunities for the people who live outside the city. Changes in human value judgement have also caused conversion of forest areas and watersheds to alternative utilizations where high economic benefits were gained. As a result conservation of forest and watershed lands in Istanbul is now a most important issue faced by the administrative organizations. For this reason various regulations to protect and improve the utilization of water resources have been applied throughout the history of Istanbul. However, these measures today are not as powerful as they used to be once and this causes exploitation and destruction of water resources.

1.1. Relation between forests and drinking water production

Fresh water is produced in the watershed where natural forests are located. Across the globe, there are numerous examples of the vital role that forested watersheds play in protecting drinking water supplies (Geray; 2004; Dudley and Stolton, 2003). Forests can also store water and delay its flow towards the lowlands and to the sea. Forest soils act as a reservoir as they usually have a higher water storage capacity than non-forest soils. Moreover, forest vegetation keeps water back and delays soil saturation (UNECE, 2004).

Evapotranspiration from forests of a certain age can remove a considerable proportion of storm rainfall. Surface run-off can therefore be prevented or slowed down, even in high precipitation events. The effect of flood reduction is particularly relevant at the local scale for small watersheds (UNECE, 2004).

Forests tend to slow down the passage of water and encourage the deposition of sediments, thus reducing sediment transport, sedimentation of waterways and water pollution (SAEFL *et al*, 2002). In forests, high infiltration rates, interception of rain by forest canopies, the developed root systems and coverage of soils by forest vegetation and leaf litter counteract soil erosion and reduce the risk of landslides. Sediment retention and erosion reduction also have positive effects on infrastructure, such as decreasing deposition of suspended soil particles in water treatment installations, storage structures, pumping equipment and turbines, which in turn increases their operating lives and reduces their operation and maintenance costs (UNECE, 2004).

1.2. Forestry and Drinking Water Production Relation in Turkey

Due to rapid population growth and rural poverty, forests and grasslands were heavily damaged in Turkey. Therefore the natural balance in watersheds became highly deteriorated and the amount of sediment reached 500 million tones per year, reducing the life span of some dams from 100 to 15-20 years. In order to regulate water functions and avoid soil erosion, afforestation operations are applied to the environs of recently established dams. (GAP Projesi, 2002).

To resolve this unfavourable situation the General Directorate of Forest allocated 378 875 hectare as "protected areas". However, authorities point out that technically the amount of protected areas in Turkey is approximately 3 042 489 hectares. The General Directorate of Nature Conservation and National Parks is the responsible organization for the conservation of "protected areas" in Turkey (DPT, 2001). Turkey has various problems related to the management of freshwater resources produced in watershed and forested areas. Among these unplanned and heavy construction for residential purposes is the most common problem.

1.3. Forestry and Drinking Water Production Relation in Istanbul

Istanbul's location is both unique and strategic. For more than a thousand years this was a centre of the civilized world, a capital of three great empires: the Roman, Byzantine and Ottoman.

Built on the edge of two continents, Asia and Europe, throughout history this was a bridge between the Orient and the trading centres of Europe and the *Middle East*. Connecting the Black Sea to the Sea of Marmara is the Bosphorous Strait, a narrow fifteen-mile long waterway, cutting through the heart of *Istanbul* (Anonymous, 2006). As new arrivals pour into the city, its water supply begins to suffer. The surrounding watershed is still productive and unpolluted, but reservoirs within Istanbul are surrounded by illegal settlements. Inadequate sewage facilities threaten Istanbul's drinking water. The impact of mass migration on the city's infrastructure is enormous (Anonymous, 2006).

As seen in Table 1., the population of Istanbul has increased faster than the population of *Turkey*. According to results from the 1927 census, the population of Istanbul was 5.82 percent of Turkey's total population. This proportion increased to 15.7 percent in 2005 and the population of *Istanbul* exceeded 11 000 000.

Table 1. Population and Population Growth Rates in Istanbul and Turkey

Census	Population		Population	Growth Rate (%)	Proportion (%)
Years	Turkey	Istanbul	Turkey	Istanbul	
1927	13 648 000	794 444	-	-	5.8
1950	20 947 183	1 166 477	53.5	46.8	5.6
1960	27 754 820	1 882 092	32.5	61.3	6.8
1970	35 605 176	3 019 032	28.3	60.4	8.5
1980	44 736 957	4 741 890	25.6	57.1	10.6
1985	50 664 458	5 842 985	13.2	23.2	11.5
1990	56 473 035	7 309 190	12.0	25.1	12.9
1995	62 526 000	8 417 000	10.7	15.2	13.5
2000	67 803 920	10 018 735	8.4	19.0	14.8
2005	72 065 000	11 332 000	6.3	13.1	15.7

Except for 1927-1950, Istanbul's population growth rate has been higher than that for Turkey as a whole. This growth in population is closely related to rapid industrialisation and urbanisation in the Istanbul Region (Eker and Ok, 2005).

Over the past 100 years, the world population has grown three times. With the rise in population of Istanbul has also increased from less than 800,000 in 1927 to around 12 million in 2005. In this case Istanbul's population has grown fifteen times in only seventy years (Eker and Ok, 2005). According to a projection, population of Istanbul is estimated to be 15 million in 2010, 16.5 million in 2020, 17.7 million in 2030 and 18.7 million in 2040.

At the municipal level, providing and transporting of drinking water, collecting and removal of wastewater and protection of water resources in Istanbul are carried out by ISKI (Istanbul Water and Sewage Works). ISKI's authorization and service area was limited with the boundary of Metropolitan Municipality of Istanbul. However, demand for water with the increasing population in Istanbul caused ISKI to provide more water from outside the border of the city. Therefore, with the decision of Ministry Committee ISKI's work and service area was extended outside of the Istanbul's border (Su Vakfı, 2006). Currently there are 15 dams with 9500 kilometers water network in Istanbul (ISKI, 2005). However, these huge investments are not satisfactory to meet the needs of Istanbul residents. With the investment in and out of the city borders ISKI cannot increase the amount of water supply to the desired level.

A comparative study in Istanbul water supply and demand was carried out by assuming that the daily water need per person is constant and the increase of water demand in 5 years would be 50%. Findings show that water deficiency level would be drastically high. In fact, accepted current water consumption level per capita is quite low (approximately 109 m^3/year). Moreover, possibility of increasing current water level by 25% per 5 years is considerably difficult. If the current annual per capita water consumption level 109 m^3 continues, today's water supply will need to be increased 374% in 2010, 411% in 2020, 441% in 2030 and 466% in 2040.

Another major problem is the lack of coordination between the organizations that manage forests and water resources. The General Directorate of Forest has reserved the areas where water production was supplied in "steady protected lands" status. The General Directorate of Nature Conservation and National Parks is responsible for protecting these areas while ISKI is responsible for the management of dams and lakes on these protected forestlands (Cevre ve Orman Bakanligi, 2006). As a rule these two organizations must be in collaboration. However, there is no agreement between these organizations on water production and protection. There are also some recreational areas within the boundaries of these protected forestlands that are managed by the General Directorate of Nature Conservation and National Parks. Heavy use of these areas by people causes damage on both forest and water resources and it also restrains water production function of forests.

The selection of forest and grasslands by people who migrate to Istanbul is an old habit with deep historical roots. Most of the migrants are rural villagers. They believe that settlement in these areas is their natural right. This belief encourages more migrants to come to the city and illegally establish new houses. (Inalcik, 2000). The most dramatic example of green space loss has occurred by the illegal establishment of a settlement area, called Sultanbeyli District, in the Asian Section of Istanbul. Its population in 5 years (during 1985-1990) increased 2100%. This district expanded by exploiting natural resources on its periphery and has become one of the most crowded regions in Istanbul.

Today people who live close to the water resources have no rights and responsibilities towards them. Having no obligation for caring and protecting of the water resources encourage them to exploit and damage these resources. However, the most important threat comes from the conversion of watersheds and forestlands to other uses. For instance the area of Belgrade Forest was 15 000 hectares in 1920. However, 2/3 of its areas have been converted to other uses (TMMOB, 2006).

2. History of Forest Protected Areas and Drinking Water Production in Istanbul

2.1. The Understanding of Forestry and Drinking Water Production in the Ottoman Era

During the Ottoman Era, free public use of the forest, perceiving the forest as a financial resource and managing it for money with the introduction of planned management stages can be identified (Bekiroglu and Ok, 1997). In this period, forestlands were abundant and there was no organization responsible for the management of forests. Therefore, no rule was applied for the use of forestlands. However, the decrease in forest vegetation in time led the Empire to establish the Directorate of Forest in 1839. This organization is connected to the Ministry of Trade (OGM, 1992). In the 19th century, "Orman Koruculari" (Forest Watchmen) were given responsibility for the protection of forests by the graduated students of the Forest School. This duty has passed from father to son in direct line.

Despite the abundance of forest resources drinking water resources have always been scarce. Therefore, the organization called "Su Nezareti" (Ministry of Water), which is responsible for drinking water, was established 300 years before the Directorate of Forest during the reign of Suleyman the Magnificent (1520-1566). First, Su Nezareti, worked with the Sultan and then it continued working under the umbrella of a municipal organization called Sehremaneti (Osmanlica Terimler Sozlugu, 2006). The person called "Su Naziri" (Minister of Water), directed Su Nezareti. Maintenance and repair of the waterways during this period was given to the people called "su yolcu" (Water Watchmen). This duty has been passed from father to son in direct line like the "orman koruculari".

At one time all the drinking water in Istanbul came from Belgrade Forest on the European side of the city. At the time of Suleyman the Magnificent the Belgrade Forest was of strategic importance as the main source of water for the city. Water from the numerous springs and streams in the forest was channelled into the city, and as the demand increased over the centuries dams known as 'bent' were built to collect the water. There are 7 bents today and although they are still in use they no longer play a crucial role in Istanbul's water supply due to the rapidly increased population of the city. The protected status of the forest granted in the 16th century has continued right through into the 20th century. Between 1554 and 1564 existing waterways were extensively repaired and new aqueducts were established in order to provide water for the increasing needs of Istanbul (Kutluk, 1948; Nirvan, 1953).

Various small dams were built within the boundaries of Belgrade Forest. A Lack of large rivers in the region led to supply water coming from small streams. Since the Byzantine times iron or marble filters were used in order to prevent the water collection pools from the stones, tree leaves and branches that were carried by the rivers during the peak rainy seasons. During Suleyman's imperial period, it was noticed that the Belgrade Forest had strategic importance in terms of providing water to the city. Therefore, the first protection measures for the Belgrade Forest were taken during that time and the forest became a water collection pool for the city.

During the 16th century, a command was made against establishing houses nearby water resources in the forest areas and a team was charged with controlling and monitoring these areas (Kutluk, 1948; Nirvan, 1953). In 1894 an act was passed to remove the inhabitants of Belgrade Village to an area outside the forest because of the damage they were causing to the hydrologic function of the forest. Strict protection measures followed this action (Eker, 1997).

In Istanbul, today's increased demand in water supply is being met by using another forest, the Istranca forest, which is a conservation site near the Bulgarian border. Despite the site being situated far from the city, its choice indicates the importance that the Turkish authorities attach to the role of forests and the necessity to protect them in order to guarantee a regular water supply of good quality.

2.2. Understanding of Forestry and Production of Drinking Water in Modern Times

Currently forests in Turkey are managed under the multiple use principle. It is accepted that the forests are managed for production of timber and non-timber goods, provision of environmental and biological services such as watershed and soil protection, conservation of genetic diversity, regulation of climate and carbon sequestration, recreational and aesthetic benefits, etc. Since 1992 management plans of some Istanbul forests have been specifically managed under the functional planning techniques that are arranged for different types of management classes in the plans. In these plans, forests were divided into different uses (such as landscape, water and soil conservation, etc) by taking management classes into account (OGM, 1992). However,

when both classical and current management plans are compared it is observed that the only economic output provided from the forest is wood products. The recent management plans prepared for different forest management groups under functional management do not recognize water as an economic output of the forest. In these recent management plans some recreational areas were allowed to be established in water production areas. Because there is a high demand for recreation in Istanbul the sites allocated for this purpose are being heavily used. However, recreational uses of these areas adversely affect the water production function of the forests. Besides, because the forest enterprises do not gain any economic benefit from the water supplied in their management boundaries forest managers do not care about the fallen trees that block the water flow on the site. In short, forest managers do not make an effort to promote the sustainable hydraulic function of urban forests due to a lack of any profit to be gained from their intervention. On the other hand, ISKI collects the water from the dams and makes a profit out of it without incurring any cost.

Today, protection of drinking water resources is undertaken by contractual or perpetual forest staff/workmen. However, their work regions are often changed for political reasons. The threat of change to their working status and areas causes compromises, which affect conservation of natural resources.

3. Results and Discussion

Historically, the watershed resources in Istanbul could not meet the full demand for water. However, with the traditional and district measures these watersheds used to produce more water compared with the current situation. Under socio-economic pressures the watersheds and forests of Istanbul were legally or illegally allocated for residential and industrial reasons to other uses causing degradation of these resources. Therefore the forest areas in Istanbul were considerably decreased and some watersheds (such as Omerli, Terkos, Buyukcekmece and Kucukcekmece lakes and surroundings) were polluted. This caused Istanbul to depend on more distant water producing resources. As a result Istanbul could not succeed in sustainable using its water resources. Besides not using their water resources in a sustainable way Istanbul residents also deteriorated neighbouring cities' forest resources and biodiversity by causing establishment of huge dams in the watersheds of these cities.

While in the past the primary and the most important product of these forests was freshwater, today this has been replaced with wood production and recreation. This situation was caused; by not accepting freshwater produced in the forests as part of the output of forest, planning forest resources only and mainly for wood production; and the resignation of some forest managers to political pressures.

A decrease in the number of people who hold similar beliefs or increase in the number of people who have conflicting values and economic goals will lead to increased pressures on the environment .A belief which in previous times was put forward for the purpose of resource protection and then accepted by the public may no longer be valid today. Water is no longer accepted as a sacred resource as it once was. This is partly because the number of people who have entered the city by migration has increased dramatically. These outsiders often do not share the values and beliefs of long-term city dwellers and they usually lack understanding of these issues. One instance, for example; ancient water sources with a variety of minerals were believed to have medical healing properties and were revered as sacred waters by local city residents. However, these sources today are not well protected, and have in fact sometimes been deliberately destroyed by new migrants.

Currently, people who live near the water sources have neither rights nor responsibilities for these water resources. However, historically these same people earned their livelihood from protecting the water. Therefore, people who once did the protecting today do not care, and are often the ones doing the most damage. The increasing number of buildings and other constructions at the edge of and into the forestlands, and the pressures of rapid population growth have resulted in an increased scarcity of water sources. Because Istanbul cannot provide satisfactory and good quality water out of its own watersheds, it gradually loses the sustainability of its natural resources. Therefore, hazardous development activities in the protected forests, which were allocated for water production, must be restricted and the water produced in the forests should be considered as the main resource output. Forest enterprises should benefit monetarily from the water output of the forests they manage. The conversion of forest and watershed areas to other uses must be prohibited and the planned development of the city must be enforced. Finally, illegally constructed residential areas in the protected forestlands must be expropriated and then removed and a system approach should be considered in natural resource management. The ecological and economic added value provided from the natural cycle and flow of water should be considered and this proportion must also benefit the forestry sector.

Acknowledgements

The present work was supported by the Research Fund of Istanbul University. Project No. UDP-723/2604042006

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Customary traditions of self-governed institutions in mountain forests of northern India – 1803-2003

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Abstract

There is a huge gap in our understanding of the history of human intervention in natural ecology of the forests in the Himalayas. Also at the same time it is not recognised that the resources of the mountains could not have been used in the past in isolation of those used in the plains. Thus the environment cannot be protected only by the conservation of forests without paying due attention to the interaction of human users both inside and outside the forests. Such traditional practices have, however, been disrupted by a combination of structural and institutional changes; consequently particular players like the Gaddi shepherds and the Gujar herders today are commonly perceived as shiftless nomads who deforest and degrade the Himalayan environment. We will map and document eco-systems known as *doabs* in northern India which operated within natural boundaries of altitude, precipitation and rivers; identify both transhumant pastoral and sedentary arable users of forests and examine their potential to conserve them and their ability to survive.

1. Introduction

The forest pastures of the Siwaliks, or the foothills of north-west *Himalayas*, are historical remnants of collective net-working of transhumant pastoral groups like the Gaddi shepherds and Gujjars with sedentary cultivators both within these forests and in the plains. Such customary usage of forest resources makes eminent sense. Collective action provides for institutional arrangements of risk sharing and uncertainty bearing; enable sharing of costs of policing and monitoring of forest use and in the process are reduced transaction costs of access, use and enforcement of rights. Thus was tackled some of the problems associated with free-riding and tragedy of the Himalayan forest commons.

1.1. Collective net-working in forest pastures: a culture of reciprocity?

British documents for the entire region of northern India, i.e. before partition in 1947, suggest that forests were a part of a fallow-system of land-use in which transhumant pastoral movement was not an isolated phenomenon, but was much more integrated into the mainstream agrarian structure of rural life than it is today. Factors which affected survival in forest environments both in the Himalayas and the sub-montane were to do with natural uncertainty and attendant risks which could be handled only through a culture of reciprocity between resource-users. What remains now are only fragments of long haul trails of the once dynamic system of transhumance-sedentary net-works which spanned across the entire "land of the five rivers".

1.1.1. Uncertainty and forest-pasture

Neither man nor beast can survive the Himalayan region at the alpine level in isolation. Grazing resources here complement the forests below this level enable grazing but it is

a struggle with uncertainty. The Himalayas being the youngest fold mountains in the world makes them prone to volcanic action. The one that occured a couple of years ago reminded the people of the devastation that occurred in 1904, in Kangra where Chamba is located. The passes or *jots* through which the Gaddi shepherds traverse in autumn and summer can also be dangerous as sudden hailstorms and snow blizzards can wipe out herds and herders. Uncertainty is sharpened by the tropical location of the mountains so that the monsoons can be torrential in the south-facing areas while dry conditions prevail in the steep rain shadow slopes. A flourishing pasture can, fairly suddenly, lose its verdant grass cover by landslips and unseasonable frost in the upper region and by flooding in the river banks in the lower valleys.

Figure 1.
The study area

Uncertainty makes communication with the plains so much more difficult. The mountains have a very brief frost-free period so the Gaddi shepherds are pushed to an intensive growth period, where they concentrate on breeding of the sheep in their herds and grow food on short fallows and also take up social activities. The Gaddi would then, by Israel Ruong's reckoning, be dictated by the "earth's rhythm ... the biological layer of the earth's surface," which "is a part of the entire culture layer" (Ruong, 1979: 11).

In the past mountains provided political security albeit at a price. Thus the Gaddi shepherds, who belong to Bharmour or Gadderan, were the nucleus of the ancient kingdom of Chamba which according to epigraphic and genealogical records was ruled by generations of one single family for more than twelve centuries and may thus "boast of an antiquity equalled by few reigning houses in India and none in Europe" (Vogel, 1911: Preface).

However this political security of Chamba did not guarantee to the Gaddi unlimited access to grazing grounds in the large forests of the State, and these would have been insufficient in isolation and so they needed to transhumance to the lower hills and the plains of the Punjab. In the forest pastures of Chamba, their own homeland, Gaddis sought access to grazing through customary rights of *bartan*. These were user rights which were appendant to their "dominant estate" which happened to be the private cultivated land which they had taken on lease through a *pattah* or deed from the Raja of Chamba. (Trevor, 1912: 3) The forests were actually exploited by the colonial forest department whom he had invited to

manage them on lease for 99 years till the first part of the 20th century. Even after the Raja took back the management of the forests, the Gaddis had little to gain, as the forest grazing space remained in the hands of the forest department. They were thus foreigners in their own homeland. Chamba was reckoned a non British territory and their flocks were treated as "foreign" herds by the British settlement officers and the forest department. Hence whether they went down to the Siwalik forests or up to the alpine pastures of Lahul, they were (and still are) hustled around as "foreigners" and sought to be controlled in their movements everywhere. (Wilkinson, 1913) Elsewhere, in the grazing runs of the forests in the lower hills of Shahpur Kandi, in the Hoshiarpur bamboo forests of Karanpur and Brindaban and in the Una forests, they had to have their rights of passage and pasture recorded by the settlement officers.

1.1.2. Transhumance – an ecological response?

Such an inter regional pasture use pattern by the Gaddis required building up reciprocal usages of exchange. Pastures, whether they were in the alpine tracts or in the inter riverine areas had to be shared with the cattle of local sedentary farmers. Thus evolved patterns of land fallows in both pastoral and arable lands. Transhumance was a Gaddi method of minimising individual risks by managing grazing fallows both inside the forest and outside in arable land where land ordinarily cultivated is left fallow for grazing in alternate situations and seasons. They protected their use of alternate pastoral resources by an oft repeated sequence of using the sheep runs or alps at different altitudes in rotation almost akin to cultivators rotating fallows and crops in the different seasons.

In the Montane, when the Gaddis came down from the snowy ranges of the upper Himalayas to graze their flocks in the lower hills, they avoided the runs of the Gujars. In the same way, the Gujars with their buffaloes would take up "divisions on a hillside" (Kangra Settlement Report, 1865– 72: 16) and each community with its herds would respect "mutual boundaries". Since the composition of the herds of the Gaddis and Gujars was different, the rights of the two communities were compatible, mutually non intrusive and did not require the demarcation of the "runs".

Additionally, transhumance involved a technique of mixing and matching herd composition and spreading the risks over species and owners. The herd composition was of utmost importance as the goats for example were capable of providing milk not only to the herders on the move but also enabled the suckling of young lambs when the ewes were on the move; besides there were the goat droppings to be provided at different levels of mountain agriculture etc. Also the herd ownership was varied according to stocks of upper ranges or lower ranges to enable marketability at different elevations.

To this was added scale adjustment in transhumant grazing. The scale was small for terraced fields in the Chamba hillsides being "no bigger than a billiard table" (Punjab Gaz. 1908, I: 363) The scale of grazing required was however, large, and cultivation alone could scarcely have seen them through more than a part of the year without being supplemented by trade or casual labour. Provisioning against uncertain and risky situations was also difficult, since the production and storage of fodder was not only labour intensive but required capital as well. Therefore insurance against harsh winters would have been costly to match the scale on which it was required. Seasonal pastoral migration was a way of lessening this gap, but it imposed high transaction costs except when the Gaddi could manipulate two circumstances to reduce overheads.

The Gaddi then managed transaction costs by first, bargaining over reciprocal arrangements with cultivators and the forest department all along the transhumant route and which had to be shifted around ever so often as circumstances demanded. Such negotiations meant time and that in turn meant expenditure too in material terms since such transaction could rarely be done in advance even though it depended on customary reciprocity and that meant cost of food and staying at a site of negotiations. Second, by reducing overheads in the first instance by choosing to trade off the more risky with the less risky. This they did when they complemented the pastoral resources in their homeland with alpine pastures elsewhere in summer and those in the lower Siwaliks and the riverine areas of the plains in winter (Table 1.). The shepherd's strategy succeeded because of the wide variation in location and quality of grazing resources available in the entire region. And third, Gaddis could minimise risks per head and migration costs which were high because of ill-defined property rights in pastures, if they operated on a large scale. They collected herds of several owners such as the Lahulis in the region above Chamba who also face similar risks at high altitudes. The movement with combined Gaddi and Lahuli flocks made not only their own migration more affordable but in return their flocks could get accommodated in the summer months when the Lahuli alpine pastures provided excellent grazing for large flocks.

Table 1. The Montane: Grazing Fallows

Districts	Types of Grazing Fallows	Season
Kangra	*Bahan*: fallow field in the terraced field or field in valley	Post harves
	Kharetars: grass preserves in enclosed field on hill side (*a)	Post hay cutting
	season	
	Intermediate waste between the different hamlets & settlements	Summer
	Soanas: exclusive pastures used by Gujars in forests.	Spring & Summer
	Dhars: grazing runs on hill side for sheep (*b)	Spring & Summer
	Forest *bartan*: hill side and valley forest rights (*c)	Spring & Summer

Source: *a, *b, *c Kangra Settlement Report, 1864, 72: 43, 45 &19.

In the Sub-montane, arrangements had to be made for using the riverine *belas* (islands in the channels) or *chambs* (marshes) of the Ravi, Sutlej, Beas, Jumna and other smaller rivers which provided winter pastures (RAF 1885: para 7) for cattle from all the three zones – the upper ranges of the Himalayas, the sub-montane and the plains – in return for the exchange of labour performed by Gaddis on arable land, wool and manure. In addition the use of pasture in the stubble of the *rabi* or crop along with the grass left in the waste and on the *dhauls* (embankments of fields) and *dhanas* (banks of the field channels) by the sedentary cultivators and the nomadic cattle required institutions similar to the English custom of "common of shack", which was penning of the Gaddi flocks in the fields of the cultivators for the droppings of manure and urine.

The sub-montane grazing lands served the interests of the Gaddis also as it was a transit point for movements of herds of different composition originating from two opposite directions – north and south. The tract acted like a buffer by complementing the weather and natural resources of two different regions. When the pastures in the plains below were scorched or flooded, the cattle took refuge in these sub montane tracts; similarly if the alpine pastures were covered with snow these foot hill regions became a haven. The synchronisation of these diverse movements with the sub montane region's own pastoral needs required detailed institutional arrangements. Transaction costs would have been prohibitive if individual cultivators or pastoralists had attempted to cope with settling the trails, the halting facilities, the penning arrangements, the food, grazing in the stubbles and other

requirements of camping and nomadic movements. Policing and enforcement of these arrangements would have been impossible and worse, the likelihood of chaos was inevitable.

Table 2. The Sub Montane Grazing Fallows

Districts	Grazing Wastes	Season of Grazing
Hoshiarpur	Common lands [Grass fallows]in villages.	Monsoon and Post-harvest
Gurdaspur	*Banjar* (fallow) plots in Andhar (*a) circle (Pathankot) and Bharari circle. (Pathankot) and Bharari circle.	Winter
	Grazing chambs of Gurdaspur and Jullundur: Khanuwan Chamb, Magar Mudian Chamb(marsh)	Winter
	Riverain tracts: Belas (*b) (islands) in the Ravi, Beas, Sutlej, Kurari and Nahar ki Bir in Pathankot	Winter & Summer
	Shamilat Forest Fallows: Gurdaspur: 16 village *shamilat* (common) forest Hoshiarpur: 17 village *shamilat* forest (*c)	Winter & Monsoon
	Forest fallows: (i) Lower Siwalik, Hoshiarpur, Jaswan Dun, Sola Singhi Range(*d), Mangowal Range, Panjal and Lohara. (ii) Gurdaspur: Shahpur Kandi.	Summer

Source: *a. Gurdaspur Gaz. 1914 : 102., *b. Siba Jagir SR, 1881 82 : 23., *c. Una Tehsil, Hoshiarpur SR, 1914 : 27., *d. P.S. Melville, Rev.& Agri. Forests, Progs. 3 5B, Oct. 1887 : 3.

Early reports from settlement officers like Richard Temple show that long fallows or *banjar kadim*, were well organised categories of land within recognised village boundaries and that they were held as common property in the sub montane region which was even at the time of British annexation, in 1849, the most highly cultivated tract (Banga, 1978: 4). One can explain this complex but orderly pattern of land use and rights using the logic which Dahlman (Dahlman, 1980) expounds in his study of the open fields of medieval England. It is wisdom of a similar kind which was reflected in a land use pattern linked to a land right pattern in the Siwaliks.

In the Plains, all these arrangements depended on the sedentary cultivators adjusting their land use pattern to those needed by the transhumants. Inducement for such accommodation arose from their own specific need of services and manure which the transhumants could render. Thus in the summer, when temperatures rose in the plains and floods occurred in the riverine tracts, the cattle would be moved to the hills and the *duns* or valleys.(RAF 1885 : para 7) The Gaddi shepherds would once again act as the conduits between the plains' herds and those of the alpine ranges. Free from the heavy rains, fleas and mosquitos of the riverine areas, Lahul would then offer summer grazing. At the same time pastures in the hills facing south and the riverine tracts would see a monsoonic movement away from them.(Ibid. Also Kangra SR, 1865-72 : 40) Likewise Gaddi shepherds would also accommodate the flocks of trading people like the Lahulis who had lent them money.

Usually village common lands which was cultivable were kept as long fallows or *banjar kadim* which meant no crop was grown for approximately for eight seasons or more and even where they were cultivated the area was seldom in scattered plots but were more in compact form. It did not mean that the land was collectively cultivated but the returns on it via rent were shared by the village community of land owners. On the other hand the short fallows or *banjar jadid* were held individually, in scattered strips. However these were open fields and without barriers, so that after the harvest all the stubbles on the cultivated fallows were open to grazing. Strictly speaking there was no reservation between the cattle of the village and those who came in from the outside. At the same time if the fields were on sloped terraces then there were physical reasons for controlling numbers on the terraced short fal-

low. Thus even the privately held short fallows became common pasture for the time that they were kept fallow. This pattern was in a manner of speaking, a persuasive pressure on individuals to go along with the collective design. Jointly the community could achieve full potential savings in transaction costs of bargaining and policing of grazing resources which prevented misuse by outsiders from the plains below and the hills above. Individuals would scarcely have been able to regulate the grazing on private fallow land whereas communal sanctions on fallows held in common had greater chances of being effective. Collectively they gained.

The scale of these vast movements went much beyond the Gaddis' tracks; they were a part of an immense pastoral network spanning the entire riverine plains of the Punjab. Hence the Gaddis could not be immune to what happened in the larger region. Interlinking at any point in time or space was based on continuity in reciprocal arrangements. Such relationships deepened and also expanded during unseasonal weather cycles and drought, with shortage in rain and intense summer heat driving the nomadic cattle from water holes of the plains located in the far flung districts of Sirsa and Hissar to the riverain lands or up the Siwaliks or Dehra Dun (RAF 1885: 324). Famines were a real testing time for such inter regional use of fallows. The natural immunity of the hills to droughts made them the surest refuge for graziers from the plains. There are several historical examples to prove this.

No individual could leave the system without imposing externalities on the others. Therefore in the event of an individual opting out there was a likelihood of a sanction. It could be the threat of witholding social support at times of marriages, deaths etc, or withdrawal of support in times of need as in times of revenue collection or withdrawal of rights of sharing some of the common sources of income etc. Preventive institutions were perhaps even more imperative as some of the grazing fallows, like the forests, were in the nature of open access and were shared with others who had different scales of production.

2. Structural and Institutional Change and Collective Action

Collective control was modified starting 1803. Colonial intervention in property rights and canals induced shortening of fallows within villages and enabled "breaking up of the waste" areas. These intermediate waste lands between villages were granted to the communities of cultivators as their village common lands or long fallows. Boundaries for these villages were marked out. Thus it is that the open grazing ranges or "wastes" of the inter-riverine areas of the Punjab were internalized and became the property of specific communities and so out of bound to the nomadic elements. (Chakravarty-Kaul : 1996) Long distance movement now had to be re-negotiated between the new communities and the old nomadic elements. Consequently it interfered with the movement of cattle or transhumance to long distance wastes. It also therefore interfered with the herders' capacity to adjust to the ecology of the larger region. Camel graziers became hemmed in from all sides and shepherdic communities like the Gaddis increasingly had to fend for themselves in a smaller tract for both food and fodder.

2.1. Compounding Uncertainty

Such official action compounded climatic and other natural risk in the pastures and forests of the middle Himalayas. These pastures were critical, as herders used these on their way to the upper reaches of Lahul. Official correspondence between officials in the forest department and those of the administration of the districts show the growing constriction of space for example in

the sub montane district of Kulu where the open grazing lands were first demarcated and closed to transhumance between 1848 and 1870-72 and then "reserved" in 1879 by the Government which meant that the area was under control of the district of forest authorities, and therefore closed to outsiders. (Hoshiarpur Gaz. 1904: 129) They also show pressure building up with the management of the common forests, *shamilat ban* in Shahpur Kandi Gurdaspur taken up by the Government in 1910 (Gurdaspur SR, 1912). The Gaddi found his tracks barred, his relationship with the cultivators taken over and recorded, giving him no chance to negotiate and alter them. Grazing fees were charged in the nature of counting the numbers of stock he herded and to keep track of his movements. All along the route his halts and use of the forests were monitored and sanctioned. His flexibility was reduced to a minimum.

Added to such increasing control in the districts, legislation like the Forest Act of 1878 placed restrictions on Gaddi movements in forests which lay along their tracks but were now "reserved" for certain parts of the year. This was not always necessary as observations of forest officials show. But regardless of these findings trespass was punished. For example the forest department was constrained to note that whenever monsoons were sufficient the graziers did not trespass reserved areas, which clearly shows that the Gaddis were using forests only in times of distress and not continuously with the intent of free riding. Conservation may have opened a new chapter in scientific forest management but in the process it broke down the institutions of collective action which had been responsible for the sustainable patterns of land use in this part of the Himalayas.

2.2. Post-Independence

Uncertainty of another kind has emerged in the last few decades, with the building of dams in the Siwaliks. The Bhakra Nangal, Pong and Thein dams have swallowed large areas of winter pasture, particularly in the communally managed forest tracts of the Shahpur Kandi, Karanpur, Brindaban and Una forests. This has pushed the Gaddis further up into higher ranges and has also forced them to remain longer in the alpine tracts. The consequences of all this change has not been assessed as yet. All we have on record are insinuations made against them by forest department officials, without empirical evidence.

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Cultural Heritage, Sustainable Forest Management and Property in Inland Spain

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Abstract

Corporation woodlands are a cultural and natural heritage from traditional rural collectivism and from the land system in central Spain during the Middle Ages. They have survived due to the permanence of traditional cultures in a depressed rural society, where social relationships remain at local level. The collective private woodlands have substantial problems adapting to the current legal framework and the socio-political context. Nevertheless, as social-spatial structures where traditional knowledge and social participation continue, they are a very interesting asset for rural development in central Spain through sustainable forest management. The aim of this paper is to provide a territorial viewpoint and assessment of common woodlands in the province of Soria, which is one of the most extensively forested provinces in Spain and has a strong collective private forest heritage. The great variety of this collective heritage stems from the origin of the land tenure, land ownership and the rights to use land, as well as the social conflicts linked to legal organisation difficulties, which will all be analysed.

1. Introduction

The concept of heritage is linked, by definition, to property and the utility value of assets. The Mediterranean forests are a natural and cultural heritage and have an important historical component. These ecosystems have played a fundamental economic role in rural societies (Montiel, 2003). Collective private forest property is one of the most evident examples in some provinces of the central Castilian plateau in Spain.

However, there is little awareness of this collective forest heritage, even when it involves large areas and is the property of most of the local population in central rural areas, where the practice of agrarian collectivism has been more prolonged. For example, in Soria this includes 19% of the surface area of the province (187,202.7222 hectares), 40% of the forest area of the province and 57.6% of the privately owned forest area.

These woodlands, which belong to several owners within a common, indivisible legal framework (*in common and pro indiviso*), are usually known *as corporation woodlands (forest land owned in partnership)*. There are no standardised characteristics for them, as there is a wide variety of collective private woodlands, depending on origin of the land tenure, the system of owner representation, the system of owner's rights and the management system.

Most of the collective private woodlands belong to companies composed of owners or neighbours based on a document of purchase from the State at a public auction for the sale of property confiscated from the Municipalities at the end of the XIX and the beginning of the XX centuries. Also, owners acquired the common woodlands in the municipal areas by direct purchases from private owners, or simply by being members of the town councils. They have survived due to the permanence of traditional cultures in a depressed rural society, where the social relationships endure at local level.

2. Methods

The methodology used to analyse the cultural component of corporation woodlands and their management consisted of the historical analysis of the structure of forest ownership, and then the historical analysis of traditional knowledge and the economic role of forestlands in rural societies. However, the starting point was the previous recognition of land tenure as a factor influencing forest management (Montiel, 2002; Parviainen, 2006).

The study area of the research was the province of Soria, which is located in the south east of the Autonomous Community of Castilla y León. Soria is an isolated region and has a strong rural character. Besides, it is one of the most forested provinces in Spain. Its surface area is 1,031,800 hectares, of which 632,923.02 are woodlands (61% surface). This is partly due to the high rate of rural migration which affected this province during the XX century. At the present time, the population is sparse (90,954 inhabitants) and elderly. Moreover, the average population density is just 8.82 inhabitants per square kilometre. In addition, the population is very concentrated in a large number of villages and hamlets (347 nuclei), which implies serious problems as regards spatial planning. However, the permanence of a high number of small population nuclei has led to the persistence of traditional systems of organisation of space and socio-economic activity, together with the maintenance of structures which are particular to agrarian collectivism, of which corporation woodlands are part.

Due to its mountainous terrain, high average altitude and a harsh climate, the countryside of Soria is made up mainly of pinewoods or oak forests in the mountains and highlands, while cereals are grown in the basins and valleys. Thus, the main contrast as regards the landscape and the socio-economic factors is the distinction between the southern agricultural areas and the cattle and forest rangeland (Ortuño et al, 2006). In the forest areas, the main differences are established depending on the dominant tree species, whose distribution has been strongly influenced by human activity throughout history. The main units of the forest countryside are as follows: high forests *(Pinus sylvestris and Pinus pinaster)*, coppice forest *(Quercus ilex)*, savin association and grazing wasteland.

The ownership of forestlands is mostly private (70%), and these are generally distinguished by smallholdings and a rather undefined legal status (see Fig. 1.). Nevertheless, private forests can be owned by individual persons or collectives (legal) bodies:companies.

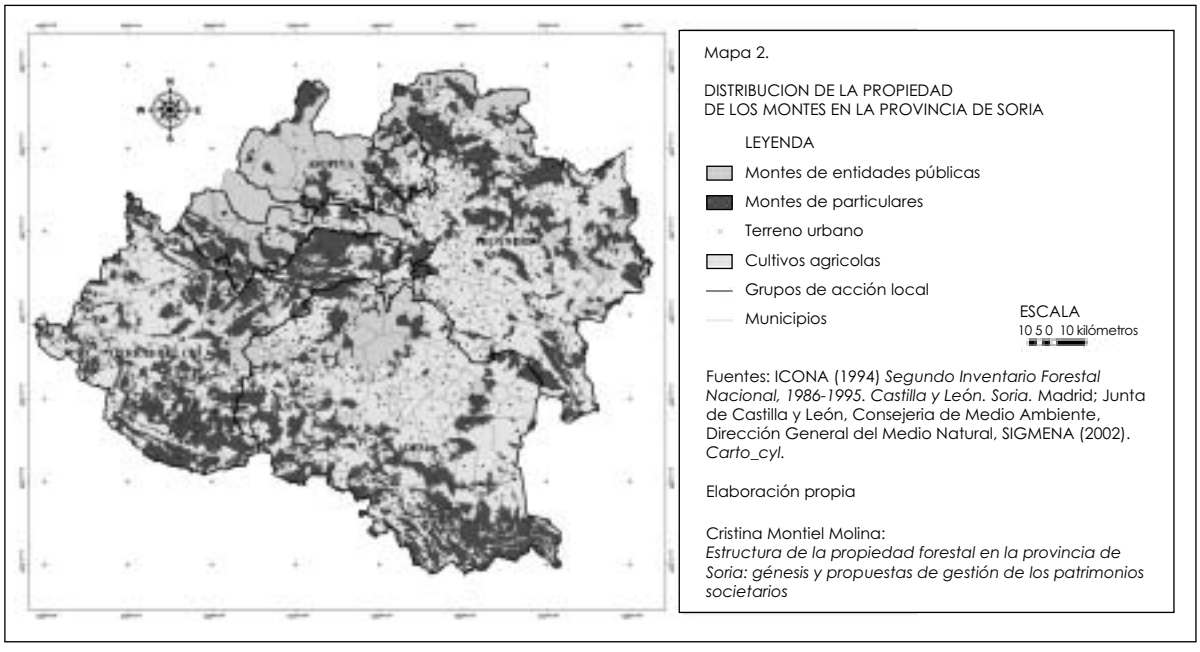

Figure 1. Distribution of the ownership of woodlands in the province of Soria

The main difficulty which this research had to overcome was to identify the owner companies in the province of Soria and draft the list of corporation woods. The oral information sources in the popular memory of the villages are scarce in the rural regions due to the rural exodus, the abandonment of the traditional forestry activity and a lack of young people in the area to take over from the older generation. In the case of the collectively owned woodlands in the province of Soria, for example, it is almost impossible to find witnesses to the acquisition of land, the constitution of companies, or neighbours who know the systems of traditional corporation forestry management. Thus, the oral information is usually contradictory and often mistaken.

In this situation, the only source which can provide complete information on the situation at provincial level is the Rustic Land Register where a search was made using a number of key words by "owner name", such as *association, depopulation, woodlands, company, neighbours, owners,* etc.

Once the *corporation woodlands* were identified, documentary information was sought (ownership deeds for the woodlands, corporation memorandums of association, statutes regulating the functioning of the companies and forest management plans). The existing private files of the owner companies were researched. A search was also made for public and private sale-purchase deeds and for the constitution of companies through notary protocols, Property Registries and Historical Municipal Files.

At the same time as the documentation process on corporation woodlands were carried out, a study was made of the evolution of the territorial jurisdiction of the region from the time of the Christian conquest and repopulation up to now in order to define a typology which would make it possible to classify the assets depending on their origin and the ownership system.

A historical analysis of traditional knowledge and the economic role of woodlands was then carried out with regard to local people. Finally, field work was performed, consisting of visits to the woodlands selected as test-sites representing the *corporation woodlands* identified, in order to carry out an evaluation and to study the possibilities of the conservation of the traditional management practices.

3. Results and Discussion

3.1. Origin of corporation ownership

There is a close relationship between the political-jurisdictional organization system of the territory and the ways to use the land during the Feudal Regime and the current structure of forest ownership. The territory of Soria was organised throughout the Christian re-conquest and re-population, between the XI and XIII centuries through the system of villages with assigned land *(Village and Land Communities)*. A total of twenty *Village and Land Communities* were formed within the territory of the present province and each one of these had some uncultivated lands *(baldíos)*: woodlands belonging to the king by right of conquest, but for the collective use of all the neighbours of the Village and Land Community.

The *baldíos* were more extensive in the mountainous areas and included the best grazing land, thus, they were fundamental in order to maintain the migrating cattle (Photo 1) of all the neighbours on the land, and these acquired fundamental socio-economic importance for the Communities and for the town councils, as well as for the institution of the Mesta[1] . In fact these were

[1] The *Mesta* was an institution created by King Alfonso X in 1273, which united all the shepherds of the Crown of Castile and provided them with important prerogatives and privileges, in order to facilitate the movement and passage between pastures. The herds of sheep from Soria were the most important in the *Mesta*.

lands owned by the crown, but were defended as *communal lands* by the villages. Thus, the traditional systems for using the land, dominated by agrarian collectivism, (López-Gómez, 1954) shared a popular consciousness of possession of the *baldíos* (uncultivated lands), used by all the neighbours freely, and the majority of the crown lands became the property of the villages during the liberal revolution of the XIX century.

Figure 2.
Livestock in San Pedro Manrique (photo by Luis Galiana)

The use of the woodlands was also fundamental for the passage of carts, which was also based on early medieval privileges, and consisted of the transport of goods throughout the peninsula using wooden carts drawn by yokes of oxen. Its development was sustained in the area of Pinares de Soria due to the woods, which provided the wood needed for the construction of the carts, and the pastures for feeding the cattle (Kleinpenning, 1962).

However, the liberal revolution of the XIX century, with the reform of the municipal regime (1812), the suppression of royal privileges as regards transport by carts (1834) and as regards the *Mesta* (1836) and the disappearance of the concept of Village and Land Communities as municipal units, with its grazing easements (1837), led to the break up and collapse of the traditional socio-economic system based on agrarian collectivism. Thus, after a period of economic progress from the XIII century onwards, the province of Soria began to decline in the XVII century, through a depopulation process which would reach a climax in the XIX century, when the development of the urban middle class and industrialisation slowed down. This has determined the rural nature of the province and the continuance of the traditional social and spatial organisation systems.

Furthermore, the end of the Feudal Regime also involved the sale at public auction of all the goods owned by the State, the clergy, the Town Halls and other public organisations, ordered by the Law of Disentailment of Madoz March 1, 1855. Faced with the announcement of the sale of the old uncultivated lands in public auction which entailed a threat to the traditional practices of agrarian collectivism, in many places neighbourhood societies were formed to protect the ownership rights over the woodlands which had been used collectively since the Middle Ages. The objective was to prevent outsiders from acquiring the woodlands in the area. To achieve this, the neighbours joined together in order to obtain the funds required to purchase the woodlands in public auction as these were vital for their economies. This led to the collective ownership of the Spanish woodlands during the second half of the XIX century and the beginning of the XX century, which made it possible to continue with the traditional practices of agrarian collectivism in the woodland areas.

Finally, in the XX century, due to the massive rural depopulation, it was necessary to join villages together to form municipalities with sufficient inhabitants to enable economic and territorial planning. As a consequence of the disappearance of borders, new collectives of owners, whose objective is to safeguard the rights of exclusive use in its woodlands, were formed opposing the neighbours in the new municipality. Thus, the process of municipal unification, which particularly affected the most depopulated areas of the province, explains the territorial concentration of collective forest ownership in the agricultural areas of the south of the province (Fig.2.).

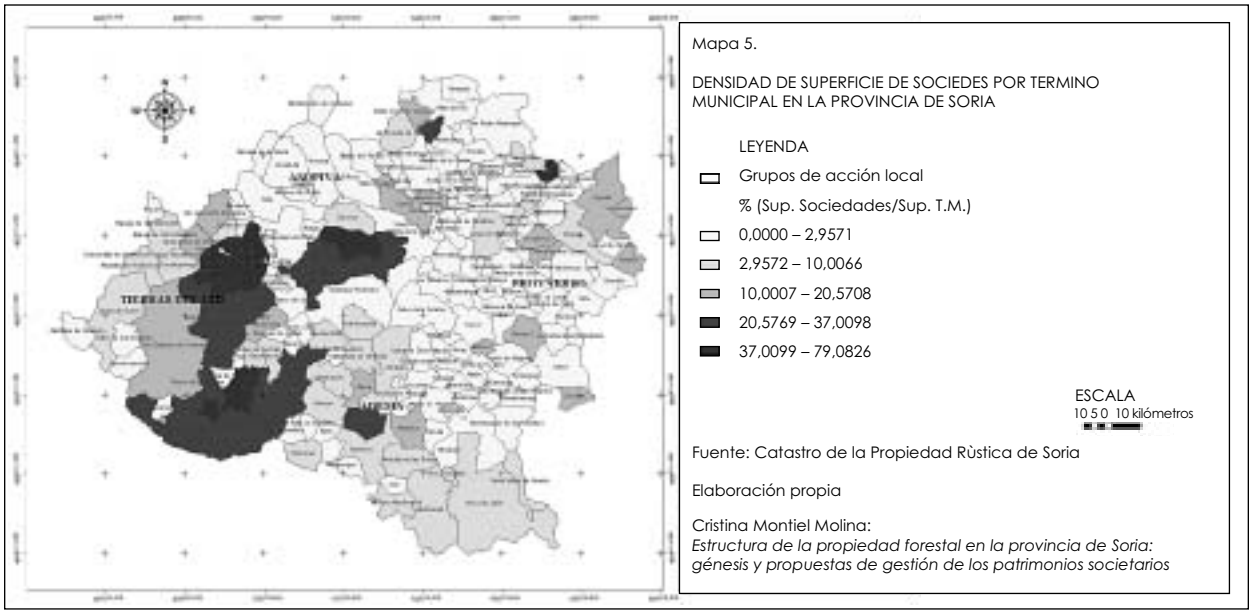

Figure 3. The surface density of corporation woodlands by municipal area in the province of Soria

3.2. Classification of the corporation woodlands

There are a wide variety of collective private woodlands, according to their origin and the organisation system of the ownership corporation (see Table 1.). The more widely known cases are those involving the woodlands which were auctioned off under the disentailment laws of 1855 and 1856, and were acquired by a person who acted as intermediary for a group of neighbours, to which he subsequently transferred ownership of the woodlands (for example, the *Pinar de Herrera de Soria* or the woodlands of the Corporation *Baldíos de Pozalmuro*).

There are also corporations in which all the citizens acquired the woodlands though a sale-purchase document from a private owner, an heir or a buyer with the common ancient aristocratic rights (for example, the Corporation of *Conde de la Póveda*). Moreover, mention should be made of the corporations which were constituted in order to manage assets from uncultivated lands, which had belonged to the Town Hall and had been used by the community as a whole until the liberal reforms of the XIX century and which, were protected from the disentailment process and the interventionist, centralised management of the forestry policy at the end of the XIX century and the beginning of the XX century (for example, the corporation of Neighbours of Tardelcuende).

Finally, a large number of corporations were formed due to the aggregation of municipalities in order to safeguard the private rights of the citizen members of the new minor entity as regards the totality of the neighbours of the unified municipality. There were also cases in which plots were being concentrated in the area, in such a way that the Act for the Reorganisation of the Property in the Area made it possible to regulate the legal situation of the woodlands and the ownership of the neighbours constituted as the minor entity was acknowledged and could access the Property Registry (i.e. the Corporation of Neighbours of Canredondo de la Sierra).

Table 1. Typology of the corporate woodlands in the province of Soria

Origin	Classes (land property & land use rights)	Local cases
Buy on public auction (Disentitlement process) or to the former landowners	Private pro-indiviso	– Corporation *Baldíos de Pozalmuro* – Corporation of *Conde de La Póveda*
	Private pro-indiviso with neighbourhood easements	*Pinar de Herrera de Soria*
Communal woodlands affected by county gatherings	Municipal neighbourhood companies.	– Corporation of the Neighbours of Tardelcuende
	Minor local neighbourhood companies.	– Corporation of the Neighbours of Canredondo de la Sierra

In accordance with the legal regime (ownership rights and rights of use), three wide categories of woodlands should be differentiated. In the first place, are the woodlands where ownership rights and rights of use are exclusively in the hands of the heirs of the buyers of the woodlands (i.e. *Palositos* woodlands, in Espejón), or in the hands of the de iure members of the corporation of neighbours (i.e. woodlands of the neighbours corporation of Tardelcuende). However, the ownership rights and the rights of use may be split in such a way that there are conditions and/or easements as regards the benefits deriving from the use of woodlands. This occurs in the *Pinar de Herrera de Soria*, where the condition for profiting from the production of the woodlands is to live in the local area and be the heir of the buyers. Finally, the third category is composed of the corporation woodlands with a communal origin, which have private land property rights, but communal land use rights (Montiel, 2005).

In all cases, forest landscape is the result of the link between forest management and cultural practices. Specifically, coppice forestry and forest pasturage (Photo 2) predominate. Consequently, there is also a close relationship between the systems of ownership and the dominant forest species. The majority of corporation woodlands are grazing wasteland or open forests of *Quercus ilex and Quercus faginea* which are a result of the traditional ways of using forests and forest products (Parviainen, 2006).

Figure 4.
Forest landscape resulting from the traditional forest management as regards making use of firewood and pastures (Corral del Llano, Castilviejo) (photo by author)

3.3. Conflicts and needs

The ownership of corporation woodlands presents greater difficulties. The corporation woodlands are the forestry properties which currently have the greatest difficulties as regards management due to the judicial confusion in this regard, that is to say, with regard to collective ownership. Furthermore, depressed economies and depopulation of rural areas, which have resulted in the disorganization of the traditional systems of forestry management, often render the management of these woodlands impossible as certain decisions can not be adopted without the participation and agreement of all the owners of the property.

This is impossible in the current situation of multiplication, dispersion and lack of knowledge of the co-owners (third and fourth generation descendents of the buyers currently resident outside the municipal and provincial area), and the lack or loss of Foundational Statutes of the companies. The lack of property deeds in the most cases, ignorance about property history and the common lack of registration of property rights have always caused numerous disputes about land ownership.

The previous clarification of the legal status of forest ownership is a necessary condition for the sustainable management of resources, the maintenance and improvement of the living conditions of the current population, and the guarantee of the continuity of the ecosystems for future generations. In addition, the consolidation of ownership can invert the emigration and rural abandonment processes and lead to new dynamic processes which entail demographic revitalisation and the recuperation of the heritage.

4. Conclusions

The cultural heritage values in forest areas are linked to the collective land tenure systems in some Spanish rural areas. For instance, the existence of corporation woodlands has made it possible to maintain traditional practices related to agricultural collectivism in districts of Soria. However, as a consequence of their recent dynamic, ownership structure in Mediterranean forests are disorganised and fragmented.

While the collective private woodlands show substantial problems as regards adaptation to the current legal framework and the socio-political context, they are nevertheless a valuable asset for the rural areas under development. These territorial concentration, association and social participation structures are ideal for calculating the value of the terrain within the framework of sustainable development strategies.

Consequently, knowledge about land tenure and regulation must be a priority of National Forest Programmes in Mediterranean regions. Well-planned regulation of land tenure can preserve the cultural heritage and valuable knowledge passed down through generations and lead to the implementation of sustainable forest management.

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Opportunities in Turkish Cultural Heritage for Conservation of Natural Values

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Abstract

Turkey's long history and rich cultural heritage causes conflicts and generates opportunities for present conservation activities of the natural and cultural values. Turkish people believe that hunting of the some wild animal species such as deer and gazelle produces a bad destiny in future. Some places or trees in forests are accepted as holy so that nobody desires any destruction of them. Since traditional medicine uses some plants based on the forest, people are more sensitive to conservation of them than others. These values can be considered opportunities to promote sustainable forest management. On the other hand, timber is the main load bearing material of the traditional Turkish House. Most of the geographic areas where the Turkish House has spread are within seismic zones in Turkey. It may because timber frame construction systems were devised and widely used. However, during last fifty years, timber material has lost its position in the building sector and concrete was generally preferred. Protection of some traditional structures is linked to protection of the the knowledge used in their construction. Knowledge generated by local masters is hidden in these protected structures. After the 1999 earthquake in İzmit, the importance of the timber material was remembered again and a new opportunity may be used to protect cultural heritage and to expand the demand on timber material. In this study, opportunities hidden in the Turkish Cultural Heritage are explained with reference to use in natural conservation activities.

Keywords: conservation, natural values, turkish culture and forests.

1. Introduction

Tangible goods produced by forests have attracted attention almost every term of mankind. However, social demand on forestry services and values or intangible goods of the forestry increased rapidly in the last century. Consequently, forest resources managers in present have to manage all values of the forests concerning to the sustainability principle.

Humankind has made contact with nature, has affected it or has been affected from it since beginning of the human life. This relationship is easily seen in Hittites who was one of the first civilizations of Anatolian. Name of Şuppiluliuma, who was the most famous king and commander of the Hittites, means "clean spring, clean pool or holy lake" (Akurgal, 1997; Çığ, 2000). It is known that when kings ascend the throne, they accept a specific name what they want. He preferred a name, which means clear water. Rivers and mountains were important for II. Muwatalli, which can be observed from his prayer tablets that written the names of the cities and the Gods together with rivers and mountains (Alp, 2000). Another king of Hittites was Telipinu, who identified himself with nature, bequeathed written literature that meant "Whenever God Telipinu will certainly get cross all nature dies, when he comes back it refreshes (Akurgal, 1997). Likewise, they could believe that when kings or community crime, their country has a natural disaster (Çığ, 2000). This belief proves that identification of Telipinu includes more wide periods.

Therefore, it is not coincidence to find secret opportunities not directly related nature but suitable for nature conservation activities in cultural heritage produced by long history of human. Today in

Turkey, protected areas consist of thirty-five National Parks (636.631 hectares, ha), seventeen Nature Parks (69.370 ha), thirty-five Nature Protection Areas (84.230 ha) and fifty-eight Nature Monuments. Most of them acquired protection status as taking into consideration of their natural protection values. However, while some protected areas have directly cultural values such as Çanakkale National Park and Başkomutanlık National Park, most of the others have cultural values indirectly.

The aim of this study is to investigate hidden opportunities in the Anatolian culture will able to be used in nature conservation activities. Culture or civilization is a complex system including knowledge, art, tradition-custom, ability, accomplishment and practices learned or gained by human as a member of the society (Güvenç, 1997). Therefore, this article focuses on nature protection opportunities in Turkish Culture from the point of views of wildlife, cultural places, traditional medicine and non-wood forest products, and architecture.

2. Wildlife in the Anatolian Culture

When historic ruins are examined, it is seen that Anatolian civilizations made nearby contact with wildlife. Although, it is thought that first settlings started after the agricultural activities, excavations in Çatalhöyük indicate that there was a settlement of hunter community before agricultural revolution. Historic relief and drawings include figures of lion, deer, fallow deer, wild ox, tiger and leopard. In today, it is not possible to see any lions, wild oxes, tigers and leopards in Anatolian forests. It is known that there were animal parks in today's Kültepe between B.C. 1800's and 1700's. (Yavuz, 2002).

Fallow deer *(Cervus dama)* and deer (*Cervus elaphus*) were called in the folk stories. In a folk story written by Yaşar Kemal who is famous writer in Turkey and also world (Kemal, 2004). Fallow deer is called as Alageyik in Turkish and Alageyik story was published as a novel, composed as song and made a movie in many times. This story could not prevent decreasing of fallow deer population in Anatolia. But, in recent years there have been more people believing this story and not any tolerance for fallow deer hunting.

In Turkish culture, particularly in Alevi communities, while crane, goose and pigeon, cock are accepted as auspicious, mule, rabbit *(Lepus capensis)* and partridge *(Alectoris chukar)* are defined as unlucky animals (Arslanoğlu, 2001). Nevertheless, there are some exceptions about partridge and rabbits. In southeast part of Anatolia, owing a partridge provides honor and prestige for owners. There is not a common thinking about accepting rabbit as unlucky. While rabbit was one of the first totems of Turks in Asia, it has become a bad animal by the time for some Turks in Anatolia. According to Öktem, some Anatolian peoples were affected from Christians applying the rule of the Fourth Council. Fourth Council prohibited eating rabbit for Christian people to stop some pagan applications (Öktem, 2002).

Bringing good luck and holiness of pigeon is especially valid for turtledoves *(Streptopelia decaocto)*. It is believed that hunting these birds brings bad luck. Therefore, in big cities, there is possible to see that turtledoves and pigeons are very close to people. There are private nests called as bird place in some old buildings. In most cities of Anatolia, people having a great interest in pigeon and there are pigeon markets to facilitate barter. Besides pigeons, nightingales *(Luscinia spp, Cercotricas galactotes, Erithacus rubecula)* and goldfinches *(Carduelis carduelis)* can also be seen easily to barter in these markets.

Stork *(Ciconia ciconia)* is another bird that Turks feel attracted to it. Storks nest on chimney of high buildings, posts in the middle of cities and people take care so that these nests couldn't be dam-

aged. Also, nests of the swallows *(Delichon urbica)* are allowed to construct into the eaves of the houses. Anatolian people do not permit to damage these nests.

Predator birds have a specific importance with regard to hunting ability and power in Turkish culture. Especially, in East Blacksea region, female sparrow hawks *(Accipiter nisus)* are obtained and trained so that they can hunt other birds. In this region, having a good predator bird means a big prestige. According to written literature, this tradition originates from Ottoman Era (Çanakçıoğlu and Mol, 1996).

3. Cultural Places and Monuments for Nature Conservation

In Anatolia, some places are more important than the others. Mountains are interesting places in that context. According to mythology, Great mother of the Gods, known as Kubaba, Hepat, Kybele, Artimu, Artemis, Rhea in Anatolian civilizations was accepted as mother of the goddess and people. The mother goddess feeds all livings, forgives all sins and all winds and seas are belong to her. Snow covered summits of holy Olympus Mountain were defined by Anatolian people as her thrones (Yavuz, 2002). Turks also accepted the mountains as divine places before their migration from central Asia. In Old Oğuz tribes, each clan or each tribe had a holy mountain and every year they visit there (Arslanoğlu 2001).

Yatır and Türbe words are corresponding a tomb in Turkish. People believe that there was an important and holy person's grave in the Yatır. According to some authorities, Turk's belief in the god of the sky in Central Asia changed as Yatır tradition in Anatolia. Yatırs are usually located on mountains and hills.

Beliefs on Yatır create an opportunity for nature protection by transferring tree cult of old shaman Turks. In Initial Turkish beliefs, single trees, especially beech and black pine, were accepted holy trees (Duymaz, 1993). As a result of these beliefs, if there is a Yatır or Türbe, people do not cut these trees. Similarly, people also do not cut trees that have a specific story. In Anatolia, today, when a single tree or small woodland, different from the others, is seemed, probability of finding a Yatır near it or a story about it is strongly high.

Yatır and other holy places are visited in particular days of a year. One of the most important visiting is Cılbak, which is conducted from many places in Turkey to Sarıkız, Karataş and Baba Hills in Kazdağı National Park (Kudar, 1999). This visit takes place in every year in August and it continues for a week. There are many people joining and celebrating Cılbak visit. These activities prevent forgetting why this place is accepted holy. Therefore, while holy places support protecting trees, forests around, they provide sustaining of cultural values.

In Anatolia, there are also two important celebrations named as Nevruz and Hıdrellez related natural values. While Nevruz is celebrated on 21 of March for spring, Hıdrellez conducted on 6th of May for summer in every year. Hıdrellez is a word derived from Hizir (Hızır) and the prophet Elijah (İlyas). While Hızır is strong person helping people on land and symbolizes hot, İlyas is symbol of seas and symbolize water (Yücel, 2002). In Hıdrellez day, people go to natural areas near spring of water and rural areas to meet nature.

4. Traditional Medicine and Non-wood Forest Products in Anatolia

Non-Wood Forest products (NWFP) have a specific importance concerning their both use and non-use values for nature conservation. NWFP that can be used as a raw material for food, spices,

paint, spell, poison, ornament or medicine may also include option value concerning their potential usage areas.

Cultural diversity and very rich flora indicate that traditional medicine is important in Anatolia (Yeşilada, 2002). In a research project in order that it saves this diversity there were scanned all Turkey and relevant literature so a Data Bank Of Turkish Folk Medicine (TUHIB) was set up. According to this data bank, distribution of the plants used in traditional medicine is shown in Table 1.

Table 1. Overview of data in the Data Bank Of Turkish Folk Medicine (TUHIB) segregated by origin (i.e. plant family, animal, mineral and human) and medicinal and non-medicinal uses (Yeşilada, 2002)

Family name	Total use	Non-medicinal uses	Medicinal uses
Lamiaceae	954	127	827
Rosaceae	914	97	817
Asteraceae	608	90	518
Plantaginaceae	375	4	371
Urticaceae	332	6	326
Pinaceae	275	11	264
Malvaceae	246	19	227
Liliaceae	230	43	187
Cucurbitaceae	226	5	221
Apiaceae	180	87	93
Solanaceae	174	7	167
Caprifoliaceae	164	5	159
Ranunculaceae	162	15	147
Fabaceae	163	50	113
Cupressaceae	155	11	144
Poaceae	132	19	113
Anacardiaceae	123	27	96
Hypericaceae	118	2	116
Plant-originated	7380	874	6506
Animal-originated	129	4	125
Inorganic material	9		9
Human-originated	4		4
TOTAL	**7522**	**878**	**6644**

The number of plant species employed as folk remedy was approximetly estimated about 500. However, through evaluation of the data accumulated in TUHIB, the number of wild/cultivated plant species employed as folk medicine in Turkey is found as 1011. It should be taken into consideration that this number is obtained only from the available scientific studies have been published so far and entered in TUHIB. The rank order list of plants that are employed most frequently in traditional medicine is listed in Table 2. (Yeşilada, 2002).

It is able to be understand that Endemic species in protected areas have an option value or not by examining of traditional knowledge. Likewise, as shown in Table 2., it is known that *Sideritis arguta, Sideritis congesta and Sideritis psidica* are endemic species. For this reason, it is possible that benefiting types from these species may be known only in Anatolian cultures. Therefore, while their characteristics on endemism cause their existing values, traditional uses of them generates a usage value for local people and option values for other people in the world. On the other hand, protection of these plants and traditional knowledge on using types create bequest value for future generations.

Table 2. Rank-order list of plant species according to their citation frequencies for the treatment of any ailment (Yeşilada, 2002)

Genus name	Total uses	Main species
Plantago sp.	371	*lanceolata, major*
Rosa sp.	354	*canina, montana*
Urtica sp.	327	*dioica, urens*
Sideritis sp.	194	*arguta, congesta, libanotica, perfoliata, psidica*
Malva sp.	188	*neglecta, nicaensis, slyvestris*
Ecbalium sp.	176	*elaterium*
Rubus sp.	175	*canascens, discolor, hirtus, sanctus*
Pinus sp.	173	*brutia, nigra, sylvestris*
Teucrium sp.	158	*chamaedrys, polium*
Sambucus sp.	147	*ebulus, nigra*
Juniperus sp.	146	*drupacea, foetidissima, oxycedrus, sabina*
Salvia sp.	145	*fruticosa, tomentosa, triloba, verticillata*
Allium sp.	140	*cepa, sativum*
Thymus sp.	121	*atticus, longicaulis, praecox, pseudopulegioides, zygioides*
Hypericum sp.	118	*atomarium, lydium, olympicum, orientale, perforatum, scabrum, triquetifolium*

Plants in Table 2. are the most demanded plants for medical treatments and other reasons. It is possible to think that these plants may be more destroyed than the others in Anatolia or the world. However, List of Restrictly Protected Species in Bern Convention does not include the species in Table 2. While sub-species of the *Sideritis, Teucrium, Juniperus, Salvia, Thymus* and *Hypericum* can be found in the List, species benefited for traditional purposes cannot be observed in the List. On the other hand, it is known that Sideritis arguta in Table 2. has only LR cd (lower risk, conservation dependent) status concerning classification of IUCN in 1994. *Sideritis congesta* and *Sideritis psidica* in Table 2. are classified as LR nt (Lower risk, near threatened) according to same classification for nature conservation. These results may be indicators of the sensitivity of people on sustainability of species used traditionally.

5. Architecture in Anatolia and Turkish Culture

In Byzantium, although houses included widely stone or bricks, most of the buildings were constructed by using wood. Spreading in tradition of wooden house in Ottomans may be related to influence of Balcanic Culture (Batur, 2002). The basic system of construction in traditional Turkish houses is the timber frame within filling material or and plaster. All these characteristics are the same for all houses, regardless of the societal class of their owner. (Günay, 1998). Nevertheless, it may be considered that this building type is also an inheritance for the periods including thousands years. Indeed, this kind of houses were developed by Anatolian and related other civilizations.

Timber which is the main load-bearing material of the Turkish Houses also defines, its geographic boundaries. The chestnut is the most dependable tree in timber construction along the Black Sea coast. Oak and yellow fir are preferred in western and Northern Anatolia, while in the Mediterranean and up on the Tauros mountains cedars, cypresses and junipers are generally used. Different types of pine were preferred in the interiors. Generally in humid and windy coasts the exterior was cladded with wood while in others it is lime plastered. In forested areas the roof was cladded with wooden slates while in most of the other regions cylindrical clay tiles were used (Günay, 1998).

The main building material in the Turkish house is wood and consequently the building method is generally timber frame. The timber frame construction is preferable because *Anatolia* region is

within the seismic zones. For the same reason the details of wood construction are very simple; simple joints and nailed bindings have been preferred to complicate joint details. The broad sectioned timber elements do not exist in the Turkish house. This construction method also facilitated the reconstruction, within a short time when whole quarters were destroyed instantaneously by fire. (Günay, 1998).

Despite all advantages mentioned in above and secret opportunities, concrete and tenements for houses took place of wooden buildings in last fifty years in Anatolia. Increases in price of wooden materials, migration from rural areas to urban and fashionable trends etc. cause decreasing in the number of wooden residences. But, after the İzmit Earthquake, in 17 August 1999, people reminded that Turkey is in seismic zone. Forty thousands people died in İzmit earthquake and too much concrete houses and tenements were destroyed. After the earthquake, wooden residences became a current issue and alternate for concrete.

According to Sözen, art historian and architect, wooden houses constructed on tableland imply the best way of life adaptable to local snow, cold, rain, tree and fruit, shortly local conditions. Vanishing of these cultural values means that lost of traditional knowledge and masteries produced by local experiences (Sözen, 2002). Therefore, the main problem is not protection of a cultural existence, is to conserve the knowledge hidden in it.

Restoration workings especially in Safranbolu region stimulated attention of the people for traditional Turkish houses and quarters. Another successful restoration workings in some places such as Kastamonu, Muğla, Beypazarı, Taraklı, Göynük, and İbradı also increased attention of Turkish people for the advantages of traditional Turkish houses. This situation should be considered as an opportunity ensured by cultural conservation activities for forests which a resource of materials needed for cultural aims. In other words, cultural conservation generates positive externalities for forest management and nature conservation.

6. Discussion

Social assessment is a subject mentioned often in recent years in forest resources management. It is used to determine the variables in planning environment and to evaluate alternate management regimes concerning social conditions. However, there are some differences between contents of social assessment studies. For example, planners of the ecotourism activities in protected areas prepared different charts or forms on inventories, to determine ecotourism values of planning area. In these studies, cultural values related to planning unit also considered. But, it is understood that planners could take into consideration generally tangible components of culture. However, as explained above, only in Turkish cultural heritage, many intangible elements are hidden and create an opportunity for nature conservation. Whereas, the share of intangible elements of culture that mentioned above is not enough in the inventory or social assessment analysis in present.

In order to discover the opportunities hidden in intangible cultural values for nature conservation, site-specific situation analysis must be realized and expanded from tangible to intangible cultural values. Furthermore, when occupations responsible for nature conservation activities, such as forest engineer, landscape architecture, biologist, ecologist, are investigated, it is understood that they don't have knowledge and experience to expose intangible culture values. Consequently, there should be constituted a team, which helps for discovering together tangible and intangible cultural opportunities for nature protection.

7. Conclusion

When cultural inheritance in Anatolia is investigated, it is seen that there are some opportunities to provide positive supports for wildlife protection. Especially, the sympathy on fallow deer, pigeon, turtledove, goose, stork can be used as a symbol for public awareness in conservation projects. In this way, attention of the people may be attracted on some animals such as wild cat *(Felis silvestris)* and black stork *(Cicinia nigra)* that they have serious problems to survive their life. While management plans are developed for protected areas, entrance gates, simulation places, visitor centers and education tracks are also designed. In this step, to use the species those were exhausted such as Anatolian leopard, lion, tiger is another opportunity to call attention on restrictly-protected species.

However, people having a great interest on breeding of hunter birds, partridge, nightingale, and goldfinch may be accepted as potential human source for voluntary activities and participation opportunity for nature conservation. Especially, breeding of hunter birds was perceived like an illegal activity in Turkish legislation and there were some serious conflicts between official employees and breeders. In today, it can be done taking a "breeder certificate" and this situation is more suitable protection strategy for cultural conditions. At the same time, if these breeders are controlled, it is clear that there is another opportunity to sustain old experiences related to biology of these animals for using in nature protection.

Experts preparing the nature protection plans in present have opportunities by discovering of intangible cultural values using some of them to support protection aims. But, it should not be forgotten that some elements of culture might be a threat for protection aims at the same time. Beliefs on owl, rabbit, partridge and boar in Anatolian culture have negative characteristics, at least for some parts of the people. And these believes are the weakness, or problems and are accepted as targets of the nature conservation projects.

In Anatolia, some local stories increase both value of protected areas and function as a cultural memory. For this reason, visiting such as Cılbak should be included in official activities of agents responsible for nature. Responsible conservation organizations must join effectively to manage to this kind of folkloric activities and support them. These places both protect trees and forest in which theirs around and provide sustainability of culture.

Likewise, Nevruz and Hıdrellez should be entered in timetable of official institutions. In this context, Hıdrellez may be accepted and declared by General Directorate of Nature Protection and Natural Parks as a beginning of the visiting season of protected areas. By celebrating of Hıdrellez officially, Directorate on nature conservation may benefit from these cultural opportunities for its public relations.

Lists of the benefited and protected species prove that there is no relationship between using of NWFP density and sustainability. However, it is known that some species used in mass production and traded densely such as *Orchis spp* are under the risk and vulnerable plants. These examples prove that people connected with nature by using their traditional knowledge are more sensitive than commercial collectors. Therefore, traditional usage of people regarding protected areas should not be restricted; on the contrary this experience should be introduced as an "option value indicator" of other plants.

However, while plant species are protected, traditional type or shape from them also must be recorded and sustained by nature conservationists. Consequently, a protected area not only conserves natural values but also conserves traditional knowledge and intangible cultural heritage. As much as NWFP, there should be saved knowledge related to these products. For this reason, introductory and demonstrative activities that stimulate the traditional knowledge on NWFP should be used in management plans of nature conservation.

As shown in architecture example, achievements in protection projects on pure cultural values are able to create positive approaches or opportunities regarding forests and natural protected areas. For this reason, it should be researched that there are some possibilities of constituting synergy in culture and nature protection issues. In this context, a decision of the Turkish Council of Ministers, numbered with 2512 in 2001 was an experiment to support cultural values by subsidizing with cheap material for restoration projects. Unfortunately, quantity of the timber material used in restoration project by using facility in the decision of 2512 is very low because of price applied for allocation. By determining the timber prices near market, nature conservationists could not start a cooperation opportunity.

8. Acknowledgment

The present work was supported by the Research Fund of Istanbul University.
Project No UDP-722/26042006.

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Learning from traditional knowledge on plants uses: a field investigation in the area of Monte Ortobene (Nuoro, Sardinia)

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Abstract

During the years 2004-2005, an investigation about local traditional uses of plants has been carried out in the area of Mount Ortobene. The collected data were stored in a data-base and are currently being processed. First results show that traditional uses of plants are still widely known within the investigated community.

1. Introduction

Documenting and safeguarding traditional ecological knowledge (TEK) have become a central issue in natural resource planning and management. Traditional knowledge of plants and their uses is the result of natural evolutionary dynamics and technical skills developed through education methods (e. g. telling stories) and experience (both apprenticeship and self-directed learning-while-doing).

In developed countries, the major part of this knowledge has already been lost as a consequence of the "insatiable growth of the modern-industrial world system" (Zent, 1999). Consequently, it is essential to record this fast-disappearing knowledge before it definitively vanishes together with the present generation of elders.

Several researches on this subject have been carried out or are currently in progress in the Department of Plant Biology of the University of Florence, both in developing and in developed countries.

In the island of Sardinia (Italy), people are still very proud of their traditional cultural heritage and a lot of folk uses of plants are still maintained, especially in rural and mountain areas. On this subject, see, among the others, Camarda, 1990; Atzei *et al.*, 1991; Ballero & Fresu, 1991; De Martis Murranca, 1992; Ballero *et al.*, 1997. 1998; Ballero & Poli, 1998; Loi *et al.*, 2002; Palmese *et al.*, 2001; Maxia *et al.*, 2005; and the recent monograph by Atzei, 2003.

2. Methods

This investigation has been carried out at Monte Ortobene near Nuoro (Central Sardinia), during the years 2004-2005. The extension of the investigated area is approximately 40 sq km, the mountain is up to 995 m. high and the prevailing geological substrate is granite. The climate can be referred to the Mediterranean type and vegetation consists mainly of different stages of Mediterranean series (maquis, scrubs, grasslands). Human settlements in this area are documented since 3500 B.C.

Special care was taken in choosing the informants. All of them were native and the source of their knowledge about local uses of plants was only traditional culture. They were interviewed through semi-structured questionnaires. All the plants cited by the informants were collected *in loco* during plants gathering excursions leaded by the informants themselves. Plant specimens were later iden-

tified and dried; they are currently being mounted as herbarium specimens and will be filed into the herbarium FIAF in Florence. All the collected data were recorded in a detailed data-base consisting in a spreadsheet with rows containing the species names and columns containing the information on each species. For each plant, the following general data were recorded: scientific name (species or subspecies); botanical family; local; vernacular name(s); number of informants reporting that use; categories of use; number of different uses; whether the plant is wild or cultivated; local frequency; and habitat. Apart from scientific names and classification, all the data have been recorded exactly as they were referred by the informants.

For each category of use, further information was collected, such as used part(s) of the plant, preparation and detailed explanations of their usage (recipes, etc.). For medicinal plants, also therapeutic action, administration methods and dosages were recorded.

In processing data, some indexes were also used, in order to quantify the diversity of information contained in each species of plant and/or in each informant. They were:

Shannon Index:

$$H' = -\sum_{j=1}^{s} p_j \log p_j$$

Evenness Index:

$$E: H'/\log s$$

In both, s is the number of cited uses, for each plant or for each informant.

3. Results

Data processing is currently in progress, but initial results are of some interest.

The informants were mainly women (82%), and almost all over 60 years old (94%, with 35% over 75 years old). Educational levels varied among informants: 6% had received education at the university level, 35% at the high school level, 6% at the secondary school level, and 53% at the primary school level. Some of the initial results of the investigation are summarized in the Table 1.

Table 1. Summary of initial results

Total number of used species	109
Number of used species per informant	Min. 2 – Max. 83
Total number of known uses	352
Number of known uses per informant	Min. 3 – Max. 136
Shannon Index per informant ($H'=-\sum_{j=1}^{s} p_j \log p_j$)	Min. 0.63 – Max. 4.16
Evenness Index per informant ($E = H'/\log s$)	Min. 0.57 – Max. 0.87

As shown by Shannon Diversity Index values and Evenness Index, the information was not equally distributed among the informants. However, this different level of knowledge proved not to be statistically related to any socio-economic attribute of the informants.

Traditional uses were reported for 109 different *taxa*, belonging to 37 botanical families (Fig.2.). The most represented families resulted to be Compositae (32%) and Rosaceae. Most of the plants are widespread and even synanthropic species, growing mainly in disturbed habitats, such as wastelands, marginal areas, roadsides, field edges and courtyards.

As expected, the most numerous categories of use resulted to be food and medicinal plants, but information was also recorded about other uses, such as: magical-medicinal, domestic, handicraft, ludic (i. e. as toys and pastimes), agricultural, religious-ritual, ornamental.

4. Conclusions

First results of this research show that a high richness and diversity of knowledge on traditional plants uses still survives as a part of the cultural heritage of the studied community. It is of great importance to consider this heritage in a sustainable management approach, with the aim to preserve all the components of environmental diversity.

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'Vayal' – the sacred landscape in the forest of Kerala

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Abstract

This paper discuss on the complex eco-sacred heterogeneous landscape called 'Vayal' (meaning 'agriculture field') by the first people of Kerala, the forest dwelling tribes in the Parambikkulam wild-life sanctuary (area km^2 295.00, date of notification 12 Feb 1973), Palghat district. The 'Sahyadri' forest, the Western Ghats is a hotspot of diverse flora and fauna. Each community in the forest has distinct tribal features and ethnic eco-history. The tribes living in tune with nature have a very strong oral tradition, eco-culture, epistemology and shamanistic performances encoded with a number of concepts for the preservation and enrichment of biodiversity. Their indigenous knowledge systems and culture impart a lot of information about their contributions for keeping the ethno science and fertility ecology; and this forest lore about their primitive landscapes was handed over from generation to generation. Their knowledge about the tuberous roots, medicinal plants, honey, rice varieties, edible plants and of fruits is rich and scientific. As totemism connected with the concept of conservation of bio-diversity was strong, its rituals and customs were automatically transmitted. Animism and anthropomorphism was a strong concept and also a practice; hence they had a devotional feeling towards land, animals, plants and the whole forest landscape. They worshipped trees, animals, hills and rivers; and their myths and songs are indicators of their intuitive knowledge and worldview about nature. Ethnic people have acquired knowledge about their surroundings through hundreds of centuries of experience and observations.

'Vayal 'is the part of the landscape ecology of the forests of Kerala.The main inhabitants in the forest is Kadar, Malayar and Muthuvans of this area.'Vayal' is the open space in the middle of the evergreen forest and usually the wild animals like Spotted deer, Samber deer and Gaur (Indian bison) gather here for grassing, drinking water and using it a resting place. I collected ethno zoological, ethno botanical and environmental knowledge from the tribes on this landscape. Some of the 'Vayals' are very marshy and like Myristica swamp. There are many fresh water swamps in Kerala evergreen forests, there the common trees being, *Myristica magnifica*, *M. malabarica* etc. Myristica swamp is reported by Krishnamurthy (1960) as a rare and threatened habitat from the Western Ghats of southern Kerala. The natives considered this open space as sacred and it is the 'watershed of the forest'. We can study the 'observation method' and the knowledge of wild ecology from the conceptions about this open space of tribes. They have there own world view about the forest ecology. This is part of the ecohistory of the landscape. The water in this space called 'old water', means primitive water and they never touch or misuse this sacred pond or natural tank. They also observe the behavioral system and internal signaling methord and the communication net work of the animals in the forest.

Indigenous knowledge is the sum of all the achievements traditionally attained in every field by the indigenous people in each place. Traditional Environmental Knowledge is a branch of indigenous knowledge systems that latended in the cultural expressions of ethnic communities. Indigenous Knowledge Systems have views different from the conventional modern research practices. Its strategies are totally eco-centric and objective as well as intuitive and they are derived from practical and innovative life of the generations. Their classification systems, identification through the observations, etc are different from modern science. The methodology cannot be defined as a uni-

versal formula for everything and everywhere, but it sprouts from the logic of the local people and specific landscape. The subtle categorization of aspects related to conservation ecology, indigenous agriculture, ethno zoology etc. at micro levels, is done by acquiring knowledge from local people intricately and is supported with the massage of sustainable harvesting of biological resources. The images, motifs and metaphors in the local myths and art forms are imprints of their simple life and primitive landscape. Their songs and myths are the diachronic documentation of eco-history. Performing arts are the visual language of the landscape they live in, and all of them invariably are the register of the biodiversity. These sacred landscape help to retain the alluvial soil and water level of the area providing ecological balance. These swamps are left untouched and protected by forest communities which are the like herbariums of the forest.

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A Blackfoot (Kainai) traditional land use study: preserving and protecting aboriginal traditional knowledge through natural resource education in Alberta

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Abstract

Traditional land use and occupancy studies have been completed in various parts of western and northern Canada during the recent past by local and regional First Nations communities, to assist in the collection and conservation of traditional aboriginal ecological knowledge and culturally significant sites. These studies are costly to complete, and funding issues often represent one of the major challenges to be faced. Through an innovative process of intergovernmental collaboration, the Red Crow Community College, in association with the Blood Tribe (Kainai) in southern Alberta, Canada, recently implemented a significant traditional land use study for their reserve lands and traditional area. By developing a specialized course curriculum and education program targeting local community members, and combining this with local elder traditional knowledge, a community driven project was completed. With adequate financial resources from the First Nations Forestry Program (FNFP) and other national and provincial government funders, a program was developed to include completion of geographic information system (GIS) training and database management. Traditional plants were located, identified, and mapped with local First Nation elder guidance, and recorded using a Global Positioning System (GPS). By integrating the involvement of aboriginal youth trainees, Blood Tribe elders, and modern computer technology, the study facilitated the collection of and provision for the transfer of traditional ecological knowledge for the tribe. The First Nations knowledge collected and mapped during these studies is also proving useful for informing and negotiating with external decision-makers seeking to access to and develop of local resources within the traditional territory. Specifically, the cultural significance of local plants, animals and culturally significant places, e.g., medicinal sites, burial sites, ceremonial sites, and other sites of traditional events or significance are now able to be given full consideration before development proceeds. This process will help ensure conservation by providing a better understanding of and enhancing stewardship of local resources. In summary, the study describes a unique approach to ensuring the conservation and management of traditional knowledge from a Canadian aboriginal perspective. Though collaboration, a community-based knowledge collection and preservation model is described, which will be of interest to other aboriginal and non-aboriginal communities throughout Canada and internationally. This approach will also describe how historic and culturally significant information, essential for meaningful participation by aboriginal groups in resource management can be recorded and utilized.

Theme 8.
PLANNING AND MONITORING FOR CONSERVATION

Multitemporal forest spatial patterns analysis in the framework of sustainable forest management

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Abstract

Quantitative methods that link spatial patterns and ecological processes at broad spatial and temporal scales are needed both in basic ecological research and in applied environmental problems. Ecological processes such as plant succession, biodiversity, foraging patterns, predator-prey interactions, dispersal, nutrient dynamics and the spread of disturbance all have important spatial components. New methods to analyse and interpret landscape have been developed in the past decades thanks to the growing diffusion of Geographic Information System technology and the increasing offer of remotely sensed data. Landscape ecology methods emphasize large areas and the ecological effects of the spatial patterning of ecosystems. Specially they consider (1) the development and dynamics of spatial heterogeneity, (2) interactions and exchanges across heterogeneous landscapes, (3) the influences of spatial heterogeneity on biotic and abiotic processes, (4) the management of spatial heterogeneity. Since the mid of the 80's landscape ecology is increasingly dealing with spatial analysis of ecosystems. The ability to quantify landscape structure is a prerequisite to the study of landscape function and change. Therefore, much emphasis has been put on developing methods to quantify landscape structure. Landscape ecology is frequently specifically linked to the study of the spatial and temporal characteristics of natural and semi-natural environments, even if important applications are also linked to other environments (for example in urban and agricultural areas). In this area the conjunctions between forest monitoring and landscape ecology have a growing interest, especially in order to achieve the result of fulfilling such a source of information in traditional forest management approaches. Within such a framework a number of studies are now dealing the relationships between forest spatial patterning and forest functions.

Sustainable Forest Management (SFM) represents a vision for the use of forests based on satisfying ecological, economic and social values. The international and national policy arenas, the forest sector, non-governmental organisations and scientists are the major actors trying to develop and interpret international and national policies on sustainable development in forests. In Europe the Ministerial Conference for the Protection of Forests in Europe (MCPFE) has derived a complete set of indicators defining different SFM criteria at the policy level, including biodiversity and forest health. Landscapes are not constant. The variation among different European regions in the trajectories of the development towards the SFM vision is a reflection of this. Because most of Europe's landscapes have an origin as forests or wooded grasslands, forests and forestry must be seen in a landscape perspective. Spatial indicators are then required for the policy implementation process. Following the review of policy instruments related to Biodiversity and Nature protection and their respective objectives, identified available European sets of indicators. Regarding specific forestry related indicators the "Improved Pan-European indicators for Sustainable Forest management" comprises a set of six criteria and 35 quantitative indicators. The keys factors as potential indicators of European forest biodiversity project BEAR of the 5th EU RTD that characterize the forest ecosystem according to the major ecosystem attributes (structural, compositional and functional) and scale (national/regional, landscape, stand). Indicators for Biodiversity and Nature protection, reference to the European Core Set of the European Environmental Agency, for reporting and policy-making on several thematic environmental topics has been made, particularly on

sets on biodiversity and terrestrial environments. In more detail some of the most relevant already operative indicators directly related to the landscape dimension of forests are: in MCPFE indicators 1.1 (Forest area and changes) and 4.7 (Landscape pattern); in the BEAR factors "forest area with respect to forest left to free development" and "History of landscape use"; from the EEA the indicators "Landscape changes" (BDIV 06) and "Landscape-level spatial pattern of forest cover" (BDIV 06A).

It is now clear that forest spatial pattern is one of the main source of information to correctly support sustainable forest management choices. The relationship between forest spatial patterning (and its relationship with the scale of analysis and the changes over the time) and forest functions have to be anyway clarified and investigated with more detail. In the present paper several methods for quantifying forest spatial structure are presented in a set of test areas where multitemporal forest maps have been carried out. For each forest map, for each test area and for each date of analysis a complete group of spatial pattern indicators have been tested both at landscape and patch level with the extensive use of moving windows filters in a GIS environment. The final aim of the work is to provide an evaluation of different techniques for the quantitative evaluation of changes in forest spatial pattern, enhancing information contribution and redundancies between indicators related, for example, to: fragmentation, landscape diversity, cohesion, contagion, core areas and patch shapes. Results are presented and discussed in order to support the future operative use of multitemporal forest maps for spatial pattern analysis providing useful information for the derivation of indicators to support SFM as required in most relevant international frameworks at pan-European level (such as MCPFE and EEA).

A methodology to integrate SFM standards on forest cultural heritage into meso-scale forest planning: preliminary results of the Ri.Selv.Italia 4.2 research project

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Abstract

Nowadays, the role of traditional cultures and local knowledge for maintaining forest landscapes values is recognised by different sets of standards for Sustainable Forest Management (SFM), such for example those developed at international level by the Forest Stewardship Council (FSC) or those defined within the framework of the Ministerial Conferences on the Protection of Forest in Europe, which are now the basis for the Programme for Endorsement of Forest Certification schemes (PEFC). A national research project named Ri.Selv.Italia – task 4.2, launched in 2001 and with more than 30 among scientists, experts and public forest officials taking part in, is developing a methodology to integrate such SFM standards into meso-scale forest management planning. In addition, considering that public participation is a key-element to identify traditional knowledge, social values of local forest landscapes and ecosystems, and their most appropriate management systems, the project is dealing with participatory approaches too. The paper includes four parts. In the first one, some key concepts to understand the Italian forest planning context and examples of sets of SFM standards which include forest cultural heritage and related themes are reported. In the second part, the Ri.Selv.Italia 4.2 research project and the (draft) methodological approaches proposed by the research group are presented, focusing on forest cultural heritage and landscapes. Preliminary results and expected outputs are described into the third part of the paper. Final considerations and recommendations are included in the fourth and last part.

Keywords: meso-scale forest management planning, SFM standards, participatory approaches, Italy.

1. Introduction

The adoption of SFM standards as forest resources management guidelines or as forest management certification requirements is becoming more and more familiar within the forestry sector world-wide. The role of traditional cultures and local knowledge for maintaining forest landscapes values is recognised by different sets of such standards (Principles, Criteria and Indicators) for Sustainable Forest Management (SFM). According to the SFM standards developed at international level by the Forest Stewardship Council (FSC), for example, sites of special cultural, ecological, economic or religious significance to indigenous peoples or local communities have to be clearly identified and protected by forest managers; indigenous peoples have to be compensated for the application of their traditional knowledge regarding the use of forest species or management systems in forest operations. Similar requirements are included in other sets of SFM standards, such as those developed at the level of forest management unit within the framework of the Ministerial Conferences on the Protection of Forest in Europe, which are now the basis for the Programme for Endorsement of Forest Certification schemes (PEFC).

At the same time, the adoption of participatory approaches is increasing within the forestry sector, following progresses in decision-making processes for environment protection and management. Regarding this, it is worthwhile to mention that local communities participation and stakeholders consultation are key-elements to properly identify traditional knowledge, social values of local forest landscapes and ecosystems, as well as the most appropriate management systems for protecting/improving them.

A research project named Ri.Selv.Italia – task 4.2. is developing a methodology to integrate selected SFM standards and participatory approaches into meso-scale forest management planning. A brief description of some key concepts to understand the Italian forest planning context, included the meso-scale planning concept, and examples of sets of SFM standards which refer to forest cultural heritage and related themes are reported in this first part of the paper. In the second part, the research project and the (draft) methodological approaches proposed by the national research group are described. In the third part, the main preliminary results and expected outputs are described.

1.1. Key concepts to understand forest planning in Italy

Making reference to the National Forest Inventory (actually in progress), forests in Italy extend over 10,673,589 ha, corresponding to 35.4% of the total land area. In order to fully understand the Italian forest planning context, it is worthwhile to briefly describe hereafter some key features (Pettenella et al., 2005).

First of all, potential vegetation of Italy envisages forest distribution from coastal and plain zones up to the higher elevations, mainly because of the climate heterogeneity of the country. Various forest environments are distributed over the different Italian regions. Not only the Italian flora includes more than 5,800 species (5,300 herbaceous and 500 woody) (in the all Europe there are in total 7,500 species), but 5 main forests types[1] are spread along the peninsula and approximately 150 forest typologies are officially defined at national level.

Moreover, plain mesic deciduous forests, in the past abundant in the northern river valleys (i.e. the Po Valley, from Turin to Venice), have been cleared a long time ago and replaced by agriculture, industry and heavy urban settlements. Most of the wooded areas (about 95%) are therefore left on hills and mountain regions, which often represent the less developed areas. In such areas, where industry is not developed or very limited, agriculture and forestry are poor economic activities: income of local population is often based on tourism and quality farm products, while timber and fuelwood productions have a minor role.

Italian forests are often multi-functional forests. Soil-erosion control and water cycle regulation are very important goals in Italian forest management due to the very irregular morphological features of the country and the importance of water resources. It is also important to keep in mind that people's demand for recreational uses, as well as itsconsciousness of the ecological role of forests for biodiversity conservation, are very strong today. Among others, forests' functions like recreational, tourism and educational uses are strictly connected with landscapes protection, cultural heritage and local tradition conservation. Often, incomes from mushrooms, chestnuts, truffles, and other NWFPs but also from tourism and recreational services (e.g. concerts in forests with famous national and international artists in July and August in Trentino region) are often much higher than those from timber production (Pettenella et al., in press). Nevertheless, the economic value of these kind of forests services is rarely recognised by the market.

[1] Italian forests, according to the syntaxonomical classification system, can be grouped within the following main types: Mediterranean evergreen forest *(Quercetea ilicis)*; Mixed oak woods and other mesic forests *(Querco-Fagetea, Alnetea glutinosae, Salicetea purpureae)*; Montane beech woods *(Querco-Fagetea)*; Alps and Apennines pine woods *(Erico-Pinetea, Junipero-Pinetea)*; Boreal coniferous forests *(Vaccinio-Piceetea)*.

Especially in the last years, a decreasing active forest management can be recorded in the country. A part from the general trend of abandonment of mountain rural areas, this is due to some structural weaknesses of the Italian forest sector: high fragmentation and very limited dimensions of forest ownerships (60% are private forests, with an average area of about 3.2 ha/holding; 40% are public forests, mainly owned by municipalities and communities); environmental and land management policies based on strong "command and control" instruments, without any forma of compensation for the protection against soil erosion, forest fires, environment degradation, etc.; very limited dimensions and scarce organisational structure of logging companies and sawmills, if compared with non-domestic competitors; reduced competitiveness of local supply in the framework of the international timber market (internationalisation and concentration of wood working industries, low prices for low quality wood products, etc.); still limited development of new markets for public environmental and social services deriving from forests management.

As a consequence of the abandonment process, there is a clear forest cover expansion: about 2-3 millions hectares are actually under natural conversion to forests, on a total amount of about 10 millions of hectares of wooded lands. This phenomenon leads to some positive impacts (increased stock, biodiversity conservation, carbon sequestration), but also to negative ones, especially in Mediterranean areas: risks of fires, un-controlled grazing, homogeneous landscape and habitat, loss of cultural heritage, loss of employment opportunities, etc.

Finally, decentralisation of the administrative power in the agro-forestry sector has to be mentioned. Exclusive competencies in the forest sector have been transferred to the Regional and Local authorities. As a consequence of a federal administrative structure, in Italy there are 21 regional forest policies, but not a National Forest Plan, while the State still maintains a national forest service (*Corpo Forestale dello Stato*). This situation has led to many different models of institutional arrangements for forest policies implementation at local (regional) level throughout the country.

In this context it has been considered of high relevance to agree among the representatives of various regional forests administration with the support of a group of researchers[2] a common methodological frame for a meso-scale forest plan (*Piano Forestale di Indirizzo Territoriale* – PFIT). This planning instrument is intended to have an intermediate role between forest-management-unit-level plans and regional forest plans. PFIT should address long-term forest management issues, with special attention to land and environmental aspects (such as landscapes, biodiversity, etc.) that cannot be properly considered by referring to a single forest management unit (i.e. single forest ownership). In other word, it should refer to an area which includes several land ownerships, presumably both public and private (e.g. a watershed, a valley, a park, …).

Moreover, PFIT should be designed taking into account also specific management objectives and targets expressed by local actors and institutions, even those only marginally involved in forest related activities (tourism, recreation, watershed management, pasture, renewable energy resources, etc.). In such a perspective, it is expected to be a useful tool for collecting information on a certain territory and for better coordinating all local actors.

1.2. SFM standards on forest cultural heritage

By means of specific Criteria and Indicators (C&I), the SFM standards are reference documents that regulate a large range of forest management, forest planning and monitoring aspects, taking

[2] F.Ferretti is the scientific responsible person for the "Ri.Selv.Italia 4.2 – *Information Systems to Support Forest Management*" Research S.Agnoloni, I.De Meo and P.Cantiani are member of the working group coordinating the research at national level. D.Pettenella and L.Secco are the scientific responsible persons for the project's section 4.2.10 – *Criteria and Indicators for SFM*.

into consideration environmental, social and economic dimensions (e.g. biodiversity conservation, property rights, forest workers health and safe, environmental impacts of harvesting operations, multi-functionality of forests, forest plantations, etc.). As the SFM is a concept based on values that inevitably differ throughout the world's forests and forest management systems, SFM standards differ by regions or countries (Rametsteiner, 2000). In addition, SFM standards differ according to: application level (global, regional or local, forest management unit); predominant approach (performance-based or system-based); main goals (monitoring of forest resources trends towards SFM or forest management certification); groups of interest which have developed the standards (governmental or non-governmental initiatives).

As a consequence, existing SFM standards world-wide are various and numerous (Lammerts van Bueren and Blom, 1997; Rametsteiner, 2000). Among those developed at international/regional and governmental level can be mentioned: the ITTO[3] C&I for tropical forests, the ATO Principles and Criteria for Central/South Africa, the FAO/UNEP lists of criteria and indicators for other African regions, the Tarapoto, Lapaterique and Montreal lists of criteria and indicators respectively for South and Central America, and for temperate/boreal forests outside Europe, the MCPFE Criteria and Indicators for European forests. Among the standards developed by non-governamental initiatives at international level can be mentioned: the FSC Principles and Criteria which are the basis for the FSC forest certification scheme; the PEFC Criteria and Indicators (developed in the framework of the MCPFE standards) which are the basis for the PEFC forest certification programme. National standards have been developed by governments in several countries, e.g. Canada, Norway, Malaysia, Brasil, Denmark, Ghana, etc. Most of them have been recognised under the PEFC umbrella. SFM standards have been defined also by research institutes like CIFOR or the Tropenbos Foundation.

The paper refers only to those standards more strictly regulating aspects of forest management related to the protection and improvement of forest landscapes and ecosystems, cultural heritage and traditional knowledge. Some examples of such kind of rules are reported in the following, not exhaustive list (in bracket, the specific standard which they source from is mentioned):

- Sites of special cultural, ecological, economic or religious significance to indigenous peoples or local communities have to be clearly identified and protected by forest managers (FSC P2, PEFC 6.5).
- Indigenous peoples have to be compensated for the application of their traditional knowledge regarding the use of forest species or management systems in forest operations (FSC P3, P5).
- The relationship between forest maintenance and human culture is acknowledged as important (CIFOR C.5.3): i. Forest managers can explain links between relevant human cultures and the local forest; ii. Forest management plans reflect care in handling human cultural issues.
- Where the landscape is under protection for well recognised high conservation values (on the basis of local authorities documentation), the forest landscape's historical structure is maintained at least over 30% of the area (SAM – AAT 7 – AT 1.1).
- Research and educational programmes oriented to local cultural heritage and traditional knowledge conservation are established and carried out (SAM – AAT 7 – AT 2.1).

[3] The acronyms reported in the paper are: ITTO: International Tropical Timber Organization; ATO: African Timber Organisation; FAO/UNEP: Food and Agriculture Organisation/United Nations Environment Programme; MCPFE: Ministerial Conference on the Protection of Forests in Europe; FSC: Forest Stewardship Council; PEFC: Programme for Endorsement of Forest Certification schemes; CIFOR: Centre for International Forestry Research.

2. Methods

The national research project named Ri.Selv.Italia, financed by the Italian Agricultural and Forestry Department of the Government, was launched in 2001. The task 4.2 – Information Systems to Support Forest Management is led by CRA-ISS *(Consiglio per la Ricerca e Sperimentazione in Agricoltura – Istituto Sperimentale per la Selvicoltura)* and specifically deals with forest planning. One of the main goals of this task is to create a common method for developing meso-scale forest plans to be used all over the different Italian regions.

More than 30 among scientists, experts, forest managers, technicians and public forest officials (belonging to Regional Forest Services) are taking part in the project. With a positive cooperation attitude, the participants are periodically meeting at the national working group plenary sessions, which are scheduled every 2 months, in order to discuss details on a meso-scale forest plan minimum contents, on practical problems and limitations in implementing the planning method, etc. Restricted sessions, where single topics (e.g. social-economical aspects of forest planning, intersectoral coordination among forest planning and urban planning, etc.) are discussed and addressed by sub-working groups, are also carried out.

An important part of the project is led in collaboration with Dept. TeSAF of the University of Padova, with the objective to incorporate Criteria and Indicators of SFM into meso-scale forest management planning. In other words, the forest management plans based in the future on this method will take into account all data and information needed to demonstrate that forest management practices effectively comply with selected SFM Criteria and Indicators. Another objective, at the same scale, is to integrate participatory approaches into forest planning.

As regard the first objective, different sets of SMF C&I have been analysed in order to select those which properly can fit into a meso-scale forest management plan in the framework of the Italian forestry context. The selected standards are the following: a) the FSC Principles and Criteria developed at international level, adapted for the Italian alpine regions; b) the PEFC Criteria and Guidelines developed in the framework of the MCPFE and adapted at national level; c) the standards developed at national level by ANPA, the former APAT *(Agenzia nazionale per la Protezione dell'Ambiente e per i Servizi Tecnici)*, as a basis for monitoring the Italian forest resources and their developments towards sustainable management; and d) the SAM *(Standard Appenninici e Mediterranei)* developed at national level by the initiative launched by *Accademia Italiana di Scienze Forestali*. All this standards' requirements (indicators) have been analysed, partly simplified and included, when appropriate, into the modules for field surveys and/or other scale-specific studies which are needed for meso-scale forest planning. The modules have been developed on the basis of those defined for local-scale forest management plans by *ProgettoBosco* research project (Bianchi *et al.*, 2006).

As regard the second objective, questionnaires have been developed for local stakeholders interviewing and actively involving into the planning process from the very beginning (Cantiani, 2006). Among the toolkits that are going to be developed by the project, the first one is the definition of a "methodological framework" (that means a procedurally well-defined participation process) with basic operating rules, minimum contents and specific rules for public communication (Secco and Pettenella, in press).

The method is actually being tested in field in 4 pilot areas in Italy: in the area of the *Comunità Montana Collina Materana*, in Basilicata region, in the South; in two areas *(Comunità Montana Alto Molise* and *Comunità Montana Trigno-Medio Biferno)* in Molise region, the first one with an high forest vocation, and the second one with relevant farming activities and soil conservation and slopes stability harms; in the area of municipality of Seneghe, in Sardinia region. These areas have been

selected on the basis of 2 main criteria: (i) proper geographical, vegetation and socioeconomic characteristics; and (ii) a specific interest expressed by local forest public authorities to implement and test a meso-scale forest plan.

3. Results and Discussion

At the moment, only preliminary results are available and a draft methodology has been developed, as the project is expected to be finalized by the end of 2006 – mid 2007.

As mentioned, modules used in field surveys have been integrated for gathering basic data and information on all the selected SFM standards requirements. Some of these requirements refer to local landscapes features, traditional forest knowledge, uses and management practices, cultural and social values related to forests.

Examples of how the attributes related to these aspects have been included in the modules can be seen in Figure 1[4] . They refer to the micro-habitats and forest landscape esthetic elements attributes as surveyed in the field by adopting a forest inventory approach.

By means of direct interviews to local population/stakeholders, carried out within the framework of the public participation approach, information on local forest landscape's most appreciated characteristics, special places and their location, social values, etc. have been collected. Examples of how the questionnaire is organized can be seen in Figure 2.

In addition, *ad hoc* direct surveys for evaluating tourist-recreational demand/supply have been carried out by means of a systematic survey of accesses for recreational activities; questionnaires to a sample of tourists/visitors; direct interviews to public officials, hotels & restaurants associations, cooperatives of operators supplying tourist and recreational services. *Ad hoc* surveys have also been carried out for zoning the area on maps and for creating itineraries/routes about historical elements (rural houses, mills, furnaces, etc), cultural elements (museums, mansion houses, etc), religious elements (chapels, cloisters, churches, etc), naturalistic elements (springs, caves, etc), scenic elements (viewpoints, panoramic roads, etc), wine and gastronomy elements (local food, typical dishes, etc) and others.

The practical and widespread implementation of the method in Italy shall provide:

- Common, minimum core set of data on forest resources over different Italian regions, which is not fully achievable at the moment because of the mentioned 21 different "regional" forest policies. Such a core set of data shall be a preliminary condition for comparing diverse forests conditions and for (possible) coordination among local authorities.
- Better coordination/integration of forest plans with other planning instruments, such as urban planning, landscape management planning, transport network planning, economic development plans (e.g. Rural Development Programmes).
- A wider use of forest management plans (also over small private forest ownerships).

[4] Please note that the extract from the modules for field surveys (Figure 1.) as well as the extract from the questionnaire (Figure 2.) reported in the present paper must be considered drafts still under development: they have to be submitted to the final discussion of the national working group before being finally approved. At the moment, they are being tested in field and changes are possible on the basis of tests results and of internal discussions.

Figure 1. Micro-habitats and forest landscape esthetic elements attributes extracted from the draft module for forests' field survey

Bozza in fase di sviluppo riservata al gruppo di lavoro Ri.Selv.Italia 4.2

SCHEDA DI DESCRIZIONE DELL'AREA DI RILIEVO **BOSHI**

MICROHABITAT ☐ Assenza di microhabitat

Microhabitat estesi	**Specificazioni**	**Microhabitat a carattere lineare o puntiforme**	**n°**
☐ Radure		☐ Muretti a secco	
☐ Acque superficiali		☐ Macere	
☐ Zone umide		☐ Sorgenti, risorgive	
☐ Ghiaioni, macereti		☐ Alberi con cavità naturali	
☐ Strutture abbandonate		☐ Tane, grotte, ripari naturali evidenti	
☐ Elementi geomorfologici rilevanti		☐ Alberi morti in piedi > 20 cm	
☐ Altro		☐ Alberi morti in terra > 20 cm	
		☐ Altro _____	

PECULIARITA' ECOLOGICHE-ESTETICHE

	Specificazioni
☐ Piante con caratteristiche di monumentalità	
☐ Alberi di particolare pregio estetico (fioritura vistosa, cambiamenti cromatici)	
☐ Abbondanza di epifite, licheni, muschi ricoprenti fusti e rami	
☐ Piante isolate con rami prostrati	
☐ Zona di nidificazione avifauna	
☐ Elementi geomorfologici rilevanti	
☐ Altre peculiarità	

Figure 2. Examples of survey on relationships between local stakeholders and their own lands extracted from the draft public participation questionnaire

Bozza in fase di sviluppo riservata al gruppo di lavoro Ri.Selv.Italia 4.2

MODULO PARTECIPAZIONE – Interviste

L-IL PAESAGGIO E IL LEGAME CON IL TERRITORIO (stetica e valore)

- Si sente legato al suo territorio?
- A lei piace il paesaggio del suo comune? **SI** **NO**
- Qual è la caratteristica che le piace di più? (zone agricole, pascoli, boschi, paesi, plternanza pascoli e boschi, ...)
- Secondo lei, il paesaggio è apprezzato da chi non è del posto? **SI** **NO**
- È migliorabile?
- Può indicarmi nella carta un luogo dalle caratteristiche paesaggistiche particolarmente attraenti per lei?
- Ritiene che sia un compito degli enti pendersi cura del passagio? **SI** **NO**
- Cosa potrebbero fare gli enti per prendersi cura del paesaggio?
- E la popolazione locale cosa può fare per contribuire a mantenere un bel paesaggio?
- Ci sono dei luoghi per lei molto significativi e tipici? (a cui si sente legato, es. luogo di cerimonie, feste ...)
- In quali luoghi porterebbe un suo ospite? Perchè? (segnare sulla carta con "ospite")
- In generale, che importanza da'al paesaggio che la circonda?
  Alta, media, scarsa .....
- Perchè? (E'bello, mon è bello, non è più bello come una volta, ha un valore affettivo, lo vedo come una fonte di guadagno per me, per la comunità, ...)

4. Conclusions and recommendations

Landscape management is a complex issue which needs a multi-disciplinary approach. The methodological proposal presented in this paper is aimed at providing a tool for landscape planning at meso-scale level based on a reasonable compromise between data collection costs, stakeholders' information and consultation, practicability of the method and quality of results. By sure other approaches, based on more detailed field analysis and on dynamic simulations of different land use alternatives, could lead to more detail results in understanding and planning landscapes structures.

In setting down the methodological approach special attention has been given to the aspects connected with the method's feasibility, e.g. implementation costs. A detailed analysis of the costs connected with the method implementation will be part of the final step of the research programme[5] . Additional costs related to new forest planning attributes (i.e. those related to more detailed landscape aspects) and to a larger involvement of stakeholders in the planning process will be evaluated. Local community participation and stakeholders consultation are crucial to identify traditional knowledge, social values of local forest landscapes and ecosystems, as well as the most appropriate management systems for protecting/improving them.

Finally it is possible that in the future, through field tests made by the research team and the practical implementation of the methodology by practitioners, a more balanced condition among traditional forest indicators on stocks, increments, removal potential and "new" indicators connected with non-wood production functions will be reached.

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Analisi e valutazione degli indicatori per la caratterizzazione del paesaggio su scala locale nell'Umbria centro meridionale

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Abstract

Il lavoro si è posto l'obiettivo di individuare una serie di indicatori per misurare la qualità dello stato attuale del paesaggio e le sue potenziali trasformazione nell'ambito di un contesto territoriale prevalentemente rurale nell'area centro meridionale dell'Umbria dove la componente agroforestale risultava dominante nella caratterizzazione del paesaggio. Dopo la caratterizzazione del territorio di studio e le analisi delle diverse componenti del paesaggio attraverso la documentazione cartografica, fotografica ed ortofotografica, sono stati definiti degli indicatori di identità, di qualità e di trasformazione nonché parametri oggettivi per la costruzione di un modello trasferibile per la valutazione e certificazione dell'identità e della qualità paesaggistica. Il secondo obiettivo è stato quello di porre in relazione l'identità paesaggistica con le attività economiche e le produzioni tipiche del territorio interessato, analizzando le relazioni, le dinamiche storiche ed il grado di rappresentatività della/e produzione nella caratterizzazione del paesaggio esaminato. Il terzo obiettivo è stato quello di porre in evidenza la caratterizzazione della/e identità paesaggistica/che del territorio analizzato con gli interventi di trasformazione avvenuti in ambito rurale negli ultimi 5 anni ed il loro grado di correlazione con le identità paesaggistiche evidenziate. I risultati hanno posto in evidenza alcuni indicatori in grado definire le identità paesaggistiche territoriali, la loro qualità nonché indicatori che consentono di valutare la trasformazione e la loro compatibilità con il paesaggio di competenza. Tali indicatori sono trasferibili e possono rappresentare un utile strumento per la certificazione dell'identità dei paesaggi e degli interventi di trasformazione potenzialmente possibili (certificazione in fase progettuale). La relazione tra contesto paesaggistico e prodotto tipico è abbastanza rilevante ma allo stato non ne rappresenta un elemento di valorizzazione ed appunto nel caso di studio, gli interventi di trasformazione eseguiti negli ultimi 5 anni non sono in relazione con le identità paesaggistiche individuate sia per funzione, per contesto e per forma.

Theme 9. CULTURE AND TRADITIONAL KNOWLEDGE

The production of pitch in Calabria in the 18th century

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Abstract

From ancient times until today, certain coniferous trees of the forests of Calabria have provided resinous substances which, when suitably treated, have been use for a variety of purposes, from the food sector to shipbuilding. One of the results of the growing human pressures on forests and the progressive shrinking of wooded areas, is the impoverishment of specialist production of such non-timber products which has often been particularly valued for their quality. In the course of the 18th century the resin-producing sector appeared to be in a clear state of crisis and was no longer able to contribute significantly to the growing requirements of the navy of the Kingdom of Naples, which was expanding rapidly in the last decades of the century. The deteriorating condition of the forests of the Calabrian Sila, a vast Crown property over which the monarchy claimed wide-reaching rights (including those of ownership of the trees and the production of pitch), was a subject of repeated concern to the Neapolitan reformist movement. It is, however, the judge of the *Vicaria* Giuseppe Zurlo who, at the end of the century, provides us with the most detailed analysis of the extent and topography of the Sila area, of the conflict between the different interests involved (the Crown, private individuals and the community), and of the centuries-old production techniques employed locally in the treatment of resinous trees.

1. Introduction

As is perhaps true for many, also for me the word "pitch" for a long time represented something dark, contaminated and even dangerous. In part this negative meaning originated in the family. How often parents exclaim to their children expressions such as: "How do you always manage to get as black as pitch". Or: "Stop it, or I'll hit you until you're as black as pitch". In both cases, if they were dictated by desperation or assumed threatening tones, it was clear from these expressions that pitch promised nothing good: it was black, dirty and dangerous. It was better never to have anything to do with it, above all after the terrorizing form which it inevitably assumed when we came across it in the course of our studies at school. Pitch was the "thick black tar" that boiled in the fifth pit of Dante's Inferno in which swindlers, rogues and cheats of every kind were forced to remain completely submerged and suffered eternal torment.

And yet, in the course of an excursion in the mountains between Africo, in the heart of the Aspromonte, the visit to a small and dilapidated church forced me to radically modify my sense of aversion for pitch. The church was dedicated to St. Leo, and I had never seen such a strange statue: the saint held pitch (in the form of a sphere) in his left hand and an axe in his right. The statue was dated 1635, but the cult had probably flourished as early as Byzantine times: St Leo was a "pitchman", that is he worked pitch, and the axe served to cut into the trees from which it could be obtained; from the mountains of Calabria he went to Messina in Sicily, where he sold the pitch so as to help the poor.

Figure 1.
Church of St. Leo
(Africo mountains),
statue of the Saint. F. Bagalà

In this way pitch passed from the Dante's terrifying infernal depths to the hands of an Italo-Greek saint and, in relieving poverty, served the common good. What a fascinating transformation! From further study of the history of the region I learned how close was the relationship of Calabria with the production of pitch, and how pitch was not always only "black", but might even be "white" as well. From the Bretti peoples to the Greeks and Romans, the great Calabrian forest, which with the name"*Silva Brutia*", in ancient times, indicated a geographical *continuum* – from Mount Pollino to the present-day Sila and, across the Serre as far as the Aspromonte – had always provided excellent wood for construction and a sought after quality of pitch. This was so highly prized as to represent a kind of trade-mark, almost a DOC *ante litteram*, if it is true that the mark on a fragment found in excavations at Pompei in the 1980s indicates a specific content (*Pix Bruttia*, pitch from Bruzio) and perhaps a particular special form of amphora (De Caro,1985). All the classical sources (Cicero, Dionigi, Strabone, Virgil and Pliny) agree in celebrating this important local production, which continued, even though as a minor activity, until the present day.

2. Traditional management of resin-yielding trees and forests in Calabria

In addition to the many ways in which their wood is used, various conifers (including the scotch pine, cluster pine, larch, Aleppo pine and spruce fir) have always been tapped for resin to obtain substances of use in shipbuilding, medicine, veterinary medicine, and in the sectors of food, typography and art. Many trees of this species grow in the south of Italy, but in Calabria over a long period of time that commonly known as "*zappino*" assumed a particular economic importance both for the utilization of the wood and the production of resin[1] .

An effective description of the techniques employed for this purpose in the Sila is that which Giuseppe Zurlo gives in his "Official Report" of 1792, without neglecting some aspects of the productive process (Zurlo, 1852)[2] . At the end of the 18th century the Crown which had already for many centuries enjoyed prerogatives on the ownership of the trees of the Sila and held the monopoly on the production of pitch *(jus picis)*, contracted out this right to an individual on the payment of rent. The contractor, in turn, contacted a certain number of "*partitari*" (sub-contractors) who undertook to carry out the necessary work for five or six years, with the commitment to deliver a specific quantity of the product every year in return for the corresponding amount of money (Zurlo, 1852, 58-59. Table 1.).

Table 1. Products delivered to the contractor every year by the "partitari" of pitch (18th century)

Years	Turpentine (cantara)	White pitch (barili)	Black pitch (barili)
I	15	700/800	
II	12	1000	
III			1000
IV			1000
V			700/800

Source: Zurlo, 1852. 58-59.

[1] Although here we are speaking of the pinus laricio, the name *zappino* or according to G. Rohlfs, (Rohlfs, 1982) indicated different species of pine and fir. For Zurlo (Zurlo, 1852) the fundamental distinction remains that between "red pines", producing resin and employed in the making of pitch, and "white pines" unsuitable for this purpose. The whole argument is more fully dealt with in Gangemi, 1989 and bibliography ivi cit.

[2] While for an analytical description of the whole area cfr. (Zurlo, 1862-1867), see (Ostuni, 2004) for the most recent transcription of the Report to the Minister Acton, together with that edited in the 1780s by the Presidi of the province of Calabria Citra (Cosenza), G. Danero and V. Dentice.

In selecting the forests, the "*partitari*" not only took into account the good quality of the trees and their favourable exposition to the sun, but they sought as far as possible to obtain those nearest to the villages of the areas of Cosenza and S. Giovanni in Fiore and the homes of the workers who, as in previous generations, still used the experience, knowledge and techniques they had inherited to extract the pitch (Placanica, 1985).

The first work should have begun in October but rarely did so before April. On the trunk of every tree, on the side facing the sun and about two "*palmi*"[3] from the ground, a notch was cut to collect the the resin (Zurlo, 1852). This first operation, known as "*intaccatura*" (notching), was followed after at least forty days, by another phase to "*rinfrescare*" the trees: having removed the bark, incisions were progressively made in small portions of the trunk above the notch, forming grooves that guided the resin towards the cavity, while that which had already deposited was removed. The trunk was barked up to four *palmi* above the notch within the first year, and up to 6 or 7 *palmi* within the second year. This work continued all summer, according to a precise rotation. The workers divided the forest into three sections; every day they worked to *rinfrescare* the trees in one of these sections, each of which was subdivided into three "*mangiate*" (meals), so-called because the workers ate after finishing work on the trees there. At the end of the third day they returned to the section they had worked first, and in this way they continued for the three or four months of summer. For two years they usually collected the resin, which was then refined by heating in the so-called "*caccavi*" (cauldrons) so as to obtain turpentine and white pitch.

From the third until the fifth, but sometimes even the sixth year they continued to produce black pitch[4] . To obtain this product it was necessary to "*stellare*" the trees already involved in the previous operations. A "*stella*" is the piece of the trunk which is obtained by cutting ever more deeply with an axe the part previously *rinfrescato* reaching, with the aid of the necessary trestles, a height of more than 10 *palmi* from the notch. According to the *peciari*, in the course of these three or four years the trees matured: that is there was a growing volume of resin flowing to that part of the trunk continually exposed to the combined action of repeated cuts, the sun and the air, action which they favoured by frequently hitting the tree with their axes. The pieces of trunk were then taken to the places where the ovens were. Here, arranged in the form of a pyramid and covered by clay in a first oven (Padula, 1977), they burned from the top: the substance which flowed out was the tar which, refined in a second oven, became black pitch.

3. Decline of resin production in the late 18th century

The white pitch and turpentine were used in pharmacopoeia, in soap-making processes and in the composition of colours and paints, while tar and black pitch were used in great quantities in a sector that was of great importance for the economy of the Kingdom – shipbuilding and the activities connected to it. A limited demand for white pitch was accompanied by a greater requirement for other resinous products for the expansion of the naval sector which began in the second half of the century (Gangemi, 1999) and which had to be satisfied on foreign markets.

In 1771, the Kingdom exported white pitch and resin, for an overall value of 3,133 ducats while it imported black pitch and tar for 19,832 ducats, the deficit was of 16,699 ducats (Galanti, 1969). At the end of the century, the possibility of continuing to rely on traditional suppliers from the Sila was judged to be seriously threatened. And the difficulty of production, which was even suspended for some years, was reflected in prices, which increased by as much as four times in the course of the 18th century (Figure 1.).

[3] Unit of mesurement and money of the Kingdom of Naples used in the text: palmo = 0,263670 m.; rotolo = 0,8990997 kg.; barile = 50 rotoli (in Calabria Ultra), 70/75 rotoli (in Calabria Citra); 1 grano = 12 cavalli, 10 grani = 1 carlino, 10 carlini = 1 ducato.
[4] If the agreement is stipulated for six years, 1.000 barili are delivered for the fifth year and 700-800 for the sixth. (Zurlo, 1852, 80).

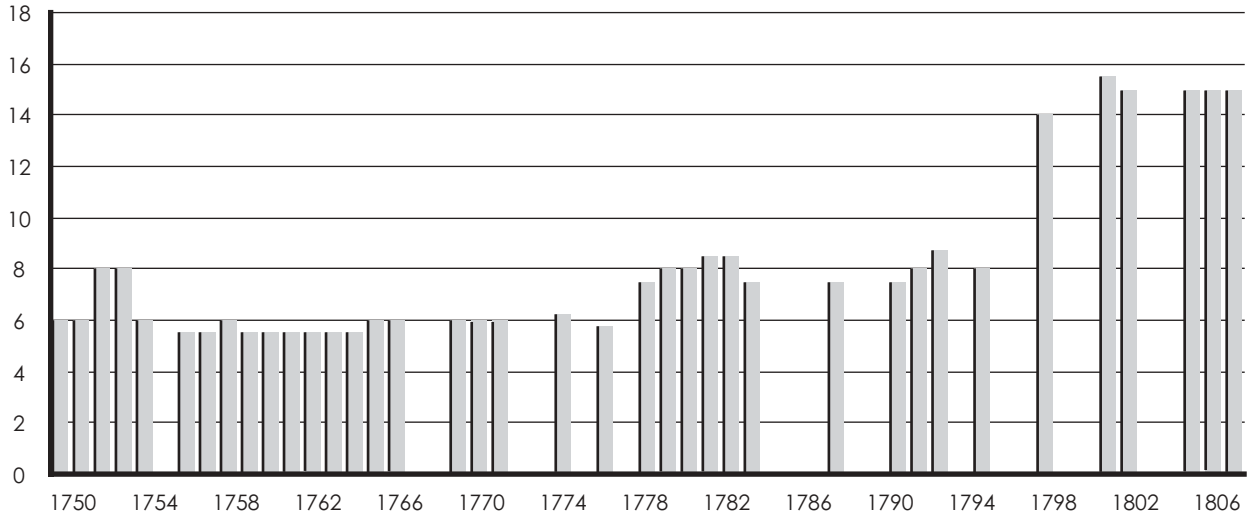

Figure 2. The price of pitch from the Sila in Naples. 1750-1806. (grani per rotolo)
(Source: Romano, 1965. 118)

For every pitch-producing oven, Zurlo estimates that 60,000 pines were necessary and in some years as many as 14 ovens were built at the same time, with an indiscriminate use of trees (Zurlo, 1852, 79). In his opinion, it would have been useful to prolong the period of turpentine extraction and production could have been increased by cutting the notch for the collection of resin as low as possible so as to exploit as much as possible the trunk of the pines, then using a large part of the tree for the creation of pitch.

The trees intended for this purpose, however, after having supported for some time the treatment described here, remained standing as long as they were able to resist the force of the winter winds and the weight of the snow. Once they fell (they are then said to be "*traverse*") they cluttered wide stretches of forest, and with or without permission from the authorities the proprietors started fires to free the ground and make it suitable for sowing. If the fires reached other forests, so much the better. The Crown's rights over the trees and the production of pitch were, in fact, seen by the proprietors and local communities as an intolerable yoke, a limit on full possession of their property, even though these had often been obtained through the illegal occupation of crown property. Consequently, fires and deforestation succeeded each other in a destructive spiral that seemed to know no limits.

The contribution that could be made by the remaining forestal resources of the region continued to be limited with respect to the great Sila. But not even the conifers in the mountains of the Aspromonte were spared the damage provoked by centuries of pitch extraction (Liberti, 1984). Perhaps an availability of fewer resources in this narrower part of southern Calabria may explain some differences that a source of 1740 appears to indicate in the practices adopted in the feudal mountains of Bagnara: much evidence confirms that ovens and *caccavi* for pitch were used here for as long as memory recalled; it is however specified that white pitch is extracted from *zappino* trees unsuitable for the building of ships; black pitch, on the other hand, was obtained from the roots and trunks of fallen *zappini trees*[5] . In contrast with the practices on the Sila, therefore, it seems that in this area of the Aspromonte, *stellatura* of the standing trees was not employed for the production of pitch, instead, as was commonly the case in other localities, it was obtained from trees which had already fallen and various parts of the trees were utilized[6]. The data on the exportation of pitch produced in the Catanzaro and Reggio areas that I have managed to document, though discontinuous, appear to indicate also here an activity that was in sharp contraction during the last years of the century (Gangemi, 1991. Figure 2.).

[5] State Archive of Catanzaro, Regia Udienza Provinciale, Cartella D 150, fascicolo XV, a. 1740.
[6] Pine leaves and branches could also be used, as well as the clods of earth soaked in resin that had flowed from the trees (Giornale d'Italia, 1767).

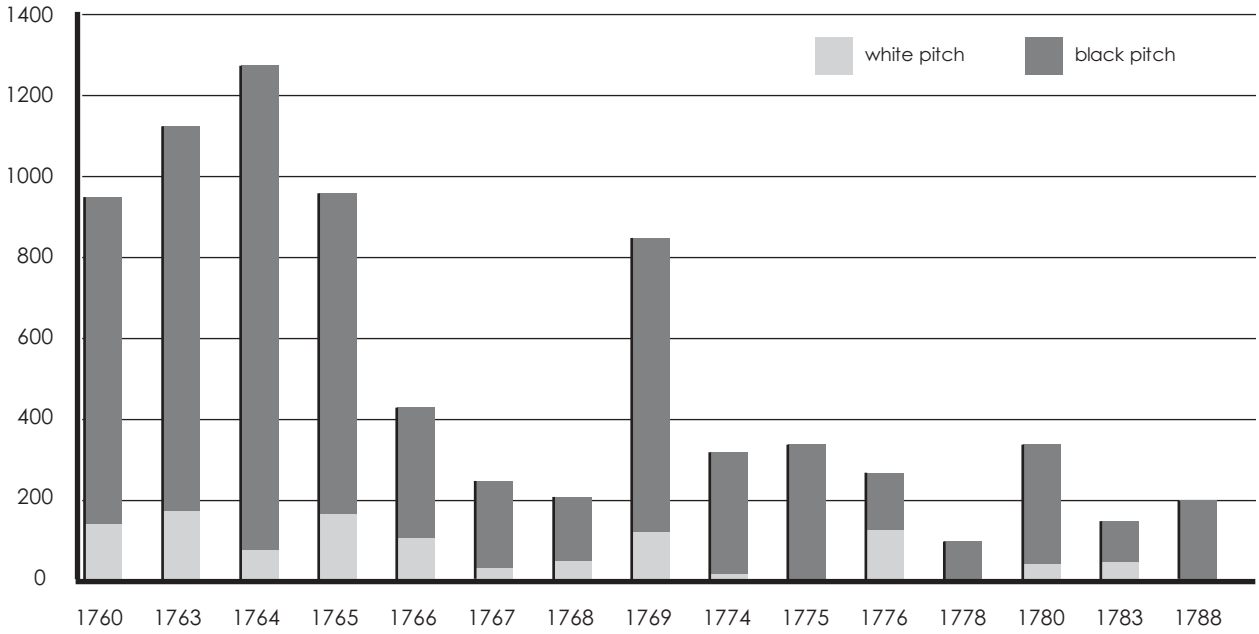

Figure 3. Pitch exported from Calabria Ultra in some years of the 18th Century (barili)
(Source: Gangemi, 1991. 43)

After describing the typical techniques and methods of pitch production and indicating its limits, in order to complete his task Zurlo makes some proposals for the improvement of the system (Zurlo, 1852, 76-84). Above all he argues that the fiscal regime should be reviewed as he considers it to be an excessive burden on the sector, a considerable brake on greater production, which was also penalized, in the long term, by the backwardness of the technology employed and by the "fragmentation of the firms" Probably the creation of "a large industrial organization directly managed by the state", as well as contributing to an overall rationalization of the sector, would also have made it possible to reduce the damage caused by the utilization of the forests that was extensive rather than intensive[7] .

Zurlo then expresses a negative opinion on the renting system: for the purpose of the construction and maintenance of the ovens: the contractors could enter private land with large numbers of men and animals, thus provoking continual damage and sharpening the aversion for the forests on the part of the proprietors', whose only interest was that of spreading as much as possible the fires in the forests that were to provide pitch. A valid alternative could have been that of limiting the Crown's rights to the fiscal returns and entrusting the proprietors of the land with the production of pitch; they would then have viewed the pines as a valuable source of income which therefore deserved protection and development. Another solution was to restrict production only to some forests with clearly limited boundaries where only a few ovens would be built. Once the pitch work was completed, the forests could be cut down or burned as long as they were renewed with the planting of seeds in other, preferably sterile locations. The Crown would, however, have to directly assume the responsibility of managing the whole sector itself, appointing honest and competent officials to guarantee the supervision and direction of the work. This would avoid the many frauds perpetuated by the contractors at the expense of the Treasury and the uncontrolled exploitation of a resource that was once so abundant as to have perhaps created the mistaken idea that it was inexhaustible.

[7] A proposal the echo of which could still be heard in the mid-twentieth century (Milone, 1956).

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Russian wooden architectural heritage: century-old traditions to use forest products

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Abstract

The paper compares the quality of pine (*Pinus sylvestris L.*) timber used in 18th century wooden monuments and the wood quality of trees growing in old-age stands in Republic of Karelia. A wide range of wood properties was investigated: wood density, annual increment, late wood proportion, resin content. The research shows that timber of different quality was used in the monuments. The density ranges from 400 to 600 m^3, average tree ring width – from 0.08 to 0.20 cm, late wood content from 22 to 30%, resin content from 5 to 10%. All logs have 200-300 annual rings. In ancient times constructional methods were used to extend the service life of structures. They used higher strength logs in the load-carrying parts of the structure and decreased the structure weight using looser timber for the upper part. In nearly all parts of Republic of Karelia with intensive forest management only small sites with old-age trees (stock of 100-150 cub. m) have been preserved. The timber has high density, high late wood proportion and low increment. The main problem however is that as a rule this wood is damaged by wood-destroying fungi. Our paper discusses the new based on deep knowledge approach for selection the timber for the restoration.

1. Introduction

Republic of Karelia located in North-West Russia is the land of forests and lakes. Scots pine (*Pinus sylvestris* L.) and Norway spruce (*Picea abies Karst*) are the main forest species in the region. The tradition to use timber as a building material goes back to ancient times. Timber is an excellent building material with good strength, insulation properties, processing capacity.

Wooden architectural monuments traditional for North-West Europe are an essential part of world cultural heritage. Nowadays, Northern Russia is a treasury of wooden architectural monuments 200-600 years old. Problems of their conservation are widely discussed. According to the „Principles for the preservation of historic timber structures" (ICOMOS, 1999), timber of the same species, quality and size should be used to replace historic elements during restoration. That is why the quality of timber becomes a key question in the restoration.

The search for and logging of timber for building purposes has always been based on deep knowledge and traditions. In our region, nearly all wooden structures (houses, churches, chapels) were built of pine logs. Spruce was used rarely, mainly for roof details and small house-holding structures. The reason was better strength properties and decay resistance of pine wood. Birch bark is still the best isolation material for wooden roofs. Aspen was used for wooden shingles.

Finding identical timber has become a problem nowadays. At first sight, the main challenge is to find a 200-300 year old tree with a certain (sometimes quite big) diameter and length. One should remember however that due to intensive forest management the structure of forests and the quality of timber have changed greatly. Unfortunately, no database of information about the location, volume and quality of such timber has yet been compiled. The aim of the research was to evaluate the possibility of finding identical material for restoration of wooden monuments in modern forests.

2. Objects and methods

The quality of historic timber was investigated in the following architectural monuments: the Church of Transfiguration in Kizhi; the Church of Assumption in Kondopoga, the Assumption Cathedral in Kem'. Location of the churches is presented in Fig. 1. All the structures were built of pine timber with 200-300 annual rings. The diameter of the logs ranges from 20 to 45 cm.

Figure 1.
Location of sites and monuments:
1. The Church of Transfiguration in Kizhi
2. The Church of Assumption in Kondopoga
3. The Assumption Cathedral in Kem'
4.-5. sample plots in Prionezhsky and Prjazha regions

Two of the churches – the 22-domed Church of Transfiguration (1714) and the Church of Intercession (1764) form the Kizhi Pogost architectural ensemble – are gems of the Kizhi Open Air Museum, a UNESCO World Heritage Site (Fig. 2a.).

The Church of Transfiguration is 37 m high, 29 m long from east to west and 26.6 m wide. The structure incorporates three octahedrons set one on the top of another with transitional quatrahedrons. More than 2000 logs with an average diameter of 30.1 cm and 3-5 m in length were used in the structure.

The Church of Assumption in Kondopoga was built in 1774. The Church is 42 m high, 24.2 m long and 14.8 m wide. Logs with a very large diameter (40-45 cm) were used for the lower timber sets. The main characteristics of the timber were very narrow tree rings (less than 1 mm) and high resin content (Fig. 2b.).

The Assumption Cathedral in Kem' was built in 1714. It is 35.5 m high, 33.47 m long from north to south, 24.25 m wide, (Fig. 2c.).

Old-age pine forests were searched for in different locations. The quality of wood of 200-300 year old pine trees growing on sandy soils was investigated in Prionezhsky and Prjazha districts (see Fig. 1.).

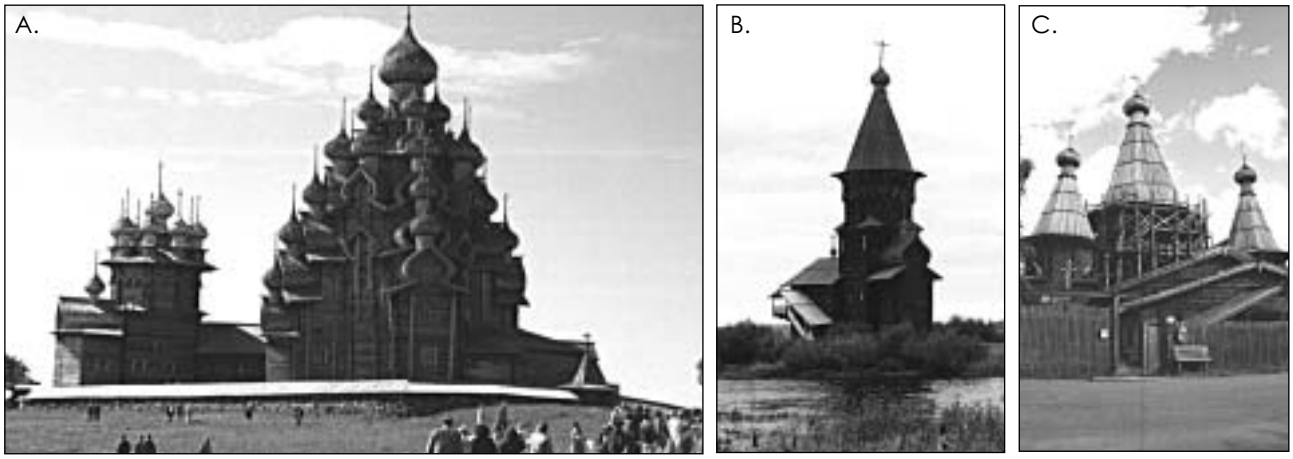

Figure 2. A: The churches of Intercession (left) and Transfiguration (right), Kizhi pogost
B: The Church of Assumption in Kondopoga
C: The Assumption Cathedral in Kem'

Core samples (5 mm in diameter and up to 300 mm long) were extracted with an increment borer from the above-mentioned monuments and from living trees in selected sample plots. In each stand, 15-25 trees were sampled at breast height (1.3 m) along random diameters. At least 20 samples were taken from each monument.

The cores were measured with a direct scanning X-ray densitometer and density profiles were obtained (Kozlov, 1991). The data obtained were computer processed to determine wood density and annual ring characteristics: tree ring width, latewood/early wood ratio.

Resin content was determined after alcohol extraction by gravimetric method (Obolenskaya et al., 1961). Chemical analyses were performed by the analytical laboratory of the Forest Research Institute, Karelian Research Centre of RAS.

3. Results and discussion

The quality of timber used in the monuments is still questionable. On the one hand, there is a commonly held opinion that the monuments have survived because of the high quality of the timber used. On the other hand, the hypothesis is not corroborated by research data (Larsen,. Marstein, 2000). Our results support this idea – monuments in Republic of Karelia were built of pine (*Pinus sylvestris* L.) logs with different density (400-600 m^3), annual increment (0.08-0.20 cm) and chemical composition (Table 1.). Late wood content ranges from 22 to 30%, resin content is 5-10%.

Table 1. Physical properties of historic timber

Monument	Average tree rings width, cm	Density, kg/m^3	Late wood content, %
The Assumption Cathedral in Kem'	0.07-0.10	500-600	24-30
The Church of Transfiguration on Kizhi	0.06-0.20	400-525	20-25
The Church of Assumption in Kondopoga	0.06-0.10	450-600	22-30

Our investigations show that ancient carpenters used 200-300 year old pine trees for the structures. Unfortunately, mainly only small sites (1 ha) with old-age trees (stock of 100-150 cub. m) have survived in our intensive forest management region.

If we consider the wood of living 200-300 year old pine trees, the density varies from 470-550 kg/cub. m, average tree rings width – from 0.08 to 0.11 cm, late wood content – from 29 to 32%, resin content is 5-16% (Table 2.). Thus, it is noted for high density, high late wood proportion and low increment. The main problem however is that the wood is as a rule damaged by wood-destroying fungi. Some of the trees bear traces of forest fires.

Table 2. Properties of 200-300 year old pine timber

Region	Average tree ring width, cm	Average density, kg/m^3	Av. late wood content, %	Av. resin content, %
Prionezhsky	0.11	515	31.9	7.4
Prjazha (site 1)	0.08	492	29.2	5.2
Prjazha (site 2)	0.08	474	29.0	16.5

Traditionally, carpenters used constructional methods to extend the service life of structures. As mentioned above, logs of different density were used in structures. E.g., pine logs with a density of 400-525 kg/cub.m were used for the 37-m high 22-domed Church of Transfiguration on Kizhi island. Yet, narrow-ringed wood was used for lower timber sets. The upper octahedrons were mostly built of wide-ringed wood with lower density. The regularities revealed indicate that ancient carpenters tried to use timber in the most efficient way, used stronger logs in the load-carrying parts of the structure and decreased the structure weight using looser timber for the upper part (Fig. 3.).

4. Conclusions

We can conclude that when selecting timber, restaurateurs should mind not only the tree species and the size of the element, but also the following set of parameters: age, density, tree ring width, late wood content and resin content. Thus, the preservation of historic wooden architectural monuments would be ensured.

Nowadays, finding timber suitable for restoration of wooden monuments has become a key problem. Although the quality of timber of 200-300 year old pine trees is very close to that of historic ones, it is extremely difficult to find trees not damaged by biological agents. Given that only small sites with old-age trees have survived to our days, compilation of the database of old-growth forest is of great importance. This kind of research would no doubt give rise to new approaches and requirements to timber selection and help preserve our cultural heritage.

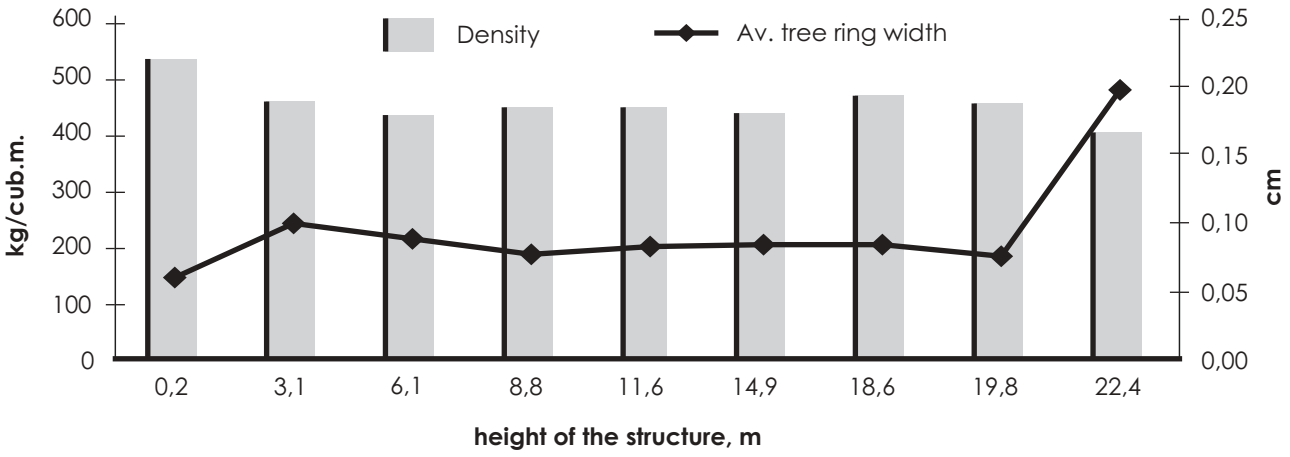

Figure 3. Properties of timber used for the building of the Church of the Transfiguration

5. Acknowledgements

The research is supported by Russian Foundation for Basic Research. Grants No 03-06-88025, 06-06-80076

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Cultural indigenous management systems as a basis for traditional community forestry in Cameroon: a case of the Ijim mountain forest area

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Abstract

This paper presents an analysis of the nature of various cultural indigenous forest management systems in the Ijim forest areas of the North west province of the Republic of Cameroon. The papers describes various internally culturally and indigenous generated forest and tree management systems in the ijom montane forest areas.. It demonstrates that a gap exists between culturally indigenous and externally sponsored management systems. In the externally sponsored projects, the concept of participation is used in the sense that rural people should participate in the professionals' project rather than that professionals should participate in the livelihood projects of rural people. The cultural indigenous interventions in this area generated confrontations as well as degrees of collaboration and participation between local people, local leaders, traditional councils and authorities as well as opinion leaders and the projects. On the basis of these synthetic findings, the paper identifies several actor categories to be considered in community indigenous cultural forestry project management in the Ijim area, i.e. local formers, local councils, traditional authorities, king makers, opinion leaders, village extension workers and supervisors. The relationship between these actor categories constitutes the middle ground of community cultural indigenous forestry development. This concept refers to the totality of cultural and various anthropological as well as social processes and fields, within which the actors attempt to establish common ground for their negotiations over resources and development alternatives. The paper continues to bring to the common understanding of how strategic actions and interactions of different actor categories have shapes the outcome of community cultural forestry projects have been executed on the Ijim montane forest as well as how to the interventions bridged the gap between internally generated activities and externally sponsored interventions in the area.

Humanity and Bestiality in forests, with reference to the topic "Forests, Cultures and Religions"

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Abstract

Words, fundamental instruments for communicating, can also lend themselves to false intepretations and misunderstandings which are capable of seriously upsetting the normality of personal and social relationships in general, causing even effects of incalculable proportions. Forest etymology is the preferred instrument for entering into the controversial humanity/bestiality and for understanding the importance of historical and cultural references which hand down the values of life in the prospective of the "beyond" and the "after." Added to the text is a brief study highlighting how pertinent, in this regard, is the representation, in a mystic-religious key, that Dante Alighieri proposes in "The Divine Comedy", in which the "wild woodland" and "divine forest" metaphors constitutes the point of departure and that of arrival in the voyage that calls all of creation to a song of praise and joy for the reconciliation of heaven with earth effected by the Paschal event.

1. The premise

This paper is directly related to the follow-up of the "European Forests on Ethical Discourse" Symposium held in Berlin, January 18-20, 2005 (Vincentini 2005a, 2005b). My paper entitled "Forests and forestry, night and day: learning to communicate" highlights, as the title indicates, the need to grasp the importance of words in reference to their etymological roots and the problem of correctly translating them in and from other languages.

2. Recalling from the former intervention

The origin of the word "parola", which derives from "parabola", was the starting point – taking inspiration from an illuminating poem in Spanish by Miguel Angel Asturias, several striking verses of which were quoted – for delving into the sense of the nothingness that envelops life in the passing of time, with the birth and death of things created, and for entering, therefore, into the heart of medieval tradition that had, borrowing from the Latin *foris* (outside), transformed the concept of *selva* (wood) into that of "forest". "Forest", in fact, was the term used in the decree issued by a king of the Franks, a successor of Charlemagne, which established that the people were prohibited from hunting high-value game – especially dear – which was instead reserved to the sovereign and his court. The use of the word "forest" therefore became the expression of a despotic system that excluded the people from partaking of natural resources, along the lines of the expulsion from Paradise narrated in Genesis, which, in time, would bring, to the maturation of systems of government towards democracies in the modern era.

The paper thus highlights the masterly contribution of Dante Alighieri, champion of *laicité* in the authentic meaning of the term, who, in the face of the despotism of the rulers of his time, offers in the allegory of his "Comedy" an enthralling interpretation of the "selva-foresta" dualism, in a Christian interpretive key. The classic antitheses of prey-hunter, servant-master, host-visitor, son-father are overturned in the eschatological depths of the Kingdom of God and the Trinitarian glory that,

in the immense gratuity of Eucharistic sacrifice, redeems humanity from the oppression of death, annihilating its effects in the reconciliation mediated by the Paschal event.

After having recalled the crucial definition of "development, the new name of peace," quoting Pope Paul VI from his historic speech to the United Nations General Assembly, in New York on October 4, 1965, and connecting it to the encyclical *Pacem in terris* by Pope John XXIII, the paper proposed the interesting comparison, in a metaphysical key, between normality and circularity, as a continuous renewing of Being in the events of every day.

On the basis of a choice made by the organizers of the Berlin Symposium, my paper was the subject of a reciprocal review with the work of Professor Promode Kant of the Indian Council of Forestry Research and Education. His work looked at the ethical aspects of the relationships between indigenous populations of the mountain forests of north east India – among the world's richest in terms of biodiversity – and plainsmen, jeopardized by the rash growth of commercial logging in the overlying areas (Vincentini 2005a, pp. 203-214).

The close analogy of my text with the positions, in a pagan setting, proper to oriental philosophies and, in particular, with Indian philosophy – of which I have, however, only limited knowledge – was linked to the conception of annulment-renewal, which is inherent to natural processes, with the continual regenerating of life from decomposed material constantly at work in ecosystems.

3. Forestry etymology, an instrument for linking humanity and development

On the basis of suggestions from Professor Kant, changes were made to the set-up and style of the text which I had presented at the Berlin Symposium, in order to streamline it, also on the basis of the effective advice of "technical editor" Mark Richman, and the revised text was then published in *Silva Carelica* 49, with its new form and the title changed to "Sustainable forestry: an etymological search for equitable development" (Vincentini 2005a, pp. 177-184).

Revisions to the final text, with respect to the original version discussed in Berlin, appear to be in full accord with the opening paragraph of the illustrative page of this Conference: "modern approaches to Sustainable Forest Management (SFM) cannot be developed without understanding the significance and the role of traditional cultures in shaping today's forests."

This sentence suggests various considerations at the philological level, starting with the word "approaches", the Italian translation of which, "approccio", hides the French derivation "approche" *(approximate)* (IEI 1994), which renders well the idea of getting close to something that can be glimpsed on the background. Then, there is the term "sustainable", which, in the usual Italian translation of "sostenibile", distances itself from the original ontological meaning, inverting the roles of object that receives and the subject that determines, as I had the chance to demonstrate in the above mentioned texts (Vincentini 2005a, p. 180 and Vincentini 2005b, p. 9). It is also interesting to delve into the term "management", because it shares its etymological root with the Italian term "maneggio" ("manège" in French) (OED 1989a), which is the place in which horses are trained, held on a lead, as they move in a circle, the lead marking the rays of the circle; thus, this consideration reproposes forestry management as an encounter between normality and circularity, mentioned above in relation to *Pacem in terris*.

I would also like to underscore the etymological strength of the term "understanding" which is composed of the present participle "standing" which follows the proposition "under" and contains in itself the tension of seeing things from underneath – with humility – and not from above, as if placing oneself on a high horse!

Another reason for interest in the suggestions received from Professor Kant was the connection between the word *humus* (material fundamental to forest ecosystems) – which is the Latin root of the word "humility" *(humilitas)* (Cortellazzi-Zolli 1988, p. 1395), as well as humidity *(humiditas)* – and the word "humanity" *(humanitas)* (Cortellazzi-Zolli 1988, p. 1399).

Besides facilitating, in *Silva Carelica* 49, the understanding of the text I presented at Berlin, Professor Kant felt it worthwhile to make reference to my text in the 7th chapter of his presentation offering the unique and enthralling interpretation of "sustainability" as the return to the original harmony founded on relationships of "humanity" (Vincentini 2005a, p. 208). Relationships of "humanity", contrasted to "dishumanity", would appear, in effect, to be undividable from the historical, political and social contexts to which the characteristics of sustainable development find themselves related over time.

Humus, humility and humanity: words that weave together, in various ways, to give shape and substance to the two polarities highlighted at the beginning of the illustrative page of this Conference: development and traditional knowledge. We can turn the consideration around and provocatively ask ourselves: how is life possible without history, and development without continuity in time, the sharing of experiences and messages, the participation and the memory that connects the past to the present and gives it vitality, as does the substratum for forests, and as happens in every moment of our existence?

4. Culture and Philosophy on woods and Man

At this point, it would be useful to take a few cues from the final documents of the conference on "Woods and Man", held here in Florence, in May 1995, at the initiative of the Italian Academy of Forestry Sciences.The final documents of the above-mentioned Conference of 1996 include papers by various authors, from which useful suggestions and precious indications emerge for reflecting on the connection between humanity and woods (Ciancio 1996).

The starting point remains, as always, the interpretation of words, the means by which languages and the expressions of the world's peoples are articulated, with the forestry world tapping mainly into the Germanic tradition. It is enough to think of term *forst* itself and the concept of *nachaltingkeit*, which corresponds to the English "sustainable development", the French *durabilité* and, in current Italian usage, *sostenibilità*. Germanic populations also had a great influence on the spread of philosophic thought in relation to woods and to Man, as emerges right from the preface of the final documents of the above-mentioned Conference, with reference to *Weltanshauung*, worldview. That same preface highlights the ineluctability of ethical discourse in relation to nature, as has already been sensed from the remotest of times, even if it does not make any reference to the serious problems that are connected to the distorted interpretations of concepts of Man and of nature that led to the delirious ideologies of Nazi-Fascism, to the terrifying utopias of Communist materialism, and to the blossoming of so many antagonisms detrimental to the balance of ecosystems.

For these particular aspects, useful in-depth considerations are available in the final documents of the International Conference "Woods in European Culture, between Reality and Imagination," held in Rome, November 24 and 25, 1999, at the Department of Comparative Literature of Rome-3 University (Liebman Parrinello 1999).

In the text presented at the Berlin Symposium, I referred several times to references to German culture which had emerged in the 1999 Conference and these references were put into relation with the teachings of Roman Guardini, an illustrious professor who held the chair of "Religionsphilosophie

und christliche Weltanshauung" (Christian worldview and Philosophy of Religions) at the Humbold University of Berlin, from 1923 until he was removed by the Nazi regime (Guardini 1971).

To speak in Berlin, the heart of Protestant Germany, of Guardini, who, in that prestigious university, had tackled, as a priest of an ecclesial community that was distant from that cultural climate and in a very particular historical moment, a subject so demanding in terms of educational processes and reverberations on social and political fabrics, was experienced by me as a natural urge to revitalize the thought of him in the memory also of those close to me who held him in very high consideration.

Guardini's work, which shone not only for its religious interest, but also for the vastness of its literary interest, proved to be a head start on many aspects of renewal that issued from the Vatican II Ecumenical Council, which I remember from the years of my university studies here in Florence and about which I will speak further ahead in reference to Dante Aligheri and the "Comedy."

5. Spirituality as the breath of life

The problem of differing interpretation of worldview, within Christianity, is a subject of great interest that shows the particular influence on them, as far back as ancient times, of the Germanic peoples, already converted in the 4th century to the Arian heresy by Bishop Wulfila, founder of the Gothic alphabet and author of the German translation of various parts of Sacred Scriptures. In line with the Arian heresy and its aversion to the Trinitarian vision, Wulfila moulded to his own thesis the original sense of the Latin world *spiritus*, which corresponds to the Greek *pneuma*, breath, which recalls the fundamental inspiration of life, translating it into *geist*, idea, thought, which did not implicate a direct contact with matter (Rizzoli Larousse 1964). Recognizing it only in human nature, Christ's conception would have occurred in the normal way, reinforced by a particular thought or idea of the one creator. From the Germanic language, the term geist, having become "ghost" in English (OED 1989b), lead to confusion also in Italian between spirit and ghost, which did not exist in the Latin root. As far as I know, it was only following the indications of the Vatican II Council that liturgy in English-speaking countries returned to the term "Holy Spirit", etymologically correct, and abandoned the expression "Holy Ghost" previously in use.

Reference to the translation in French is also significant, where the word *esprit*, while maintaining the tie with the Latin origin of "source of life" and "vitality", widens its meaning to intelligence, adapting it, as in Italian, to the meaning of *humour* and to particular qualitative distinctions, such as *esprit de geometrie* and *esprit de finesse* (Le Grand Robert 1985), which are also accepted in dealings on selviculture topics.

It would seem important to recall at this point, among the various papers of the Convention "Woods and Man," the following quotation from Rosario Assunto which my colleague Paola Porcinai used as subtitle for the text "The forestry profession" (Ciancio 1996, p. 175): "Hostility to beauty, as a consequence of the adoration of the useful, is the characteristic of our times, in which we produce to destroy and we destroy to produce again, refusing the pleasure of contemplation that does not destroy to produce but creates." And to clarify the profoundness of this thought, it is worth referring to an article by Paolo Miccoli, entitled "Vertical aesthetics and transcendence in Rosario Assunto", published in edition no. 2/2003 of *Studium* (Miccoli 2003), where he affirms, in the conclusion, that the more mature position of Assunto in matters on metaphysical aesthetics is found in the book *Ontology and the Theology of Gardens* (1988), the character of which he sketches in the following paragraphs: "Just as the metaphor of voyage, in Rousseau, indicates the return of man to the paternal home of complete happiness, so must the nostalgia of Paradise lost set off in the

children of Adam, according to Vico and Assunto, the desire to "repatriate" towards a horizon of meaning and of values, once the boredom of living in the city of Prometheus has been tasted. Garden as ontological condition and as teleological orientation, in the nostalgia of a lost Eden and in the intentional commitment oriented to reliving it in the present in a hopeful perspective directed toward the future."

The references in Vincentini (2005b) also pointed various times to the need to find anew the horizon of sense and of qualitatively consistent values, in view of an outlook which is sustainable over time, but attention was then concentrated on the importance of a correct use of words to arrive at understanding problems in their correct dimension, without excluding the prospect of "beyond" and of "after."

Chapter 5 of this last text, entitled "Forest Development and Ethical Values" is particularly significant in this regard (Vincentini 2005a, pp. 180-181). Considerations, beginning with the tendency of the word "forestry" to be identified with "sustainable", dwelled on the definition of "forestry" formulated by the group of experts in preparation of the new Action Plan for Forests of the European Union, as "a challenge for balancing forest functions in accordance with various needs". The sense of this challenge brings us to orient "sustainable development" into the channel of "equitable development" and therefore into that of the balance in nature, gaining awareness of the important relationship between development and peace, in accordance with the four foundations indicated in *Pacem in terris*, which include freedom in its true and full meaning.

6. Total Economic Evaluation of forests and benefits which are difficult to quantify

Interesting here is the reference to studies on the "Total Economic Value" (TEV) of Mediterannean forests conducted by various experts published in the volume entitled "Valuing Mediterranean forests – Towards Total Economic Value" (Merlo and Croitoru 2005).

The concept of the total economic value of forests, dealt with in particular in Chapter 3 of the book (Mongillo 2000), distinguishes the benefits which derive from effective use, which are more or less easily quantifiable, from those not related to use, such as the value of passing forests onto future generations and to the conservation of forest habitats, defined as "bequest values" and "existence values", for which any quantification is truly difficult. The text then dwells on clarifying that the TEV is just a part of the total value of an ecosystem, because we must recognize the intrinsic value of forests and ecosystems, independently of human preferences and of the fact that they contribute to the well-being of humanity.

In fact, here we enter into ontological considerations, which I had the occasion to refer to earlier (Vincentini 2005b), in relation to the presentation by Dalmazio Mongillo at the Conference on "Corporeity and Thought" (Rome, October 21-23, 1999), on the topic "*The original Logos-Verbum*".

The presentation in question dwells in particular on the ontological character as referred to the body-thought person, to which it refers in the following terms: "Greek tradition, passed on by Gregory Damasceno and recalled by Saint Thomas at the beginning of the Moral section of his *Summa*, attests to the rich and beautiful intuition according to which the body-thought person is "principle" which is intelligent, free, and endowed with autoexousia" (Mongillo 2000).

The extension of the ontological concept (*autoexousia*) to forests and ecosystems, which underpins the text by Maurizio Merlo and Lelia Croitoru and which is also represented by Orazio Ciancio and Susanna Nocentini in their authoritative interventions referred in the notes (22 and 23), shows itself in effect to be an opening to metaphysical aspects and therefore to implications of a religious

nature represented in Thomism, which give surprising élan to the concept of *autopoiesi*, used with limits substantially anchored to naturalistic physiology.

7. The value of humanism in relationship to the Italian cultural tradition in the wake of the fabulous and metaphysical adventure narrated by Dante Alighieri

Even in relation to this research, it appears evident how attention to values of humanism has significant implications on the vitality of the cultural heritage of all countries, on their potentiality and originality in elaborating projects and activities appropriate to situations as they evolve.

Notable is the contribution of the cultural heritage of the various Italian schools and in particular, the Tuscan and Florentine schools which, starting from the Latin world, crossed the Middle Ages, humanism, the Renaissance, the baroque period of the 1600s, neo-classicisim of the 1700s, romanticism of the 1800s, to arrive at the various ramifications of the cultural movements of the last century. If it is possible to draw from all these schools enormous amounts of material of every kind that is useful to studying traditional knowledge on forests, by following the extreme synthesis of Eugenio Montale in the speech he gave in 1965 at Palazzo Vecchio, on the occasion of the 700th anniversary of the birth of Dante Alighieri (Zampa 1997), it can be said that the reference he made to the "Comedy", in the fullness of its content of mystic-religious poetry and exemplary witness of civil coherence and authentic *laicité*, can represent them all[1].

8. Conclusions

"O fortunatos nimium, sua si bona norint,/Agricolas! Quibus ipsa procul discordibus armis/ fundit humo facilem victum iustissima tellus."

These verses, written in hexameter, from Book II of Virgil's Georgics, are carved around the frescoes of the upper vault of the conference room of the building which houses the Italian Ministry of Agricultural, Food and Forestry Policies.

They are verses from 2000 years ago which celebrate life with an incisiveness that was grasped well by the person who chose them, among the many, to celebrate the "divini gloria ruris (the glory of the divine farmer)", as an inscription reads on the front of the Ministry itself, on Via XX Settembre in Rome.

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[1] draw your attention to the attached note that I prepared for an encounter on a topic indicated in the notes: these can help to understand the reasons for the judgement expressed so succinctly by Montale.

It would not seem unfitting to begin this note by recalling that the "Comedy" was conceived by Dante in the mystic-religious vision, proper to the Canticle of Canticles, of the conjugal theme, which he himself had already dealt with, in a goliardic key, in his early work "The Flower". In the "Comedy", work of his maturity and conceived to celebrate the first Jubilee of the modern age, the metaphors of "wild woodland" and "divine forest" would appear in effect determining for indicating, respectively, the departure point and the arrival point in the voyage towards joy. From the state of confusion (the wild woodland in which we find the one who has lost the straight path and looks for the way to find it again) to the state of grace (divine forest) of he who has purified himself and freed himself of the sense of sin and can finally partake in the encounter with the infinite.

In "Paradise", the metaphor of the "divine forest" is therefore fundamental for understanding the immense scope of the Trinitarian mystery which reserves to the king-hunter (lover, the Father) rights over the prey (the highly-valued deer prey, the Son), in the push toward the sacrificial target (love, Holy Spirit). Paradise thus presupposes openness to the mystery of the Most Holy Trinity, and communicating with the divine is the inherent process, through Faith, in the immense gratuity of the Eucharistic sacrifice, as Dante has Virgil say in verses 114-117 of Canto XXVII of Purgatory (Mandelbaum translation): „Today your hungerings will find their peace through that sweet fruit the care of mortals seeks among so many branches", in which "today" is the time that transforms itself into eternity, as also appears therefore in the triumphant exclamation of the last Canto of the Comedy, used by Pope Benedict XVI in his presentation speech for his encyclical "Deus caritas est": "Eternal Light, You only dwell within Yourself, and only You know You; Self-knowing, Self-known, You love and smile upon Yourself!"

"The fortune of he who cultivates natural resources in the awareness of the good that he administrates, to whom the Earth, on her own, far from fratricidal battles, pours forth from the soil easy sustenance."

But the link between the word *humo*, which gives "humility", and *victum*, which means sustanence but also "to be won" (passive past participle of "to win"), calls for a comparison with verses 94-99 of the 20th canto of Paradise: (from to the Mandelbaum translation) *Regnum celorum suffers violence from ardent love and living hope, for these can be the conquerors of Heaven's will; yet not as man defeats another man: the will of God is won because It would be won, and, won, wins through benevolence*.

Returning therefore to the encounter between normality and circularity in relation to the Word, and to humility in which there is the re-creation of the bridge with Life that is born and unfolds from germinal energy, in silence, like a child in its mother's womb, it is interesting to read the following passage of Juan de la Cruz (Ravasi 2006b): "Silence is mildness when you do not respond to offences and leave to God your defence. Silence is patience, when you suffer without complaining, you look not for human consolation, you wait for the seed to sprout. Silence is humility, when you keep silent to let the brothers emerge and leave to others the glory of the task. Silence is faith when you do not seek comprehension and renounce to personal glory because it is enough for you to be known by God!"

To conclude: a simple reference to an elementary rule of universal value, suggested by Fr Carlo Gnocchi, in the book *Dio è tutto qui* ("God is all here", Mondadori Publishing, 2005) (Ravasi 2006a): "Many worry about being well, much more than living well. For this reason they end up even being very unwell. Seek to do a lot of good in life and you will end up being very well." This is in homage to the best tradition and a wish to all those present, with my most sincere thanks for the kind and patient attention.

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POSTER SESSION

Tree carvings as witnesses of traditional forest use in central Sweden

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Abstract

Culturally modified trees (CMTs) provide unique insights into traditional knowledge and uses of the forest ecosystems. In close relation to pre-industrial livestock herding in central Sweden, there was a custom to carve text and symbols on trees and use them as "notice boards" in the forest. The main aim of this paper is to highlight the importance of carved trees in studies on traditional forest use by describing the documentation and analyse of carved trees in a managed forest landscape of 160 km^2 in south-central Sweden. The same area was surveyed twice in 1986 and in 2003. A number of 488 carved trees were documented and classified into legible themes that were interpreted with past herding practices. Name was the most common theme, found in 85% of the carvings. Most of the carvings were made in the 1750s until the early 1900s. The custom to carve in trees was closely related to important grazing areas and the needs for claiming the right to it.

1. Introduction

Past uses of land leave typical traces in ecosystems. Under current conditions, in which traditionally used forests are being transformed into high-yielding silvicultures, culturally modified trees (CMTs) represent important artefacts, providing unique insights into traditional knowledge, perceptions and uses of the forest ecosystems (Andersson 2005). A modification to a long-living tree, e.g. a man-made scar, blaze or carving in the bark or wood, can be preserved for centuries, as discussed by various authors from the early 19th century (Liljevalch 1829) onwards. In this way CMTs can transmit information with high temporal and spatial resolution from the past about specific events in the forest (Mobley and Eldridge 1992; Östlund et al. 2002). Such knowledge of indigenous and other long-resident peoples have importance for husbanding biodiversity and the long-term management of local resources.

The boreal forests in central and northern Sweden have played a central role in the subsistence of their native people by providing important biological resources for them and their livestock (Frödin 1952). The forests offered less scope for traditional agricultural activities due to the harsh climate, topography and soil conditions. Instead, the farming was based on raising livestock and the forests were used as grazing and hay-making areas. This use was intensified by the development of summer farming systems, a sustainable adaptation to the climate that was practised since at least the Middle Ages (Segerström and Emanuelsson 2002). The systems included seasonal movement of livestock between permanent settlements close to large lakes and summer farm settlements in the vast forests (Veirulf 1937; Frödin 1952). The livestock (cattle, goats and horses) grazed the forests in joint flocks and were often herded. There was great regional diversity in the organisation of land use within this general system (see Olsson et al. 2000).

After an intensification of summer farming, leading to possibly the most intensive period of traditional forest use ever in central Sweden, in the middle of the 19th century, this practice declined in importance (Montelius 1977). With increasing access to fertiliser and the introduction of a new form of land use, industrial forestry, farmers were advised or forced to stop using the forests in their

traditional way. The more or less sparsely-wooded forests and grassland areas were fragmented, most of the old trees were cut and the forest stands were transformed into high-yielding forests with even-aged stands (Ericsson et al. 2000, Andersson and Östlund 2004). Since most of the summer farms have been abandoned for almost a hundred years few people living today can bear witness to the traditional forest uses, with summer farming and herding, which is unfortunate given the increasing interest in traditional ecological knowledge (cf. Turner et al. 2000).

1.1. Aims

This paper highlights the importance of carved trees in studies on traditional forest use by describing the documentation and analyse of carved trees remaining in a forest landscape in the south-central part of boreal Sweden. The carved trees were interpreted in the context of traditional land use practices from the 18th to the 20th century.

Specific aims were:

- To analyse spatial patterns of the remaining carved trees on a landscape scale
- To characterise themes in the carvings and to establish their meaning and significance in traditional land use practices
- To analyse temporal patterns in the practice of carving trees in the 18th and 19th centuries based on inscribed years

2. Methods

2.1. The study area

The study area (Fig. 1.), approximately 160 km^2 in area, lies mostly in the southern part of Ore parish, within the main boreal zone in south-central Sweden (Ahti et al. 1968). The area mainly is surrounded by large lakes. Mires are frequent. Only about 1 % of Ore parish consists of cultivated land, which is associated with glaciofluvial sediments surrounding Lake Ore. Most of the area is forested (>80 %) and the dominant tree species are Scots pine *Pinus sylvestris* L. and Norway spruce *Picea abies* (L.) Karst. The most common deciduous tree species are hairy birch *Betula pubescens* Ehrh. and silver birch, *B. pendula* Roth. Species diagnostic of pasturage are the herb common cow-wheat *Melampyrum pratense* L. and sedges, *Carex spp. L.* (Frödin 1952).

On a specific day in early June, the herders moved with the livestock (cattle, goats and sometimes sheep) from the village to a summer farm located up to several tens of kilometres away. Here, the livestock were taken daily via trails and cow tracks to suitable grazing areas in the forests. The most attractive pasture was found on previously burned areas due to the long-lasting beneficial effects of fire on the growth of grasses and herbs (Frödin 1952). Other types of land used for pasture were the swamp-forests and bush-covered mires in the transitional zone between forest and wetland. Tree carvings were preferably made in pine trees close to resting places and along forest paths (Lundqvist 1994). Bark was partly removed from the stem and eventually the wood surface was smoothed. Notches in the form of letters or signs were then carved into the wood.

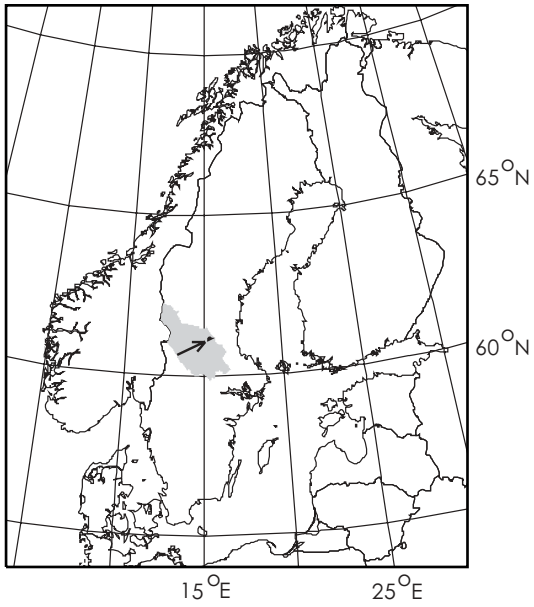

Figure 1. The study area in the county of Dalarna, Sweden (left) and a Scots pine with a complex carving containing the word "SI", three female names, the comment "bad" ("LETT"), the year 1905, seven crosses indicating length of stay in weeks and the message "we have lost three cows!" –"VI HAR TRE KOR BORTA" (right). Tree carvings were often made by using a small herding-axe to hammer on the back of a knife (Kronestedt 1965)

2.2. Documentation of carved trees in the field

All known remnants of old growth tree stands were systematically inventoried. The first inventory was carried out in the years 1985 to 1986 and the second re-inventory in 2002 to 2003. The same area was studied in both inventories. When a tree with an inscription was found, the stand was carefully surveyed for further carved trees. Every carved tree was documented and the following data were recorded:

- The location of the tree, measured with a GPS-receiver
- The number of carvings
- The appearance of the carving (documented by drawings and photographs)
- The status of the tree
- Additional notes about the carving, the tree and the environment, as appropriate

2.3. Analyses

The co-ordinates of the carved trees were entered in a GIS and their distribution in the landscape was analysed both for individual trees on a local topographical scale and for the study area as a whole. Legible information provided by the carvings was classified into themes. Then a count was made of how many carvings provided information related to each of these themes. Some of the themes were further analysed to extract more information about herding practices and organisation. The years in which the carvings were made, and variations in the intensity of the carving practice over time were interpreted.

3. Results

In total, we located and documented 488 unique carved trees during the two inventories. Since some of the trees had two or more carvings on them, the total number of carvings documented was 681. Up to eight carvings could be discerned on a single tree. It was possible to read 523 of the documented carvings, the rest being problematic because of encroachment by further growth, erosion or the cutting away of some of the carving.

During the interpretation, it was possible to classify information provided by 403 carvings into legible themes as follows: Name (initials and indication of gender), Year, Id-sign (associated with name), "SI" (a word for "attention!"), Stay (cross-characters indicating length of stay in weeks), End of stay (indicating the last day of the season) and Evaluation (words such as "good", "bad", "true").

3.1. Spatial patterns of the carved trees

The documented carved trees were concentrated in the centre-southeastern part of the study area, close to the summer farms and the parish border (Fig. 2.). In this "core" area the trees were aggregated as groups of up to 82 trees with an approximate spacing of 1.5 kilometres

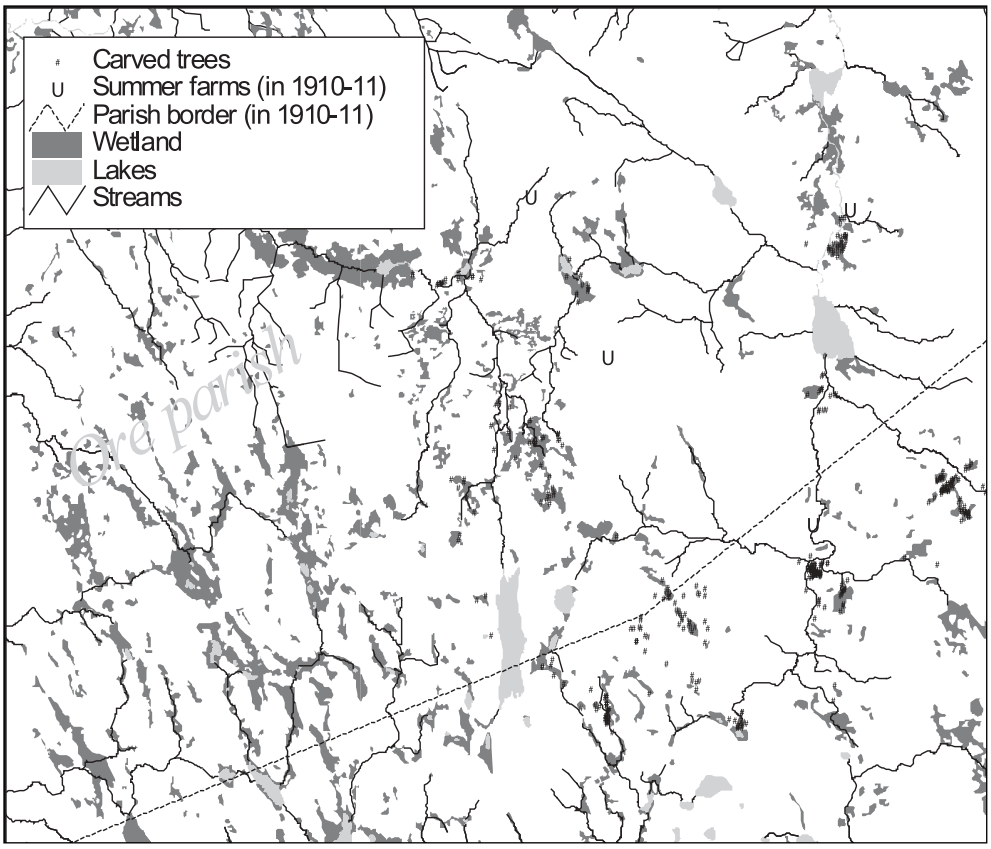

Figure 2.
Spatial distribution of carved trees. Summer farms and parish border based on the ordnance survey map of 1910-1911, Lantmäteriet. Wetland, lakes and streams based on Geographic Data for Sweden (GSD), Lantmäteriet

3.2. Contents of tree carvings

Name was the most common theme. Of all interpretable carvings, 342 or 85% included name initials (Fig. 3.). After the name initials there was a statement of the person's gender (D for female, S for male). Of the 632 names with an interpretable gender, 97% were women and only 3% men.

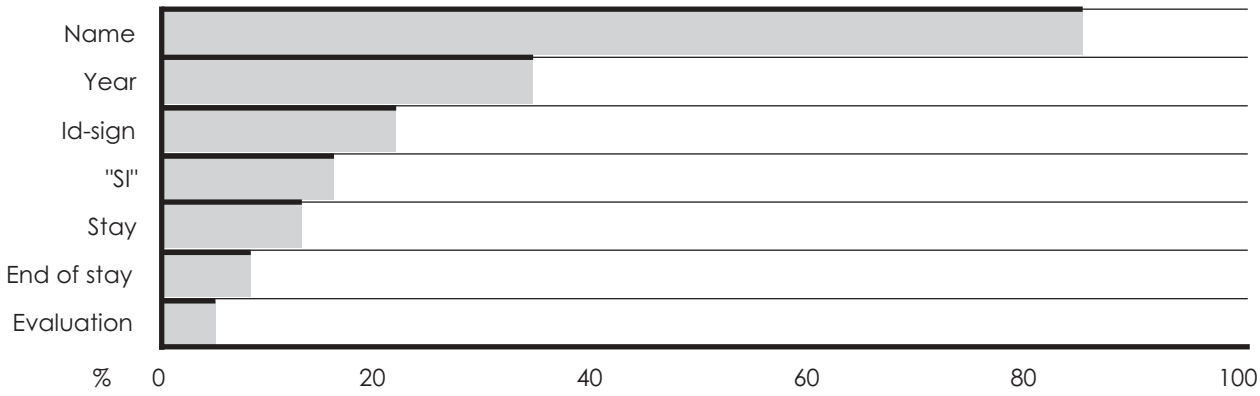

Figure 3. Percentage abundances of tree carvings related to legible themes

A third of the carvings included characters indicating a year. Of these, 49% could not be determined due to encroachment, erosion or simply because the century was never carved. The series of specified years ranged from 1708 to 1905 (Fig. 4.).

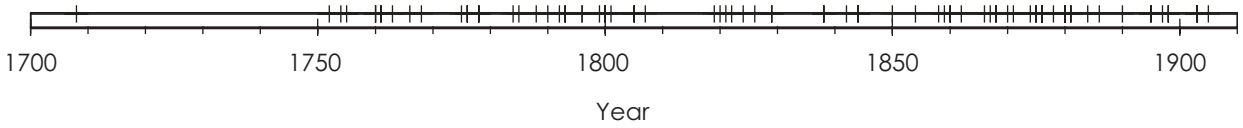

Figure 4. Time distribution of trees with interpretable carved years in the period from 18th to 20th centuries

Many carvings included simply crosses or strokes. Some of these were interpreted as the number of weeks (crosses) and number of days (strokes) that the herders stayed at the summer farms. This periodic stay was generally for two to four weeks, according to 80% of the carvings. The longest documented stay was seven weeks.

4. Discussion

4.1. The meaning of tree carvings in the traditional landscape

We can consider the distribution of carved trees documented in this study on two different scales. On a regional scale, considering the whole study area (160 km^2), the trees are highly aggregated within the area of the summer farms. On a local scale, the carved trees were found between the farms along small streams and in wetlands (Fig. 2.). This pattern of carved trees on former pastures and resting places is a remnant of the originally more extensive network aimed at communication between the herders.

Considering the tree carvings as closely related to a valuable biological resource they can be interpreted as demarcations between different herding groups. The forest grazing areas had no continuous boundaries delimiting areas of farmland. However, there was no doubt which herder group had the right to use the pasture (Levander 1943). The marking of paths to, and places next to pasture were enough to claim rights to the area, even for the year to come (Campbell 1982; Bradley et al. 1994). A tree carving was a personal mark, connected to a specific herder. The custom of carving trees was a way of maintaining the right to pasture.

The people in Ore parish were particularly zealous about carving trees (Forsslund 1920), in accordance with the relatively high number of findings in this area compared to surrounding

parishes (Rolf Lundqvist, personal comm.). Ore parish was threatened by (and in conflict with) neighbouring parishes several times over the centuries and, consequently, the border also shifted (Veirulf 1975). This pressure on territory increased the need for demarcations and tree carvings, particularly close to the parish border.

4.2. Temporal changes in traditional practices

The practice of carving trees in the studied area increased in the late 1800s, peaking in the 1860s and 1870s (Fig. 4.). This may indicate a general increase in the population and pasture requirements at these times. However, the remaining trees were found in association with only a few of the original grazing areas because of the loss of carved trees during the 20th century. Therefore, the variation in carving intensity may reflect variations in local conditions and changes in herding routes rather than general trends for the whole parish.

Very few trees were found that were carved later than the 1870s, the last inscribed year being 1905 (Fig. 4.). Because of the strong relationship with herders and pastures, the loss of this practice was a direct result of the abandonment of summer farms due to increased fodder production at the homesteads. The traditional herding routes were abandoned and there was no longer competition for pasture. Consequently, there was no longer a need to demarcate the forest resources with tree carvings. Carving associated with traditional herding practices ceased in the early 20th century, the number of carved trees decreasing since that time.

4.3. Details of herders and herding

The primary and most obvious piece of information for a herder to carve was his or her name, the next most important being the year (Fig. 3.). However, there are other ways to indicate one's identity than by name and, together with almost a third of the names, a personal sign was carved (Fig. 3.). In a few carvings, the origins of the herder were added (e.g. "from Dalbyn village, from Sörboda village"). All of this information; the name, gender, year, personal sign and origin; helped to identify the carver.

Special attention was paid to the carvings made on the last visit, which tended to be more than usually complex (Fig. 1.). In these carvings, the season often was stated (e.g. "spring" or "autumn"). This indicates a shift between two different summer farms, a tradition possibly related to increased competition for pasture (Montelius 1977). The complex carvings could also include expressions of sadness, a longing for home, or indications of pasture conditions.

5. Conclusions

Carved trees have the potential to make significant contributions to our understanding of traditional forest use. They can document similarities and differences in traditional herding practices, as well as personal statements from the herders, both through time and across geographic space. Carved tree studies can be combined with archaeological investigations and historical records to document changes in forest use and herding practices over time. This paper demonstrates this potential and illustrates the importance of treating the remaining relicts of carved trees as a cultural heritage.

6. Acknowledgements

The author wants especially to thank an important link to traditional knowledge, Knuts-Hans Hansson from Lenåsen, for directing the initial attention to trees carved by herders. I also want to thank my co-workers Rolf Lundqvist and Lars Östlund, the co-authors of the original publication from which this material was extracted (Andersson et al. 2005), with kind permission of Springer Science and Business Media.

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Le pratiche agro-selvicolturali e le strutture per la caccia di selezione agli Ungulati come elementi caratterizzanti il paesaggio forestale

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Abstract

Ungulates hunting represents one of the fundamental elements of faunal-environmental management of landscape. This technique is becoming very common not only in the Alps, but also in the northern Apennines mountains, because of the demographic increase of ungulates populations (Roe deer, Red deer, Fallow deer, etc) in this areas. For this reason, agronomic and sylvicultural practices, but also traditional structures aimed to the management of ungulates populations are spreading in several parts of the Italian territory. These management forms are also directed to the conservation and the restoration of open areas like clearings, meadows and pastures whose presence allows easier monitoring of animals and more efficient interventions for managing populations. "Altane" are traditional specific emplacements for ungulates hunting; they accomplish the function to raise hunter position in order to consent more precise shootings and more accurate observations of animals during monitoring and rating phases. The proposal of different patterns and structural arrangements meets the need to define new constructive schemes, characterized by operative efficiency, use safety and low landscape impact.

1. Introduzione

L'esercizio dell'attività venatoria ha accompagnato l'Uomo nel corso dei millenni. Innumerevoli sono le testimonianze dell'antico legame uomo-caccia tra cui si ricordano le famose immagini rupestri delle grotte di Lascaux, Rufignac e Altamira o i racconti di caccia riportati in opere come l'Odissea e l'Eneide. In un primo momento l'attività venatoria era mirata alla difesa dalle belve feroci e all'approvvigionamento di beni necessari come il cibo e le pellicce mentre, in seguito, è divenuta sempre più un esercizio ricreativo e, in alcuni casi, una vera e propria professione.

A tal proposito Di Berenger nel suo testo "*Studii di archeologia forestale*" *(1859-1863) riporta: "…l'uomo, dapprima costretto a muoverla (la caccia n.d.a.) contro animali feroci, che gli contrastavano l'esistenza, ed il tranquillo possesso della terra, si trovò spinto dappoi a rinnovarla pel bisogno di cibarne le carni, e valersi delle spoglie loro per ricoprirsi*".

Lo stesso autore parla di una caccia che da "devastatrice", allorché indirizzata alla difesa dalle fiere, diviene "conservatrice" al fine di utilizzare la selvaggina quale bene primario di sussistenza. Infine, parla di un'attività venatoria "*riproduttrice*" con riferimento alla caccia per diletto esercitata dai ricchi per i quali "*…essendo divenuta passione dominante,…., fece che si moltiplicassero i boschi per soddisfarla; ciò che avvenne per certo di già ai tempi dell'impero romano, e non soltanto nell'età di mezzo, come opinerebbero alcuni storici*".

In pratica, fino agli anni '70 del secolo scorso, al fine di conservare la fauna selvatica si mirava soprattutto alla protezione delle superfici forestali che svolgevano il ruolo di "serbatoi" per molte po-

polazioni animali selvatiche; queste venivano sospinte a cercare rifugio in tali aree soprattutto per la forte pressione delle attività antropiche sul territorio, prime fra tutte, l'agricoltura e l'allevamento.

Oggi, il problema appare completamente diverso; i profondi cambiamenti dell'economia e della società rurale hanno modificato il paesaggio montano e collinare soprattutto a causa dell'abbandono delle pratiche agricole e selvicolturali tradizionali. La situazione attuale si configura quindi con una forte espansione delle aree boscate e della fauna legata ad esse, e quei paesaggi, una volta caratterizzati da elevata eterogeneità di utilizzazione e frammentazione degli habitat, stanno subendo un processo di "semplificazione".

Oggi, tra le priorità di intervento si deve inserire il recupero degli ambienti aperti come i pascoli e i prati falciabili così da favorire la conservazione di habitat idonei a molte specie animali selvatiche e, al contempo, incrementare la biodiversità e ridurre l'impatto della fauna sulla vegetazione forestale attraverso l'incremento dell'offerta pabulare fornita da tali ecosistemi. In questo modo, infine, si possono riproporre modelli di assetto del territorio e caratteri paesaggistici un tempo legati a pratiche agricole tradizionali e oggi in disuso.

In questo contesto di gestione ambientale sostenibile, si inserisce anche la caccia di selezione agli Ungulati: tecnica venatoria, di recente introduzione in Italia, basata su razionali piani di assestamento faunistico attuati mediante prelievi programmati e il monitoraggio delle popolazioni gestite. Per la corretta esecuzione di tali piani, tra gli altri, risultano necessari due elementi:

- La presenza di ambienti aperti al margine dei boschi dove gli animali possono essere osservati, censiti, abbattuti e recuperati.
- La presenza di strutture chiamate "altane" che hanno la funzione di consentire una più attenta e accurata osservazione degli animali nelle fasi di stima e monitoraggio delle popolazioni e di permettere prelievi effettuati con maggior precisione.

Il presente lavoro ha lo scopo di illustrare, attraverso alcuni esempi, le opportunità di valorizzazione dell'ambiente forestale che possono derivare dalle esigenze di una corretta e razionale gestione delle popolazioni animali selvatiche, in particolare in quelle zone ove la generalizzata ricostituzione di fitocenosi forestali in ambienti aperti ormai abbandonati dalle attività agricole e zootecniche può essere causa di riduzione della biodiversità e di eccessiva uniformità paesaggistica.

2. Materiali e metodi

Al fine di valutare il ruolo svolto dalle aree aperte sulla gestione della fauna selvatica ad Ungulati, è stato realizzato uno studio in un'area dell'Appennino centro-settentrionale dove viene esercitata la caccia di selezione al Capriolo (*Capreolus capreolus*, L., 1758) che, insieme al cinghiale, rappresenta uno degli Ungulati più diffusi nell'Italia centrale (Pedrotti *et al.*, 2001). Tale area è rappresentata da un distretto di caccia, denominato "La Bastia", che si estende su circa 2750 ettari e si colloca nell'alta valle del fiume Senio, sull'Appennino Tosco-Romagnolo, tra le province di Firenze e Ravenna. I territori del distretto si trovano ad un'altitudine compresa tra i 400 e 1100 m s.l.m. e sono per la maggior parte occupati da formazioni forestali costituite principalmente da boschi cedui di Roverella (*Quercus pubescens*) e di Carpino nero (*Ostrya carpinifolia*); sopra i 900 m di quota si ritrovano cedui di Faggio (*Fagus sylvatica*) avviati all'alto fusto mentre, nelle zone di media e bassa montagna si rinvengono ancora discrete superfici a castagneto da frutto.

In questa area è stata analizzata l'influenza dei tipi di uso del suolo sull'esercizio della caccia a carico del Capriolo e, in particolare, sulla possibilità di effettuare gli abbattimenti previsti dai piani di prelievo annuali. A tal fine, ci si è basati su due elementi fondamentali:

- Una carta digitale di uso del suolo del Distretto, realizzata in ambiente GIS con il software ArcView GIS a partire da rilievi effettuati in campo
- La posizione degli abbattimenti a carico degli individui di Capriolo all'interno del Distretto nelle stagioni venatorie 2003 e 2004

Questi due tematismi, una volta sovrapposti ed intersecati, hanno restituito come risultato il valore delle frequenze degli animali abbattuti all'interno di tre diverse classi di uso del suolo ottenute per accorpamento di più tipologie di copertura del suolo. Queste classi sono costituite da:

Zone boscate (boschi cedui, fustaie, boschi ripariali, castagneti da frutto).

- Arbusteti e cespuglieti (prati cespugliati e cespugliati alberati, cespuglieti su roccia ecc.)
- Zone aperte (prati polifiti, pascoli, erbai di erba medica e varie colture agrarie)

In seguito, mediante un estensione del software chiamata Random point, sono stati generati dei punti random in ugual numero rispetto ai punti di abbattimento dei caprioli, per la precisione 144, in modo da valutare eventuali differenze tra un modello di prelievi distribuiti casualmente sul territorio e la distribuzione reale (Figura 1.). Le frequenze attese (punti random) e quelle osservate (posizione degli abbattimenti) sono state confrontate tra loro mediante il test statistico del χ^2.

In un secondo momento, sono state prese in analisi alcune soluzioni costruttive per la realizzazione delle altane, al fine di proporre modelli e schemi costruttivi che possano contribuire a definire nuove forme strutturali caratterizzate da efficacia operativa, sicurezza di uso e ridotto impatto paesaggistico.

Infatti, queste strutture vengono spesso realizzate con i materiali più disparati e con tecniche costruttive che non rispondono a pieno alle funzioni che tali appostamenti devono adempiere. In primo luogo, le altane devono rispondere a precisi criteri di sicurezza nell'uso che derivano dalla solidità e dalla stabilità della struttura anche in presenza di forti venti o di carichi da neve.

Inoltre, queste strutture dovrebbero consentire un'elevata visibilità dell'area di caccia per rendere più efficaci i prelievi, limitando al massimo le possibilità di ferimento degli individui, e per semplificare le operazioni di censimento e monitoraggio degli animali; sarà quindi opportuno realizzare tali strutture in punti strategici del territorio e con un'altezza idonea alle caratteristiche morfologiche e vegetazionali dell'ambiente in cui devono adempiere alle proprie funzioni.

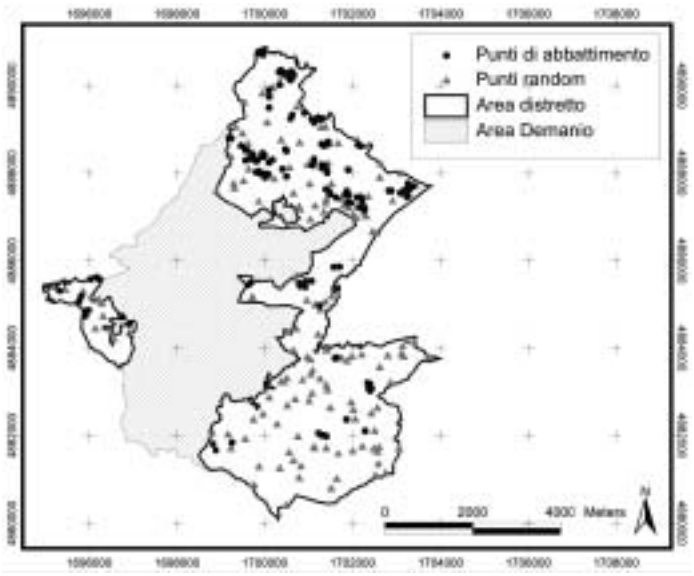

Figura 1.
Posizione dei punti di abbattimento e dei punti random nell'area di studio

3. Risultati e discussione

Come messo in evidenza dalla Figura 2., gran parte degli abbattimenti a carico del Capriolo vengono effettuati all'interno di zone aperte. Infatti, più della metà dei 144 individui abbattuti, sono stati prelevati in questi ambienti che rappresentano nel complesso solo il 6% circa dell'Superficie Agricola e Forestale (SAF) del Distretto.

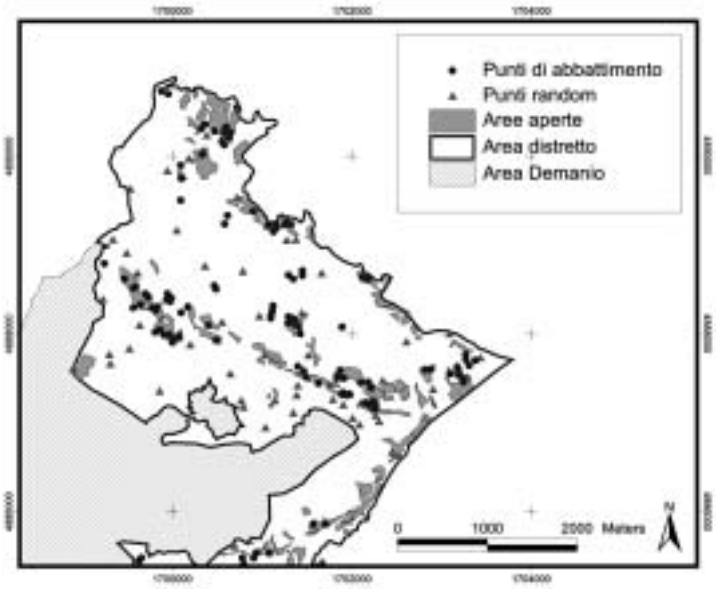

Figura 2.
Posizione dei punti di abbattimento e dei punti random rispetto alle aree aperte

Al contrario, il numero dei capi uccisi nelle aree boscate, che occupano gran parte del territorio agro-forestale (72%), appare di gran lunga inferiore di quello atteso (Figura 3.). Evidentemente, in tali ambienti, le attività di monitoraggio e di gestione delle popolazioni presentano non poche difficoltà. Il test statistico del χ^2 conferma la notevole differenza tra le frequenze attese e quelle osservate in quanto ha fatto registrare un valore altamente significativo ($\chi^2 = 345{,}75$, $p < 0{,}001$).

Quindi, in ambienti con elevata copertura forestale come quello in analisi, la presenza di zone a prato, a pascolo o a colture agricole rappresenta un fattore di primaria importanza per la corretta gestione delle popolazioni di Capriolo. Inoltre, in precedenti studi, è stato notato come nei territori in cui si alternano di frequente ambienti forestali e zone aperte, caratterizzati da elevati valori degli indici di diversità ambientale come l'indice di Shannon e di Edge Density, risultano di molto migliorate le condizioni di vita degli animali (Casanova *et al.*, 2005a).

Un'importante conseguenza di quanto sopra illustrato è che, data la spiccata territorialità del Capriolo, i prelievi si concentrano sempre sugli stessi gruppi familiari che vengono così fortemente limitati: così come il loro patrimonio genetico. Si assiste quindi ad una grave perdita di variabilità genetica che, soprattutto per specie ad elevato livello di *imbreeding* come il capriolo, produce conseguenze estremamente negative sulle popolazioni.

Al contrario, i gruppi presenti nelle aree boscate non vengono in pratica gestiti (selezionati) in quanto le possibilità di abbattimento degli animali sono ridotte a sporadiche occasioni di incontro durante la caccia alla "cerca": attività venatoria eseguita vagando per il territorio e non da appostamento fisso.

Si vuole comunque ricordare che gli ambienti forestali rappresentano habitat indispensabili per lo sviluppo delle popolazioni di capriolo, come di altri ungulati selvatici, i quali svolgono molte fasi del ciclo biologico all'interno di tali ecosistemi. Per questo motivo, anche allo scopo di ampliare le potenzialità gestionali dell'attività venatoria sulla fauna selvatica ungulata, si dovrebbe favorire la conservazione o il ripristino di aree forestali che offrono una buona visibilità al loro interno e che, al contempo, presentano caratteristiche ecologiche idonee alla sussistenza delle popolazioni animali.

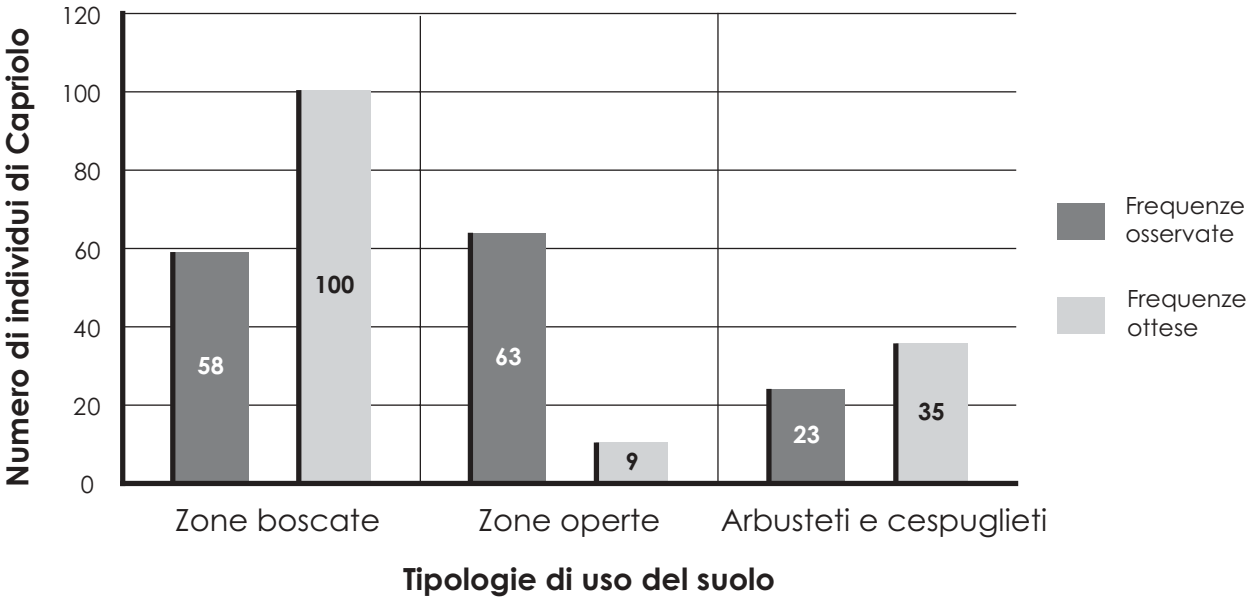

Figura 3. Confronto tra frequenze osservate e frequenze attese degli abbattimenti nelle diverse tipologie di uso del suolo

Tra queste si ricordano i castagneti da frutto i quali, data la grande distanza tra pianta e pianta, consentono una buona visibilità al loro interno e costituiscono aree di pascolo preferenziale per gli ungulati che possono usufruire delle castagne e di un ricco strato erbaceo.

Allo stesso modo, le tagliate dei cedui si configurano come aree idonee all'avvistamento e all'abbattimento dei capi in quanto all'interno delle stesse spesso si concentra l'attività di pascolo degli ungulati che si rivolgono sia alla vegetazione erbacea sia ai ricacci delle ceppaie (Casanova *et al.*, 2005b).

Nei boschi di alto fusto, oltre alla creazione di radure dislocate a macchia di leopardo, sarebbe utile apportare interventi di diradamento piuttosto forti che riducano la densità del soprassuolo, così da favorire un migliore sviluppo del sottobosco (strato arbustivo ed erbaceo) e permettere una maggiore visibilità all'interno del bosco.

Per quanto riguarda la realizzazione delle altane, appare opportuno scegliere materiali di costruzione che bene si inseriscano nel paesaggio agro-forestale come il legno. Questo materiale risulta molto idoneo per la costruzione di tali appostamenti, come di numerose altre strutture rurali, in quanto può essere facilmente lavorato e assemblato mediante elementi di collegamento molto semplici; inoltre, presenta costi contenuti, è diffuso e reperibile in vari assortimenti e può essere smaltito e riciclato in modo ecologico (ARSIA, 1998).

Un primo elemento da considerare in fase di realizzazione è fare in modo di non vincolare la struttura agli alberi poiché questi, muovendosi sotto l'azione del vento, influiscono in maniera negativa e determinante sulla precisione nel momento dello sparo. Proprio per garantire una maggiore immobilità della struttura, risulta indispensabile quindi far poggiare l'appostamento direttamente in terra mediante dei pali di legno, conficcati nel terreno in profondità o immersi in piccole gettate di calcestruzzo.

Un altro aspetto fondamentale è costituito dalla controventatura degli stessi pali per mantenere solida, e quindi anche sicura, la struttura anche quando sollecitata dai venti o dai carichi di neve. Il capanno vero e proprio dove opera il cacciatore viene posto in cima alla struttura e dovrebbe essere costruito in tavole di legno, utilizzate sia per le pareti che per il pavimento; queste contribuiscono alla solidità e al corretto inserimento nel paesaggio di questa parte della struttura la quale, data la sua posizione molto sollevata da terra, contribuisce in maniera determinante al grado di impatto visivo di tutta l'altana.

Per lo stesso motivo, anche la copertura dell'appostamento deve essere realizzata con materiali naturali come ad esempio le canne e le frasche poste sopra ad ondulati inclinati verso il lato posteriore del capanno che assolvono alla funzione di garantire riparo al cacciatore in caso di pioggia o neve.

4. Conclusioni

Le conoscenze che derivano dall'antica pratica dell'arte venatoria risultano oggi trasferibili alla moderna tecnica della caccia di selezione agli Ungulati. In particolare, il recupero di aree abbandonate dalle attività agricole tradizionali e dal pascolo consente di aumentare la capacità portante dell'ambiente nei confronti di questi grandi erbivori e, al contempo, di consentire una migliore esecuzione dei piani di assestamento faunistico (monitoraggio e prelievi).

Nelle aree boscate, un'utile pratica di gestione delle popolazioni animali consiste nell'apertura di radure da destinare al pascolo degli Ungulati in modo da diminuire l'impatto di quest'ultimi sulla rinnovazione forestale. Anche il recupero dei castagneti da frutto e il taglio dei boschi cedui ampliano le possibilità di intervento sulla fauna selvatica rappresentando aree idonee per il pascolo e gli abbattimenti dei capi.

Un concetto moderno di appostamento fisso è rappresentato dalle altane che prendono origine, con opportune modifiche, dai tradizionali appostamenti per l'avifauna migratoria (colombaccio, tordi ecc.). Queste, per la sempre maggior diffusione della caccia di selezione, stanno diventando elementi caratterizzanti del paesaggio non solo sulle Alpi, zona in cui questa tecnica venatoria è presente da molto tempo, ma anche nei territori appenninici dove è di più recente introduzione. Per questo motivo è necessario che tali strutture rispondano in modo adeguato, oltre che alle esigenze tecniche e strutturali, anche a quelle di un corretto inserimento nel contesto paesaggistico.

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Sugumagi – The Korean traditional forest planted near Sugu by the backgrounds of Fengshui

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Abstract

Sugmagi is an unique Korean traditional forest by the backgrounds of Fengshui and it is located near Sugu (a city entrance) like the main door of a house. And various facilities (Jangseung, Sosdae, CheongJa, etc.) are located inside of Sugumagi. The goal of this study is to find out historical meanings and roles of Sugumagi planted around Sugu and to offer some ideas and techniques by Fengshui. By written documents, actual cases, and visual maps and pictures, this study probably can provide you with a more understanding of Sugumagi meanings and roles.

1. Introduction

Fengshui is an ancient method of approaching a property that maintains balance and harmony for those who hold the land and for the earth. Until the present, Fengshui has been a powerful paradigm which has affected the formation of the spatial structure of cities in Korea. We can define Fengshui as the theory of spatial formation and suitability analysis based on the concept of oriental natural animism.

Fengshui's main goal is to make and search for the best site (Myungdang) surrounded by mountains or hills which moderate the wind (Feng) and gathers the water(Shui). The climate being ruled by the winds, the winds become the cause of all things. Too much wind is malicious. In short, Fengshui theory related to the management of wind shall complete an urban topography encircled on all sides without opening in order to moderate the winds.

One of the most important observation objects is Sugu (a floodgate, the exit of the river from the site on the narrow throat of it) in Korea. But Sugu area in the traditional city is usually open, most of Fengshui complementary methods (mounds, ponds, monuments, and plantings) were built near Sugu. So the forest planted near Sugu or a gorge in which wind blows is called Sugumagi.

2. Results and Discussion

2.1. Some examples of Sugumagi

2.1.1. The Sugumagi of Seoul(the Capital of Korea)

The Sugumagi of Seoul does not exist now. It was located around the east gate of Seoul's citadel.

2.1.2. The Sugumagi of Haenam city

2.1.3. The Sugumagi of Kyungju City

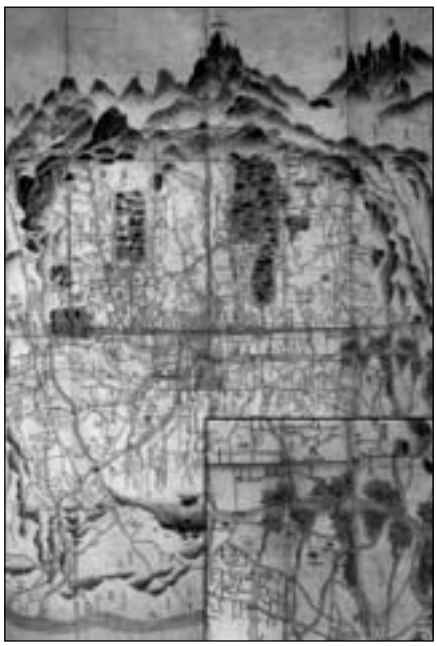

Figure 1. Old map of Seoul City(1780)

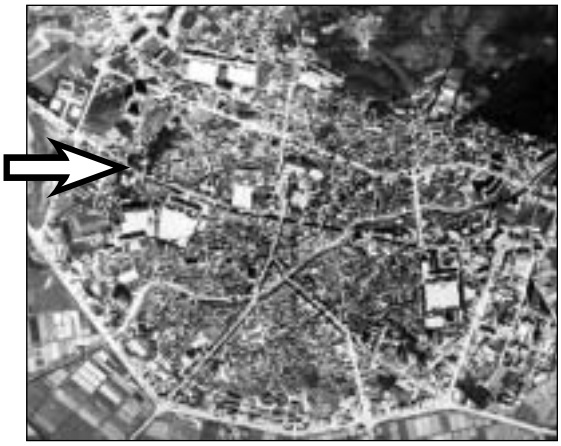

Figure 3. Aerial photo of Haenam's Sugumaki (2004)

Figure 5. The Sugumagi of Kyungju Cityin an Old Map

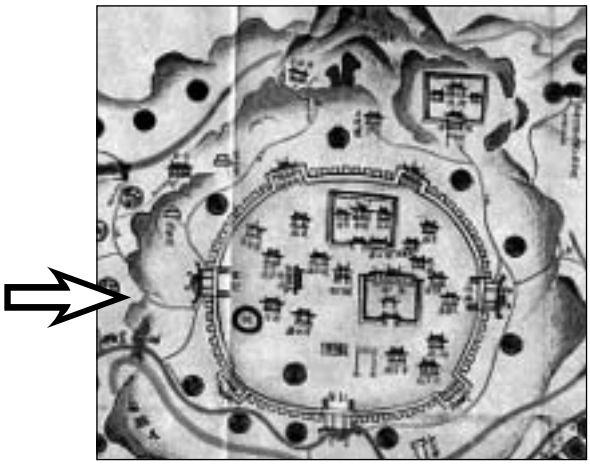

Figure 2. The Sugumagi of Haenam City in an Old Map(1872)

Figure 4. The Sugumagi of Haenam City(2004)

Figure 6. Aerial photo of Kyungju's Sugumaki(2003)

Figure 7. The Sugumagi of Kyungju City (2000)

2.2. Roles of Sugumagi

Sugumagi serves as a conspicuous visual element that enhances the sense of place in a city, because it locates in a Sugu (the only open area of the city) and makes a totally enclosed landscape. And various facilities (Jangseung, Sosdae, CheongJa, etc.) are located inside of Sugumagi. It looks like a city entrance as the main door of a house.

Sugumagi framework that embraces surrounding mountains and ridges is able to play a role in forming and maintaining ecological networks and can create ecological corridors conditioning the city and its water balance.

Sugumagi usually played an important part in protection against cold wind in winter and the storm in summer saving heating and cooling energy. Sugumagi controlled internal temperature and humidity of the city. The application of ecological corridors by the construction of Sugumagi can greatly enhance the bird and animal habitat of the city. Sugumagi is one of the best ecological methods to construct a friendly environment.

People's anxieties are related to natural fears of floods and storms which are unpredictable and uncontrollable. Sugumagi is a way to alleviate these anxieties. A safe urban topography encircled on all sides without an opening is completed by constructing Sugumagi.

This presentation briefly summarizes Sugumagi meanings and the role on the urban edge. In addition, some cities in Korea were selected as examples of case studies. By written documents, actual cases, and visual maps and pictures, this poster probably can provide you with a more comprehensive understanding of Fengshui meanings and roles of Korean Sugumagi.

Acknowledgement

This work was supported by a research grant from Hankyong National University in the year of 2006.

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Assessment of traditional cultural landscape visual quality loss by spontaneous afforestation of abandoned lands

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Abstract

Due to depopulation of rural areas during last half-century the cultural landscape in Slovenia has been affected by a widespread process of spontaneous afforestation of abandoned agricultural lands. Although this process has also positive aspects, the traditional cultural landscape is thus losing its outstanding aesthetic beauty. In order to assess where the spontaneous afforestation will be aesthetically most damaging, and to assist the sustainable management of forested landscape, we developed a quantitative spatial model for the assessment of cultural landscape visual quality for a region in western part of Slovenia. The input variables of the model were the mapped physical features of the landscape, including the spatial pattern of forest edge, relief, landscape composition and anthropogenic degradation (quarries and industrial sites). Based on the model the aesthetically most valuable areas of landscape were identified. Finally, the current spatial trend of spontaneous afforestation was extrapolated into the next 20 years, and intersected with the modeled map of aesthetically valuable areas, in order to assess the areas needing special protection against spontaneous afforestation.

Rimboschimento ed incendi: un problema antico con un nuovo approccio

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Abstract

The report of the European parliament on the implementation of European Union Forestry Strategy clearly calls for a recommendation aimed at suggesting an integrated approach to protecting forests against fires, with measures such as the harvesting and utilisation of residual forest biomass, a temporary ban on changes in the use of burnt land to prevent speculation following fires, and the creation of special prosecution services for environmental offences. The recommendation is particularly important for Italy, where more than 1.000.000 hectares were reforested from 1867 onward, of which 420.000 from 1925 to 1945 and more than 120.0000 only in Calabria. In these even-aged forests, quite often abandoned after the early phase of planting, trees increased resulting in dense, multi-storied conditions. This condition, in heliophilous (light-loving or shade-intolerant) pioneer species, such as *Pinus*, results in the abundance of necromasse, represented by shaded dead branches, forming a very dangerous fuel ladder. A possible solution, which perfectly complies with EP recommendation, is the implementation of prevention sylviculture, i.e. stand tending aimed to modify and reinforce stand structure and at reducing fire effects through the reduction of fuel load.

1. Introduzione

Nell'ultimo decennio si è assistito ad una crescente rivalutazione del ruolo delle foreste nei dibattiti e nelle iniziative politiche internazionali: l'allargamento dell'UE ha comportato una notevole espansione del settore forestale europeo, non solo in termini di superfici, ma anche di potenziale produttivo ed ecologico. Rapporti recentemente pubblicati indicano un progressivo aumento della copertura forestale totale in Europa durante il periodo 2000-2005, stimando che la superficie boscata è incrementata di circa 2,3 milioni di ha, sia per un processo di naturale espansione che per attività di imboschimento. A queste considerazioni si affianca la presa di coscienza che le foreste, e una loro gestione sostenibile, possono contribuire a fornire benefici multipli alla società, assumendo un ruolo cruciale per l'adempimento degli impegni assunti dalla Comunità relativamente alla perdita di biodiversità e all'attenuazione dei cambiamenti climatici.

È pertanto divenuta sempre più pressante la necessità di coerenza fra le politiche forestali degli stati membri e le relative attività forestali, necessità che ha incentivato, il 15 dicembre 1998, l'approvazione di una Strategia Europea di Protezione delle Foreste da parte del Consiglio d'Europa, che ha inoltre invitato la Commissione a relazionare sulla sua esecuzione, relativamente al quinquennio 1999-2004.

In risposta la Commissione ha inviato una comunicazione al Consiglio ed al Parlamento Europeo contenente una revisione dettagliata delle attività effettuate nel contesto della strategia, le conclusioni sui principali successi e le possibili azioni per il futuro e ha inoltre concretizzato l'impegno ad aumentare la conduzione sostenibile delle foreste proponendo l'adozione di un Piano d'Azione delle Foreste Europee da realizzare entro il 2006. L'esecuzione di tale piano rientra nelle competenze di ciascuno Stato membro, che, attraverso programmi nazionali e mediante l'attuazione di politiche comuni, supportate dell'UE, ha il compito di perseguire gli obiettivi previsti.

La *European Union Forestry Strategy* (2005/2054 (INI)) affronta numerose tematiche inerenti la gestione sostenibile delle foreste soffermandosi sull'importanza del ruolo multifunzionale da esse svolto e ribadendo la necessità di misure di tutela e di recupero, mette a fuoco gli obiettivi prioritari che mirano a migliorare, compatibilmente con la protezione dell'ambiente, la competitività a lungo termine dei prodotti forestali, promuove le attività di ricerca e di innovazione e incentiva azioni mirate ad incrementare l'uso delle risorse della foresta per la produzione di energia.

Riconoscendo la vasta gamma di risorse naturali, le differenze sociali, economiche e culturali, l'ampia varietà di regimi di proprietà all'interno della comunità europea, la gestione del patrimonio boschivo, attraverso la selvicoltura sostenibile, mira a ridurre le importazioni delle materie prime legnose, a promuovere il valore dei prodotti forestali secondari quali sughero, resine, piante medicinali, funghi e bacche, a tutelare le funzioni ambientali, sociali e turistiche che il bosco svolge, per garantire la fornitura continua di merci ed i servizi ai cittadini.

Lo sviluppo del piano d'azione potrebbe dare risposta alle numerose problematiche ambientali, prima fra tutte gli incendi, che costituiscono il fattore offensivo più importante nei paesi mediterranei: basti pensare che nel 2000 in Italia sono stati percorsi dal fuoco 59.957 ha di foreste (ISTAT, 2002) (Tab. 1.); l'intensificarsi di condizioni molto calde ed asciutte, verificatesi in conseguenza ai cambiamenti climatici, favoriscono senza dubbio il pericolo degli eventi e ne aggravano gli effetti.

La stessa strategia, al punto 5, espone esplicitamente suggerimenti mirati ad un approccio integrato per la protezione delle foreste dagli incendi, da realizzare con misure di prelievo e di riutilizzo della biomassa forestale residua, con la temporanea proibizione del cambio di uso del suolo nei territori percorsi, per prevenire successive speculazioni, e con la creazione di specifiche accuse e pene per i reati ambientali.

Tabella 1. Incendi forestali e superficie forestale percorsa dal fuoco per tipo di bosco e zona geografica nell'anno 2000

	Numero di incendi	Superficie forestale percorsa da incendi (ettari)								
		Fustaie			Cedui				Totale	
		Conifere	Latifoglie	Miste	Semplici	Composti	Macchia mediterr.	Degradati	ha	% della sup. for.
Nord	1.384	828	160	542	2.198	342	208	2.080	6.358	0,2
Centro	1.172	965	631	427	2.058	189	2.132	948	7.350	0,4
Sud	5.971	7.336	7.330	6.296	11.350	1.003	9.328	3.606	46.249	2,2
TOTALE	8.527	9.129	8.121	7.265	15.606	1.534	11.668	6.634	59.957	0,9

(Fonte: ISTAT, 2002)

2. I rimboschimenti in Italia

Quanto raccomandato dal Parlamento Europeo in tema di protezione dal fuoco suscita la necessità di una concreta risposta, soprattutto in Italia, dove fin dagli anni '20, si è assistito ad un progressivo aumento delle superfici rimboschite, incentivato dall'emanazione di una serie di leggi. Si può stimare, infatti, che, dall'Unità d'Italia (1861) in avanti, siano stati rimboschiti più di 106 ha di terreno (Schirone,1998) con l'obiettivo di incrementare la scarsa produzione legnosa e di migliorare l'azione di protezione del suolo, utilizzando prevalentemente conifere quali *Pinus halepensis* Mill. e *Cupressus sempervirens* L.

A partire dal 1923, è operante il Regio Decreto Legge n. 3267, „Riordinamento e riforma della legislazione in materia di boschi e di terreni montani", noto anche come "Legge Serpieri", che rappre-

senta a livello nazionale il testo fondamentale, ancora vigente, nel settore forestale. La legge, nata da esigenze prevalentemente protezionistiche di conservazione dei suoli e delle acque e di difesa delle pendici montane, non solo ebbe l'effetto di preservare le foreste dalla distruzione, attraverso l'imposizione di una serie di vincoli, ma favorì le opere di rimboschimento, prevedendo l'esenzione dell'imposta fondiaria, la direzione tecnica gratuita, contributi e la fornitura gratuita delle piantine. Tra il 1925 e il 1945 vennero rimboschiti circa 420 000 ha di terreno.

In fase successiva, dopo un'interruzione forzata delle opere in seguito allo scoppio della Seconda Guerra Mondiale, la legge sui cantieri di rimboschimento, nel 1949, ebbe lo scopo di prevenire i fenomeni di erosione e garantire l'occupazione, mentre il progetto speciale PS 24 della Cassa per il Mezzogiorno, nel 1975, si prefiggeva un'integrazione tra il settore della produzione legnosa e la sua utilizzazione industriale, conferendo agli interventi un'impronta prevalentemente produttivistica.

Alla legislazione nazionale si affianca oggi quella comunitaria, che, attraverso i Regolamenti CEE 2080/92 e 1257/99, emanati nell'ambito della Politica Agricola Comunitaria, ha inciso sulla politica forestale italiana. Il primo regolamento, diretto a incentivare e a migliorare la superficie boscata, prevedeva l'istituzione di un regime comunitario di aiuti alle misure forestali nel settore agricolo, quali contributi alle spese di imboschimento, premi annuali per ettari rimboschiti, incentivi alle sistemazioni per il miglioramento delle superfici boschive (frangivento, fasce tagliafuoco, strade forestali). Promuovendo un'utilizzazione alternativa delle terre agricole mediante l'imboschimento il Regolamento ha contribuito allo sviluppo dell'arboricoltura da legno e ha determinato una ripresa delle piantagioni forestali, che tra il 1998 e il 2002 hanno interessato oltre 54.000 ha (Schirone, 1998). Tra gli obiettivi perseguiti dal Regolamento era inoltre citata la lotta all'effetto serra e l'assorbimento di anidride carbonica: non va dimenticato il ruolo che i rimboschimenti e la corretta gestione di quelli già esistenti potrebbero assumere in questo senso. Successivamente, il Reg. 1257/99 ha abrogato il Reg. CEE 2080/92 e ha rifinanziato il sostegno comunitario alle misure forestali nel settore agricolo.

3. I rimboschimenti in Puglia

La Puglia fu interessata, alla fine degli anni Trenta (1937-1940), da un vasto e capillare programma di rimboschimenti, che, pensato ed attuato per soddisfare esigenze di diversa natura coinvolse i terreni improduttivi, nudi, pascolivi e pietrosi, situati sulla Murgia, in provincia di Bari, con la realizzazione di circa 20.500 ettari di rimboschimento (Fig. 1.).

Di tale iniziativa, peraltro poco nota anche agli addetti ai lavori, abbiamo fortuitamente trovato documentazione nell'Archivio di Stato di Bari (Buste Titolo 7, rimboschimenti), che conserva tutto il carteggio tra Comuni e Comando Legione della Milizia Forestale Nazionale.

Quest'opera di recupero forestale fu propagandata dal regime fascista come intervento di sicuro giovamento in una provincia poverissima di boschi, sia per gli interessi nazionali che per quelli della provincia di Bari e per gli interessi di privati che avrebbero avuto l'opportunità di valorizzare terreni nudi a bassissimo reddito. Alla valenza idrogeologica, che i nuovi boschi avrebbero assunto, contenendo i danni causati dalle alluvioni, si aggiungevano e si enfatizzavano la possibilità di produrre legname, alleviando le condizioni di penuria legata all'autarchia, finalità paesaggistiche e turistiche, ed un importante ruolo di contenimento della disoccupazione.

Data la natura del lavoro, detti rimboschimenti non furono inclusi nel programma quindicennale della Bonifica Integrale; si pensò, pertanto, per il carattere di assoluta urgenza e di interesse generale che rivestivano, di iniziare i lavori con parte dei fondi che l'Ente Comunale Assistenziale (E.C.A.) di ogni Comune aveva a sua disposizione per l'assistenza alla disoccupazione invernale: l'Ente assi-

stenziale interessato nel rimboschimento, avrebbe fatto affluire sul luogo del lavoro gli operai validi disoccupati che doveva assistere, affinché scavassero un certo numero di buche, proporzionato alla quota di assistenza che l'operaio stesso doveva percepire.

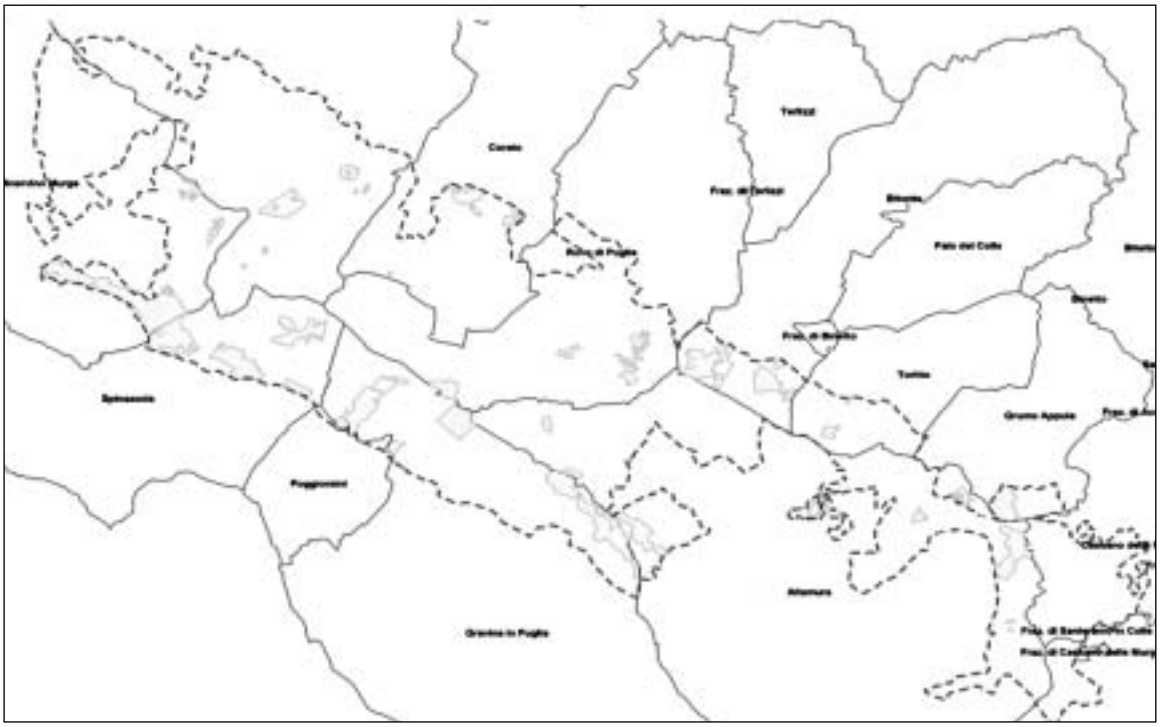

Figura 1. Mappa dei rimboschimenti nel territorio della Murgia Alta, in Puglia
(il tratteggio indica il confine del Parco Nazionale dell'Alta Murgia, istituito nel 2006)

I lavori di rimboschimento furono materialmente seguiti dalla Milizia Forestale Nazionale, che aveva il compito di organizzare, dirigere il lavoro e fornire le piantine necessarie, con i predetti fondi, sostituendo il sussidio per la forzata inattività con un compenso per lo scavo di un certo numero di buche.

In questo modo si riuscì a non far gravare la spesa sulle casse dello Stato che, tuttavia, poteva intervenire o con contributi diretti all'E.C.A. che finanziava i lavori, o con finanziamenti, a norma degli Articoli 90 e 91 della Legge 30 Dicembre 1923 n. 3267, ai proprietari privati che, dietro versamento di un contributo di circa L. 200 ad ettaro e impegnandosi a versare nella Cassa Comunale l'eventuale contributo dello Stato, concesso per rimboschimento volontario e ad utilizzare le proprietà secondo le norme stabilite dalle leggi forestali, potevano rimboschire i propri terreni.

Prima che iniziassero i lavori, l'E.C.A. si occupò di stabilire il costo delle buche, caso per caso, e, in base a questo, il numero di buche che ogni operaio avrebbe dovuto scavare durante il suo turno di lavoro. La Milizia, invece, doveva controllare giornalmente la qualità e la quantità del lavoro svolto da ogni operaio e settimanalmente inviare un resoconto all'E.C.A.

Le modalità di esecuzione, relativamente semplici, prevedevano lo scavo di circa 400 buche per ettaro, alla distanza di 5 m l'una dall'altra, lunghe 1 m, larghe 0,50 e profonde 0,50, ubicate non necessariamente in modo simmetrico, nei punti in cui fosse più facile lo scavo stesso. In ogni buca erano poste 2 piantine e lo scavo fu eseguito a mano. Laddove la roccia era estremamente compatta, si sarebbe potuto ricorrere all'uso di esplosivi, come per esempio la geoclastite, per frantumare le rocce e aprire la strada alle radici, aumentando la percentuale di attecchimento; tuttavia questo tipo di soluzione non fu mai attuata e si preferì ricorrere al lavoro umano di scavo, per ridurre la disoccupazione.

L'impianto fu eseguito, prima nei demani comunali e successivamente nei terreni privati, con il cipresso come essenza principale, dal quale poter ricavare legname di alto valore commerciale, e con il pino domestico ed il carrubo, come essenze secondarie da utilizzare in zone limitate, più adatte ed a reddito elevato.

Si riporta di seguito una tabella riassuntiva dei Comuni interessati dal progetto e dell'entità degli interventi (Tab. 2.).

Nonostante l'importanza assunta in passato, la quasi totalità di questi rimboschimenti sono stati abbandonati, spesso anche subito dopo la fase di impianto; solo raramente sono stati eseguiti i necessari interventi di sfollo e di diradamento, negli anni successivi, per mancanza di finanziamenti specifici; gli interventi talvolta sono stati effettuati in modo irregolare o con modalità non adeguate.

In mancanza di cure colturali le caratteristiche strutturali dei superstiti soprassuoli monospecifici, ormai adulti, sono irregolari e instabili: essi conservano spesso la densità iniziale, con conseguente presenza di numerose piante morte o deperienti e abbondanza di necromassa presente al suolo, come risultato dell'autopotatura, tipica delle specie eliofile quali i Pini. L'accumulo di necromassa e l'abbandono colturale costituiscono una condizione predisponente di pericolo per gli incendi, rappresentata dall'accumulo di materiale potenzialmente infiammabile e dall'elevata continuità verticale dello stesso: non a caso una percentuale considerevole di incendi interessa formazioni classificate dall'ISTAT come "fortemente degradate" (Brun e Magnani 2003) fenomeno che induce a riflettere sulle conseguenze che la mancata gestione dei boschi può avere.

Una possibile soluzione, in linea con le raccomandazioni del Parlamento Europeo, consiste nell'applicazione della selvicoltura preventiva, mirata a ridurre la potenzialità di diffusione dell'incendio, attraverso la modifica della distribuzione e quantità del combustibile e della struttura dei popolamenti, da attuarsi mediante la creazione di discontinuità orizzontali e verticali capaci di limitare la propagazione del fuoco, nel caso in cui l'incendio si verifichi.

Il diradamento è la misura elettiva di selvicoltura di prevenzione; in particolare, il diradamento dal basso appare come un efficace strumento di prevenzione nei riguardi degli incendi di chioma.

Oltre a migliorare la stabilità e funzionalità complessiva dei soprassuoli, il diradamento dal basso aumenta, infatti, la distanza media tra terreno e chiome e nel caso del diradamento "dal basso di grado forte" (Wiedemann, 1935), eliminando quasi del tutto lo strato dei soggetti dominati e rilasciando soggetti con diametri più elevati, a maggior resistenza specifica legata allo spessore della corteccia (Lovreglio et al., 1998) (Fig. 2.-3.).

Figura 2.
Soprassuolo di conifere di origine artificiale prima del diradamento
(Foto Leone)

Figura 3.
Id. dopo un diradamento dal basso di grado medio basso
(Foto Leone)

Tabella 2. Rimboschimenti in Puglia in attuazione degli interventi con fondi ECA (1937-40)

Comune	Bosco/Contrada	Proprietà		Anno	Buche aperte	Specie utilizzate	Operai impiegati	Giornate lavorative	Spesa sostenuta
		Comunali (ha)	Private (ha)	dei lavori	(n.)		(n.)	(n.)	(Lire)
Corato			560	1938					
	Contrada "Torre di Nebbia"				2432		25	197	
	Contrada "Piano Maugeri"				2880		19	210	
	Contrada "Svignano"				1249		14	109	
	Contrada "Piano la Monica"				1934		13	91	
	Contrada "Foresta"				1566				
Monopoli	Bosco "S. Nicola"		19,72	1938					
	Bosco "Mammutte"								
Gravina		2040	4500	1937-1938					
	Contrada "Fornognola", bosco "Difesa Grande"					Cupressus arizonica Greene			
		20		1938	9747	Cedrus deodara Loudon	15	383	3197,1
	Contrada "Finocchio", bosco "Difesa Grande"					Cupressus arizonica Greene			
		18		1938	8250	Cedrus deodara Loudon			
	Bosco dell' "Impero", località La Gravina								
				1938	4676	Cupressus arizonica Greene			
	Località "Campanale", bosco "Difesa Grande"								
				1938	1346				
Gioia del Colle									
	località "Montursi"		5	1939-1940		Cupressus arizonica Greene	10	36	3600
						Pinus halepensis Miller			
Spinazzola		90	3000	1938					
Altamura		216	10000						
	Contrada "S. Chiara – Ovile Penzola".								
				1938			12		
Cassano Murge	Bosco "Mercadante"			1937-1938	80	Pinus pinea L.	15		
						Cupressus spp.			
Toritto	"Bosco del Littorio".	10		1937-1938					
Tot.		2356,00	18079,72		34160		123	1026	6797,1

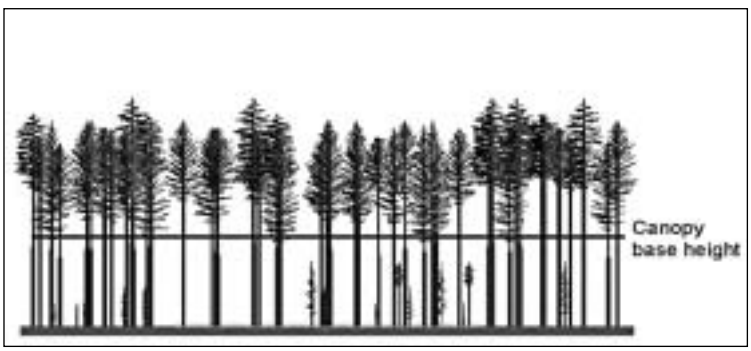

Figura 4.
Altezza media della base della chioma (SCOTT, 2001)

L'aumento della distanza media tra chioma e terreno è il parametro cruciale nel definire il passaggio da incendio di superficie ad incendio di chioma, come teorizzato da Van Wagner (1977), che identifica l'intensità critica (CFI) in kWm-1 capace di avviare un fuoco di chioma, in funzione dell'altezza media della base della chioma (CBH) (Fig. 4.) e dell'umidità del fogliame (FMC), considerata una costante pari a 100:

$$CFI = .001 * (CBH)^{1.5} * (460+25.9 * FMC)^{1.5}$$

Un intervento di diradamento forte dal basso, nei soprassuoli di origine artificiale descritti, seppur tardivo e da realizzarsi con cauta gradualità, con la finalità di regolare la distribuzione spaziale delle piante, assicurerebbe una riduzione della competizione fra gli elementi arborei, limitando il pericolo di incendio e contribuirebbe ad elevare la diversità e la complessità floristica, attivando processi di rinaturalizzazione oltre che a fornire biomassa combustibile dai residui di utilizzazione.

L'utilizzo di tecniche selvicolturali tradizionali, quali i diradamenti, teorizzati a partire dal XIX secolo e largamente eseguiti per finalità strettamente funzionali alla produzione legnosa, potrebbe, oggi, assumere una nuova e diversa connotazione ecologica, se rivisto nell'ottica di miglioramento della stabilità e della funzionalità complessiva dei soprassuoli, oltre che della loro difesa dagli incendi, di cui rappresenta l'unico intervento possibile di tipo preventivo (Leone e Lovreglio, 2005)

4. Conclusioni

Quanto sopra esposto evidenzia la necessità di una diversa gestione di tutti i rimboschimenti in abbandono colturale, soprattutto alla luce della crescente attenzione che viene oggi rivolta al ruolo che essi possono svolgere sul controllo dell'erosione e principalmente sul contributo che possono apportare per mantenere gli impegni di riduzione delle emissioni dei gas clima-alteranti, secondo quanto previsto dal Protocollo di Kyoto: si è calcolato che, per compensare le emissioni di CO_2, in Italia sarebbe necessario rimboschire circa 35 000 ha l'anno (Schirone,1998); un valore enorme, se rapportato alle iniziative finora svolte, di cui quella illustrata, benché poco nota, è sicuramente tra le più ampie mai realizzate.

Benché realizzati con tecniche e modalità superate, i rimboschimenti monospecifici di conifere della Murgia Alta da noi descritti fanno ormai parte del paesaggio anche culturale, rappresentando spesso le uniche interruzioni in una monotonia di land-use accentuata dalle recenti operazioni di eliminazione dei muri a secco e di spietratura che hanno modificato radicalmente l'ambito, storicamente deprivato quasi del tutto della originaria copertura boschiva.

Tecniche selvicolturali tradizionali, quali i diradamenti, rivisitate sulla base delle esigenze di tutela e dei molteplici ruoli che il patrimonio boschivo può svolgere, in aggiunta a quello economico, da sempre riconosciuto, diventano oggi strumento per l'attuazione della Strategia Europea di Protezione delle Foreste e per una più efficace tutela del paesaggio e delle sue risorse, di cui i rimboschimenti sono una componente non trascurabile.

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Temporal pattern over the last 200 years in the SCI Mt. Vigese (IT4050013) Northern Apennines (Italy)

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Abstract

The landscape – a geographical and ecological space where interaction between its elements creates a unique pattern – is transformed by spatial reorganization of its elements due to interaction between human impact and natural processes. Comparing land use/land cover maps of different years highlights the main trends in vegetation types. The Mt. Vigese SCI (Site of Community Importance) is an excellent example of a mosaic where coltural systems dating from different periods are found together with highly natural systems. The changes of the last 200 years (1807-2005) were assessed on the basis of cadastral maps (1807, 1924) and aerial photographs. A geographical database from these different sources was created. Despite the difficulty of standardization, the historical cadastral data was found to be invaluable and is still very relevant if we consider that the well delineation of chestnut orchards is the real starting point for any study of community dynamics.

1. Introduction

The landscape is not simply a collection of diverse elements combined into a complex systems and subject to constant change; it is a continuum of traces, layered one upon the other, which natural processes and human activity have left over the time (Antrop, 2005; Farina 1998; Skånes e Bunce (1997).

Historic maps and associated documents provide the raw material for landscape analyses. From the 17th century onwards these start to be topographically consistent and by the 19th century can be considered scientifically precise documents. They can be put together with modern aerial and satellite images, to create an enormous archive using Geographical Information System (GIS), which makes it possible to compare quite different documents by georeferencing and associating qualitative data. A scientific basis for this approach comes from Landscape Ecology (Forman & Godron, 1986; Farina, 1998). Here a landscape is described as a mosaic made up of discrete patches each with own spatial features. A "landscape-system" analysis can be made by classifying these patches according to habitat type (which frequently means vegetation types).

The analysis of "Mt. Vigese" SCI (Northern Apennines, Italy) uses data gathered over the last two centuries as the first professionally drawn up cadastral map for this area which provide a fairly dependable picture of land use was made in 1807. This together with subsequent documentary evidence make it possibile to trace how the distribution and extent of various sorts of vegetation of varying degrees of naturalness have changed. Five land use/land cover maps in a GIS environment using cadastral maps from 1807 and 1924 and by interpreting aerial photographs from 1954, 1971 and 2000 were produced. The up-to-date interpretation was supported by releves (Pezzi *et al.*, 2005).

Creating a single geographical database to include this data with very different origins, scales and purposes was a demanding task. The 19th century cadastre was interested in land potential, more

than in current use. By contrast, other data were created in order to describe the terrain as they really was. These two different aims created different types of classification. Comparing such different sources required a common classification system although at a cost of losing some precious information from the terms used in the oldest survey. We have therefore included separate tables of these terms. Moreover overlaying the maps based on interpretation of cadastral maps and of aerial photographs is made more difficult because the patches in the former are largely geometrical as they relate mainly to ownership and the prevailing use and tend not to show internal environmental heterogeneity.

Nevertheless the historical data is indispensable especially concernig chestnut orchards which were the main resource right up the mid 20th century in southern and central Europe. An accurate picture of this vegetation type provide a starting point for more detailed studies of landscape change and of the species composition of the woods which have gradually taken over.

2. Materials and methods

2.1. Study area

The "Mt. Vigese" SCI (IT4050013, Bologna Province) covers an area of 617 ha. Altitudinal range is between 495 and 1089 m a.s.l. The geology consists largely of sandstone and marl (Antognola and Bismantova) which "float" on a vast clay base (Regione Emilia-Romagna, 1994a e b). The area, in general, is subject to landslides, notably in 1852, 1903, 1950 (eg. Mazzuoli, 1903; Biagetti, 1997).

The present vegetation[1] is largely woodland and reflects the past chestnut based economy (Gabbrielli 1994; Pezzi et al, 2005). In the last few decades commercial chesnut growing has declined and most orchards have been coppiced. Chestnut coppices (altitude: 495-990 m), have largely acidophylic undergrowth with *Luzula pedemontana, Luzula sylvatica, L. forsteri* on damper aspects with *Geranium nodosum*. Generally herbaceous layer includes *Pteridium aquilinum* and *Salvia glutinosa. Castanea sativa* is still dominant but in some areas suffers competition from *Ostrya carpinifolia* and *Fagus sylvatica* at higher altitudes.

On western and warmer slopes there are thermophilous woods with *Quercus pubescens, Ostrya carpinifolia* and *Fraxinus ornus*. The undergrowth is characterized by *Cytisus sessilifolius, Chamaecytisus hirsutus, Teucrium chamaedrys, Carex hallerana, Juniperus communis and Brachypodium pinnatum subsp. rupestre*.

On cooler slopes there are *Ostrya carpinifolia-Acer opulifolium* woods. They have a high woody species diversy *(Fraxinus ornus, Laburnum anagyroides, Castanea sativa, Quercus pubescens, Acer pseudoplatanus, A. campestre, Fagus sylvatica; Crataegus monogyna, Lonicera xylosteum e L. caprifolium, Daphne laureola, Cornus mas and C. sanguinea). In the herbaceous layer Hepatica nobilis, Melica uniflora, Carex digitata, Primula vulgaris, Dryopteris filixmas, Geranium nodosum* are frequent.

Near the top of Mt. Vigese there is a small beech wood. On clays *Quercus cerris woods with Fraxinus ornus* and *Quercus pubescens* very often derive from recolonization processes of abandoned pastureland.

There are also herbaceous communities in recently abandoned agricultural areas and pastures.

[1] Nomenclature of Pignatti (1982) used for higher plants.

The most extensive Habitat in the area is *Castanea sativa* woods (9260). Other extensive Habitats are: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia); 6110 Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi; 5130 Juniperus communis formations on heaths or calcareous grasslands. From the conservation point of view, the Quercus ilex population on arenaceous outcrops, cited by Cocconi (1883), is of particular interest.

2.2. Data treatment

We produced and analyzed 5 land use/land cover maps in a GIS environment using ArcGIS 8.3. Data sources were cadastral maps and aerial photographs. The first document we used was the "Boncompagni" cadastre (Salterini & Tura 1995; Giacomelli 1987). Named after the person who planned it, it started in 1780 and was the first one professionally drawn up for the Bologna area, in order to tax landowners, including the previously exempt nobility and the church. A new survey was made between 1801 and 1819 in order to revise the cadastre. All parcel information was collected in land registers (*brogliardi*). For every parcel the following data were collected most notably including actual land use and land potential. The maps we used derive from Marchignoli's revised versions (1807). We also interpreted the 1924 cadastral maps and aerial photographs from: 1954-1955 (fligth G.A.I.); 1971-73 (flight R.E.R.); ortophoto TerraItalyTM 98/99. The up-to-date interpretation was supported by phytosociological releves (Pezzi *et al.*, 2005).

For purposes of comparison we used a common nomenclature system (Skånes & Bunce, 1997). However, so as not to lose precious historical information, cadastral data (1807; 1924) are separately commented on. It should be noted that cadastral maps include a wide variety of buildings (public, privat, agricultural, churches), which here are included under the term artificial surfaces as they not relevant to this study.

3. Results

The five land use/land cover maps are shown in Figure 1.

Table 1. lists the 38 different types of land use as described in the cadastral register in terms of our classification system. Although there are many categories, 9 of them make up 92%. These are chestnut orchards (24%): *pastonesi* (10%) is a variety which still today is considered excellent especially for drying and for flour production, and *selvano* is another variety still found in Garfagnana (Maltoni personal observation); 11% of them are on unstable areas (*lavinosi or calancosi* terrains) Due to their economic importance chestnut orchards are listed in extremely small parcels in this map compared the other type of equal extensive vegetation.

Forests (*boschi* and *boschivi*) cover about 30% (*boschivi di cerri* = 11%, *di quercioni* = 10% e *boschi di quercioni e cerri* = 8%). Other extensive types are: pastureland (20%; *pascolivo*), various types of spontaneous herbaceous communities particularly on clay soils; agricultural areas (*arativo* and *lavorativo*; 12%) mainly cropland.

In the 1924 landscape (Table 2.) chestnut orchard cover remains almost unaltered in extent (24%), but is only partially stable in spatial localization. The same is from for cropland (11%). We also find uncultivated areas which may be: a) fertile (*incolto produttivo* = 8%) or b) infertile *(incolto improduttivo)*. The former are in areas registered as chestnut orchards in 1807 which had suffered landslides, especially in 1852 and 1903 (Mazzuoli, 1903) or forests which also suffered landslides; Infertile uncultivated areas consist largely of rocky outcrops or badland. Forests especially coppices (43%),

dominated the SCI area in the 1924. However, the dominant woodland species are not specified, as these were listed on separate forms (Gabbrielli personal observation) which have unfortunately been lost. The information would have been particular interesting for this study.

The land use/land cover map from 1971 and 2005 indicates the decline of the chestnut based economy already damaged by the 1950 landslide (Biagetti, 1997). In 2005 chestnut coppices cover 21% of the whole area of the SCI.

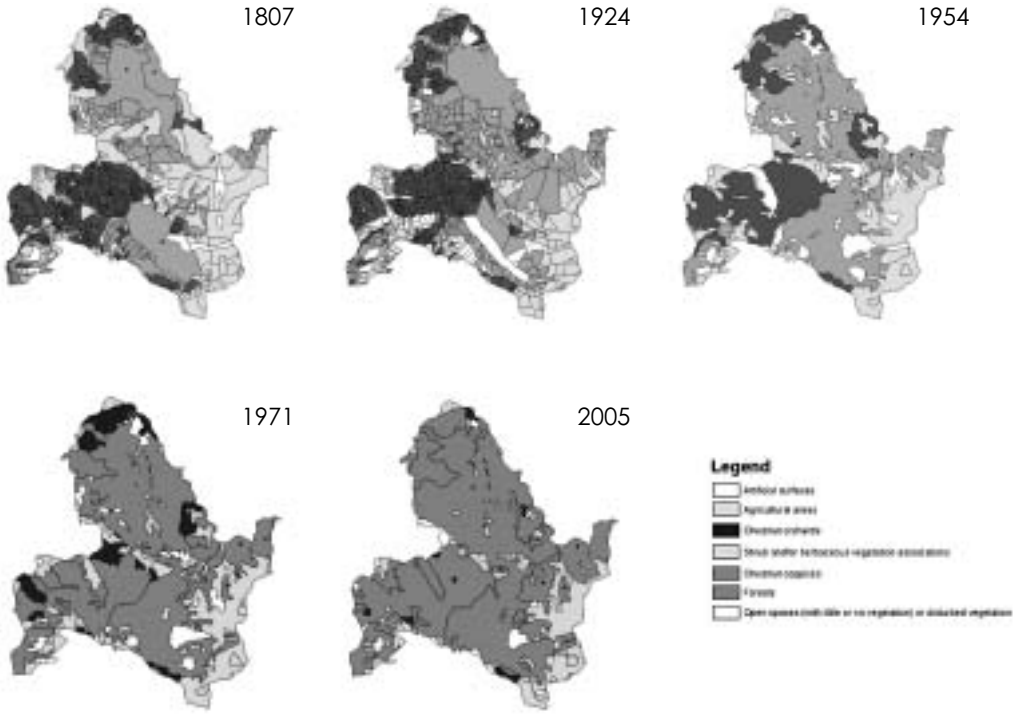

Figure 1. "Mt. Vigese" landscape in (a) 1807, (b) 1924, (c) 1954-55, (d) 1971-73, (e) 2005.
* indicates *Quercus cerris* woods.

Today landscape is dominated by forests which increased in extent particularly between 1954 and 2005, partly as a result of the coppicing of orchards and also due to the decline of agriculture and pastoralism. The 1954-2005 analysis also shows that woodland has tended to increase in surface area and spatial continuity. Of particular note is the steady recolonization of clays by *Quercus cerris* on 19th pastures (Figure 1c,d,e. indicated by *).

4. Conclusions

Changes in the "Mt. Vigese" SCI cultural landscape (Antrop, 2000; Antrop, 2005) were recorded using data that varied in origin, scale, periods and purposes which had to be carefully normalized. Of crucial importance were the old cadastral maps as they detail the major changes in land management and the decline of the old chestnut based economy ("chestnut civilization", sensu Gabbrielli, 1994).

An interesting feature of the temporal vegetation pattern is also the topological shift of *Quercus cerris* woods. The 19th century document describe these woods has being largely on sandstone, but from 1954 they have mostly found on clay which is what *Quercus cerris* usually prefers. The 19th century banishment to sandstone which is unfavourable for agriculture was probably a result of deforestation to make way for agricultural land and pasture on clay.

The "Mt. Vigese" case study is representative of the whole northern Apennines: land uses deriving from pre-industrial revolution systems still co-exists side by side with much more natural systems (mixed oak woods). The reconstruction of the recent history provides a knowledge base for predict modification in short term and for conservative management in long term.

5. Acknowledgments

The study was promoted and financed by the Province of Bologna Servizio Pianificazione Paesistica (Dir. Arch. Paola Altobelli) through an agreement with the Experimental Evolutionary Biology Department (ref. Prof. Carlo Ferrari) in order to create a census of protected Habitats in SCIs in the Province of Bologna. Many thanks to the management of the Montovolo Provincial Park and the Comune of Grizzana Morandi.

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Elementi della dendroflora sarda impiegati nella tradizione popolare di Putifigari e Villanova Monteleone (Sardegna Nord-Occidentale)

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Abstract

Nell'ambito di una ricerca etnobotanica, condotta in alcuni paesi del Nord-Ovest della Sardegna (Putifigari, Villanova Monteleone), sono emerse interessanti informazioni relative al ruolo svolto dalla dendroflora locale nel contesto delle tradizionali attività agricole, pastorali e silvane. Alberi, arbusti, liane e suffrutici, così come numerose piante erbacee, svolgono un importante ruolo non solo a livello ecosistemico, ecologico, ambientale e paesaggistico, ma anche storico, culturale ed economico, garantendo alle popolazioni locali la fornitura di materie prime da impiegare in ambito alimentare, fitoterapico, cosmetico, veterinario, antiparassitario, artigianale (intreccio, intarsio, ebanisteria), tintorio, ornamentale, foraggero, mellifero, combustibile e dei materiali da opera, ittiotossico e velenoso, magico e religioso. Tra le numerose specie vegetali raccolte in campo, 208 sono state riconosciute dagli interlocutori locali quali piante impiegate tradizionalmente in differenti ambiti. Tali specie sono ripartite nel modo seguente: 30 arboree (14,5%), 41 arbustive (19,7%) e 137 erbacee (65,8%). Nel presente lavoro, tra le entità arboree, viene dato particolare risalto al genere Quercus, le cui specie entrano a far parte delle principali formazioni forestali del Nord-Ovest della Sardegna. Nello specifico, verranno illustrate le principali conoscenze locali, riportando le utilizzazioni del legno, della corteccia, del sughero, delle ghiande e delle foglie. Dalla ricerca emerge come alcuni impieghi, oggi relegati alla sola memoria degli anziani, siano particolarmente importanti in ambito economico, fornendo spunti utili per pianificare e promuovere iniziative nei settori della ricerca applicata.

Keywords: etnobotanica, Putifigari, Villanova Monteleone, Sardegna, Quercus L.

1. Introduzione

Nell'ambito di una più vasta ricerca etnobotanica, condotta in alcuni paesi del Nord-Ovest della Sardegna *(Putifigari, Villanova Monteleone)*, il ruolo svolto dalla dendroflora locale assume una grande rilevanza nel contesto delle tradizionali attività agricole, pastorali e silvane.

Le piante di un determinato territorio rappresentano una importante fonte economica, garantendo la fornitura di materie prime impiegabili in ambito alimentare, fitoterapico, cosmetico, veterinario, antiparassitario, artigianale (intreccio, intarsio, ebanisteria), tintorio, ornamentale, foraggero, mellifero, combustibile e dei materiali da opera, ittiotossico e velenoso, magico e religioso (Atzei, 1980, 2003; Atzei, Camarda, Piras, Satta, 2004; Ballero, Poli, 1998; Camarda, 1990; Camarda, Valsecchi, 1982, 1992; Camarda, Satta, 1996; Piras, 2005, 2006; Viegi, Camarda, Piras, 2006).

2. Materiali e metodi

La ricerca si è basata sul censimento delle specie della dendroflora dell'area d'indagine, erborizzate durante le ricerche floristiche.

Gli *exsiccata* sono custoditi presso l'Erbario SS (Dipartimento di Botanica ed Ecologia Vegetale, Università di Sassari). Il materiale vegetale è stato mostrato agli interlocutori (persone ultra ses-

santenni, residenti da sempre nel territorio). Con alcuni di loro, sono state effettuate escursioni, avendo modo di identificare direttamente le specie in campo.

Le informazioni etnobotaniche raccolte, relative alla nomenclatura, agli usi delle piante e alle conoscenze legate al mondo agro-silvo-pastorale, sono state raccolte in un *data base* e successivamente verificate attraverso una analisi comparativa.

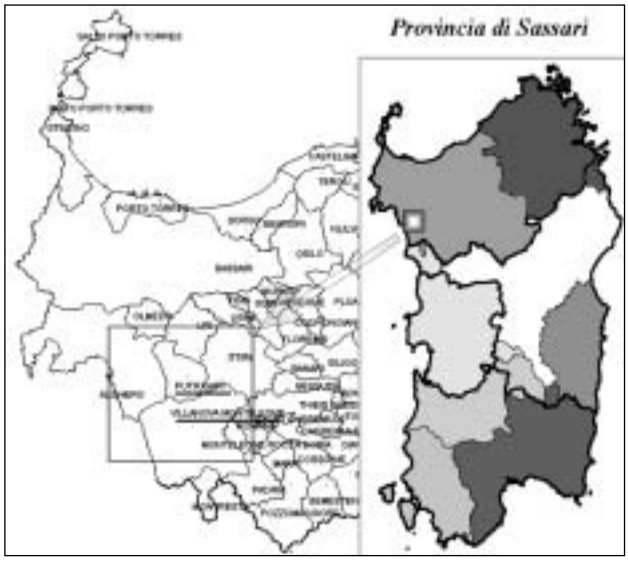

Figura 1.
Inquadramento geografico dell'area di ricerca. Limiti amministrativi dei Comuni di Putifigari e Villanova Monteleone

3. Risultati

Tra le numerose specie vegetali raccolte in campo, oltre 220 sono state riconosciute dagli interlocutori locali quali piante tradizionalmente impiegate in differenti ambiti applicativi.

Tali specie sono ripartite nel modo seguente: 38 arboree (17,3%), 27 arbustive (12,3%), 13 suffruticose (5,9%), 9 lianose (4,1%) e 133 erbacee (60,4%). Nei successivi prospetti si riportano le principali specie legnose (alberi, arbusti, suffrutici, liane) tradizionalmente impiegate nell'area di studio, indicando la forma biologica, la nomenclatura locale, le categorie d'impiego e le parti anatomiche principalmente utilizzate. Nel presente lavoro, tra le entità arboree, viene dato risalto al genere *Quercus*, le cui specie entrano a far parte delle principali formazioni forestali dell'area d'indagine, riportando le conoscenze locali legate alle utilizzazioni del legno, della corteccia, del sughero, delle ghiande e delle foglie.

3.1. *Quercus ilex L.* (Leccio – *Elighe)*

Il legname stagionato presenta un colore rossiccio, è particolarmente duro, difficile da lavorare, tradizionalmente impiegato per produrre carbone e legna da ardere. Grazie all'elevata resistenza e tenacità, veniva impiegato come materiale da opera per la costruzione di carri (es. la noce delle ruote, i raggi, il giogo), aratri (es. il timone), utensili vari (manici di mazze, zappe) e altri arnesi da lavoro (es. torchi, presse). Il legname è stato utilizzato per armare gallerie e costruire traversine, per realizzare steccati, orditure di tetti, stipiti di porte e finestre.

La corteccia *(colzòlu)*, grigio-chiara lucente, contiene tannini, è stata utilizzata per conciare le pelli. Le ghiande *(landes d'elighe)*, pur essendo amarognole, venivano torrefatte, macinate e consumate in infusione come surrogato del caffé. I frutti venivano raccolti per alimentare i maiali tenuti all'ingrasso. L'acqua piovana, ristagnante nei fusti cavi *(tuvas)*, veniva utilizzata per colorare il formaggio fresco, conferendo la parvenza di quello stagionato.

Tabella 1. Elenco delle specie ad habitus arboreo ed arbustivo tradizionalmente impiegate nell'area di studio

	Specie	F. biologica	Nome Locale	Categoria Impiego	Parte imp.
1.	*Alnus glutinosa* (L.) Gaertner	P scap/caesp	*Alinu*	Me; Ut; Ti; Or.	Fu, Ra, Co
2.	*Anagyris foetida* L	P caesp	*Fae giolva*	Me; Intr; Inta; Ti; Ven.	Fu, Ra, Fr, Co
3.	*Arbutus unedo* L.	P caesp	*Mela Lidone*	Al; Lq; Me; Ve; Fo; Ut; Intr; Inta; Eb; Ti; Co; Mel; Or; Rit.	Rd, Fu, Ra, Fg, Fi, Inf, Fr, L, Co, Su, Ga.
4.	*Calycotome spinosa* (L.) LInk	NP, P caesp	*Tiria*	Intr.	Ra.
5.	*Calycotome villosa* (Poiret) Link	NP, P caesp	*Tiria*	Intr.	Ra.
6.	*Castanea sativa* L.	P scap	*Castanza*	Al; Me; Ut; Intr; Inta; Eb; Ti; Co; Or.	Rd, Fu, Ra, Fg, Fr, L, Co.
7.	*Celtis australis* L.	P scap	*Sulzaga*	Ut; Intr; Inta; Eb; Ti; Co; Or.	Rd, Fu, Ra, L, Co.
8.	*Chamaerops humilis* L.	NP caesp	*Pramma*	Al; Ut; Intr; Or; Rit.	Fg, Ge, Fr.
9.	*Cistus incanus* L.	NP caesp	*Mudeju rosa*	Ut; Intr; Co.	Rd, Fu, Ra.
10.	*Cistus monspeliensis* L.	NP caesp	*Mudeju*	Ut; Intr; Co.	Rd, Fu, Ra.
11.	*Cistus salvifolius* L.	NP caesp	*Mudeju biancu*	Ut; Intr; Co.	Rd, Fu, Ra.
12.	*Crataegus monogyna* Jacq.	NP, P caesp	*Calarĕghe*	Al; Fo; Me; Ut; Inta; Co; Mel; Or.	Fu, Ra, Fg, Fi, Fr, L.
13.	*Cydonia oblonga* Miller	NP, P scap	*Mela ghidonza*	Al; Me; Ut; Mel; Or; Rit.	Ra, Fi, Fr.
14.	*Cytisus villosus* Pourret	NP, P caesp	*Mattigusa*	Me; Fo; Ut; Intr; Or.	Ra, Fg, Fi.
15.	*Daphne gnidium* L.	NP caesp	*Trivusciu, Incanta padeddas*	Me; Ti; Ven.	Rd, Ra.
16.	*Erica arborea* L.	NP, P caesp	*Tuvara, Kantentalzu*	Me; Ut; Intr; Inta; Eb; Ti; Co; Mel; Or.	Rd, Fu, Ra, Fi.
17.	*Erica scoparia* L.	NP, P caesp	*Tuvara, Kantentalzu*	Me; Ut; Intr; Inta; Eb; Ti; Co; Mel; Or.	Rd, Fu, Ra, Fi.
18.	*Eucalyptus camaldulensis* Dehnh	P scap	*Eucalittu*	Me; Ut; Co; Mel; Or.	Fu, Ra, Fi.
19.	*Eucalyptus globulosus* Labill.	P scap	*Eucalittu*	Me; Ut; Co; Mel; Or.	Fu, Ra, Fi.
20.	*Euphorbia dendroides* L.	NP, P scap	*Lŭa*	Me; Ven.	Rd, Ra.
21.	*Ficus carica* L. var. *caprificus*	NP, P caesp	*Figu era*	Al; Me.	Fg Fr.
22.	*Ficus carica* L. var. *sativus* Fior.	NP, P caesp	*Crabu vigu*	Al; Me.	Fg Fr.
23.	*Fraxinus oxycarpa* Bieb.	P scap	*(Frassinu)*	Ut; Inta; Eb; Ti; Co.	Fu, Ra, Co.
24.	*Genista corsica* (Loisel.) DC.	NP	*Tirĕa*	Intr; Or.	Ra.
25.	*Ilex aquifolium* L.	P scap	*(Agrifozzu)*	Me; Ut; Inta; Eb; Ti; Co; Or.	Fu, Ra, Fi, Fr..
26.	*Laurus nobilis* L.	NP, P scap/ caesp	*Laru*	Al; Ar; Lq; Me; Fo; Ut; Intr; Ti; Co; Mel; Or; Rit.	Fu, Ra, Fg, Fi, Fr, Co.
27.	*Lycium europaeum* L.	NP	*Ippina Santa*	Ut; Intr; Rit..	Ra.
28.	*Morus alba* L.	P scap	*Murighessa bianca*	Al; Me; Ut; Ti; Co; Mel; Or.	Fu, Ra, Fr, Co.
29.	*Morus nigra* L.	P scap	*Murighessa niedda*	Al; Me; Ut; Ti; Co; Mel; Or.	Fu, Ra, Fr, Co.
30.	*Myrtus communis* L.	NP, P scap	*Murta*	Al; Ar; Lq; Fo; Ut; Intr; Ti; Co; Mel; Or.	Fu, Ra, Fg, Fi, Fr.
31.	*Nerium oleander* L.	P caesp	*Oleandru*	Me; Ven; Or.	Fg, Fi.
32.	*Olea europea* L., var. *sylvestris* Brot.	P scap/caesp	*Ozzastru*	Al; Me; Fo; Ut; Intr; Inta; Eb; Ti; Co; Il; Or; Rit.	Fu, Ra, Fg, Fr, L, Co.
33.	*Olea europea* L., var. *europaea*	P scap/caesp	*Olĕa*	Al; Me; Fo; Ut; Intr; Inta; Eb; Ti; Co; Il; Or; Rit.	Fu, Ra, Fg, Fr, L, Co.
34.	*Osiris alba* L.	NP	*Iscoběle*	Intr; Ti.	Ra, Fr.
35.	*Phillyrea angustifolia* L.	P scap/caesp	*Aladérru*	Me; Fo; Ut; Intr; Inta; Ti; Co; Or.	Fu, Ra, Fr.
36.	*Phillyrea latifoglia* L.	P scap/caesp	*Aladérru*	Me; Fo; Ut; Intr; Inta; Ti; Co; Or.	Fu, Ra, Fr.
37.	*Pinus halepensis* Miller	P scap	*Pinu*	Eb; Or.	Fu.
38.	*Pinus pinea* L.	P scap	*Pinu*	Al; Eb; Or.	Fr, Fu.
39.	*Pistacea lentiscus* L.	P scap/caesp	*Chessa*	Al; Me; Fo; Ut; Intr; Ti; Co; Il; Or.	Rd, Fu, Ra, Fg, Fr.
40.	*Populus alba* L	P scap	*Colstĕavu, Polstĕavu*	Ut; Inta; Eb; Co; Or.	Fu, Ra.

	Specie	F. biologica	Nome Locale	Categoria Impiego	Parte imp.
41.	*Populus nigra* L.	P scap	*Colstĕavu, Polstĕavu*	Ut; Inta; Eb; Ti; Co; Or.	Fu, Ra, Co.
42.	*Prunus dulcis* (Miller) D.A. Webb	P scap	*Mendula*	Al; Lq; Me; Ut; Inta; Ti; Co; Mel; Or.	Fu, Fi, Fr.
43.	*Prunus spinosa* L.	P caesp	*Prunizza*	Al; Me; Inta; Ti; Co; Mel.	Fu, Fi, Fr, Co.
44.	*Punica granatum* L.	P scap/caesp	*Melagrenŕda*	Al; Me; Intr; Inta; Ti; Co; Mel, Rit.	Fu, Ra, Fi, Fr, Co.
45.	*Pyrus amygdaliformis* Vill.	P caesp/scap	*Pirŕstru*	Al; Me; Fo; Ut; Inta; Ti; Co; Mel, Or.	Fu, Ra, Fi, Fr, Co.
46.	*Pyrus communis* L.	P scap	*Pĕra*	Al; Me; Fo; Ut; Inta; Ti; Co; Mel, Or.	Fu, Ra, Fi, Fr, Co.
47.	*Pyrus pyraster* Burgsd.	P scap	*Pirŕstru*	Al; Me; Fo; Ut; Inta; Ti; Co; Mel, Or.	Fu, Ra, Fi, Fr, Co.
48.	*Quercus congesta* C. Presl	P scap	*Kercu*	Al; Me; Fo; Ut; Inta; Ti; Co; Or.	Fu, Ra, Fg, Fr, Co, Ga.
49.	*Quercus ilex* L.	P scap	*Člighe*	Al; Me; Fo; Ut; Inta; Ti; Co; Or.	Fu, Ra, Fg, Fr, Co.
50.	*Quercus pubescens* Willd.	P scap	*Kercu*	Al; Me; Fo; Ut; Inta; Ti; Co; Or.	Fu, Ra, Fg, Fr, Co, Ga.
51.	*Quercus suber* L.	P scap	*Sučlzu*	Al; Me; Fo; Ut; Inta; Ti; Co; Or.	Fu, Ra, Fg, Fr, Co, Su, Ga.
52.	*Rhamnus alaternus* L.	P scap/caesp	*Laru maschiu*	Me; Fo; Ut; Inta; Ti; Co.	Fu, Ra, Fg, Fr, Co.
53.	*Rosa canina* L. sensu Bouleng.	NP	*Ru caddĕnu*	Al; Me; Cs; Or; Rit.	Ra, Fi, Fr.
54.	*Rosa sempervirens* L.	NP	*Ru caddĕnu*	Al; Me; Cs; Or; Rit.	Ra, Fi, Fr.
55.	*Rosmarinus officinalis* L.	NP	*Romasĕnu*	Al; Ar; Pr; Me; Mel; Or; Rit.	Ra, Fg, Fi.
56.	*Salix alba* L.	P scap	*(Salighe)*	Me; Ut; Intr; Or.	Fu, Ra, Fg, Co.
57.	*Salix atrocinerea* Brot.	P caesp/scap	*Toa*	Me; Ut; Intr; Ti; Or.	Fu, Ra, Fg, Co.
58.	*Salix fragilis* L.	P caesp/scap	*(Salighe)*	Me; Ut; Intr; Or.	Fu, Ra, Fg, Co.
59.	*Sambucus nigra* L.	P caesp	*Sauccu*	Al; Lq; Me; Ut; Intr; Inta; Ti; Mel; Or.	Fu, Ra, Inf, Fr.
60.	*Sorbus domestica* L.	P scap	*Suppeva*	Al; Me; Fo; Ut; Inta; Ti; Co; Or.	Fu, Ra, Fg, Fi, Fr.
61.	*Spartium junceum* L.	P caesp	*Nistra, Inistra*	Intr; Or.	Ra, Fi.
62.	*Tamarix africa* Poiret	P caesp/scap	*Tramarittu*	Ut; Intr; Ti; Or.	Fu, Ra, Co.
63.	*Teline monspessulana* (L.) Koch	P caesp	*Mattigůsa*	Me; Fo; Ut; Intr; Or.	Ra, Fg, Fi.
64.	*Ulmus minor* Miller	P scap/caesp	*Umulu, Ulumu*	Ut; Intr; Inta; Ti; Or.	Fu, Ra, Co.
65.	*Viburnum tinus* L.	P caesp	*Laru masciu*	Me; Ut; Inta; Ti; Co; Or.	Fu, Ra, Inf, Fr.

Tabella 2. Elenco delle liane e suffrutici tradizionalmente impiegati nell'area di studio

	Specie	F. biologica	Nome Locale	Categoria Impiego	Parte imp.
1.	*Artemisia arborescens* L.	NP, P caesp	*Attentu*	Al; Me; Ve; Or.	Fg, Inf.
2.	*Arundo donax* L.	G rhiz	*Canna*	Me; Ut; Intr; Or.	Culmo, setto internodo.
3.	*Asparagus acutifolius* L.	G rhiz	*Iparalu*	Al; Me; Intr; Or.	Turione, P.I.
4.	*Asparagus albus* L.	G rhiz	*Iparalu biancu*	Al; Me; Intr; Or.	Turione, P.I.
5.	*Clematis cirrhosa* L.	P lian	*Ligadolza*	Ut; Intr.	Fu.
6.	*Clematis flammula* L.	P lian	*Ligadolza*	Ut; Intr.	Fu.
7.	*Clematis vitalba* L.	P lian	*Teti*	Ut; Intr; Co.	Fu.
8.	*Hedera elix* L.	P lian	*Edera, Ligadolza*	Intr; Or; Rit.	Fu, Fg.
9.	*Helichrysum italicum* (Roth) Don.	Ch suffr	*Usciadina, Fiore'e santa Maria*	Me; Co; Or; Rit.	Ra, Inf.
10.	*Hypericum hircinum* L.	NP suffr	*Murta crabina*	Me; Ut; Intr; Ti, Or.	Ra, Inf, Fr, Co.
11.	*Lavandula stoechas* L.	NP	*Archimissa*	Pr; Me; Ve; Fo; Ut; Mel; Or; Rit.	Ra, Fg, Inf.
12.	*Lavatera arborea* L.	NP, Ch suffr	*Nalva*	Me; Ut; Mel; Or.	Ra, Fg, Fi.
13.	*Lavatera olbia* L.	NP, Ch suffr	*Nalva*	Me; Ut; Mel; Or.	Ra, Fg, Fi.
14.	*Lonicera implexa* Aiton	P lian/caesp	*Ide bianca*	Ut; Intr.	Ra.
15.	*Rubia peregrina* L.	P lian	*Pigulňsu, Marrůbiu*	Me; Intr; Ti.	Fu, Fr.

	Specie	F. biologica	Nome Locale	Categoria Impiego	Parte imp.
16.	*Rubus ulmifolius* Schott.	Ch, NP, P suffr	*Růu*	Al; Me; Fo; Intr; Ti.	Fu, Fi, Fr.
17.	*Ruta calepensis* L.	NP, Ch suffr	*Ruda*	Me; Ve; Ut; Ven.	Ra, Fg, Fi.
18.	*Smilax aspera* L.	NP lian, G rhiz	*Tittĕone, Teti*	Al; Me; Intr.	Fu, Fr.
19.	*Stachys glutinosa* L.	NP/Ch suffr	*Issopo*	Me; Ut; Co; Or.	Ra, Fi.
20.	*Thymus capitatus* (L.) Hofmgg. et Link	Ch suffr	*Timu*	Me; Mel; Or.	Ra, Fi.
21.	*Vitis vinifera* L.	P lian	*Ide*	Al; Me; Fo; Intr; Inta; Co; Or; Rit.	Rd, Fu, Ra, Fg, Fr.

Legenda:

Forma biologica:
Nanofanerofita (NP); Fanerofita cespugliosa (P caesp); Fanerofita arborea (P scap); Fanerofita lianosa (P lian); Fanerofita succulenta (P succ); Fanerofita epifita (P ep); Fanerofita strisciante (P rept); Camefita suffruticosa (Ch suffr); Camefita scaposa (Ch scap); Camefita succulenta (Ch succ); Camefita reptante (Ch rept); Camefita pulvinata (Ch pulv); Camefita tallofitica (Ch thall); Camefita fruticosa (Ch frut).

Categorie d'Impiego:
Alimentare (Al); Aromatizzante (Ar); Liquoristica (Lq); Profumeria (Pr); Medicinale (Me); Cosmesi e saponeria (Cs); Veterinario (Ve); Foraggero (Fo); Utensileria, (Ut); Intreccio (Intr); Intarsio (Inta); Ebanisteria (Eb), Tintorio e conceria (Ti); Combustibile (Co); Illuminazione (Il); Venefico (Ven); Mellifero (Mel); Ornamentale (Or); Rituale-magico (Rit).

Parte impiegata:
Pianta Intera (P.I.), Radice (Rd), Fusto (Fu), Ramo (Ra), Foglia (Fg), Fiore (Fi), Infiorescenza (Inf), Frutto (Fr), Germoglio (Ge), Legno (L), Corteccia (Co), Sughero (Su), Galle (Ga).

Figura 2.
Ruota di carro a buoi, con 12 raggi. (Piras)

Figura 3.
Giogo, impiegato per accoppiare i buoi. (Piras)

Figura 4.
Carretto (tumbarella), trainato da cavallo. (Piras)

3.2. *Quercus pubescens* Willd. (Roverella – *Chescu)*

Il legno è tenace, pesante, resistente all'umidità, apprezzato principalmente come materiale da opera per realizzare montanti, travi e correnti per solai e ballatoi. Essendo abbastanza impermeabile, è stato impiegato per realizzare botti *(cubas)*, tinozze *(tinas)* e contenitori vari.

Gli anziani distinguono due tipi di Roverella:

- "*su Chescu masciu*", considerata "maschio" perché "produce poche ghiande"; fornisce legname resistente, utilizzato per realizzare aratri in legno, impalcature per ferrare i buoi ed alcune parti dei carri;
- "*su Chescu femina*", considerata "femmina" perchè "più produttiva", fornisce un legname meno resistente, più contorto e nodoso, utilizzato per la costruzione di arnesi da lavoro. Tale entità sarebbe da associare, molto probabilmente, a *Quercus congesta* C. Presl.

Il legname è considerato ottimo combustibile, impiegato sia come legna da ardere, sia per produrre carbone. I pastori utilizzavano la corteccia per colorare il formaggio cotto: durante il riscaldamento del latte si inseriva la scorza nel pentolone, conferendo un colore rossastro al coagulo. Il prodotto assumeva velocemente un aspetto stagionato, conservandosi più a lungo grazie alla funzione antisettica dei tannini. Esso veniva venduto allo stesso prezzo di quello stagionato, ottenendo così migliori rese economiche.

Le galle *(ballarittones)*, di forma sferoidale e consistenza legnosa, venivano utilizzate dai ragazzi per giocare a biglie. Le galle rosse, che si formano sui piccioli delle foglie e sui giovani rami a seguito di punture di insetti imenotteri del genere *Cynips*, venivano utilizzate per ottenere inchiostri ed estrarre coloranti impiegati nella concia delle pelli. Le foglie e le ghiande, di sapore dolciastro, venivano impiegati nella alimentazione del bestiame. La scorza dei rami giovani veniva usata in infuso come febbrifugo ed astringente.

Figura 5. Contenitori vari (*cuba, portadora, tina*), impiegati durante le operazioni di vendemmia e vinificazione, realizzati con legno di roverella. (Piras)

3.3. *Quercus suber* L. (Sughera – *Suelzu*)

La Sughera è apprezzata come legna da opera, da ardere e per la produzione di carbone. Il legno risulta tenace, relativamente facile da spaccare, utilizzato per realizzare il telaio *(iscala)* del carro a buoi e i versoi laterali *(orijas)* dell'aratro a chiodo. L'importanza economica di questa specie deriva essenzialmente dall'estrazione del sughero: quello di prima estrazione è chiamato "*erdone*", il sughero gentile "*ortiju*", il fellogeno rossastro "*rusca*". Le infiorescenze maschili sono chiamate "*ramas*". Il sughero gentile veniva usato per realizzare tappi *(tappos)* per damigiane e bottiglie, contenitori e manufatti vari. Le porzioni concave della corteccia venivano impiegate come recipienti *(trovieddas)*, usati sia come piatti fondi, sia per attingere l'acqua dalle fonti. Era usanza servire gli arrosti di agnello, capretto e maialetto, sopra i vassoi *(trovias)* in sughero. Per la realizzazione degli sgabelli *(banchittos)* si preparavano lastre parallelepipede di sughero, spesse 1-2 dita, impilate e fissate con chiodi di legno *(obilos)* stagionato di olivastro. Il sughero, tagliato sottile, veniva usato come suola *(impianteglias)* delle scarpe, in grado di assorbire il sudore. Particolari erano i cappelli di sughero, apprezzati perché in grado di riparare il capo dalla calura estiva.

I pastori impiegavano una sorta di grembiule in sughero *(falda 'e ortiju)*, legato nel sottopancia degli arieti per impedire gli accoppiamenti. I primi secchi con i quali i pastori mungevano erano realizzati in sughero, così come il contenitore (*moiteddu*) in cui avveniva la coagulazione dello yogurt *(gioddu)* e l'acidificazione del latte *(jagadu)*. Per chiudere l'ingresso delle capanne *(pinnetas)* e per realizzare il sottotetto delle case, venivano impiegati pannelli di sughero. Durante la lessatura della carne di pecora, si inseriva un pezzo di sughero nel pentolone per assorbire gli ioni

di rame, ceduti dai punti di saldatura non stagnati, evitando che la carne assumesse un cattivo sapore. Il fellogeno, ricco di tannini, veniva impiegata per la concia delle pelli. Normalmente veniva estratta dagli alberi che non producevano sughero di qualità e da quelli destinati a produrre carbone. In seguito all'estrazione della pellicola, la pianta non era più in grado di produrre sughero, poiché veniva intaccato il tessuto meristematico secondario.

All'inizio del XX secolo, la commercializzazione del fellogeno aveva assunto un ruolo importante per l'economia dell'area, grazie alla crescente richiesta di coloranti naturali per le fabbriche tessili e le concerie, determinando l'abbattimento di numerosi alberi da cui estrarre la materia prima. Le ghiande *(landes suerinas)* erano considerate più pregiate delle altre querce per l'alimentazione umana: esse venivano, tostate sulla brace, sbucciate e consumate come fossero castagne. Alcuni macinavano le ghiande tostate, impiegandole come surrogato del caffé. Per gli animali tenuti a pascolo brado, le ghiande forniscono un importante fonte di alimentazione e nutrizione.

Il sughero di prima estrazione veniva bruciato e usato come antisettico e cicatrizzante per gli animali, durante la tosatura degli ovini. Il sugherone veniva utilizzato per realizzare contenitori rustici impiegati come vasi *(pasteras)*. In passato, i pastori erano soliti colorare il formaggio tipo "fiore sardo" con l'acqua che stagnava negli incavi *(tuvas)* e nei nodi delle querce da sughero, conferendo al formaggio un aspetto stagionato. Oggi, il sughero è impiegato in ambiente edile come materiale isolante termico e acustico, come galleggiante per attrezzi da pesca, come materia prima di tessuti e indumenti, o diversi manufatti artigianali.

4. Conclusioni

La ricerca contribuisce al recupero di *saperi tradizionali*, spesso tramandati oralmente e relegati alla sola memoria degli anziani a causa delle mutate condizioni economiche e sociali avvenute negli ultimi decenni. Tali informazioni forniscono utili suggerimenti per pianificare e promuovere iniziative nei settori della ricerca applicata.

Il complesso delle conoscenze tradizionali rischia di affievolirsi inesorabilmente: ad ogni cambio generazionale si ha una naturale perdita delle conoscenze legate al mando agro-silvo-pastorale.

Pertanto, si auspica una maggiore presa di coscienza ed un tempestivo intervento finalizzato ad incentivare e promuovere progetti di ricerca su scala locale, regionale e nazionale, con la consapevolezza che le conoscenze tradizionali legate ad un territorio costituiscono oggi un importante strumento di sviluppo economico, soprattutto di quelle aree definite marginali o svantaggiate.

a) b) c)

Figura 6. Manufatti artigianali, realizzati in sughero. (Piras)
– (a,b,c) *Moiteddos* – contenitori impiegati per i processi di fermentazione e acidificazione del latte;

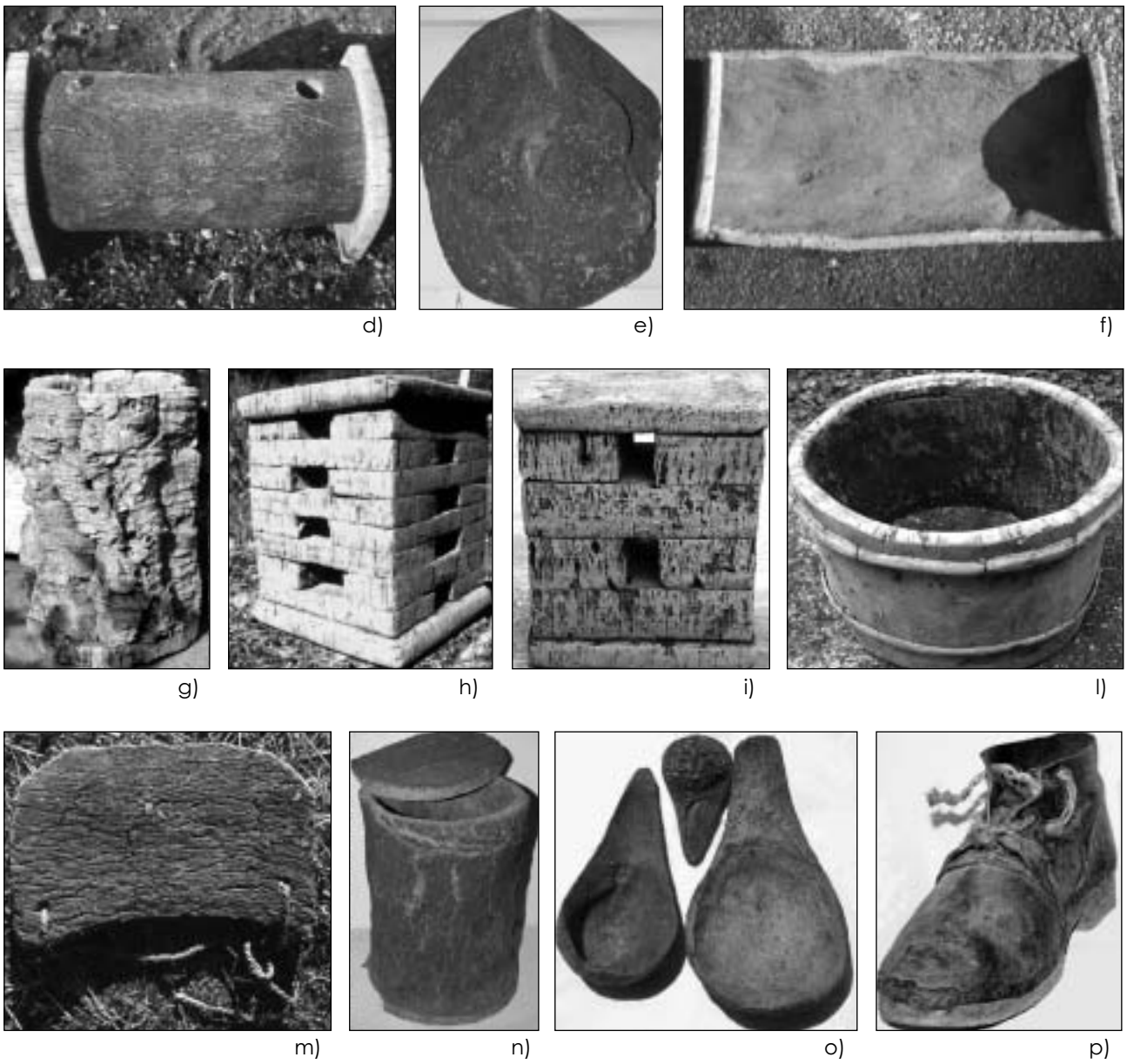

Figura 6. Manufatti artigianali, realizzati in sughero. (Piras)
- (d) *Moiteddu* – utilizzato per il trasporto di acqua e vino.
- (e) *Concu* – vassoio in sughero impiegato come piatto fondo;
- (f) *Trovia* – vassoio in sughero gentile utilizzato come piatto di portata;
- (g) *Pastera* – contenitore in sugherone, utilizzato come vaso;
- (h,i) *Banchittu* – banchetti, con elementi parallelepipedi in sughero gentile;
- (l) *Tina* – vasca in sughero, rinforzata con stringhe di legno;
- (m) *Falda* – grembiule in sughero, utilizzato per impedire gli accoppiamenti degli arieti;
- (n) *Casiddu* – arnia cilindrica, realizzata in sughero;
- (o) *Trovieddas* – tegami, ottenuti sagomando ad arte le porzioni concave del sughero;
- (p) *Impianteglia* – suola in sughero.

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On the environmental history in Molise: an approach to the sources of the 19th century

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Abstract

The paper describes how the documents and the institutions influenced forms of utilizations and managements of forestal patrimonies in the 1800's. Particularly analysed is a specific Italian territorial area, called "The Molise region". The paper illustrates the importance of the *Agricultural Society* founded in 1820, and the *Economic rural Journal of Molise*, edited between years 1820-1824. The "society" and the "journal" were the place and instrument for discussions about some environmental problems like the reforestation, the relationship between the woodland areas and agricultural areas, the soil exploitation and the utilization of novice techniques. The journal documents landscape transformations, in Molise, and assumed the important function to inform farmers.

1. Introduction

The contribution focus the importance of the documents in the regional approach of the environmental history to know how an area changes in that time. The sources consent to reconstruct the conditions of a specific territory. Therefore, they are a testimony that, together with maps and iconographic descriptions, demonstrate human decisions, mentality or political realities of social group. The documents allow a complete geographic reconstruction with analysing a territory from natural to human aspects.

2. Methods

As a case study, it is proposed an Italian region: "Molise"(Figure 1.). The documents show the phenomenon of the deforestation, the relationship between woodland and agricultural areas in the 1800. Such sources indicate the transformations, techniques utilised, the productivity, the difficulties that were also due to the illiteracy of the workers. These documents furnish suggestions on the mentality of that time, useful for reconstructing a spatial unity with its identity through the interaction between man and environment. The documents, presented in this paper, are the orations held at the *Society of Agriculture* and the articles published in *The Economics Newspaper of Rural Molise.*

3. Discussion

The Agricultural Society was founded in Campobasso in 1810, the main city of Molise, after a few years re-defined as "The Economics Society" leaded by the most important political men of the region. Raffaele Pepe was nominated to be Memorial Secretary, because he was a scholar of Agricultural Economics. The secretary along with other politicians illustrated considerable relationships to members, to inform them of the conditions in "Molise" and to further its change. In particular findings, for example, the relationship presented by Nicola De Luca to the Society in 1844, in which it placed in evidence a few characteristics of the agricultural area in Molise:

- the nature of the fields and the antique methods of work,
- the fields are not adequately fertilized,
- woodland areas are destroyed without reason,
- the field workers are illiterate.

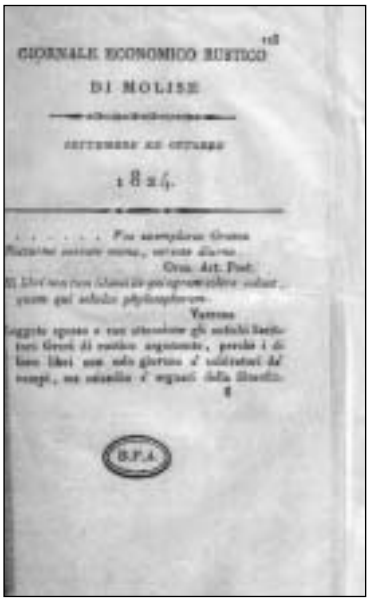
After examing the problems, De Luca proposes the necessary changes: the rotation of crops, the utilization of animal and plant fertilizers, the correct equilibrium between agriculture and pasture. The element that is specifically evidenced is the forest resource, in fact it's written: " *the woodland areas could and must be the third element of resource in the region of Molise. A major part of the uncultivated land should be reafforested*" (De Luca, 1978).

This is similar to the articles presented in the "The Economics Newspaper of Rural Molise", published between 1820 and 1832. It was founded by Raffaele Pepe, Memorial Secretary of the Agricultural Society, which thought it was opportune that the society had an extension with the newspaper. The articles describe the desolate condition of "Molise" and underlines the illiteracy of the field workers. The local authorities and the intellectuals reviewed the articles and tried to transfer to the population a new mentality, the utilization of new and up-to-date techniques (Figure 2.).

Here is an example of an article in 1832 of which Pepe illustrates: " *Eager Farmer of Molise, in this bimestrial, listen to the old expert "Farmer" what must be done in the fields (…): now I recommend to the meteorological observations written, you add yours, and it will or should be the same in every year: because you must know that the first expert in the fields is your own experience*" (Pepe,1978).

Therefore, the Society and the newspaper were the places and the instruments to discuss the environmental problems, such as, deforestation or reafforestation, the realization of the areas between the farmlands and the pasture, the utilization of new techniques. Furthermore, these different contributions were idealised to create the conditions for a new mentality, to change their way of thinking and to inform the farmers.

Figure 2. Economic rural Journal of Molise consultable in Albino Library of Campobasso


GIORNALE ECONOMICO RUSTICO

DI MOLISE

Figure 1. Regione Molise

4. Conclusions

In synthesis, both the "Society" and the "Newspaper" were busy relating the problems of Molise and problem-solving as is evidently clear in the following graphics:

Problems	*Solutions*
Old techniques for tilling	Novel techniques, rotation's utilization
A few livestock for grazing	Numerous livestock for grazing
Absence of animals for manure	Increase of animals for manure
Deforestation	Reforest the highland areas
Illiteracy of farmers	Institutions for teaching

Although the role of these institutions and documents were in fact limited, nevertheless, it's very important for the documentation proposed, that consents the knowledge of Molise's landscape in the 1800's and to reconstruct on the whole, such a phenomenon of the reafforestation. The articles and the reports were proposed in a referential descriptive outlook approach, which relate opportune resources to understand the characteristics of the area; to put in action the importance of the erosion due to the deforestation and on the whole the types of environmental impacts that are still of great importance in the region of "Molise" today.

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Charcoal production in Sunart (Scotland) and Vavestino (Italy) – the legacy of traditional crafts and silvicultural systems

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Abstract

The production of charcoal by rotational coppice of broadleaved woodland is a tradition shared by the study areas in Valvestino (N. Italy) and Sunart (W. Scotland). In the paper we compare two different experiences: the Italian one based on the knowledge of two old people and a low market interest on the product, and the Scottish one with a strong tradition, higher market interest and the development of new production techniques.

1. Introduction to the study areas

1.1. The Sunart Oakwoods Initiative

The Sunart Oakwoods Initiative (SOI) covers the peninsulas of Morvern and Ardnamurchan in a relatively remote area of the west coast of Scotland. It began to take shape in 1996 and is an active partnership between local communities and local agencies (namely Forestry Commission Scotland, Scottish Natural Heritage, Highland Council, and Lochaber Enterprise). From the beginnings of the project, a key aim has been to maximise the contribution that sustainable management of woodlands can make to the local economy, by helping to provide jobs directly through forestry and environmental management, and via enhanced tourism facilities.

1.2. Il Consorzio Forestale della Valvestino

During recent decades, the Lombardy Region has promoted and supported the creation of forestry consortiums based upon partnership between public and private woodland owners. These forestry consortiums are legally recognised bodies and they play an active role in the management of publicly-owned woodlands. In this context, in December 2000, the Consorzio Forestale della Valvestino (CFV) was set up as an association between private woodland owners, local agencies (including Comunità Montana Alto Garda Natural Park, Comunità Montana Valle Sabbia, 5 Municipalities) and woodland sector entrepreneurs, in order to develop solutions to local rural land management needs in one of the most socio-economically challenged areas of the region.

Both areas have their own distinctive local cultures and display a long history of silvicultural management and use of local timber, which is still kept alive (to varying degrees) by a handful of small farmers, craftspeople and woodworkers.

2. Why was charcoal manufactured in the past?

Some main reasons have confered the success to the charcoal production in Europe in far and recent past:

- *Availability of low-cost manual labour:* Charcoal-making involved the whole family, requiring them to inhabit temporary woodland sites for the length of the charcoal-making period;
- *Reduced cost of transport:* The charcoal-making process made it possible to reduce the weight and the volume of raw material, thereby facilitating its transport by pack-animals;
- *High market demand:* Towards the end of the 18th century, the 'industrial' demand for charcoal as a fuel starts increasing, particularly for use in iron smelting, in brick furnaces, and in lime kilns.
- *Increased calorific value compared with fuelwood:*

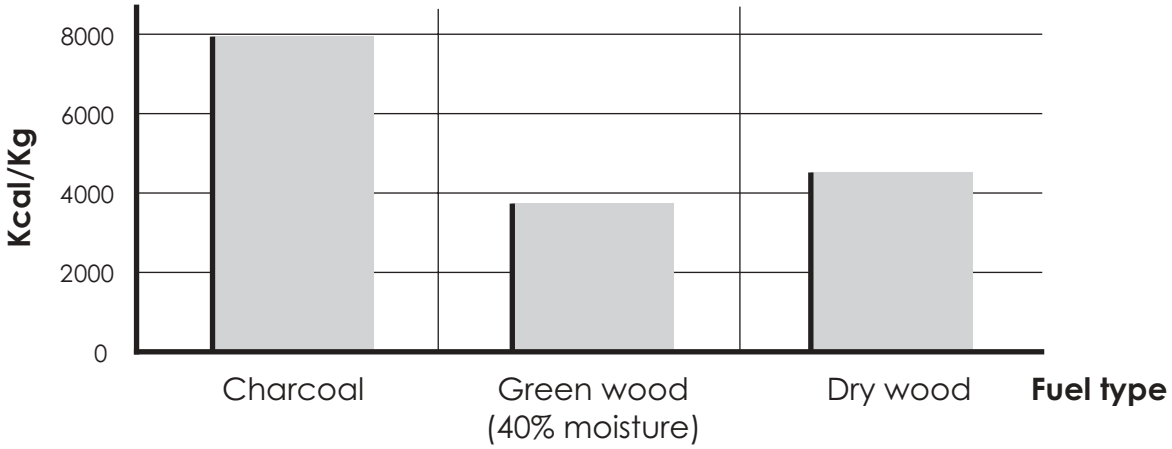

Figure 1. Average calorific value of charcoal – CFV

- *Access to suitable woodlands for management:* In Italy the most suitable tree species are those that grow from lower altitudes right up to the montane zone: *Quercus, Ostrya, Fraxinus, Robinia, Fagus.* The most appropriate woodlands are those with trees of average diametre <10 cm. This small raw material is typical of short-rotation coppice. In Scotland the major charcoal species was Oak (*Quercus petraea*) and the main market was for use in iron smelting during the late eighteenth and nineteenth centuries. During this period Oak woodlands throughout the west coast of Scotland were intensively managed for charcoal and tanbark production, and many of the remaining woodlands in the Sunart area date from this period of 'industrial' charcoal production.

3. The present situation: Italian experience

Today, throughout the Leader+ area, the cultural heritage surrounding charcoal production only survives through two old people. Research was undertaken to assess the economic viability of charcoal production through the traditional "Poiat" technique using present-day conversion ratios and prices from local markets. The analysis of retail prices demonstrates that the value added to the raw material clearly makes the coaling process advantageous.

Table 1. Comparison of retail prices between different woodland products – CFV

Fuel type	Average retail price €/100 kg	Average conversion rate, by weight	Value added through conversion €/100 kg of wood	Value added compared with the baseline €
	5,00	-	-	-
Air-dried split wood for use in stoves	12,00	0,98	11,76	6,76 (=+35%)
Charcoal	110,00	0,167 (=1/6)	18,34	13,34 (=+167%)

However, calculating the conversion costs of the coaling process shows that, in a modern context, its small scale of operation (Consorzio Forestale) for a local market, is anachronistic and uneconomic. The whole operation results in a net return, expressed in terms of manual labour rates, of €5.56/hour.

Table 2. Analysis of conversion costs of the traditional coaling process "Poiat" – CFV

Type of work	Duration days	Number of workers involved	Man-days
Poiat construction	2	2	4
Combustion	7	1	7
Bagging	2	2	4
Total days worked			15
Total hours worked			120 hours

Figure 2. Traditional coaling technique – *Poiat* (source: Internet)

Figure 3. Traditional coaling technique – *Poiat* (source : Internet)

4. The present situation: Scottish experience

The woods of the Sunart area (Morvern & Ardnamurchan) are now some of the most important woods in the UK from a biodiversity perspective, and are of European significance as recognised by the Natura 2000 network. The traditional methods of charcoal production and associated woodland management techniques are no longer practised in Scotland, but are of great interest to researchers and forest managers from the Sunart Oakwoods Initiative who are working to restore and expand these important habitats. An in-depth study of the historical usage and management of the Sunart woodlands, using only archival and archeaological evidence, has revealed how widespread and important charcoal production has been in shaping these woodlands.

Over recent years members of Morvern Community Woodlands have been developing a modern small-scale charcoal production technique using a 'retort kiln'. This insulated metal structure is

designed to produce charcoal more quickly and effectively under the cool wet conditions of the west coast of Scotland. Wood (currently *Fraxinus, Acer, Rhododendron*) is sealed into the body of the kiln and a fire is lit underneath. When a critical temperature is reached within the kiln, the exhaust gases are expelled through a pipe on the underside of the kiln.

These flammable gases are directed into the fire below the kiln helping to further accelerate the fire and completing the carbonisation of the wood inside. The whole process of 'firing' can take place over a period of 3-4 hours, rather than the period of around 24 hours for a more traditional burn. It is hoped that this technique can be further developed to add value to small roundwood and thinnings from silvicultural operations within native woodlands. With each burn producing over 50 kg of charcoal, Morvern Community Woodlands expects to find a niche market for their product among both local people and tourists visiting the increasingly well-known Sunart Oakwoods.

Figure 4.
Experimenting new charcoal manfacture – the retort kiln

5. Conclusions

With the assistance of EU Leader + both areas are working in collaboration to share their skills and knowledge, and to begin to develop possible future markets and modern techniques for coppice fuelwood and charcoal, in the hope of maintaining and reviving a tradition of active sustainable management of broadleaved woodland, to the benefit of both rural communities and European biodiversity.

Toponimi e distribuzione de Quercus suber L. in Italia

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Abstract

Phytotoponymy is a subject that can give precious information about the fluctuation of the distribution area of wooden species in a historical period. The distribution area of the cork oak in Italy is compared to the location of places names linked to this species. The research indicates a clear tendency to recent rarefaction of the species placed at the limit of the south-eastern distribution area, moreover, an over estimation of its frequency and finally the onomastic insertion of the *Quercus crenata* on the border of the distribution area, on the northern and Adriatic side of the Appenine chain.

1. Generalità

La fitotoponomastica è disciplina che può fornire indicazioni preziose sulle fluttuazioni dell'areale di distribuzione di specie legnose verificatesi in epoca storica. L'affidabilità di tali indicazioni è verosimilmente proporzionata alla "utilità" di una determinata specie nell'economia agro-silvo-pastorale di epoca preindustriale. La fissazione del nome di specie in fitotoponimo è inoltre subordinata verosimilmente alla capacità degli individui o popolazioni di una specie, di identificate nel paesaggio agrario e naturale particolari siti. Per cui è in genere la rarità della specie stessa o al contrario la vastissima diffusione in formazioni non frammentate, a determinarne il successo onomastico o meno nel territorio considerato. L'areale di *Quercus suber* (sughera), per la natura stessa della specie, ben si presta a una analisi comparata con i dati della ricchissima toponomastica ad essa inequivocabilmente riferita in territorio italiano. La specie è capace di dar vita nel sistema naturale a formazioni miste o in consociazione sia con sclerofille sempreverdi mediterranee *(Quercus ilex)*, in relazione alle quali sembra condividere la maggior parte delle esigenze ambientali, che con legnose decidue di foreste submediterranee di affinità balcano appenninica *(Quercus cerris, Q. petrea, Castanea sativa.)*, oltre a partecipare con individui isolati o piccoli nuclei, alla componente arborea degli spazi aperti del paesaggio agrario e dei pascoli arborati di vaste plaghe peninsulari e insulari. Essa viene pertanto a collocarsi in modo emblematico, come specie utile alla economia tradizionale, in quella casistica che meglio ricalca il dualismo fra condizione di "rarità" e condizione di vasta formazione estesa su aree continue, così favorevole a una fissazione della sua presenza qual essa sia , nella toponomastica di un territorio.

Quercus suber è specie a gravitazione eminentemente tirrenica in Italia. La sua dipendenza da un clima a termicità mediterranea, subordinato però a discreta disponibilità idrica durante la stagione più arida, le permette di penetrare nella foresta submediterranea decidua a *Q. cerris* in zone retrocostiere, soprattutto qualora in contatto catenale con una vegetazione mediterranea sempreverde. Può esser considerata espressione di vegetazione zonale in Sardegna ma verosimilmente nel continente è quasi solo extrazonale. Lacunosa e rarefatta, la sua distribuzione lungo il versante adriatico suggerisce qui condizioni di regresso in atto da tempi lunghi sotto controllo climatico, aggravato da rarefazione antropogena più intensa che altrove.

Dà vita a ibridi con cerro (*Q.crenata* Lam. = *Q.adriatica* Simonk), diffusi per piccole popolazioni o individui isolati che si spingono entro una fascia di territorio leggermente più interna dell'Appennino. *Q. crenata*, entità morfologicamente eterogenea e spesso confusa nella nomenclatura popolare con la sughera vera e propria, sostituisce quest'ultima nei distretti nordadriatici e prealpini.

Verosimilmente favorita competitivamente rispetto ad altre legnose della fascia climatica della foresta sempreverde, almeno dall'epoca delle culture umane postglaciali (galleggianti, ricoprimenti), non è efficacemente utilizzabile, come produttrice di sughero, prima del raggiungimento di dimensioni del fusto corrispondenti a 60 cm di circonferenza. Ciò contribuisce a rendere irrealistica l'ipotesi di impianti intenzionali *ex novo*, come prassi corrente in antico, che possano aver ampliato i confini esterni dell'areale ad oggi conosciuto ad aree di altra connotazione biogeografica.

Figura 1. Distribuzione italiana di Q. *suber* e Q. *crenata*

E' estesamente registrata nella toponomastica peninsulare. I toponimi ad essa collegabili sono linguisticamente omogenei nelle varie parlate. Mancano indicazioni dall'area grecanica calabra e dalla Grecìa salentina, ove *Q. suber* , sulla base di censimenti in atto da parte degli scriventi, sembra esser più comune di quanto creduto in precedenza. Nell'area di parlata albanese in Calabria si registra il termine"zùfer" (sughera) ed è segnalata una contrada *Zùfer* in comune di Vaccarizzo (CS), ove fino alla fine del XX secolo era conservato un popolamento di sughere ora annientato. Con "sugherella" si intende *Q. crenata* (cerrosughera) in una parlata della zona di M. Amiata: verosimilmente toponimi affini della Toscana e Lazio potrebbero far riferimento a popolamenti di quel *taxon*, anche se esempi del territorio di M S Biagio (M Aurunci, Terracina) sembrerebbero non confermare l'assunto.

2. Fonti toponomastiche

La raccolta dei dati relativi alla toponomastica si è basata sulla elencazione e schedatura dei toponimi presenti nelle tavolette IGM in scala 1:25.000, dalla consultazione di repertori bibliografici regionali italiani contenenti censimenti di toponimi e microtoponimi e da aneddoti raccolti dagli autori durante campagne di censimento sulla distribuzione di *Q. suber* e *Q crenata* nel territorio della penisola.

3. Criteri per la scelta dei toponimi

In questa fase di disamina delle fonti sono state prese in considerazione solo radici toponomastiche in *Sug-, Sog-, Suv-, Sov-*. Sono state escluse radici dubbie di presunta derivazione dal fitonimo ma verosimilmente a questo attribuiti nei repertori regionali per mera assonanza. E' il caso dei nomi prealpini, emblematico fra i quali il valdostano *Soverorii* sostenuto da autori (Olivieri, 1965) ma qui escluso sia per motivi linguistici che per uno scenario ambientale improponibile per la specie, oltre a quelli veneti, per equivoco interpretativo di termini dialettali (*Sogàra da soca*, 'legaccio', 'correggia' anche ligneo *e/o soca* 'zolla' o 'ciocco').

Figura 2.
Distribuzione di Q. suber e Q. crenata sovraimposta alla distribuzione dei fitonimi ad essi correlati etimologicamente affidabili

4. Considerazioni

Una sovrapposizione dell'areale italiano con la localizzazione di un'aliquota di nomi geografici considerati suoi derivati, mostra la sostanziale coincidenza fra distribuzione della specie e distribuzione dei toponimi.

Si rileva comunque una corona periferica di discordanza soprattutto nel settore adriatico, ove si evidenzia una sovrastima del popolamento di sughera derivato dal fatto che quasi tutti i toponimi censiti corrispondono ad altrettante popolazioni presenti, al contrario del resto del territorio nel quale la frequenza della specie non la rende conoscitiva nei meccanismi di attribuzione toponomastica. Questo documenta una rarità della specie già a partire dall'epoca di fissazione dei toponimi. Si confronti con la situazione toscana e sarda, ove l'elevata frequenza della specie rende quella dei toponimi relativamente molto più bassa. Nel Lazio *Q. suber* ha dato luogo a pochissimi microtoponimi in relazione alla sua frequenza. Il toponimo stesso evidentemente segna la rilevanza ed eccezionalità della specie nel paesaggio vegetale, sia nel sistema agricolo che nel sistema naturale.

Nel caso di toponimi esterni all'area di massa della specie sono emerse anomalie in vicinanza o coincidenza con stazioni eterotopiche. È infatti possibile rilevare come alla periferia orientale dell'areale la toponomastica non faccia apparentemente distinzione fra le due entità specifiche, così come invece a volte nella nomenclatura popolare registrata in alcuni distretti (Conti, 1984). *Q.crenata* viene apparentemente assimilata a Sughera in Umbria e nel bacino del Bisenzio in Toscana (Prato).

Emblematico è comunque il caso di M.Cucco-M Catria in Umbria ove al toponimo *Sugherone* corrisponde la presenza di individui di *Q. crenata.*

La toponomastica contribuisce quindi decisamente a far luce su stazioni disgiunte come evidenza accessoria di notevole valore esplicativo sui fenomeni di rarefazione di epoca recente, coeva perlomeno a quella di fissazione del toponimo (periodo di affermazione delle parlate neolatine). In questo senso le stazioni isolate dell'Italia sud orientale possono quindi essere interpretate come resti di una rarefazione antropica di epoca sub recente impostatasi su un processo di retrazione dell'areale nella regione transadriatica meridionale protrattosi per tutto il Quaternario superiore fino ad epoca protostorica. In questo senso sarebbero interpretabili reperti di macrofossili provenienti dall'Eubea (Grecia Centrale) e l' esistenza nelle parlate elleniche del termine *phellos* (sughero).

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Knowledge from 1832 cadastral maps: a source of information for present woodland management

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Abstract

The collection of the original cadastral overviews compiled in the beginning of the nineteenth century appears a valuable source of traditional knowledge for the preservation of cultural heritage in woodlands and rural areas. Originally aimed to register land property throughout the Netherlands, this data collection implicitly contains the first national forest survey in history. The large survey started in 1812 and was completed by 1832. It became operational 1 January 1833. In various ways, this information source can contribute to research, policymaking and management of rural environment in general and of woodlands in particular.

1. Introduction: the material and data of 1832

Registering of landownership started during French occupation (1810-1813) in order to develop a land tax system for the Dutch departments of the French Empire. It took two decades to finish the mapping and classification of all land property (Veldhorst, 1991). This registration included a list of land lots of which size, name of owner, land use type and classes of corresponding tax tariffs have been recorded for each section of a cadastral municipality (Figure 1.). Especially land use categories offer insight in different types of woodland appearance. The economic valuation with respect to the yield of these woodland types can inform us about woodland characteristics in the beginning of the nineteenth century as well. The maps show size and form of the lots. When these different types of cadastral information are combined they will give an image of the early nineteenth century landscape.

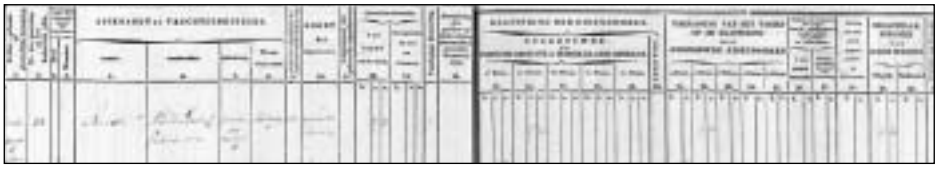
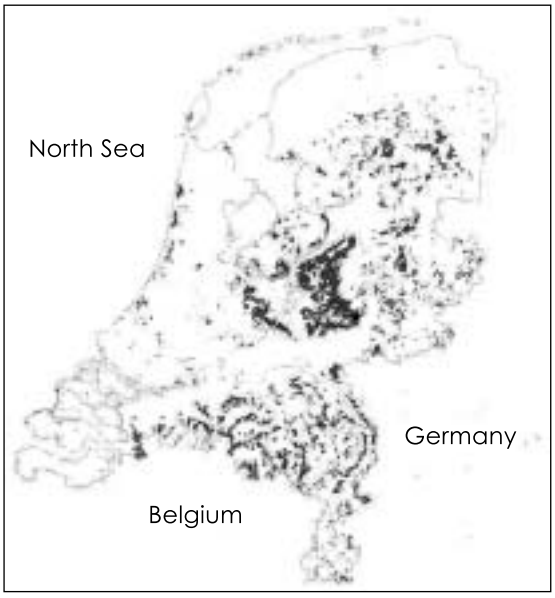


Figure 1. An example of an original lot wise registration of owner features, size, land use type and tax tariff classes used between 1812 and 1832

The original cadastral information is being kept in state archives but has been elaborated and manually reproduced by interested volunteering historians in recent years. Although the value of the material was already recognized for soil research and studies in agrarian history in the middle of the last century (Veldhorst, 1991), its value for landscape research is rather new. Increasingly, this original material will be available and accessible via digital media for further research in landscape and woodland history (Gerding, 2004). Recently, authors in Tuscany, Italy, (Agnoletti et al, 2002) and Flanders, Belgium, (Verboven et al, 2004) made use of original cadastral data in woodland history research and demonstrated its usefullness in understanding forest landscape dynamics.

2. Forest landscape in 1832: an example

The area described in this section is 'Middachten' and 'Hof te Dieren', which are old private estates in the cadastral municipality of Dieren, originating from twelfth and thirteenth century. The area is located at the southeastern edge of the forested centre of the Netherlands called Veluwe, which is a part of the Province of Gelderland as shown in Figure 2.



The landscape in the case area is characterized by a transition zone of riverine lands near the IJssel River (8 meter a.s.l.) to the top of the pleistocene moraine of the Veluwe (65 meter a.s.l.). A variety in poor and rich soil types, in moist and dry conditions has resulted in different types of vegetation like grasslands, wet alder woodland, high beech forest, outgrown coppice, mixed pine forest and heather.

The authentic maps of 1832 have been digitalized and electronically elaborated as presented in Figures 3a. and 3b. This makes it possible to show lots with approximately same land use and tax class and thus to show a schematic image of the landscape around 1832.

Figure 2. Location of case area

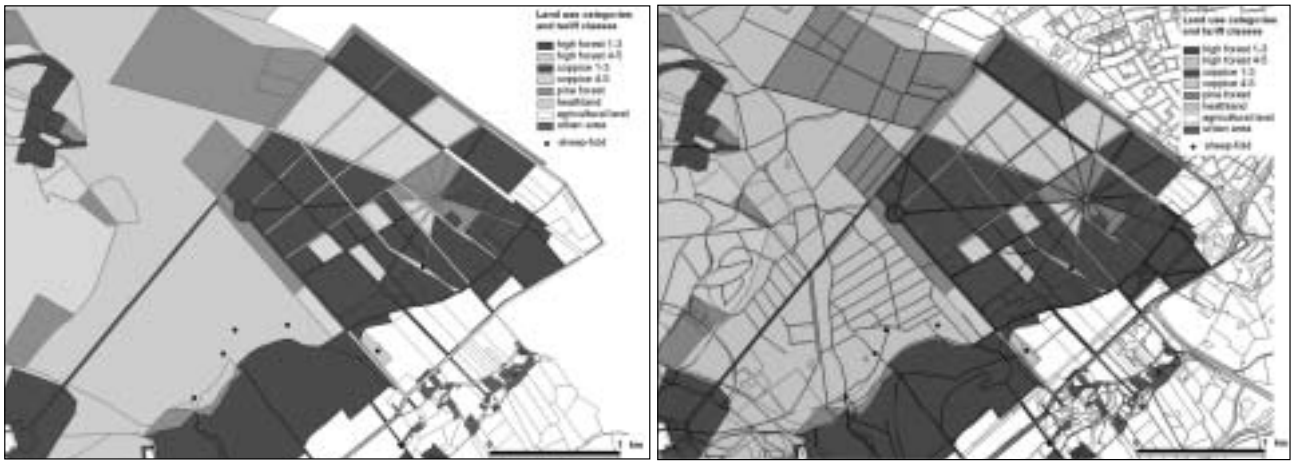


Figure 3. An example of 1832 cadastral maps after elaboration with (left) and without (right) an overlay of a recent topographical map (1997)

In this case the maps show heathlands in pink, Scotch pine plantations in grey, oak coppice and high forest of a number of quality categories in several green colours, old agricultural fields in white and settlements in red. Alleys and old roads and even six sheep-folds can be recognized. In these maps two heatland classes have been combined to one. Originally they were classified as different tax classes because of their different quality for practical use.

The question can be raised what features or phenomenae that can be discovered or explained from these authentic cadastral data in this particular case. Without being complete a number of peculiarities that emerged from the 1832 data set will be described below.

- Coppice of oak used to be an important forest type in the beginning of the nineteenth century. It was classified in several tax classes, depending on their production capacity. During twentiest

century much coppice has been replaced by coniferous forest. At present most coppice lots have evolved to uneven aged mixed stands of high forest.

- Between heathlands and coppice cultures a strip of pine was planted to prevent coppice and beech alleys from severe western winds. Now these pine lots are totally integrated in the latter heatland afforestations north of the medieval Middachter Bosch.

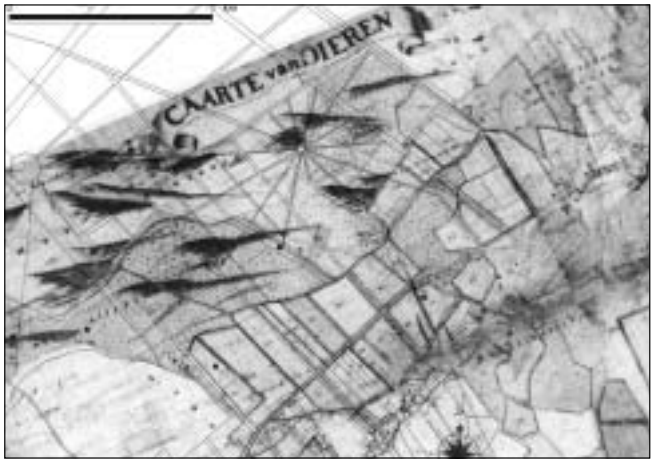
- Locations of a number of sheep-folds in the former heathlands that all have disappeared a long time ago and have been covered with mixed deciduous and coniferous forest has been identified. This series of sheep-folds tells about nineteenth century land use and common rights to graze sheep. The ways to guide the sheep from the village to the heathlands or grazing fields ('schapendriften') have disappeared now as well. Still woodbank structures of 20-40 meters apart from each other to keep the sheep out of the forest can be recognized in the forest.

- Also woodbanks and didge structures between high forest and heathland or between pine plantations and heathland still exist, but are now situated in the present forest. They were meant to keep out wild and domestic animals and to mark property bounderies.

- An old beech alley from 1832 appears to be covered with trees, without any trace and not much different from the surrounding forest stand, to make it more profitable in terms of timber production. Some other alleys were converted to forest for the same reason.

- Relics of the medieval *Quercus petreae* woodland are discovered in former coppice lots. They represent remnants of the old open woodland forest even before coppice had been planted. Also pine trees of more than average age can be traced back with the 1832 map.

- Structures like roads and woodbanks from 1832 maps match very well with older maps like the 'Caarte van Dieren' as shown in Figure 4a. In this way also locations of indigenous ancient woodlands like the medieval Dierense Bosch could be retrieved.



Figures 4a., 4b. Fragments of 'Caarte van Dieren' (1725) and' the 'Topografische Kaart van de Veluwe en de Veluwe-Zoom (De Man, 1807). Comparison with maps from other periods appears very useful to understand dynamics in woodland and woodland management.

3. Potential values of the 1832 data set

From several points of view the 1832 cadastral dataset has potential information. It can be used for research and science in broad sense: the information and maps form a systematical and reliable basis for comparative historical studies. After interpretation and elaboration, the 1832 maps and cadastral data help us to understand early nineteenth century landscape.

Clerkx and Bijlsma (2003) have shown that socalled extensive heathlands on parts of the Veluwe appeared to be an open forest landscape after studying the data via an ecological approach.

In case policy makers recognize cultural heritage values, it provides fundamental information for policymaking, spatial planning and land consolidation plans on local and regional scale.

The other way around, this information source can make policymakers aware of cultural heritage values via consciousness-raising and education.

As the 1832 data source shows type, quantity and quality of the Dutch woodlands in the first decades of the nineteenth century, it provides information for ecological historical studies and ultimately for recovery of remnants and protection of ancient woodlands, for forest restoration or reconstruction.

Then, this 1832 source can be profitable for decision making in woodland management when being included in management plans. On very small scale cultural historical structures in the forest or woodland types can be recovered and if necessary protected, restored or made visible as Jansen and Van Benthem (2005) have indicated in their book on management of historical forest elements.

It can be concluded that the large data set of recorded land use features and cadastral maps published in 1832 provides an enormous potential source of information that can be used for preservation of cultural heritage in general and for management of woodlands, forests and nature in particular as well as in present woodland management and landscape restoration and contribute to the understanding of landscape dynamics.

4. Acknowledgements

I am grateful to dr Rienk Jan Bijlsma from Centre for Ecosystem Studies of Wageningen UR for making the presented maps available for this publication.

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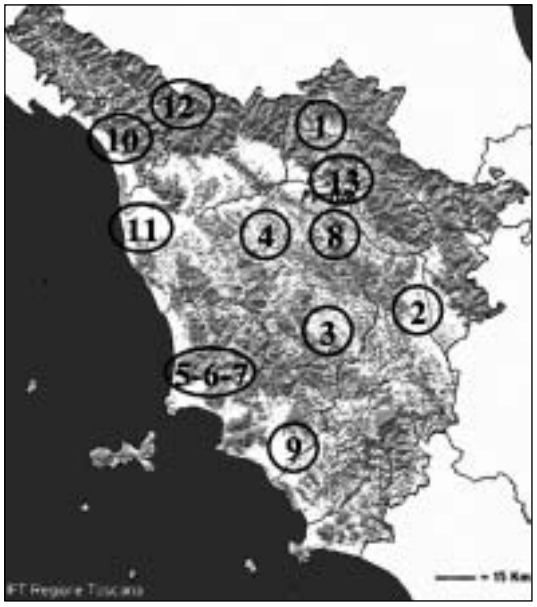
Study tour: the landscape park project at Moscheta, Mugello Valley (Florence)

On Sunday June 11th seminar participants visited Moscheta. This is one of the study areas of the project establishing a monitoring system for landscape quality in Tuscany, which currently includes 13 areas covering 1% of the region. Moscheta was recently selected to develop a pilot project to create a park of the rural landscape. The project was carried out by the Department of Environmental Forestry Science and Technology (University of Florence)[1] in collaboration with the Mountain Community of Mugello Valley, the administrative body managing this mountain district. Is the first time that a project like this has been developed since only natural protected areas are formally authorized under current Italian law. The excursion was hosted by the Community of Mugello, represented by the officer in charge of the project, Dott. Giovanni Miccinesi, and was reported on "La Nazione" the most important newspapers of Tuscany and one of the most important of Italy.



1 – Moscheta
2 – Gargonza
3 – Spannocchia
4 – Barbilla
5 – Castagneto C.
6 – Donoratico
7 – Bolgheri
8 – Montepaldi
9 – Paganico
10 – Cardoso
11 – Migliarino
12 – Castiglione Garf.
13 – Mensola

Figure 1.
Location of Moscheta in the monitoring system for landscape quality in Tuscany. Darker areas are woodlands, covering 47% of the region, the most forested of Italy.

The site

The area of the project is located in a small mountain valley on the south side of the Santerno River basin, flowing from the eastern side of the Tuscan Apennine towards the Emilia-Romagna Region. The 901-hectare project area includes the bottom of the valley and the mountains surrounding it; the average altitude is 680 meters a.s.l. The valley is characterized by the presence of an historic abbey founded in 1034 by Saint Giovanni Gualberto, a monk of the Benedictine order. The monks initiated farming activities, and within two centuries the abbey became one of the most important in Tuscany. In the 18th century the abbey lost its importance and was suppressed. The new owners organized the area as a rural estate, according to the share crop system, where each farmer shares the crops produced with the owner. This structure is the one we find at the beginning of 19th century when the estate appears to have been divided into holdings, "poderi", each with a house for the farmer and a piece of land for cultivation.

[1] Mauro Agnoletti is the Coordinator of the project.

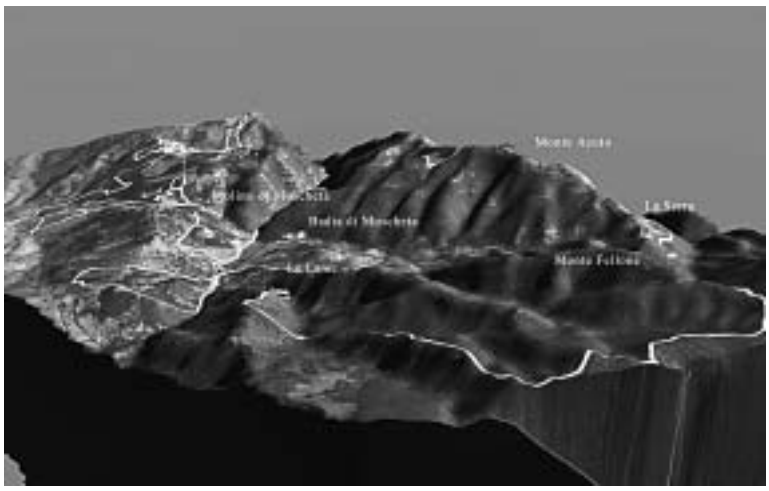


Figure 2.
The project area

The project for the park addresses two main problems related to the conservation of cultural landscapes and the development of marginal mountain rural areas, but also involves analyses of landscape dynamics. Marginal territories, especially those once intensively cultivated and now abandoned, represent a problem not only in developing countries but also in western societies. Also for this reason the Community of Mugello promoted and supported the project, trying to tackle the lack of any real initiative favouring the conservation of their cultural landscape. The recent indications of the National Plan for Rural Development 2007-2013, and the European Landscape Convention, favor these kinds of initiatives. Is should be noted that there are no laws allowing the creation of a network of landscape parks, as there are for the NATURA 2000 network of natural protected areas. This is particularly problematic for cultural landscapes.

Moscheta was initially studied according to the HCEA[2] methodology developed for the main project for Tuscany:

1) Creation of a GIS database, including digitized data collected from the land survey of 1832, the aerial photographs of 1954 and 2000.

2) Production of several kinds of maps for the tree dates.

3) Analysis of landscape changes producing maps of landscape dynamics, cross tabulations, indices of landscape ecology and the "Historical index" (Hi), specifically developed to assess historical landscape changes.

4) Analysis of written and oral sources documenting these changes.

5) Sampling areas to analysis soil, vegetation and material evidences.

6) Interviews to tourists and residents to assess public perception and economic value of landscape resources.

Landscape changes

Since 1832 there has been an enormous increase in woodlands, from 39% to 78% in 2000. A fundamental aspect related to this trend in Moscheta is the dramatic reduction of landscape diversity, reflecting huge changes from all points of view: social, economic, environmental. A reduction of 67% in the number of land uses and the increase of the average size of forest patches of 54%, have

[2]Historical and Cultural Evaluation Approach (M.Agnoletti, 2006, The conservation of cultural landscapes, CABI, New York)

A.

B.

Figure 3. Photo A: Afforestation with conifers has degraded the landscape in Moscheta, introducing elements not related to the local landscape from either the aesthetic or cultural points of view. These afforestations, like most others existing in Italy, have no economic relevance but are still promoted by European forest policy. Photo "B": participants enjoying the chestnut orchards with monumental trees. These woods are threatened by the abandonment of the rural territory and the tendency to turn them into mixed stands to achieve renaturalization. Afforestation has replaced a large portion of these woods in Moscheta.

contributed to the reduced complexity of the landscape mosaic. The period 1832-1954 was characterized by a reduction in wooded pasture and an increase in woodlands and cultivated land, while during the period 1954-2000 there was a continuous increase of woodlands and afforestation, as well as a decrease in cultivated land and wood pasture. The participants visited some of the most interesting sites of the area and gained an understanding of the effects of these transformations and some of the most interesting historical land uses still there. The old chestnut orchards with veteran trees were visited, as well as the new afforestation of Douglas fir that replaced part of the former chestnut orchards. A rare pastured wood, now used for horse grazing, some wood pastures, and pastures in the higher part of the valley were also visited.

Landscape restoration

The project for the Park was also discussed. The situation in Moscheta is quite different from the one presented for Vallombrosa in this volume by Ciancio and Nocentini, related to the conservation of a portion of the even-aged fir stand, around the Abbey, which is very well suited for indicator 6.11 of the present MCPFE criteria. In the case of Moscheta we need to preserve a landscape that includes several land uses with the goal of restoring some of the previous ones, recovering at least a part of the diversity existing in the past, and reversing the process of reforestation. In fact, the simplification of the landscape mosaic occurred in the last two centuries requires the reduction in the extent of certain land use categories, mostly forest and woodland, and the increase of others, redistributing them in the territory. There are several problems connected to this vision. From a technical point of view the actions have been focused on a total of 200 ha, in order to find a reasonable size for economic and management reasons. The latter also presents important problems. Official forestry has neglected to incorporate traditional practices, therefore, even well known textbooks do not mention them, while others refer briefly to the existence of traditional silvicultural systems, such as wood pastures. The other problem is due not only to the lack of any law allowing such a park, but also to laws forbidding the reduction of the extension of woodlands, even in places previously cultivated, although special permission for study and research can be granted. This is

a problem affecting not only any restoration of former rural mosaics, but even the creation of panoramic sites. Tuscany has hundreds of roads potentially offering outstanding scenery and landscape views, but most of them are obscured by trees growing at the side of these roads.

The steps in the project were as follows:

1) Assessment of changes in the landscape mosaic.

2) Identification of the land uses and landscape diversity to be recovered.

3) Selection and description of interventions.

4) Production of a map of interventions (a total of 193), locating them in the territory and assigning an index of "restoration complexity" that characterizes degree of complexity of restoration.

5) Production of a map of future land use of the areas after restoration interventions.

6) Production of a management plan

The project for Moscheta is now entering its operational phase, with initial interventions scheduled for late 2006. The restoration of the ancient land uses, as well as the maintenance of the existing ones, underline the main approach of the project which is the need for the presence of the man, not interpreted as a "disturbance", but as the main and necessary actor in this landscape.

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