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Valuing Trees in a Changing Cultural Landscape: A Case Study from Northwestern Greece

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Abstract This paper explores the changing relationship between society and the environment, taking as a proxy the local valuation of trees in Zagori, NW Greece. We used voucher specimens and asked informants to score perceived value for selected tree species and list associations with the trees. The 4,511 responses were sorted into broad categories. Utilitarian values dominated responses although intangible values were a constant feature. In species that were culturally dominant in the past the change in utilitarian values has been dramatic. Younger informants failed to identify common tree species and were generally unaware of values attached to trees by previous generations. Some species remain highly valued but now more for their intangible significance. We argue that simple tools to record the valuation of trees are useful in exploring the relationship between people and the landscape they inhabit.

Keywords Ethnobotany · Traditional ecological knowledge · Biocultural diversity · Northern Pindos National Park/ Greece · Mediterranean mountains

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Introduction

Cultural landscapes can be viewed as manifestations of the management systems and cultural values held by local communities for over long periods (Blondel 2006). History, politics, religious practices and conceptualizations of nature along with well-adapted practices to exploit local resources (sometimes referred to as Traditional Ecological Knowledge [TEK]) define the character of cultural landscapes and allow us to interpret them in relation to human life and activity (Carvalho and Frazão-Moreira 2011; Terkenli 2001). At the same time long-term human interactions with the land have created a unique assemblage of species, patterns and processes. Consequently the components and dynamics of current biodiversity are an expression of the history of human-induced changes (Blondel 2006; Farina 1998).

Cultural landscapes as dynamic interactions between natural and cultural forces often change, but when changes are characterized by the loss of diversity, coherence and identity they are often viewed as threats to the integrity of the landscape (Antrop 2005). Uncontrolled urban growth, loss or degradation of cultural character, desertion of rural landscapes and the absence of protection measures plague the cultural landscapes of Greece (Sorotou 2012). Moreover, abandonment of traditional activities and consequent loss of rural landscapes are the most severe threats to mountain landscapes and other Less Favoured Areas (LFA, a European Union designation first established in 1975 to support farming where production conditions are difficult) in Greece (Kizos and Vlahos 2012) and elsewhere in the Mediterranean (Plieninger and Bieling 2012). Until the beginning of the nineteenth century Greek rural landscapes were conceptualized as idealized places equated with "freedom" and "prosperity," but from the 1950s, as a consequence of land abandonment, they became synonymous with "isolation" and "poverty" (Terkenli 2010). Recently the advent of local

tourism has reversed their conceptualization to that of an idyllic countryside and has associated them with "unspoiled nature" and an "authentic local cultural tradition" of a distant, "pure" and more "natural past" (Green *et al*. 1998).

In the study we have used trees as indicators to investigate the changes in the conceptualizations of nature in a mountainous area of special cultural heritage and exceptionally high biodiversity. The chosen study area, Zagori in Epirus within the Northern Pindos National Park in NW Greece, is undergoing rapid economic and demographic changes, which we hypothesized would have a strong impact on local perceptions of the environment. We choose trees as a cipher because of their special place in landscapes and culture. Almost everywhere in the world wood serves as a basic element of human material culture (Baumann 1993; Cooper 2004). Furthermore old trees are witnesses to history and their forms are a record of past cultures and the uses they were put to (Rackham 2006). Trees have been worshiped as gods or avatars of the divine and often act as protagonists in myths and folklore. Humans have glorified the great proportions, long life, vitality and self-regenerative power of trees and have characterized them as the most important of nature's gifts to humanity (Baumann 1993). Moreover trees have been used as religious, political and social symbols of historical continuity, community unity and morality and are prominent in rituals related to the cycle of life (Rival 2001; Turner 1967). Thus trees form an intimately woven element of personal and community identities (Garner 2004).

Following from this, we hypothesized that cultural associations with trees could be used as indicators of modernization and change. The aim was to explore if a simple ranking exercise and listing of associations (which we term *freelisting* because the statements were voluntary) could reveal people's ecological knowledge and values on Mediterranean trees.

Materials and Methods

Study Site

Zagori is an example of a protected area with high bio-cultural value that has experienced rapid change because of rural depopulation and land abandonment. From the period of the Ottoman occupation (1479–1912) Zagori has been a self-identified network of 45 villages that since 2011 compose a single municipality which is the third most sparsely populated region of Greece (National Statistics Service 2011). The area extends around the periphery of the Vikos-Aoos National Forest (established in 1973 to protect the geomorphology, mountain landscape and rare flora and fauna of the area) and within the newly established Northern Pindos National Park (established in 2005 with the aim of conservation of landscape, habitats and biodiversity and the harmonious coexistence of people and nature). The National Park is of special international conservation importance as it includes several rare, endemic or threatened species and a unique assemblage of habitats including 11 NATURA 2000 network sites. In addition it contains prehistoric sites, Byzantine churches and monasteries, traditional stone villages, stone paved lanes and bridges used in communication and trade networks from the sixteenth to the nineteenth centuries that are protected though national legislation.

The villages of the area lie between 680 to 1,340 m. altitude and are set in a landscape composed of an intricate mosaic of rocky slopes, escarpments, dolines, summer pastures, thick forests and open scrublands on limestone or flych substratum. Vegetation at lower altitudes is characterized by rangeland or dense thickets of evergreen prickly oaks (*Quercus coccifera)* and hornbeams (*e.g.*, *Carpinus orientalis, Ostrya carpinifolia*). These are replaced at higher altitudes with mixed deciduous oaks (*Quercus spp.*), black pines (*Pinus nigra*), King Boris's firs (*Abies borisii-regis*) and, rarely, junipers (*Juniperus foetidissima* and *Juniperus excelsa)*. On the higher slopes of the mountains, woods give way to extensive anthropogenic grassland and subalpine meadows (Gerasimidis *et al.* 2009).

There is evidence of human presence in Zagori from 14,000 BC (Bailey 1997), but it was not until 3,000 BC that the pastoral activity of nomadic peoples began to shape landscape into its present form (Willis 1992). The most well-known historical period is the time of the Ottoman occupation during which Zagorians enjoyed privileges that conferred status and wealth augmented with remittances from male migration to central and Eastern Europe and later to Asia Minor, Africa and America (Campbell 1964; Stamatopoulou 1998). From the thirteenth century south and south-east Zagori was settled by the linguistically distinct Vlach pastoral community, while from the eighteenth century the summer pastures started to be rented to transhumant Sarakatsani, many of whom settled in the area after 1960 (Dalkavoukis 2001).

Zagori's prosperity in the seventeenth to nineteenth centuries was followed by an economic decline as a result of abrogation of privilege, increased taxation, changes in the markets of south-east Europe and a more general decline of Greek economic activity (Dalkavoukis 2001). The decline reached its lowest point during WWII, with the burning of many villages by the occupying German Nazi army followed by the deprivations of the Greek civil war (1940–1950). During this period entire villages were abandoned and some inhabitants never returned as they sought a better future in Athens or in the nearby town of Ioannina. Population decline continued during 1961–1970 with economic migration to northern Europe. The tide finally began to turn after 1980 when emigration started to be replaced by return of retired people to their native villages (Damianakos *et al*. 1997).

The population of Zagori peaked at around 30,000 at the end of the nineteenth century, declined to 3,724 inhabitants by 2011, and is now characterized by an aging population structure with falling birthrates and high mortality (Damianakos *et al*. 1997;

National Statistics Service; Papageorgiou 1995). The gross population figures are likely to be an overestimate of residents as locals will register in their paternal villages in order to boost numbers and maintain services from the local authorities. Labrianidis and Bella (2004) compared official census data to actual residents and found that the latter can be 30 % lower than the national statistics. Furthermore many people only live in the villages during the summer. In the winter some villages are completely deserted, while the number of residents in others falls dramatically to as few as five. This population decline has had a marked impact on the cultural landscape: croplands and open rangelands have reverted to dense scrublands or forests as a result of natural succession and almost disappeared, while open scrubland and young forests have expanded to dominate the present landscape (Tsiakiris *et al.* 2009; Zomeni *et al.* 2008). Nevertheless, communities largely composed of retired people continue to use ancestral villages as summer retreats and the population in Zagori, almost triples during the summer months (Nitsiakos 2006). There is also a trickle of "lifestyle migrants", who are attracted to Zagori searching for a better quality of life or a "rural idyll" in an attractive built and natural environment as a reaction to severe social and environmental problems of modern cities (Labrianidis and Bella 2004; Williams and Jobes 1990).

Data Collection

Within Zagori we selected 23 villages located in several vegetation units and inhabited by three different ethnic groupings in order to cover the natural and cultural diversity of the area (Fig. 1). However, it is increasingly accepted that nowadays distinctions between ethnic groups in the area have eroded, resulting in the incorporation of all ethnic groups into an emerging identity defined by Zagori as a place of origin or residence (Dalkavoukis 2001).

The purpose of the study was to explore change over time which meant that the primary concern in sampling was the age of the informants, but we also recorded gender and level of education. During 2006, 120 people (65 women and 55 men) from the 1,724 who are registered as residing in the selected villages were interviewed (Table 1).

Chain or snowball sampling was used for the research (Nichols 1991). People from a village proposed potential informants in other villages or in cases where we had no prior contacts we asked the *cafeneion* (café that serves as meeting point and focus of social life) owner to introduce residents.

The study was designed to facilitate statistical analysis of the data for which numbers of samples in each age-class should be equal. However, this was not possible because the population age structure within Zagori is skewed towards older people. The age classes used for the analyses reported in this paper were selected to represent three idealised "generations": those over 70 (born before 1936) representing people who were adults when life in the pre-war Zagori was heavily dependent on the local environment; those 40–69 years old (born between 1937 and 1966) who experienced the post war population exodus and lastly people under 40 (born after 1967) who experienced Zagori as a "poor and barren land" (Damianakos *et al.* 1997) and grew up with formal education. Lifestyle migrants were excluded from the sample, as we wished to explore individual levels of TEK among locals.

Fig. 1 Map of the study area showing location of study villages and vegetation

Table 1 Participants in the study by age class, gender, ethnicity and education

Age	Gender		Ethnicity			Education				Totals
	Women	Men	Sarakatsani	Vlachs	Zagorians	No education	Primary	Secondary	Tertiary	
≤39	5	5	4	4	2	0	0	7	3	10
40–69	16	20	7	5	24	1	16	7	12	36
≥70	44	30	12	5	57	10	50	10	4	74
Totals	65	55	23	14	83	11	66	24	19	120

During May - June 2006 specimens (leaves and branch tips) of 50 native tree species of the area were collected, pressed and mounted on card (vouchers). Six pilot in-depth interviews with key informants with these voucher specimens were held during July 2006. The analysis of these first interviews together with information from local ethnobotanical manuscripts was used to select 13, based on their significance in everyday life, economic value, abundance, presence of remarkable individuals in the landscape and symbolic associations (Table 2). The vouchers for these 13 selected species were covered with transparent plastic film to make them more durable and were used as the basis for subsequent interviews. In some cases the voucher was taken as representing a group of species in the same genus, e.g., downy oak served as representative of all seven deciduous oaks that grow in the area.

Interviews ranged from intimate in-depth home visits to short question and answers solicited from passers-by most often in the village cafeneion, depending on the interest of the informant for the subject. In each interview the 13 vouchers were presented in a randomised order as recommended by Martin (1995). Participants were asked to identify the tree and all local names provided were recorded. If people failed to provide a name or to identify the species the researcher provided the name. Next people were asked to:

i) score each species from 1 (lowest) to 5 (highest) in reponse to the question: "What is the importance of this species for you?" and
ii) list uses, non-use values and personal reactions to the tree. The lists of statements we termed freelists as they represent voluntary associations. Multiple statements for a tree were allowed. These statements are analogous to the events proposed by Phillips *et al*. (1994) as a basis for quantitative analysis of ethnobotanical knowledge and values.

Analysis

The analysis of freelists commenced with the classification of statements into categories of value. We reviewed a number of classification schemes for tree values (Alcorn 1995; Martin 1995; Phillips and Gentry 1993; Rackham 2006) but found that none of them covered the full range of statements we recorded. We therefore created a classification using a bottom-up approach that progressively grouped similar statements to form a hierarchy from which seven broad categorical groups emerged: utilitarian, symbolic, historical, aesthetic, personal, and ecological values. This list is similar to several lists of values found in the international literature concerning values that people ascribe to the natural world (e.g., Appleton 1994; Descola 2008; Kellert 1996; Manning *et al*. 1999).

Once the categories had been decided, every statement was assigned to just one category. In addition we formed a category we termed "not known" to indicate that the informant was not able to name the species. The nature of the statements was also considered and could be positive [e.g., "I like the scent of the flowers on this tree"] or negative [e.g., "This tree smells"]. This analysis was done in vernacular Greek with only the higher level classes and broad categories translated into English (see Table 3 in the Appendix). Mosaic plots (Friendly 1994) were used to graphically present freelist values.

Although the scores are numeric they are categorical data ('1' is the label for the lowest ranked responses) and therefore analysis of the scores took the form of chi-square tests of contingency tables (Zar 1974). As the sample was unavoidably heavily weighted towards older people we needed to standardize the data to facilitate comparison between the generations – hence we present the results in the form of proportions rather than the counts of responses (e.g., Fig. 3).

Results

The freelisting generated 4,511 individual statements related to use and non-use values, with a maximum of 13 statements given to one tree by an informant. Statements related to the utility of trees dominated the value systems of all respondents, but most notably the responses of older and middle aged people (Fig. 2).

Similarly, we found significant drift of young people's knowledge of trees, many of whom failed to name or were not aware of the value or use of common species which were well-known to previous generations. Old people also failed to mention uses or to recognize species which do not grow naturally in the vicinity of their villages, indicating they had perhaps not frequently visited areas outside their village.

Table 2 The 13 tree species used in scoring exercise

	Species names			Distribution		Values	
N	Scientific name	English common name	Greek common name (in bold) and local variants	Global	Local	Use	Non-use
1.	*Abies x borisii-regis*	King Boris's fir	Elato, Elatos, Bratou	S. Balkans	Forms patchy woods or extended forests in S/SE Zagori, rare elsewhere	Economically important timber tree	Found in church or graveyards as a high altitude substitute for funeral cypress
2.	*Acer monspessulanum*	Montpellier maple	Sfentami, Sfentani, Klenos, Tziougastrou	S.C. Europe, N.W. Africa to N. Iran	Sporadic tree; one of the five maple species of the area	Fuel wood and winter fodder for livestock	Often found in church or graveyards
3.	*Carpinus orientalis*	Hornbeam	Gavros, Gravia, Gravi, Graveli, Carpine	S.E. Europe, N. Turkey, Caucasus, N. Iran	Widespread tree; more often in shrub form	Pasture and spring fodder for livestock.	-
4.	*Cerasus mahaleb*	Mahaleb cherry	Agriokerassia, Kerassos, Agriokerassos, Kerassogortzo, Agriocheressou	C., S. Europe, S.W., C. Asia	Sporadic tree within forest and agricultural areas	Fuel wood and winter fodder for livestock	Found in church or graveyards; positive symbolic associations (in Christmas ceremonial fires against capricious spirits)
5.	*Cornus mas*	Cornelian cherry	Krania, Cornou	C., S.E. Europe, Caucasus and W. Asia	Widespread shrub	Poles are used to make shepherd's crooks; edible fruits	Found in church or graveyards; positive symbolic associations (in fertility rites)
6.	*Fraxinus ornus*	Manna Ash	Fraxos, Fraxi, Melios, Fraxine	Mediterranean, S., C. Europe	Widespread small tree	Useful timber often used as poles	–
7.	*Juglans regia*	Walnut	Karydia, Karya, Nouca	Native in much of the Balkans, Anatolia to Armenia; cultivated elsewhere	Widespread in abandoned orchards	Economically important timber; nut tree	Negative symbolic associations (haunted tree)
8.	*Juniperus foetidissima or J. excelsa*	Stinking or Grecian juniper	Arkeuthos, Kedro, Mourzinos, Mourzino	Stinking j.: Balkans, Anatolia to Armenia. Grecian j.: Balkans, Crimea, Anatolia, Cyprus, Syria, Iran, Afghanistan	Rare tree in rocky high altitudes	Useful timber	In tree form only when protected in sacred groves; isolated veterans often used as landmarks
9.	*Pinus nigra* ssp. *nigra var. caramanica*	Black pine	Pefko, Pefkos, Kinou	Greece	Common in E. Zagori; widespread in afforestations elsewhere	Economically important timber tree; torchwood	Found in church or modern graveyards as high altitude substitute for funeral cypress
10.	*Platanus orientalis*	Oriental plane tree	Platanos, Platani, Neroplatanos, Imerosplatanos, Platanou	Italy, Balkans, Turkey, S. Syria, N. Iran, Iraq to Himalaya	Common to riversides forms extensive forest belts across rivers	Few direct uses	Almost always found in squares where it serves as shade tree and focal point for community life
11	*Quercus coccifera*	Prickly oak	Pournari	Eastern Mediterranean, NW Anatolia	Widespread small shrub on limestone substratum where often forms dense thickets; rare elsewhere	Important fuel wood; heavily browsed by livestock	In tree form only when protected in churchyards, graveyards or sacred groves
12	*Quercus pubescens*	Downy oak	Drys, Dentro, Imerodentro, Dousko, Sioumos, Arbore	W., C., S. Europe, Crimea, Anatolia	Widespread tree; one of the seven deciduous oaks of the area	Important fuel wood and winter fodder for livestock; in the past most often in shredded form	In maiden form only when protected in churchyards, graveyards or sacred groves

Table 2 (continued)

	Species names			Distribution		Values	
N	Scientific name	English common name	Greek common name (in bold) and local variants	Global	Local	Use	Non-use
13	*Tilia platyphyllos*	Large leaved lime	Flamouria, Filyra, Tilio, Tilia, Lipa, Lipanthia	C., N. Europe, S. Ukraine, Anatolia	Sporadic tree within forest	Best known for the medical qualities of its flowers	Planted as an ornamental tree in public places

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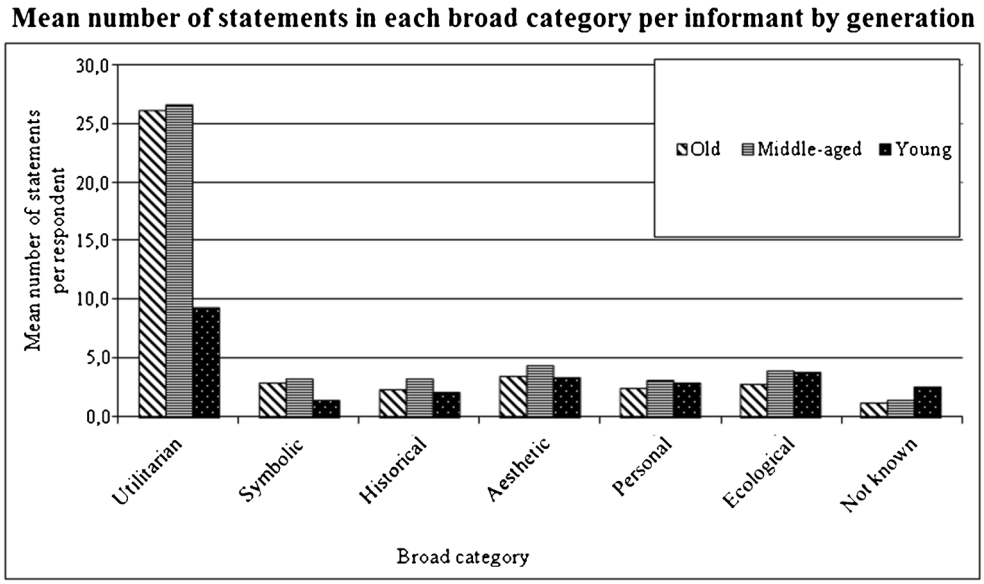

Fig. 2 Mean number of statements in each broad category per informant by generation

Examination of the values given by each of the three generations by species revealed a range of responses:

i. Significantly lower scores were given by younger than older people for downy oak, prickly oak, hornbeam, Manna ash, Montpellier maple, Mahaleb cherry, stinking or Grecian juniper and walnut;
ii. Similar scores given by all generations for oriental plane, black pine, King Boris's fir and Cornelian cherry;
iii. Significant higher scores given by younger than older people for large leaved lime.

Cross referencing this with the freelist value statements and overall scores gave us a more detailed view of these changes with characteristic examples given below:

Trees for which older people gave higher scores than younger people

There are markedly fewer uses listed for trees by the youngest generation compared to the oldest for most species. Old and middle-aged people listed a large number of uses, while young people mentioned only half as many. This suggests that the lower overall values given by young people can be attributed to adoption of livelihoods which are not dependant on traditional practices. The evergreen and deciduous oaks are a clear example of these changes (Fig. 3).

For some trees, notably hornbeam and Manna ash, the decline in utilitarian value was accompanied by an increase in instances where the tree was not known by the informants (Fig. 4).

Trees Which are Equally Valued by All Generations

Four of the 13 species studied showed no statistical differences in scores between generations, although the reasons for valuing these trees appear to have changed (Fig. 5). The few uses of the plane are unknown to young people, though they assign many more personal values to the tree. Black pine uses have also declined nowadays giving way to increasing aesthetic values.

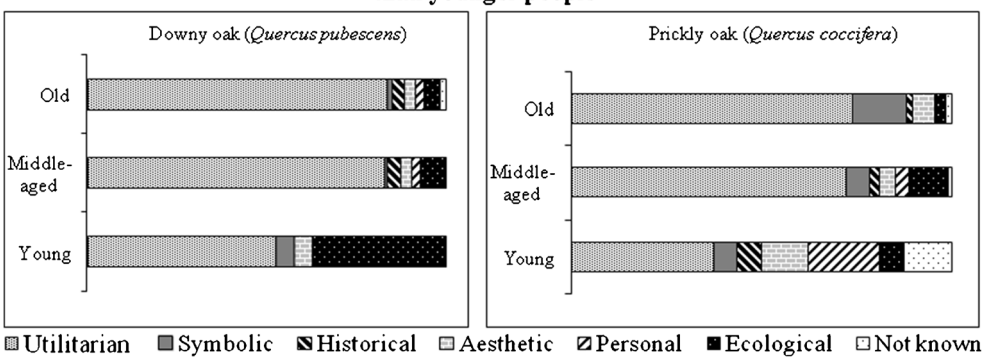

Fig. 3 Mosaic plots of freelist categories for species for which older people gave higher scores than younger people. For prickly oak loss of utilitarian value is accompanied by loss of symbolic values, while for downy oak there is increased recognition of ecological values

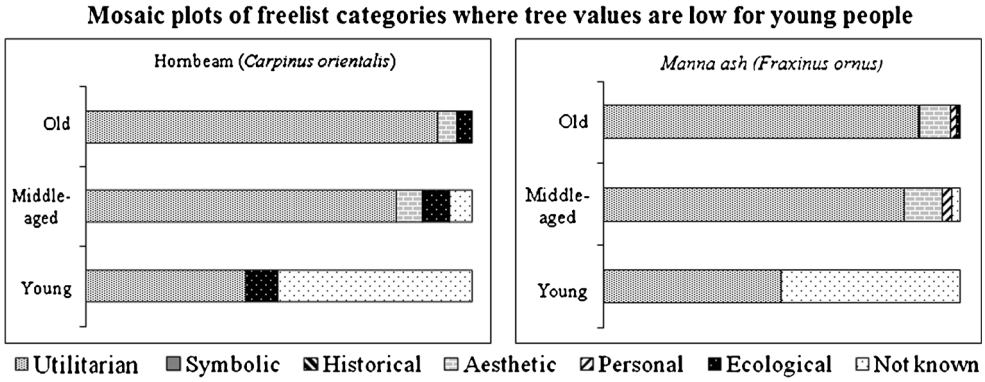

Fig. 4 Mosaic plots of freelist categories where tree values are low for young people. For hornbeam and Manna ash the decline in utilitarian value is accompanied by almost as many instances where the informants fail to recognise the species

Trees Which Were Assigned Higher Scores by Younger People

The study revealed that lime was the only tree for which young people gave a statistically significant higher value than older generations. The freelist revealed that this remains valued as an ornamental tree in public places and is still famous for the medical use of its flower bracts as lime "tea" (Fig. 6).

Discussion

The study revealed that utility is the most important single contribution to value, reflecting the findings of similar studies in non-industrial societies (Kellert 1996). Around 40 % of the statements by young people are related to uses and show that trees remain a part of the material world. Nevertheless, the lower number of uses reported by the youngest generation can be taken as a reflection of lower dependency on trees in day-to-day life (i.e., subsistence). As in other studies on TEK in a Mediterranean context the decline in utility is largest from the middle-aged to the young class, i.e., since 1970 (Gómez-Baggethun *et al*. 2009).

Some uses have almost totally disappeared from Zagori as they are no longer the basis of livelihoods and have been replaced, as elsewhere, by exogenous services or products (Gómez-Baggethun and Reyes-García 2013). Examples of declining practices are the storage of leaf fodder for stalled livestock over winter, the creation of everyday objects such as utilitarian furniture and tools, and woodcutting for fuel. However there has been a recent resurgence of interest in some of these practices, e.g., woodcutting as a response to the ongoing economic crisis.

The most highly valued of the 13 trees were the oaks that were the dominant economic trees in the past livelihoods of Epirus (Halstead 1998). They were valued as important energy sources and elements of farming practices. Deciduous oaks were cut to provide foliage fodder for stalled goats over winter. Prickly oaks were also highly valued as fodder as their evergreen branches could be cut fresh for stall-feeding or they could be browsed by goats even in quite deep snow (Dafis 2005).

At the same time, tree products that used to provide an occasional contribution to household income in the past (e.g., acorns, resin or walnuts) have been lost as changes in lifestyles and economy erased their commercial value. Furthermore local timber, especially black pine, although of good quality, cannot compete with low-priced imported timber. An exception is the lime, which along with "mountain tea" *(Sideritis raeseri)* and chamomile (*Matricaria chamomilla*) are well-known and current medicines, used as "panacea" for respiratory ailments and insomnia. Such plants are associated with the reappraisal of herbal medicine, "natural" wild foods and "traditional cuisines" in the context of "new lifestyles" (Rigat *et al.* 2009). This renewed appreciation for rural ways of life and local products is a significant and growing industry in many countries and stimulates rural tourism which is reviving

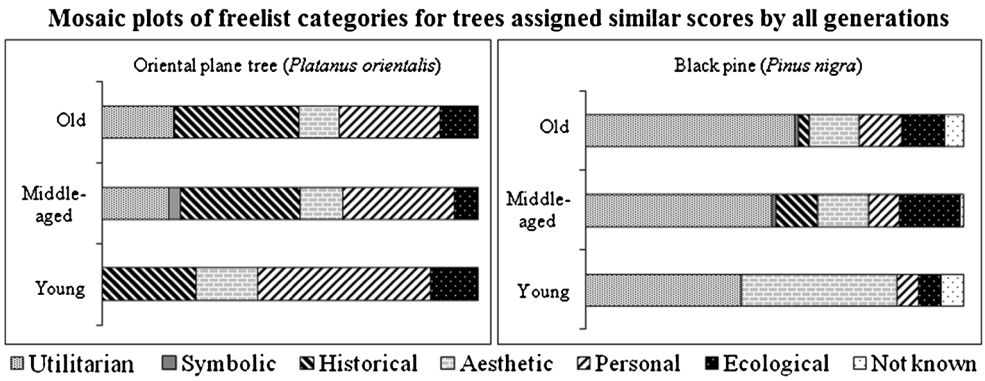

Fig. 5 Mosaic plots of freelist statements for trees assigned similar scores by all generations. The reasons given have changed between generations, e.g. use values decrease, while personal values for plane and aesthetic values for black pine increase

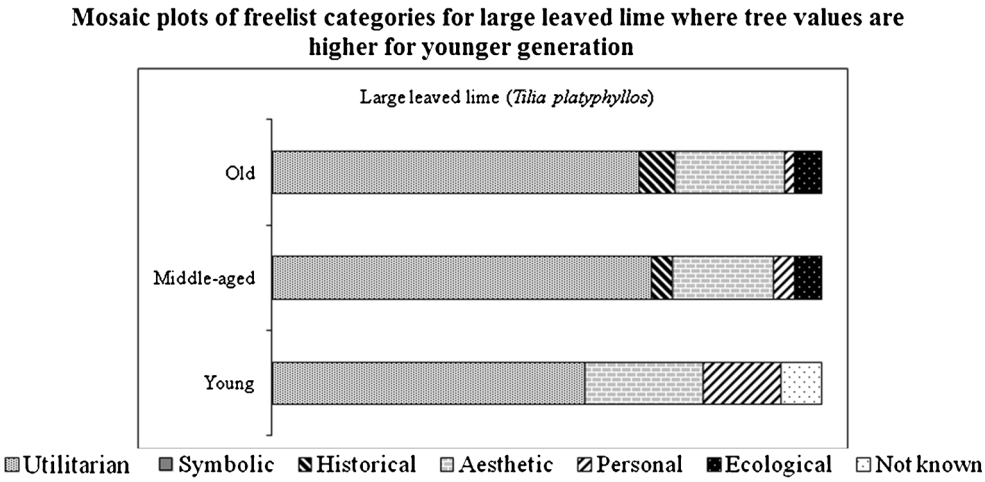

Fig. 6 Mosaic plots of freelist categories for lime where tree values are higher for younger generation. Lime remains valued as an ornamental tree in public spaces and for the use of flower bracts as lime "tea"

local economies in Zagori as elsewhere. Linked to this are increasing use values for edible species, such as Cornelian cherry, used for the preparation of traditional liqueurs and which has become highly valued recently because of antioxidant qualities (Pertidis *et al*. 2010). It is notable that Zagori has a special historic association with traditional plant use. During the seventeenth to the nineteenth centuries, folk healers, commonly known as *Vikogiatri* (literary doctors from Vikos gorge) made Zagori the most famous centre for folk medicine in the Balkans (Malamas and Marselos 1992; Vokou *et al*. 1993). Vikogiatri have long since disappeared, although people in Zagori still use herbal medicine. This combination of new trends and local history provides incentives for younger people to value trees that can offer such products, and demonstrates the adaptive nature of TEK to changes, commercialization and new conditions (Gómez-Baggethun and Reyes-García 2013).

Equally, increases in aesthetic and personal values for trees among young people reflect urbanisation and the adoption of wider modern sensibilities. Young people tend to see nature more as a source of inspiration and recreational enjoyment than as a provider of commodities for human use or profit (Kellert 1996). A good example is the plane that is a "beloved" top ranked tree for many young people (Table 4). This strength of feeling is associated with presence of planes in every village square where they serve as focus of village social life. Migrant workers returning from cities to ancestral villages for annual summer festivals that take place under the central plane tree especially place the tree as the focal point of their "imagined village." The village plane tree functions as symbol of historical continuity for the local community as it is thought to have been planted by village founders; its large dimensions symbolize the long-lasting life of the community, while its health and well-being are associated with community welfare and prosperity (Arapoglou 2005). Therefore the plane tree is emblematic of nostalgia, as an image of the past and "home" and serves as a locus for the construction of the collective identity of those who consider themselves members of the villager community (Stara *et al*. in prep.).

Evergreen conifers are perceived as "ornamental" rather than "useful" by younger generations. For example, the black pine, an important timber species which forms extensive natural forests on the Pindos massif, it is valued for its timber by the woodsmen of eastern Zagori, but for the residents of the rest of Zagori, and mainly in its western and northern parts, pines are regarded as "exotics." The local elite started to plant pines in the early twentieth century to create park-like groves in the vicinity of villages where overgrazing was a common phenomenon. During the 1950s conifer plantations were also created by the Forestry Service to control erosion from heavy rains or as ornamental features and many of the informants recalled their active involvement in these plantings. For the older informants the creation of these plantations reflects a history of conflict with central government over the imposition of national controls over land use and prohibition of grazing. The emergence of aesthetic values for pine among young people is related with the establishment of the species as a feature in the landscape, its evergreen foliage, its association with places of recreation both in town and rural areas and its identification with national campaigns for forest protection that promote pine plantations as manifestations of natural beauty, health and civilization.

Adoption of wider global values and modernization probably lies behind the rise in statements related to ecological values in all generations. The downy oak can be taken as representative of all deciduous oaks of the area. The dramatic decrease in young people's valuation of utilitarian values for this species was accompanied by a rise in their valuation of its ecological values. In particular, young environmentalists see expansion of oak forests as desirable, relating it with natural regeneration of plant and wildlife species. On the other hand, many older people and farmers perceive forest expansion negatively, as abandonment has transformed the "working

landscape" around villages from a patchy and diverse mosaic dominated by fields and shredded oaks into what they characterize as "homogenous jungles." According to Höchlt *et al.* (2005), decreasing use and accessibility of the landscape as a consequence of abandonment lead to a loss of historical experience, cultural knowledge, and identification with the land as "homeland." The older generation holds the cynical view that "what is not useful for people anymore is useful for nature," and they equate forest with the loss of fertile land and property and often also with threats from large carnivores, in particular brown bears *(Ursus arctos*) and wolves (*Canis lupus*), which prey on livestock. In many mountain areas in Greece these animals have reappeared due to their natural range expansion or population increase (Iliopoulos *et al*. 2009; Mertzanis *et al*. 2008). Rumors circulate that their presence is related to organized releases from illegal breeding sanctuaries by environmentalists and NGOs, as has been reported in other areas of Europe (Buller 2004).

Modernization is also obvious in the decrease of the symbolic value of most trees most notably the prickly oak. The importance of the prickly oak in everyday life for the older generations was reflected in its symbolic use in rites of passage and fertility rituals where its evergreen foliage represented "immortality." People cut branches from sacred prickly oaks in the vicinity of churches or icon stands to hang in the entrances of homes to impart strength and nostalgia for birthplace and family to migrant family members. Prickly oak branches were also used in the symbolic "fire marriage" on Christmas Eve and in winter bonfires to bring wealth and prosperity (Stara *et al*. 2009). One of the informants had hung a prickly oak branch in his entrance door to preserve the health of the grandchild of the family who was in the army, but most of the documented uses of this kind were related to past practices.

A somewhat similar pattern can be seen for walnut, which formerly had negative associations as a host for evil spirits. The shadow cast by walnuts was considered to represent malevolent forces that could bring illness and bad luck, while planting or cutting the tree was believed to put the life of the planter or cutter in danger from supernatural forces (Miligkou-Markantoni 2006). Today walnut has lost its negative symbolism and can be seen in many private gardens where it serves as shade tree. On the other hand, Mahaleb cherry has lost its ritual use to ward off demons and is slowly disappearing from churchyards and graveyards, as is Cornelian cherry, whose links to fertility are likewise in decline. [1]

In general, the decline in symbolic values informants assigned to trees appears to be related to a rejection of past cultural practices as sign of backwardness (Steward 1991). Contrary to this trend, however, is the case of the fir, which is the only species valued symbolically by young people because of its adoption as a symbol of Christmas. Firs as Christmas trees are a recent innovation in Greece imported from northern Europe. Middle-aged people remember junipers as the Christmas trees of their childhood, as these were more accessible, while firs were considered "sorrowful" or "bitter" trees because they were planted in graveyards (Stara *et al*. in prep.).

For some trees, notably hornbeam and Manna ash, the decline in utilitarian value was accompanied by almost as many instances where the tree was not known by the informants. A process that begins with a decline in use followed by the loss of knowledge sometimes ends with the survival of relict place names, meaningless aphorisms or the total loss of a name itself. Many species now forgotten in this way were valued highly in the past as fodder, firewood or construction material, but are now perceived as unattractive shrubs on abandoned agricultural land and forest. This confirms that traditional knowledge of nature can disappear more rapidly than the organisms themselves (Tuxill and Nabhan 1998). These the results accord with other research documenting changes of lifestyles leading to rapid changes in of local knowledge, a common pattern through the world and a big challenge for modern conservation scientists, who have started to adopt more interdisciplinary approaches to study biological, cultural and linguistic diversity (Balick and Cox 1997; Maffi 2005; Mallarach 2008).

Conclusions

We used local knowledge of common tree species to study changing values and traditional ecological knowledge in Zagori, a mountainous protected area of northwestern Greece. The results showed that in Zagori changing land use and less dependence on local environments are reflected in a loss of local environmental knowledge and changes in the perceived values of tree species. Formerly culturally dominant trees have most noticeably lost value and consequently are frequently no longer recognized and their management and potential uses forgotten. However the species themselves are much less threatened than the knowledge about them since because of land abandonment and vegetation regeneration many are expanding their range and dominate landscapes of the area. Set against this is the formation of new values for species formerly either not valued or positively avoided based on changing values and importation of outside ideas and traditions. Both of these changes are reflected in the landscape; on the one hand in the loss of distinctive shaping of trees for fodder and on the other with the planting of exotic species.

[1] Stories relate that the burial of dead infants under Cornelian cherries would magically protect the life of the next child of the family (Stara *et al.* 2009).

The research showed that techniques such as simple scoring and freelisting used in conjunction were effective and efficient research tools to reveal the extent and nature of cultural changes. Both were relatively straightforward to implement, and although the freelisting took considerably more time than the scoring, it enabled us to explore not just the values attached to trees, but also what ideas and attributes contribute to overall value. Such approaches can contribute to interdisciplinary studies to reveal the connections between cultural and biological diversity and incorporate TEK into understanding landscape evolution. Modern conservation initiatives should take into account that local people's attitudes entail values and conceptualizations of nature in remote marginal areas based on significant bodies of TEK that represent deep links with nature and can be used to guide sustainable natural resource management. The subsequent research will focus on other stakeholders', such as life-style migrants, economic migrants, and environmental managers, focusing on their values, livelihoods, expectations and visions about the area as these forces could influence and form its future landscapes.

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Appendix

Table 3 Classification of freelist statements and examples

Statements		Nature of statement		Total events
Broad category	Detailed category	Positive	Negative	
Utilitarian	Abundance (positive = widespread = potential for use; negative = rare = limits potential use)	11	32	43
	Animal feed (positive = good foliage quality, easy to cut it; negative = bad quality forage)	650	65	715
	Economic/commercial value (positive = commercial timber, firewood, charcoal, resin, lime bracts, walnuts, acorns; negative = low quality timber, past economic value)	339	15	354
	Fire (positive = firewood, firelighter, charcoal, torch; negative = poor quality, dangerous,difficult to cut firewood)	443	95	538
	Garden/Farm/ Everyday life use (positive = fencing material, poles for supporting crops e.g. beans, baskets, farm tools, shepherd's crooks, artefacts, barrels, music instruments; negative = low quality wood for specific uses)	264	6	270
	Generic utility (positive = useful, valuable, good; negative = useless, few uses)	112	82	194
	Human food (positive = edible fruits/nuts, cooking ingredient, drinks, distil alcohol, associated with mushrooms, game, bee- keeping; negative = inedible fruits)	360	9	369
	Shade for livestock	18	0	18
	Specific uses (medicinal use, dye/mordant, cosmetics, aromatic use)	300	1	301
	Tenure (positive = private property, provisioning, potential for use; negative = wild and thus un useful	4	9	13
	Timber (positive = long lasting, large sized, straight, strong; negative = not long lasting, poor form, dangerous to cut, fragile)	129	29	158
Utilitarian Total		2630	343	2973
Symbolic	Ceremonial use (ceremonial fires, Christmas tree, rites of passage)	170	1	171
	Magic action (augury, charm, sympathetic magic)	15	0	15
	Supernatural creature ("shade tree" = a phantom, a disembodied spirit or rejection as superstition)	46	30	76
	Symbol (positive = strength, fertility, sacredness, luck; negative = difficulties, stubbornness)	8	2	10

Table 3 (continued)

Statements		Nature of statement		Total events
Broad category	Detailed category	Positive	Negative	
Symbolic Total		223	49	272
Historical	Ancient history (oracle oak of Dodona, arms of Alexander the Great)	7	0	7
	Link to the past (long lived trees associated with ancestors and community foundation)	62	0	62
	Local history (places named from specific trees, trees as place signs, trees linked to pleasant or unpleasant historic events)	87	7	94
	Local vegetation history (dates and planting stories, sacred trees or trees which have died)	39	12	51
	Social life (centre of community life, meeting point, festival place)	30	2	32
Historical Total		225	21	246
Aesthetic	Smell (positive = fragrant; negative = smelly)	54	3	57
	Sound (nice sound when the wind blows)	2	0	2
	Touch (positive = not spiny; negative = spiny, itching, irritating)	6	9	15
	Visual (positive = beautiful, nice, blossom, coloured, evergreen, large; negative = ugly, not special, dead, small)	261	41	302
Aesthetic Total		323	53	376
Personal	Appreciation (positive = I like this tree; negative = I don't like this tree)	15	2	17
	Associations (positive = beloved, favourite, pleasant, part of everyday life; negative = not favorite, allergic)	178	8	186
	Personal connection (recall of pleasant or unpleasant memories, things or situations)	56	25	81
Personal Total		249	35	284
Ecological	Dynamics (vegetation recovery because of abandonment perceived positively or negatively)	23	22	45
	Environmental amelioration (positive = good air quality, enhances soil fertility; negative = unhealthy air quality, impoverishes soil)	28	14	42
	Habitat (positive = native, associated with water, resistant; negative = demanding, fragile)	46	25	71
	Natural disasters (positive = prevents landslides; negative = causes fires, attracts lightening, dangerous because old and rotten)	5	19	24
	Variability (lots of varieties or species)	40	0	40
	Wildlife (positive = provides food or shelter for wildlife; negative = dangerous mammals i.e. the brown bear)	73	5	78
Ecological Total		115	85	300
Trees not known by the respondent		–	–	60
Grand Total		3870	581	4511

Table 4 Cross-tabulation of scores by tree and generation

Tree species	Generation	Proportion of people in each generation giving each score to a species						Pearson Chi-square	Mean score
		No value	1	2	3	4	5		
Downy oak	Old			1.4	14	28	57		4.4
	Middle-aged		2.8	2.8	5.6	28	61	**	4.4
	Young			10	60	20	10		3.3
Prickly oak	Old		1.4	2.8	7	13	76		4.6
	Middle-aged		2.9	2.9	15	15	65	**	4.3
	Young		30	10	20	20	20		2.9
Hornbeam	Old		4.1	9.5	37	35	15		3.5
	Middle-aged	8.3	2.8	8.3	42	33	5.6	**	3.1
	Young	50	20		20		10		1.3

Table 4 (continued)

Tree species	Generation	Proportion of people in each generation giving each score to a species						Pearson Chi-square	Mean score
		No value	1	2	3	4	5		
Manna ash	Old		4.1	9.5	31	32	23		3.6
	Middle-aged	8.3	2.8	11	42	19	17	**	3.1
	Young	60			10	10	20		1.7
Montpellier mapple	Old		6.8	8.1	41	38	6.8		3.3
	Middle-aged	5.6	17	11	33	25	8.3	**	2.8
	Young	40		10	20	20	10		2.1
Mahaleb cherry	Old		8.2	19	34	25	14		3.7
	Middle-aged		11	11	31	25	22	**	3.4
	Young	20		30	30	10	10		2.4
Stinking / Grecian juniper	Old		6.9	12	43	19	19		3.3
	Middle-aged	2.8	5.6	8.3	31	36	17	*	3.4
	Young	10		40	10	30	10		2.8
Walnut	Old			1.4	8.1	18	73		4.6
	Middle-aged			2.8	5.6	25	67	*	4.6
	Young			20	10	30	40		3.9
Large leaved lime	Old		4.1	2.7	12	26	55		4.3
	Middle-aged		2.8	2.8	8.3	39	47	*	4.3
	Young					56	44		4.4
Oriental plane tree	Old		1.4	1.4	12	28	57		4.4
	Middle-aged		8.3	2.8	14	17	58	NS	4.1
	Young					20	80		4.8
Black pine	Old		2.8	2.8	19	35	40		4.1
	Middle-aged		2.8		19	28	50	NS	4.2
	Young				10	20	70		4.6
King Boris's fir	Old		2.7	9.6	15	30	43		4
	Middle-aged		2.8		19	33	44	NS	4.2
	Young					30	70		4.7
Cornelian cherry	Old		4.2	4.2	11	38	43		4.1
	Middle-aged			8.3	19	31	42	NS	4.1
	Young		20		10	40	30		3.6

Figures are proportion of samples in each generation: Old $n=74$; Middle-aged $n=36$; Young $n=10$. Pearson chi-square test significance **: $p<0.05$; *: $p<0.10$; NS: not significant

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