

Supplementary Material

Narrative descriptions of the four biocultural systems

Agdal, Morocco

Assembled by Laura Kmoch and Ugo D'Ambrosio

Background

The Tamazight word *agdal* (pl. *iguldan*) has many ascribed meanings, which share the connotation of something being protected, enclosed, restricted or prohibited (Navarro et al. 2017). The term may, e.g., denote lush urban gardens, as well as privately managed irrigated pastures, large agricultural storage vessels, the act of herding livestock, and even plentiful female hair (Dominguez 2013). Yet, with respect to Morocco's biocultural agroforestry landscapes, only two interrelated meanings prevail.

Here, the term either denotes specific communally managed natural resources (e.g., pastures or forest stands), or the customary institutions and governance regimes, which regulate land-users' access to these very resources. An illustration of the former use is Genin and Alifriqui's (2019) definition of *agdal* as 'collective areas where admission and uses are regulated by a local institution [...] that states rules regarding periods of time and way[s] of exploiting the natural resource'. An example of the latter stems from Dominguez (2013), who defines *agdal* as 'a seasonal prohibition of access to a given agro/sylvo/pastoral resource, in order to allow the resource a resting time during the most sensitive period of growth'.

The closely related term *tagdalt* (meaning little *agdal*) has also several meanings: It may denote 'privately owned and managed irrigated [agricultural] areas', from which landowners seasonally source fodder (Teixidor-Toneu et al. 2020); vegetation-rich religious sites, which 'beliefs and taboos' shelter against human and livestock intrusion (Dominguez 2013); or the entirety of smaller *agdal* areas, which a single village – rather than multiple user groups – relies on (Dominguez 2013). A second closely related term, *azzayin*, denotes the practice of 'temporal grazing restrictions on cultivated areas', which protects land-users' ripening (tree-)crops, before they are harvested (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020).

The defining feature of Moroccan *agdal* systems is the periodic suspension of land users' rights, to use collectively managed silvo-pastoral resources, by customary governance institutions (Auclair et al. 2011, Dominguez 2013, Ilahiane 2017). These adaptive institutions typically comprise representatives from one or several rural communities, or transhumant Imazighen kinship groups (Dominguez 2013, Ilahiane 2017, Genin and Alifriqui 2019), and have a threefold purpose (Dominguez 2013):

- They curtail an overexploitation of *agdal* commons, through systematic safeguards.
- They enhance *agdal* systems' productivity, through seasonally enforced rest periods.
- They regulate the sharing of *agdal*-derived benefits, among entitled resource users.

In addition to balancing resource conservation with local use interests, *agdal* systems also contribute to 'the maintenance of social cohesion and cultural continuity' in rural Morocco, through their interlinkage with long-standing cultural practices and religious rites (Dominguez 2013).

The characteristics of different *agdal* systems are as varied as the country's (silvo-)pastoral landscapes. Three broadly distinguishable types—highland pasture, montane forest and arganeraie *agdal*—are described in the literature:

Highland pasture agdal is common throughout the High Atlas Mountains. Agdal systems of this type typically comprise highland grass- and shrublands, at times, with interspersed barley terraces and fruit or nut trees (Dominguez 2013). Pastoral traditions in the High Atlas date back 4000 years, and historic evidence testifies to the long-standing presence of agdal here, as well as in other regions of various Maghreb states (Dominguez 2013). Yet, interview-derived knowledge about the historic development trajectories of agdal systems only exists for specific agdal systems, and pertains to no more than the past one and a half centuries (Dominguez 2013). A well-studied example of highland pasture agdal is the Agdal Yagour, situated on the north-western flank of the High Atlas Mountains (Dominguez 2013, Bonnin et al. 2021). This agdal encompasses 7000 ha of highland pasture, spans an altitudinal gradient of 300 meters (2400 – 2700 m), and supports more than 7000 users annually (Dominguez 2013, Bonnin et al. 2021). The Igourdane Agdal, in contrast, spans more than 1500 meters height (950 – 2600 m) and serves less than 400 local households (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020).

Montane forest agdal, at altitudes between 1800 and 3800 meters, are collectively managed agroforestry landscapes, or ‘living fodder-reserves’. These agdal systems typically comprise holm oaks (*Quercus rotundifolia*) and different juniper species (*Juniperus thurifera*, *J. oxycedrus* and *J. phoenicea*), from which highland people source fresh and stored tree leaves for their herds. This becomes critical in winter, when snow cover renders grass from pastures scarce. Other products that communities obtain from these multifunctional agdal systems are fuelwood, poles, and rafters. The forests also symbolise highland communities’ cultural heritage, their customary practices of intergenerational land stewardship, and are subject to land-related religious beliefs (Genin and Alifriqui 2019).

Agdal of the arganeraie prevails throughout Morocco’s south-western argan (*Argania spinosa*) landscapes. Here, agdal rules pertain to individual households’ rights to harvest nuts from specific argan trees, and they regulate land users’ pastoral access to argan stands, to feed their herds (Wahidi et al. 2015). Key benefits that people derive from these multifunctional landscapes include fodder, fuelwood, and cash from the sale of argan oil, a range of other argan products, and associated tourism enterprises. The floristically significant arganeraie was recognised as a UNESCO Biosphere Reserve in 1998 (Msanda et al. 2021), and communities’ argan-related cultural practices and know-how have been part of the Intangible Cultural Heritage of Humanity since 2014 (United Nations Educational Scientific and Cultural Organization 2021). Yet, driven by the ‘argan oil boom’, broader societal change processes, and unresolved tensions between local forest users and state authorities, the forests are now subject to gradual privatisation and land-degradation dynamics (Wahidi et al. 2015).

Given this diversity of Moroccan agdal systems, and to avoid undue complexity, we delimit our subsequent analysis of agdal-related values, rules, and knowledges, and their potential for current conservation, to highland pasture agdal.

Values

Agdal systems have outstanding instrumental value for historically remote highland communities, as they provide water and feed at times of fodder scarcity (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). This enables the sustenance of sheep, goat and cattle despite inherently challenging climatic circumstances for livestock husbandry in the High Atlas Mountains (Ilahiane 1999, Dominguez 2013). The region’s summers are hot, winters cold and snowy, and most rainfall occurs during the spring and autumn months (Auclair et al. 2011, Genin and Alifriqui 2019). There are two lean seasons, when fodder is scant: In winter, when snow covers communities’ pastures and their agdal

systems are closed (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020); and by the end of summer, when limited biomass remains to sustain farmers' herds (Dominguez 2013). This is when communities most strongly rely on fresh and stored resources from agdal systems.

The Agdal Yagour, by way of example, provides fresh fodder in July, August and September, when the area is opened for grazing (Dominguez 2013). Here, local households may also mow winter fodder for storage, in late summer (Dominguez 2013). The system further encompasses walnut groves, as well as irrigated patches of cropland and pasture, and the manure of agdal-fed animals—a locally-sourced fertiliser—nourishes crops on households' fields (Dominguez 2013). The agdal thus sustains its users with income from tree-crops, grains and animal products, and it fuels an emerging tourism industry that capitalises on communities' distinct cultural practices and iconic agdal landscapes (Dominguez et al. 2012, Dominguez 2013).

Analyses of agdal systems' intrinsic values for rural communities, or distant (inter-)national stakeholders, remain lacking. Yet, interspersed references to such values occur in the literature. Dominguez (2013), for instance, notes that the 'green grasslands' of highland pastoral *iguldan*—such as the Agdal Yagour—symbolise 'the idea of life in the environment abundant in water'. This notion reflects hydrological circumstances in the High Atlas (Auclair et al. 2013): i.e., clay layers in valley bottoms, which lead to an accumulation of soil and meltwater from seasonal snowfall. This gives rise to the wet meadows that Amazigh communities use as high altitude agdal pastures, which always harbor at least one water source.

Agdal systems' relational values are manifold and have long shaped communities' connections to land and one another. Agdal users derive a sense of place and communal belonging from their maintenance of agdal landscapes and institutions. Their transhumant livelihoods, cultural practices, and forms of social organisation, have long been closely intertwined with the seasonal cycles of vegetation growths, and communities' land-management needs in High Atlas agdal landscapes (Dominguez 2013). The *Āit Ikiss* people, for instance, regularly honour the female saint *Lalla Tacheikht*, just prior to the re-opening of their different agdal areas in spring and autumn (Dominguez 2013). Such celebrations—or *moussem*—traditionally involved animal sacrifices but are now in gradual decline (Dominguez et al. 2010, Dominguez et al. 2012, Dominguez 2013, Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). Yet, in parts of the High Atlas, they still bring communities together around weddings, markets for local produce, and shared meals, to which individuals contribute commensurate to their respective affluence (Dominguez 2013, Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). Numerous legends, which also sustain notions of agdal landscapes as 'mystic place[s]', further legitimise communities' agdal institutions (Dominguez 2013).

Rules

Moroccan communities' agdal are inherently customary systems for the collective governance of High Atlas pastoral land. Such land is traditionally governed by male representatives of all households, which rely on a specific agdal (Dominguez 2013, Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). These assemblies comprising a selection of household representatives—or *jmaa*—regularly re-negotiate their collective rules for the use and management of highland agdal, and gradually sanction rule breaches, as and when needed (Dominguez 2013, Mesnildrey 2021). *Ait Rbains*—the assemblies' nominated executives—are critical to the latter, as they guard communities' agdal-related rules and inform about rule breaches that require sanctioning (Dominguez et al. 2010, Dominguez 2013). This 'highly gendered' mode of governing communities' agdal systems (Moroccan Biodiversity and

Livelihoods Association and Global Diversity Foundation 2020) is important in so far, as it helps to mitigate access conflicts and ensures that applicable rules and institutions adequately reflect land-users' 'history, territorial heritage, political structure, and economic strategies' (Dominguez 2013).

Concrete examples of agdal-related customary rules are those of the Äit Ikiss people. They include (Dominguez 2013):

- A grazing prohibition on the Agdal Yagour, to protect various fodder grasses and highland cereals, during the 'most sensitive period of growth' in April, May, and June.
- A ban on cutting the Yagour forests, in all seasons except winter.
- Local families' annual right to mow an unlimited amount of Yagour grasses, to sustain their herds in winter, but only during the agdal's first three opening days.
- A prohibition to harvest tree-crops from the Ikiss Agdal until late September; and a summer-grazing ban in the same area, to shelter ripening fruit trees.

The formal governance of land in Morocco, shaped by Islamic law and the lasting influence of French colonial rule from 1912 to 1955, is characterised by a multitude of partially overlapping laws, decrees, and institutional responsibilities (United States Agency for International Development 2011). Four principal land tenure types can be distinguished (United States Agency for International Development 2011): i) freehold land (*melk*) in private ownership; ii) collective land in state trusteeship, with tribal usufruct rights; iii) state-owned *guich* land, with use rights for current occupants; and iv) and state land, which includes public forests and rangelands. A cadastral system for the registration of title deeds 'and relatively sophisticated land markets' dominate in urban areas (United States Agency for International Development 2011, para. 36). Yet, in the High Atlas Mountains, the formal system largely co-exist in parallel with communities' customary land governance practices, although the latter now gradually decline (United States Agency for International Development 2011).

Conservation policy (in 2010), and constitutional changes (in 2011), more than a decade ago, formally paved the way for enhanced resource protection and decentralisation efforts in rural Morocco (Mesnildrey 2021). The country's ecosystem and resource-related laws and governance institutions, nonetheless, still fail to adequately recognise highland communities' customary rights and stewardship of communally-governed land (Mesnildrey 2021). Rather, the state's recent land policy initiatives – aimed at attracting agribusiness investments to rural areas, and to secure individualised rights to land – undermine Amazigh communities' adaptive land-governance regimes, commodifies their resources, and threatens to dispossess marginalised population groups of their customary access to agdal rangelands (Berriane 2017, International Land Coalition 2019, Mesnildrey 2021).

Knowledge

Local ecological knowledge is the principal type of knowledge that informs communities' management of Morocco's (silvo)-pastoral agdal. The country's High Atlas shepherds, for instance, have detailed ecological knowledge about pasture plants' growths cycles (Dominguez 2013). This informs communities' decisions about when they need to protect their pastures through grassing prohibitions, to ensure their long-term persistence (Dominguez 2013). Observations of inter-annual climate variability, and detailed knowledge about local climate patterns and their effects on grasslands' ecology, further informs shepherds' adaptive decision-making about the opening and closing times for different agdal areas (Dominguez 2013). The Äit Ikiss also know when their low-lying pastures tend to be most drought-affected in summer; and when their fruit-trees ripen, and need protection (Dominguez 2013). Finally, communities also have detailed knowledge about the aromatic and medicinal properties of endemic agdal

plants, which they use to treat various skin, digestive, heart, lung and nervous system ailments (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020).

Agdal-related technical knowledge primarily stems from the work of various NGOs. Efforts to characterise selected highland agdal systems—the Talmest, Igourdane and Oukaïmeden agdal systems, for instance—are underway or have recently been completed (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). This included ecological assessments, as well as discussions with user groups, and record taking of communities' agdal-related narrative histories, current transhumant practices, emerging conflicts and perception of societal change processes—through movies, maps and written documents (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). Recommendations for further agdal-related interventions include the engagement of formal and customary institutions to resolve inter-community conflicts, and to enhance local governance capacities (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). NGOs further drive knowledge sharing, advocacy, and policy-related activities at the national level, e.g., for the registration and enhanced recognition of agdal systems as indigenous and community conserved areas (ICCAs) that maintain Morocco's unique biocultural diversity (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020, Mesnildrey 2021).

Much scientific knowledge about High Atlas pastoral agdal stems from the extensive research of merely a few authors. Dominguez, for instance, has published a series of solo- and co-authored studies on the Agdal Yagour, its users – including the Aït Ikiss people, and their evolving land-use, religious and cultural practices (Dominguez et al. 2010, Dominguez, Bourbouze et al. 2012, Dominguez 2013, Dominguez 2017, Dominguez and Benessaiah 2017). Alaoui Haroni et al. (2008) describe agdal-systems efficacy for wet-grassland conservation, whereas Ilahiane (1999) has traced the 'rise of corporateness' among High Atlas communities, appraised the agdal of the Imilchil Area, and discussed the historic, environmental and institutional roots of conflicts between different agdal user groups. Other authors have studied the dynamics of the High Atlas forest agdal (Aubert et al. 2009, Hammi et al. 2010, Auclair et al. 2011), contrasted them with those of the arganeraie (Genin and Simenel 2011), or modelled degradation and ownership dynamics in the latter (Wahidi et al. 2015). Mesnildrey (2021), recently synthesised literature on communities' customary agdal practices, discussed related policy processes, and reflected on options to formally recognise agdal, in the context of evolving international frameworks, which champion indigenous peoples' knowledges and biodiversity stewardship.

Known knowledge gaps about pastoral agdal pertain to (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020):

- The characteristics of different agdal systems
- Effects of agdal management practices on insect, plant and soil health and diversity
- Impacts of climatic and socio-ecological change processes on agdal landscapes' resilience and biodiversity
- A lack of livestock-related baseline data
- A need for institutional innovations, to mediate and govern agdal-related conflicts

Potential for conservation

Morocco's agdal systems typify an integrated landscape management approach that combines agro-silvo-pastoral production and resource conservation objectives, based on land users collective land-governance regimes and local ecological knowledge. People are central rather than hindering to this approach, as rural communities' customary institutions, systematic land-

management activities, and seasonal land-use restraints are what sustains Morocco's distinct agroforestry landscapes and agdal resources (Dominguez 2013, Genin and Alifriqui 2019).

One of the systems' most salient features is the reliance on temporal access concessions and impediments for resource users. These align with communities' agrarian production cycles, while remaining adaptive vis-à-vis dynamic biophysical processes. That various fodder species of highland pasture agdal are left to grow undisturbed during different times of the year, for instance, ensures that these species regenerate, rather than being so frequently grazed or cut that they never flower or set seed (Dominguez 2013). Communities' agdal-systems further aid the in-situ conservation of Morocco's highland ecosystems, such as the wet pastures of Oukaimeden, as well as their rich floral diversity (Alaoui Haroni et al. 2008). On the Agdal Igourdan, for instance, '262 species pertaining to 178 genera and 56 families of vascular plants' were identified, in a space of 4200 hectare (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020).

Agdal systems remain flexible, in contrast to fortress conservation approaches, as local communities self-govern their resource access, through institutions that enable a regular re-definition of rules, e.g., to cope with the consequences of inter-annual climate vulnerabilities, or societal change processes (Dominguez 2013, Dominguez 2017). They have traditionally shielded communities' pastoral land from overexploitation and afforded the systems' customary users (albeit only male household representatives) comparatively just access to their common resources (Dominguez 2013). The systems' endurance, and continued potential for current conservation, nonetheless hinges on their inherent adaptability (Dominguez 2013), and strategic policy efforts and interventions to further their development in the context of regional and global change processes (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020, Mesnildrey 2021).

Many agdal systems have become archaic, as the users increasingly desist from adhering to agdal-related customary rules and institutions, own fewer animals than previously, purchase more feed for their herds, or gradually intensified their crop and livestock production (Dominguez and Benessaiah 2017, Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). Some agdal landscapes are subject to privatisation dynamics, or illegitimate exploitation (e.g., off-season use, cutting of trees, stone extraction for construction), and climatic shifts and associated biophysical change processes further hamper the continued utility of agdal (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). Some agdal systems, such as the Oukaimeden agdal in Al Haouz Province, remain active and relatively well functioning. Others, for instance the intertribal land management systems in Imegdâl, have entirely vanished (inter alia due to water scarcity) although intratribal governance practices in this area, such as azzayin and tagdalt persist (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). Yet other agdal systems remain active, but with reduced utility—providing less fodder now, than in the past (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). Finally, agdal practices also decline, as younger community members choose to engage in urban economies, and agriculture or tourism-related activities, rather than their ancestors' strenuous transhumant livelihoods (Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation 2020). If and how communities adapt their customary agdal practices, under these circumstances, remains to be further explored.

References

- Alaoui Haroni S, Alifriqui M, Simonneaux V (2008). Recent dynamics of the wet pastures at Oukaimeden plateau (High Atlas Mountains, Morocco). *Biodiversity and Conservation* 18(1):167-189
- Aubert PM, Leroy M, Auclair L (2009). Moroccan forestry policies and local forestry management in the High Atlas: A cross analysis of forestry administration and local institutions. *Small-scale Forestry* 8(2):175-191
- Auclair L, Baudot P, Genin D, Romagny B, Simenel R (2011). Patrimony for Resilience: Evidence from the Forest Agdal in the Moroccan High Atlas Mountains. *Ecology and Society* 16(4):24
- Auclair L, Dominguez P, Alifriqui M, Genin, D. (2013). Un monument pastoral à l'épreuve de la patrimonialisation. L'*Agdal* du Yagour dans le Haut-Atlas marocain. In: Juhé-Beaulaton D, Cormier-Salem M, de Robert P, Roussel B (eds) *Effervescence patrimoniale au Sud. Entre nature et société*, IRD Éditions, Marseille, p. 105-128
- Berriane Y (2017). Development and counter movements. Reflections on the conflicts arising from the commodification of collective land in Morocco. *International Development Policy* (8):247-267
- Block, A (n.d.). Respecting Identity: Amazigh versus Berber. <http://linguisticanthropology.org/sla-blog/respecting-identity-amazigh-versus-berber/>
- Bonnin C, Ayoub E, Romagny B, Vaillant M, Michon G, Boujrourf S, Aderghal M (2021). Adaptation and Hybridisation of Commons in Aït Oucheg Territory, High Atlas, Morocco. *Revue de Géographie Alpine* (109-1), <https://doi.org/10.4000/rga.8528>
- Domínguez P (2013) Culturally mediated provision of ecosystem services: The AGDAL of Yagour. In: Lozny L. (eds) *Continuity and Change in Cultural Adaptation to Mountain Environments. Studies in Human Ecology and Adaptation*, vol 7. Springer, New York, p. 379-393
- Dominguez P (2017). Political ecology of shifting cosmologies and epistemologies among berber agro-sylvo-pastoralists in a globalizing world. *Journal for the Study of Religion, Nature and Culture* 11(2):227-248
- Dominguez P, Benessaiah N (2017). Multi-agentive transformations of rural livelihoods in mountain ICCAs: The case of the decline of community-based management of natural resources in the Mesoui agdals (Morocco). *Quaternary International* 437:165-175
- Dominguez P, Bourbouze A, Demay S, Genin D, Kosoy N (2012). Diverse ecological, economic and socio-cultural values of a traditional common natural resource management system in the Moroccan High Atlas: The Aït Ikiss Tagdals. *Environmental Values* 21(3):277-296
- Dominguez P, Zorondo-Rodriguez F, Reyes-Garcia V (2010). Relationship between religious beliefs and mountain pasture uses: A case study in the High Atlas Mountains of Marrakech, Morocco. *Human Ecology* 38(3):351-362

Genin D, Alifriqui M (2019). Agdal: The Forests of the High Atlas. World Agroforestry in Practice. <https://www.agroforesterie.fr/World-Agroforestry-In-Practice.php>

Genin D, Simenel R (2011). Endogenous berber forest management and the functional shaping of rural forests in Southern Morocco: Implications for shared forest management options. *Human Ecology* 39(3):257-269

Hammi S, Simonneaux V, Cordier JB, Genin D, Alifriqui M, Montes N, Auclair L (2010). Can traditional forest management buffer forest depletion? Dynamics of Moroccan High Atlas Mountain forests using remote sensing and vegetation analysis. *Forest Ecology and Management* 260(10):1861-1872

Ilahiane H (1999). Agdal institution: Indigenous range management in the Atlas Mountains. *Ethnology* 38(1):21-45

Ilahiane H (2017). Agdal (Pl. Iguldán). *Historical Dictionary of the Berbers (Imazighen)*. London, Rowman & Littlefield

International Land Coalition. (2019). New Moroccan Land Laws Imperil Amazigh People. <https://emena.landcoalition.org/en/newsroom/new-moroccan-land-laws-imperils-amazigh-people/>

Mesnildrey L (2021). “Picture a pasture open to all”: Recognizing community conserved areas and territories in Morocco. *Journal of Public & International Affairs* 32(1)

Moroccan Biodiversity and Livelihoods Association and Global Diversity Foundation (2020). Traditional Land Use Practices, Biodiversity and Community Wellbeing in a Mediterranean Cultural Landscape. A case study of the High Atlas Mountains, Morocco

Msanda F, Mayad EH, Furze JN (2021). Floristic biodiversity, biogeographical significance, and importance of Morocco's Arganeraie Biosphere Reserve. *Environmental Science and Pollution Research* 28:64156-64165

Navarro J, Garrido F, Almela Í (2017). The agdal of Marrakesh (Twelfth to Twentieth Centuries): An agricultural space for caliphs and sultans. Part 1: History. *Muqarnas Online* 34(1):23-42

Teixidor-Toneu I, Martin G, M'sou S, D'Ambrosio U (2020). Integrating Amazigh cultural practices in Moroccan High Atlas biodiversity conservation. In: *The Routledge Handbook of Indigenous Environmental Knowledge*, Routledge, London. p. 201-213

United Nations Educational Scientific and Cultural Organization. (2021). Argan, Practices and Know-how Concerning the Argan Tree. <https://ich.unesco.org/en/RL/argan-practices-and-know-how-concerning-the-argan-tree-00955>

United States Agency for International Development. (2011). LandLinks. Morocco. <https://www.land-links.org/country-profile/morocco/#1528919077724-586196eb-807a>

Wahidi F, Radoux J, Ponette Q, Defourny P (2015). Entity-based landscape modelling to assess the impacts of different incentives mechanisms on argan forest dynamics. *Land* 4(4):1003-1029

Communal forests, Spain

Assembled by Elsa Varela

Background

The communal forest property in Spain dates from the Germanic tribes' invasion to the northwest areas of the Iberian Peninsula in the fifth century and spread to other regions from the eighth to the fifteenth century (Guadilla-Sáez et al. 2020, Montiel Molina 2007, Pardo and Gil 2005). Christian kings granted land privileges to the settlers who displaced Muslim populations from the newly gained territories. Settlers organized in village councils that collectively managed land concessions (Guadilla-Sáez et al. 2020). Communal lands frequently were found in the steeper areas not suitable for ploughing and cultivation. The term *monte* (meaning mountains in Latin) describes the places where woodlands and upland pastures remained as they were confined to the roughest areas not suitable for agriculture (Iriarte-Goñi 2002, Valbuena-Carabaña et al. 2010).

The 19th century in Spain involved the abolition of the commons by either state ownership or privatization (Montiel Molina 2007, Skulska et al. 2020), as communal management was regarded as ineffective, backward (Skulska et al. 2020) and incompatible with the liberal property model (Serrano-Álvarez 2019). This implied a shift towards timber production, much needed at the national scale (Serrano-Álvarez 2019), and a ban to livestock grazing and uses incompatible with the preservation of woodlands and timber production (GEHR 1999). The different pathways followed in the abolition of forest commons are relevant to understanding current management of Spanish forest commons, as their legacy persists nowadays (Montiel-Molina 2003). *Forest commons* (*montes públicos*), *partners' woodlands* (*montes de socios*) and *neighbour woodlands* (*montes vecinales en mano común*) are the main types of collective forest property found nowadays in Spain and backed up by the most recent Spanish Forestry Act (Law No. 21/2015 of Spanish Government) (Guadilla-Sáez et al. 2020).

Forest commons correspond to public ownership forests, and they date from the concessions made by kings. During the abolition of community ownership, the management regime prevailed over the property (Montiel-Molina 2003) and ownership was transferred to municipalities, a liberal-created entity intermediating between the villagers and the administration that entailed the abolition of the traditional administration rights (Berasain 2008, Lana & Iriarte-Goñi 2015, López-Estudillo 1992, Serrano-Álvarez 2019, Skulska et al. 2020). Since then, forest commons typically have been formally owned by municipalities, but the right to manage and use them is held by the local communities (i.e., the collective of local residents) (Pérez-Soba & Solá-Martín 2004). Forest commons are the most abundant community forests with presence in all regions of the country (Guadilla-Sáez et al. 2020).

In the forested mountain areas of inland Spain, inhabitants organized themselves in the 19th century and pooled capital to collectively bid in the State auctions to acquire the forests that they had traditionally managed in common and to thus create *partners' woodlands* (Lana & Iriarte-Goñi 2015, Medrano-Ceña et al. 2013, Montiel Molina 2007). Partners' woodlands are private property of collective use by the neighbours that acquired them and who developed the collective management through ad-hoc regulations (Fernández-Muñoz 2002, Guadilla-Sáez et al. 2020, Montiel Molina 2007). Knowledge of this type of forest property has remained overlooked by forest statistics, despite their importance in some forested regions. In Soria 18.1% of the surface area (187,202 ha) and almost 40% of the forest area of the province are found under this management system. It has been estimated that partner's woodlands cover 1,5 million ha in the whole of Spain, i.e. 5% of the Spanish forest area (Montiel Molina 2007).

Communal forests in northwestern Spain (mostly Galicia) followed a different fate as in their region collective private property remained articulated as a Germanic community, commonly called *neighbour woodlands* (Caballero 2015). Ownership and usufructuary rights are limited to being a neighbour (Caballero 2015). Neighbourhood thus determines access, which is egalitarian and free and cannot be inherited or sold (Marey-Perez et al. 2021). The combination of an original private ownership form and strong local opposition to the dismantling process resulted in the early legal recognition of the community-ownership form in Galicia through their inclusion in the 1957 Spanish Forestry Act (Guadilla-Sáez et al. 2020). Due to formal legal endorsement in 1968, neighbours have been able to manage forest resources for many decades, which has resulted in many highly valued ecosystems that currently overlap with different protection categories (Guadilla-Sáez et al. 2020). In Galicia, where most of them can be found represent two thirds of the forest property, around 660,000 ha grouped in more than 3300 communal forests and 118,564 commoners that manage these forests (Bastida et al. 2021).

In the course of the 20th century the importance of communal ownership of forests was gradually recognised (Lana and Iriarte-Goñi 2015). Spain became a parliamentary democracy, and a transfer of forest control to regions, municipalities local governments and even local communities took place (Montiel-Molina 2003, Pérez-Soba Díez del Corral 2016). Communal forests are generally found in all regions in Spain under these three different types of collective forest property. However, partner and neighbour woodlands are mostly found in Castilla-León and Galicia, respectively.

Improving management on forest woodlands in Spain is challenging since 70% of the property lays in private hands and reduced profitability of forest products disincentivise their active management, increasing in turn the vulnerability of these forests to both biotic and abiotic risks. Conversely, some of the communal forests resulting from traditional ways of using forests and forest products through coppice and forest pasturage usually has a better maintained appearance (Montiel Molina 2007). While the reduced size of some private forests hampers landscape wide management, communal forests typically show wider sizes. In Galicia for example the size of individual private properties (2 ha on average) has been a limitation for their forestry sector while the average size of communal forests is considerably larger (237 ha) (Caballero 2015).

Communal forests result from complex social interactions between cultural practices and forests, existing a tight connection between ownership systems, dominant forest species and forest structure (Montiel Molina 2007). Communal forests are facing multiple challenges that are transversal to Mediterranean forests, such as wildfires, pests and diseases. The importance of communal forests for the livelihood of rural communities in the production of goods and income has decreased. Instead, new recreational functions have emerged, making management of these forests more complex to make compatible different uses and users. Increasing the involvement of commoners, specially of women and younger groups, and the collaboration with other communities would contribute to reduce the isolation of communities. Their lack of feedback from other environmental and economic contexts and the loss of economies of scale (Skulska et al. 2020) may hinder their adaptation capacity. Improving the training opportunities, the technical knowledge and networking opportunities of commoners may be key to engage them in adaptive management and hence increase their influence in regional and national planning and forest strategies.

Values

Concerning the instrumental values, oak coppices were favoured in the common woodlands where coppice wood would be used for fuel and charcoal production while acorns would serve

to feed the livestock (Pardo and Gil 2005). The transition to a post-industrial economy occurring during the second half of the 20th Century entailed that many traditional uses declined and new ones (recreational, tourism, urban ground, energy) emerged (Lana and Iriarte-Goñi 2015). Rodríguez-Morales (2020) found out that the ecosystem service most valued by users of neighbour woodlands in Galicia was the supply of drinking water. Local landowners had the widest range and frequency of ecosystem services acknowledgement, while differences were observed on the valuation of their most outstanding services between local users (drinking water) and urban users (sports).

Very scarce information still exists nowadays on the intrinsic values that the relevant stakeholders attach to these forests. However, some authors point towards the introduction of the ecocentric value perspective by the development of forestry schools in the 19th century, together with the evolution of forestry as a science where engineers wanted to increase and preserve mountain forest areas for their role in maintaining a wide ecological balance” (Skulska et al., 2020).

Communal forests provide relevant relational values to people since old times. For instance, Rodríguez-Morales et al. (2020) studied the assessment of non-recreational cultural services in Galician neighbour woodlands. Sense of place, social relations and mythical values were rated as of high importance by the survey participants. The abolition of the commons provoked a shift in fundamental values in the management of mountain community lands (Skulska et al. 2020). The commodification” of the communal forests during the liberal reform, clashed with the peasant economy (Serrano-Álvarez 2019). Re-commoning is taking place in some of these woodlands by creating spaces of socialisation and learning, intermingling productive with socio-cultural activities linked to the commonland (Nieto-Romero et al. 2021). Low participation of commoners in decision-making and management is a key issue mentioned in neighbour lands. While a positive relation between activities’ economic return and participation seems to exist (Marey-Pérez et al. 2014), monetary-based incentives can ‘crowd-out’ intrinsic local motivations to collaborate (Nieto-Romero et al. 2021).

Rules

Traditional management of forest commons was based on distribution of shares for the members of the community, the fixing of times and areas for exploitation, the enforcement of rules and the resolution of any conflicts that might arise (Iriarte-Goñi 2002). Nowadays, the management of forest commons is ruled by ordinances approved by municipalities, with the regional forestry administration monitoring the different activities. Partner woodlands regulate the use of the forests through management boards that divide it in quotas for its use. In recent decades, however, the lack of legal documents that certify the legitimate ownership of inheritors together with their geographical dispersion due to rural exodus, prevented enacting property and hence management rights over these forests. The current 2015 Spanish forestry act solved this block-in by enabling the creation of Management Boards, where the identified commoners manage the woodlands and protect the rights of these owners still not identified (Medrano-Ceña et al. 2013). Neighbour woodlands also count on management boards, but differently from the previous, there is no allocation of quotas among neighbours (Caballero 2015). Each community has autonomy to determine organization and distribution of powers. However, the public administration maintains its rights to oversee, supervise and advise on their management in order to ensure conservation and integrity (Caballero 2015). The concept of institutional bricolage” (Cleaver 2017) can help to explain the capacity of the commoners to adapt the new formal institutions to local ones by shaping institutions in response to changing situations (Lana and Iriarte-Goñi 2015).

The rules regulated the spatial use of the forest such as shifting turns among community members to move a common herd to graze in forest commons (Montiel-Molina 2003) or the division of forest in quotas for regulated fuelwood and timber harvesting, where illegal uses such as burning or logging were forbidden (Gogéascoechea 1999). More recently these rules are being adapted to new uses such as recreation, issuing permits for mushroom picking or limiting car circulation outside of forest paths.

Knowledge

Local ecological knowledge was the basis of the management of communal forests until the 19th century. Local traditions shaped these landscapes with practices such as coppice forest structures in order to produce fuelwood and charcoal or the selection of these trees producing more acorns or livestock grazing rotation to preserve soil from erosion and overgrazing. More controversial was the use of fire to expand the pastureland in mountains pastures (Pardo and Gil 2005). This local knowledge on the management of the landscape is gradually being lost due to aging of rural dwellers and reduction of rural populations depending on the forest as a source of income.

Technical knowledge was introduced in forest management in the 19th century, with a focus on timber production and soil conservation leading to banning traditional activities that would be harmful for newly established pine afforestation. Nowadays, the forest cover is experiencing a steady increase and the control of biomass to reduce the risk of wildfires while increasing the biodiversity in these afforested stands are some of the key challenges to address. The recovery of traditional practices such as forest grazing or controlled burning adopted from a technical perspective may prove as valid tools to tackle these objectives.

Scientific knowledge on the communal forests in Spain has mostly been focused on neighbour woodlands which have been studied from several perspectives ranging from new institutional economics (Caballero 2015) to the principles of collective action (Alló and Loureiro 2016), the conflicts arising in their management (Marey-Pérez et al. 2014) or the impact of formal institutional logics affecting commoners (Nieto-Romero et al., 2021). Abundant bibliography allow to understanding the historical process followed by communal forests in Spain (e.g. (Berasain 2008, GEHR 1994, 1999, Iriarte-Goñi 2002, Montiel-Molina 2003, Pérez-Soba and Solá-Martín 2004) while Skulska et al. (2020) provides a good overview of the situation on the property and uses of communal forests in five Mediterranean European countries. In contrast, there is a clear gap in understanding current practices in common forests (belonging to municipalities) and partner woodlands. Furthermore, there is no general study that shows the relationship between the type of social and human capital of each community, and the level of delegation and participation in the collective governance of each community (Caballero 2015).

Potential for conservation

Forest commons, rather than archaic leftovers from the past should be considered as areas that have performed changing functions over time, from the organic based agrarian to the post-industrial societies, concerned for the welfare of the environment, that prevail since the end of the twentieth century (Iriarte-Goñi 2002). The highly relevant provisioning functions that they performed in the past are no longer relevant for most rural communities, reason why some of them were abandoned and rested unmanaged, especially in the case of partner woodlands. However, these forests have a potential for nurturing transformations to reconnect people with nature and rural areas. Recommoning initiatives can channel management initiatives based on logics of inter-dependence with nature and can be sites for nurturing this type of transformation (Nieto-Romero et al. 2021).

Some of these forests overlap with Natura 2000 areas and hence are key for biodiversity conservation. A good example is the partners' woodland located in Sierra de Cabrejas in Castile and Leon that constitutes the largest juniper forest (*Juniperus thurifera*) in Europe (Pecurul-Botines et al. 2014). The enhancement of value chains that stimulate multifunctionality and new uses focused on cultural dimensions valued by both commoners and visitors (Rodríguez-Morales et al. 2020) may increase the profitability of management initiatives for the provision of goods and services beyond wood. This model may find in communal forests a very important ally that can also act as a model" for private ownership initiatives. Examples like the Urbion forest model (central Spain) where traditional forest management has succeeded in maintaining traditional multifunctional forestry (e.g. including timber, mushroom, cattle, game, recreation, etc) and a low fire risk by developing governance schemes that are satisfactory for all the stakeholders implied (Segur et al. 2014) exemplifies this approach.

References

- Alló M, Loureiro ML (2016). Evaluating the fulfillment of the principles of collective action in practice: A case study from Galicia (NW Spain). *Forest Policy and Economics* 73:1-9
- Alvarez J S (2014). When the enemy is the state: common lands management in northwest Spain (1850–1936). *International Journal of the Commons* 8(1):107-133
- Bastida M, García AV, Taín MÁV (2021). A new life for forest resources: The commons as a driver for economic sustainable development—A Case study from Galicia. *Land* 10(2):99
- Bersin JML (2008). From equilibrium to equity. The survival of the commons in the Ebro Basin: Navarra from the 15th to the 20th centuries. *International Journal of the Commons* 2(2):162
- Caballero G (2015). Community-based forest management institutions in the Galician communal forests: A new institutional approach. *Forest Policy and Economics* 50:347-356
- Cleaver F (2017). *Development through Bricolage: Rethinking Institutions for Natural Resource Management*. Routledge, London
- Fernández-Muñoz S (2002). Consecuencias socioeconómicas y territoriales de las repoblaciones forestales en el Alto Sorbe (Guadalajara). *Eria* 58:183-203
- Gehr (1994). Mas allá de la 'propiedad perfecta'. El proceso de privatización del montes públicos españoles (1859-1926). *Historia Agraria* 8:99-152
- Gehr (1999). Diversidad dentro de un orden. Privatización, producción forestal y represión en los montes públicos españoles, 1859-1926. *Historia Agraria* (18):129-178
- Gogeaescoechea A (1999). Los montes proindivisos en Vizcaya. *Lurralde: Investigación y Espacio* 22:299-322
- Guadilla-Sáez S, Pardo-de-Santayana M, Reyes-García V (2020). Forest commons, traditional community ownership and ecological consequences: Insights from Spain. *Forest Policy and Economics* 112:102107
- Iriarte-Goñi I (2002). Common lands in Spain, 1800–1995: Persistence, change and adaptation. *Rural History* 13(1):19-37

Lana JM, Iriarte-Goñi I (2015). Commons and the legacy of the past. Regulation and uses of common lands in twentieth century Spain. *International Journal of the Commons* 9(2):510-532

López-Estudillo A (1992). Los montes públicos y las diversas vías de su privatización en el siglo XIX. *Agricultura y Sociedad* 65:65-99

Marey-Pérez MF, Díaz-Varela E, Calvo-González A (2014). Does higher owner participation increase conflicts over common land? An analysis of communal forests in Galicia (Spain). *IForest - Biogeosciences and Forestry* 8(4):533

Marey-Perez M, Loureiro X, Corbelle-Rico EJ, Fernández-Filgueira C (2021). Different strategies for resilience to wildfires: The experience of collective land ownership in Galicia (Northwest Spain). *Sustainability* 13(9):4761

Medrano-Ceña P A, Marín Gutiérrez A, Gracia Jiménez P (2013). Montes de socios: Un ejemplo de gestión forestal al servicio del desarrollo rural. *Ambienta* 104:102-113

Montiel-Molina, C. (2003). Origen y evolución de la propiedad forestal colectiva en España. *Cuadernos de la Sociedad Española de Ciencias Forestales* 16:285-290

Montiel Molina C (2007). Cultural heritage, sustainable forest management and property in inland Spain. *Forest Ecology and Management* 249(1–2):80-90

Nieto-Romero M, Parra C, Bock B (2021). Re-building historical commons: How formal institutions affect participation in community forests in Galicia, Spain. *Ecological Economics* 188:107112

Nieto-Romero M, Valente S, Figueiredo E, Parra C (2021). Historical commons as sites of transformation. A critical research agenda to study human and more-than-human communities. *Geoforum* 107:113-123

Pardo F, Gil L (2005). The impact of traditional land use on woodlands: A case study in the Spanish Central System. *Journal of Historical Geography* 31(3):390-408

Pecurul-Botines M, Di Gregorio M, Paavola J (2014). Discourses of conflict and collaboration and institutional context in the implementation of forest conservation policies in Soria, Spain. *Biodiversity and Conservation* 23 (14):3483-3499

Pérez-Soba Díez del Corral I (2016). Los montes del Real Patrimonio y la desamortización (1811-1879). *Revista de Administración Pública* 199:93-152

Pérez-Soba I, Solá-Martín M A (2004). La tragedia de los comunales: legalidad y realidad de los montes comunales en España. *Revista de Estudios Agrosociales y Pesqueros* 203:187-232

Rodríguez-Morales B, Rocés-Díaz JV, Kelemen, E, Pataki G, Díaz-Varela E (2020). Perception of ecosystem services and disservices on a peri-urban communal forest: Are landowners' and visitors' perspectives dissimilar? *Ecosystem Services* 43:101089

Segur M, Martel S, Picardo Á, Medrano P, Lucas Santolaya JA, Martínez Rioja A, Galindo E (2014). Old solutions for today's problems in the Urbion Model Forest. In P. Katila, G.

Galloway, W. de Jong, P. Pacheco, & G. Mery (ed.), *Forests under Pressure: Local Responses to Global Issues*. IUFRO World Series Volume 32, p 561. https://www.researchgate.net/publication/265842386_Old_solutions_for_today's_problems_in_the_Urbion_Model_Forest

Serrano-Álvarez JA (2019). Forestry conflict in Spain: Rethinking peasant protest and resistance. *Journal of Agrarian Change* 19(4):579-595

Skulska I, Duarte I, Rego FC, Montiel-Molina C (2020). Relationships between wildfires, management modalities of community areas, and ownership types in pine forests of mainland Portugal. *Small-Scale Forestry* 19(2):231-251

Valbuena-Carabaña M, de Heredia UL, Fuentes-Utrilla P, González-Doncel I, Gil L (2010). Historical and recent changes in the Spanish forests: A socio-economic process. *Review of Palaeobotany and Palynology* 162(3):492-506

Sacred natural sites, Greece

Assembled by Thanasis Kizos

Background

Sacred trees and groves have had a special place in the Greek countryside for many centuries (see also Dafni 2007 for other places in the Mediterranean). According to Dudley et al. (2009), they can be considered as some of the world's oldest conservation systems. Three different types of sacred forests and trees are found today in Greece:

- Sacred forests,
- Sacred trees and sites related to trees and /or thickets outside the settlements,
- Sacred trees inside the settlements.

Sacred forests had flourished in large parts of mountainous North Greece in the last centuries. Govigli et al. (2021) provide three different types of reasons for establishing and preserving sacred forests (p. 2): either for the stability of slopes above settlements, and as natural reserves that hold important natural resources for times of need (e.g. water aquifers and feed for animal herds) serving at the same time cultural and aesthetic purposes". Their sizes vary (typically no more than 50 ha, up to 117 ha), along with the altitudes they are located, which follow settlement location patterns (from 600 to 1100 m a.s.l. depending on the topography and the relief). Tree species in these forests are typically dominated by deciduous oaks up to 1,100 meters a.s.l. (*Q. pubescens*, *Q. ithaburensis*, *Q. frainetto*, *Q. trojana*, depending on the locality), while maples (*Acer monspessulanum*, *A. obtusatum*) and hornbeams (*Carpinus orientalis*, *Ostrya carpinifolia*) are also common, beech trees (*Fagus sylvatica*) in altitudes higher than 1,000 meters a.s.l. and in Northern parts of Greece, pines (*Pinus nigra* in North Greece and *Pinus halepensis* in Southern Greece). Monumental trees of beeches, black pines, and junipers (*Juniperus foetidissima*, *J. excelsa*) can also be found. Prickly oaks (*Q. coccifera*) may also be encountered in lower altitudes and South Greece (Stara et al. 2015, p. 8-10). Less dense woodlands are also included in the Sacred Forest identified in Epirus by Stara et al. (2016)

Sacred trees and sites related to trees and /or thickets outside the settlements include the vast numbers and variety of chapels of saints (exokklisia, literally "outside churches", Seifried and Kalayci 2019), often with landscape related names (e.g. Panagia Krifti—St Mary the hidden—is the name of a chapel that is hidden and accessible only by sea). Many of these chapels, appropriate pre-Christian landmarks and shrines and were not affected during the Ottoman period, resulting in a very dense network of chapels in Christian dominated landscapes (Seifried and Kalayci 2019). These chapels are more than dedications to different saints: they provide structure to space and help orientate people in the landscape.

Typically, all such small chapels and churches have a small open space that is public and is marked and protected by the presence of one or more sacred trees (see also Stara et al. 2015). These trees are not managed in the way nearby thickets, trees or forests -public or private- are managed, but tend to be left and encouraged to grow tall and often serve as a distant landmark for the location of the chapel, resembling signs in the landscape that orientate farmers, shepherds, travelers, etc. These trees are of different species: oaks are very often found, deciduous but also evergreen ones that rarely are found in tree form in Eastern Mediterranean and Greece, plane trees are common, while pines cypresses, chestnuts are also encountered. The choice of the tree seems to be associated with the locality, for instance plane trees are often preferred in wet places, deciduous oaks in colder and upland places, etc., but in our knowledge no thorough correlation has been attempted. These isolated trees are also widely recognized as

biodiversity refugia in the sense of old-growth forest islands” that support species-dependent to large trees microhabitat (Benedetti et al. 2021).

Sacred trees inside the settlements include trees in inside” churches (those that are clearly situated within the core of a settlement with buildings in all directions around the church, Seifried and Kalayci 2019) and trees in the village squares. The former function exactly like those of outside churches. Trees inside the villages are found typically in the central square (Stara et al. 2015) or in more than one squares depending on the village size and/or topography and in and around cemeteries.

Here we will refer in the first category of sites, sacred forests with references to the rest of the categories where and when this is necessary.

Most of these sacred forests and trees are remnants of former management and socioecological systems. The Ottoman period is typically attributed as the time when most of these forests and their management rules were established (Stara et al. 2016). This is a very broad period though, but most sacred forests date from the 16th century onwards. Nevertheless, the period when major changes and ruptures in the management of these forests and of mountain areas in general is better documented and narrower, starting in Greece the mid of the 20th century onwards with changes that refer to (Kizos 2018):

- Mechanization of agriculture (including intensification, concentration and specialization) and a far denser road network, which made farming in level areas much more favorable than mountain and sloping lands and resulted in fewer and bigger farms in the plains. On the contrary, mountain agriculture is abandoned almost completely.
- The complementarity between large holdings in the plains and the dominating transhumant animal husbandry in the mountains is broken. Intensification and land consolidation due to the Land Reform of the 1920s-1930s gradually stop transhumance and force herders to seek land in the plains or in semi-mountainous areas and move there eventually.
- Other sources of livelihoods of mountain populations such as textiles, stone craft etc., slowly stop as well.
- A decade of fighting in the Second World War and the Civil War that followed (until 1949) completes the rupture: many villages are forced to relocate; others are abandoned completely, and many inhabitants leave for far away or nearby urban areas.

These changes are similar in most mountain communities and production systems in the Mediterranean and Europe and result in extreme depopulation and increase of urban areas (in the early 20th century almost 80% of the population of Greece lived in rural areas, while today, less than 20% still does, with some of the most remote mountain settlements losing as much as 90% of their population, Kizos 2018). The mountain economy is today based on animal husbandry (reduced radically compared to a century ago), forest management for timber and firewood, while tourism slowly emerges. Forest management is gaining importance due to the land cover changes: forests have increased rapidly and consumed all former agricultural areas, pastures and other communal or private lands. A complex mosaic of agriculture, animal husbandry, forest is now simplified” into continuous forests. Official data raise the percentage of forests in Greece to 39.1% (ELSTAT). Kizos (2022) includes also forests areas, grazing lands and managed forests and raises this percentage to 53% of the total area of the country. This increase of forest cover along with depopulation has brought rewilding and a change of the conceptualization of mountains and their forests that are now being considered as a new natural capital.

The impact of these changes to sacred forests cannot be underestimated. On one hand, in most of them the rules that governed their management make little sense today, as most of the activities that were described or managed are not practiced. Even timber/ firewood extraction that could theoretically affect them is strictly managed by the Forest Services that provide permits and describe what and how much is to be felled, excluding areas of sacred forests. On the other hand, the expansion of forests in the mid and longer terms reduces their importance in the landscape, since in the next few decades many new forests will acquire an old forest structure and conservation importance. At the same time though, in the less densely forested landscape of the past, they served as places of habitat variation and this elevated their conservation status. In a homogenized landscape in the future, this role will have to be reevaluated. Sacred trees were less affected by these changes. Despite all these though, sacred forests still hold important spiritual and relational values for the people of the local communities and of the greater area in general.

Values

Sacred forests have been reported to be areas of high species diversity (Benedetti et al. 2021, Muggia et al. 2018). Their old-growth character” involves larger and taller trees, and natural regeneration processes, despite their limited area sizes, reflecting their protection from felling status. They also hold higher avian diversity (Benedetti et al. 2021), supporting more bird species than other forests in the area and a greater abundance of individuals, because of their significant environmental variation. This suggests a very important role in preventing biotic homogenization with the presence of very large old living trees serving as keystone structures, especially in managed oak woods. Despite their sacred” nature though, very little socio-cultural research has been dedicated to the societal values of these forests.

In terms of instrumental values, Sacred forests have a safety function for many villages, as they used to be buffers against soil erosion (most of the Pindus Mountain Range is still geologically active and soil erosion rates are high), located as they are above the settlements. Some sites, especially forests in uplands may have served as protection against landslides and floods (Stara et al. 2016). They often also acted as a last resource reservoir of timber and branches for grazing (Stara et al. 2016). Collecting and harvesting activities in these forests were also important for food and fuel.

The intrinsic values of sacred forests are related to their sacred and taboo nature (Stara et al. 2016). They have been described as “home of gods, places related with spiritually significant historical events or people, or places of worship” (Stara et al. 2016: 284). Historically, some of the many different places, landmarks and even species that had sacred qualities and uses in Ancient Greece religious and spiritual practices were groves or isolated trees (Barnett 2007). Already in the Homeric texts, trees, groves and thickets are mentioned as landmarks, sacred spots and places of importance, along with springs, rivers, etc., which many times had also human / semi-god presences. Also, different god/goddesses were associated with specific places and spaces and worshipped there: Apollo on mountain and hill tops (being the God of the sun), Zeus/Dias on even higher mountain tops and in oak groves, Artemis in forests and hunting grounds, Pan in the wilderness, etc. (Bowe 2010). While a straightforward relation between the trees and religious and/or spiritual values has often been observed for individual trees close to chapels, for forests this relation has been very little investigated. Avtzis (2018) comments on this diversity of values: many of these groves were dedicated to specific saints, some were little more than community agreements, while others were protected by the threat of excommunication” (p. 95). A special case of sacred forests are those in a land already considered sacred: the Holy Mountain peninsula (Athos), where all forests were considered sacred, but were managed by the monks for timber, foraging, apiculture and grazing. But, their

main values were relational values, as they were part of an area with accumulated cultural knowledge, tradition and a unique way of life and interlinked with the architecture of the building complexes of the Monasteries and the landscape (Philippou and Kontos, cited in Papayannis and Mallarach 2009).

Sacred forests provide important relational values to people. They were appreciated for providing protection and forest resources, but also as an indication of the dominant community level management of these forests and other common resources such as grazing lands. Therefore, they are linked to these local traditions of common management, public participation, equitable use and sharing of natural resources, and protection of indigenous and customary rights (Stara et al. 2016). Aesthetic values are also attributed to them and to the individual sacred trees and sites.

Rules

Tacit or implicit customary rules imposed by a local (often but not always religious) authority (Avtzis et al. 2018) have governed sacred forests. In general, these rules have developed to prevent their exploitation for private use. The literature does not report formal rules, although sacred forests were and still are community owned (Stara et al., 2016), but generally the local community acted as the custodian of a site, managing, and conserving its cultural, spiritual, and environmental value (Govigli 2020). Muggia (2018) and Stara et al. (2015) report that part of these rules were religious prohibitions and mismanaging the forests was believed to cause misfortune, disease or even death to the trespasser. Some of these groves were later excommunicated in order to be protected even more efficiently, as anyone touching the grove would have been automatically excommunicated from the Church. These punishments were often attributed to the saint(s) to whom the church or site in the forest is dedicated. The uses that are allowed or not inside them are related to:

- The cutting of trees. Shredding, pruning or other forms of wood extraction were strictly regulated and generally prohibited except in cases when trees die or are uprooted.
- Activities such as “grazing, collection of dry fallen branches, as well as non-wood forest products (mushrooms, hunting, etc.) are usually allowed” (Govigli et al. 2021, p 2). More infrequent are cases of absolute protection, including grazing and harvesting of fruits or dead wood (Stara et al., 2016).

These rules are today formal in the sense that these forests are now managed by the Forest Services that provide very detailed guidelines on felling trees. Guidelines on other forms of harvesting may be provided for e.g. mushrooms or herbs by national or regional guidelines by the Ministry of Agriculture, Rural Development and Food. What seems to be missing though from these recent management efforts is an approach that will extend beyond guidelines on how just timber should be managed and consider these forests as integrated socioecological units. The use of past local ecological and recent scientific is instrumental in such an effort.

Knowledge

Local ecological knowledge is the primary type of knowledge that forms the basis of sacred forests. This knowledge has favoured the protection of such forests from grazing and logging in order to provide protection to the settlements and forest resources close to the settlement.

Technical knowledge has incorporated sacred forests into typical forest management, recently through the take-over of all forest areas management by the Forest Service.

Scientific knowledge on sacred forests has been published for 30 years or so (Stara et al. (2016) provide an overview), typically focusing on their conservation values, but also to the historical background of their establishment and management.

Potential for conservation

The forest wildfires of 2021 that have devastated major parts of central and south Greece and many places of the Mediterranean after a long heat spell, illustrate one of the most important threats for forests and trees in the area, including sacred forests and trees (Avtzis et al. 2018). The profound socioeconomic changes of mountain (and rural in general) areas have significantly affected sacred forests and isolated trees. Urban sprawl in some places and depopulation and the decline of agriculture and livestock in others has led to extensive forest expansion and impacted both the landscape matrix they are in and the management and internal structure of some formerly isolated sacred forest patches. Combined with the absence of management, the threat of biodiversity, cultural importance and sacredness loss has increased. Govigli et al (2020) demonstrate substantial variation in vegetation structure and composition in sacred forests in Northern Greece. A conservation strategy for their management must focus on reinstating at least partly former management practices (e.g., low-intensity grazing which is identified as a major determinant of species composition and structure of sacred forests, Avtzis et al. 2018) that would (Govigli et al. 2020, p. 64) support retaining large-sized trees... currently threatened by increased competition from regenerating trees". The inclusion of local stakeholders into the management of sacred forests and trees (including their boundary zones) could legitimize conservation efforts while respecting implicit existing cultural norms. The example of the recent inclusion of sacred forests in Greece in the UNESCO National Inventory of Intangible Cultural Heritage (Govigli et al. 2020) may present an opportunity for the recognition, celebration and management of this peculiar socioecological system.

References

- Avtzis DN, Stara K, Sgardeli V, Betsis A, Diamandis A, Healey JR, Kapsalis E, Kati V, Korakis G, Marini Govigli M, Monokrousos N, Muggia L, Nitsiakos V, Papadatou E, Papaioannou H, Rohrer M, Tsiakiris R, Van Houtan KS, Vokou D, Wong JLG Halley JM (2018) Quantifying the conservation value of Sacred Natural Sites. *Biological Conservation* 222:95-103
- Barnett R (2007) Sacred groves: Sacrifice and the order of nature in ancient Greek landscapes. *Landscape Journal* 26: 2-7
- Benedetti Y, Kapsalis E, Morelli F, Kati V (2021) Sacred oak woods increase bird diversity and specialization: Links with the European Biodiversity Strategy for 2030. *Journal of Environmental Management* 294:112982
- Bowe P (2010) The sacred groves of ancient Greece. *Studies in the History of Gardens & Designed Landscapes*. 29(4):235-245
- Dafni A (2007) Rituals, ceremonies and customs related to sacred trees with a special reference to the Middle East. *Journal of Ethnobiology and Ethnomedicine* 3:28
- Dudley N, Higgins-Zogib L, Mansourian S (2009) The links between protected areas, faiths and sacred natural sites. *Conservation Biology* 23(3):568-577
- Govigli VM, Efthymiou A, Stara K (2021) From religion to conservation: Unfolding 300 years of collective action in a Greek sacred forest. *Forest Policy and Economics* 131:102575

Govigli VM, Healey JR, Wong JLG, Stara K, Tsiakiris R, Halley JM (2020) When nature meets the divine: effect of prohibition regimes on the structure and tree species composition of sacred forests in northern Greece. *Web Ecology* 20:53-86

Kizos T (2018) *Anaptixi tis Ipaithrou: Ennoies, Praktikes kai Politikes*. In: *Rural Development: Concepts, Practices and Policies*, Ziti, Athens

Kizos T (2022) Μεταβολές στη μορφή και στις προσλήψεις του αγροτικού τοπίου της Ελλάδας: ο επανεποικισμός από άγρια είδη (rewilding) και η συμβίωση με τις αρκούδες στη Δυτική Μακεδονία. *Changes in the form and views towards the agricultural landscapes of Greece: rewilding and living with bears in Western Macedonia*, in *Εθνολογία-αφιέρωμα στην Ελένη Κοβάνη*

Muggia L, Kati V, Rohrer A, Halley J, Mayrhofer H 2018. Species diversity of lichens in the sacred groves of Epirus (Greece). *Herzogia* 31:231-244

Stara K, Tsiakiris R, Wong JLG (2015): The trees of the sacred natural sites of Zagori, NW Greece. *Landscape Research* 40 (7):884-904

Stara K, Tsiakiris R, Nitsiakos V, Halley JM (2016) Religion and the management of the Commons. The sacred forests of Epirus. In M. Agnoletti and F. Emanuelli (eds.), *Biocultural Diversity in Europe*, *Environmental History* 5:283-302

Seifried RM, Kalaycı T (2019) An exploratory spatial analysis of the churches in the Southern Mani Peninsula. *Greece Open Archaeology* 5:519-539

Hima, Lebanon

Assembled by Tobias Plieninger and Yaser Abunnasr

Background

Hima is an ancient type of community-based reserves that is found in Saudi Arabia, the Gulf States, Yemen, Syria, Jordan, Lebanon, and possibly other Arab and Islamic countries (Serhal et al. 2011, Verde 2010, Al-Ajlani 2006). The term hima” (sometimes also written hema”) means protected or forbidden place” and refers to an area of vegetated land to which access and use are limited by specific rules. The basic idea of the hima system is to set aside some land as a grazing reserve for restricted use by a village community, clan, or tribe as a part of grazing management strategy (Gari 2006). Typically, protection of vegetation, water, and wildlife resources were the reasons for establishing himas (Ibrahim et al. 2013). The basic idea of himas is to integrate and balance conservation and sustainable production. Due to its long history of sustainable rangeland use, hima has been considered one of the most important traditional land management and conservation practices in the Arabic world (Ibrahim et al. 2013, Saleh 1998).

Hima has been a tribal land management practise in the Arabic Peninsula and Levant for more than 1,400 years (Dukhan 2014). It dates back to pre-Islamic times when it developed as informal policy to protect rangelands from overgrazing. However, hima was also used as a tool for exerting power, as the strongest people would monopolize grazing areas and have the watering rights to themselves” (Ibrahim et al. 2013, p. 478). The rise of Islam formalized the hima system, making it a property dedicated to the well-being of the whole community around it” (Gari 2006, p. 213). Tribes now owned the himas and self-administered them in the absence of state control. This formal system persisted until the first half of the twentieth century (Gari 2006). Little information is available on the spatial distribution of himas. Around 3000 Himas have been reported to exist in Saudi Arabia in the 1960s, and most villages in the southwestern part of the country used to have their own hima. The area extent of himas could range from 10 to >1000 ha, with an average size of approximately 250 ha (Llewellyn 2003).

While the hima system has survived over centuries, political and socioeconomic changes in the Middle East caused large-scale destruction and degradation in the 20th and 21st centuries. On one hand, land use modernization often made himas less relevant for people’s livelihoods. For instance, himas allocated to grazing by cattle, horses, or donkeys often became obsolete when cars and agricultural machinery were introduced. Some himas lost their function when pasture shortages were overcome by transporting livestock on trucks or when rural people migrated into urban areas. The rise of mechanised, high-input crop cultivation also led to the disappearance of many himas. In contrast, himas linked to beekeeping were more persistent (Eben Saleh 1997). On the other hand, population growth and the subsequent demands for housing, meat and other farm products led to increased pressures on the hima, with either land conversion or overgrazing being a consequence (Gari 2006). In many cases, the hima system was deliberately dismantled through the nationalization of tribal lands after the fall of the Ottoman Empire. As most himas were allocated to a specific village, clan or tribe, himas became increasingly perceived as a source of conflict, contradicting the idea of a common good. Dropping support frequently led to uncontrolled grazing and rapid deterioration of rangelands. Only a very small number of traditional himas have survived, mainly in Saudi Arabia and Oman (Al-Rowaily 1999, Dukhan 2014, Gari 2006, Llewellyn 2003). The hima also survives in Lebanon, yet in a contemporary form, as will be discussed in the pursuant sections.

Values

Himas have frequently been reported to be situated in areas of high species diversity. Often they host valuable habitats such as juniper, olive, and *Ziziphus* woodlands (Llewellyn 2003) or wetlands (Ibrahim et al. 2013). The himas may also act as refuge for indigenous plants and animals displaced elsewhere (Llewellyn 2003). However, very little socio-cultural research has been dedicated to the societal values of himas (Gari 2006).

In terms of instrumental values, himas are an essential source of fodder and of particular importance in times of drought. By that they have an insurance function, acting as a grass bank in seasons and years of low rangeland productivity. One study found that hima management improves the ecological state of rangelands, as expressed by soil depth, organic matter content, cation exchange capacity, and soil texture. Higher densities of palatable grass species were found in ungrazed himas, while unpalatable grass species predominated outside himas (Ayyad 2003). Many himas are also appreciated for high quality honey production (Llewellyn 2003). Other tangible benefits from hima are medicinal and edible plants, including water, birds, and fish (Ibrahim et al. 2013). The hima system with its principles of reducing grazing pressure is also assumed to support rangeland rehabilitation, animal welfare, and sustainable management of water catchments (Llewellyn 2003).

The intrinsic values of the hima system as perceived by people remain unknown.

Himas provide important relational values to people. The system is appreciated for allocating scarce resources equitably among local community members, for providing social security, and for giving people influence over natural resource management. Hima is linked to local traditions of customary management that also offers pragmatic and flexible approaches (Kilani et al. 2007). Overall, the hima system rests on community-based actions, public participation, equitable use and sharing of natural resources, and protection of indigenous and customary rights (Ibrahim et al. 2013). The system is also closely linked to Muslim belief that postulates that a duty to protect and deal with nature will lead to one's own protection. The hima system has also been reported to contribute to poverty alleviation, empowerment of local communities, and support of democracy (Ibrahim et al. 2013).

Rules

Multiple unwritten but enduring customary rules have governed himas, based on the rights of users to benefit from the natural resources of given areas (usufruct) (Ibrahim et al. 2013). With the emergence of Islam, himas were further supported by formal rules as a community's common property, and its use was controlled by local stakeholders to conserve water and vegetation in harsh environments (Serhal et al. 2011, Marsuki 2009). Some of these rules have been reported to be in force over at least 200 years. They strive for social acceptability by the actors who carry the cost of their implementation and for economic viability by generating tangible benefits of the system to those who carry these costs for hima conservation. By that the system provides incentives for local communities to invest in the maintenance of their natural resources and to protect them from abuse (Llewellyn 2003). At its core, the system regulates grazing and harvesting of different natural resources, either seasonally or permanently. Most typically, land is closed for grazing from the rainy winter season into the summer dry season, to allow for a regeneration of vegetation. Construction activities and extraction of commodities for trade or financial gains are generally interdicted. According to (Gari 2006), hima rules can apply to:

- Prohibition of grazing, while permitting periodic grass cutting for feeding livestock after plants reach a certain height of growth, after they flower and bear fruit. The number of persons from each family allowed to cut grass is determined by tribe councils.
- Permission of grazing and cutting after the flowering and fruit production seeding.
- Permission of all-year grazing and grass cutting, while limiting the density and species of livestock and type of animals (e.g., milk cattle) are specified.
- Dedication of land to beekeeping. Grazing is excluded completely or permitted only after the flowering season, and the land is closed for five months of the year.
- Protection of clearing forest trees (such as *Juniperus procera*, *Acacia* spp., *Haloxylon persicum*). Cutting is only allowed for great emergencies or acute needs.
- Setting aside of woodland to halt desertification or sand dune encroachment.

Some himas were ruled by up to ten villages belonging to one tribe, while smaller himas were controlled by a single village (Saleh 1998). Rules are typically flexible, but well-developed and monitored locally, based on community consensus. Responsibilities, for instance collecting rainwater run-off, are allocated to each beneficiary. Rule violations are sanctioned, for instance by slaughtering some of the trespassing animals. More recently, this has been replaced by fines (Gari 2006, Triulzi 2002). Islamic influence defines the following principles for the hima system (Eben Saleh 1997):

- A hima is established by the legal authority.
- The establishment of a hima is in the public interest.
- The establishment of a hima should not preclude the community from a resource needed for survival.
- The hima continues as long as assets exceed liabilities.

The 20th century has been characterized by a cessation of rules. The traditional hima system has almost disappeared across the Middle East, and the informal and formal rules underpinning himas were largely abolished or abandoned. Current mechanisms of resource use are ill-defined, which has led to typical common pool resource problems of neglect and overuse. There is currently an organisational gap that needs to be filled (Gari 2006). This.

Knowledge

Local ecological knowledge is the primary type of knowledge that forms the basis of the hima system. Local traditions have shaped for instance establishment agricultural terraces, the refinement of rainwater harvesting methods over time and the maintenance wildlife populations. By that, local ecological knowledge has been considered the central driver behind the objectives of biodiversity conservation through hima (Gari 2006).

Technical knowledge has typically been ignorant of the hima system. Therefore, integrated policies that support local communities in conserving the scientific, economic, social and ethical values of biodiversity are rare. In contrast, many himas have been jeopardized by inappropriate development projects and other actions (Ayyad 2003). Himas were or are promoted by state agencies in Syria from the 1960s to the 1980s (Chatty 2001, Shoup 1990) and by non-governmental organizations in Lebanon since the 2000s (Kilani et al. 2007).

Scientific knowledge on the hima system has been published since approximately 25 years (Al-Rowaily 1999, Llewellyn 2003, Zahran and Younes 1990), most notably in the Saudia-Arabian context, but is generally underdeveloped. Experts in the biological and social sciences, economics, law, policy analysis, ethics and community organizations are generally rare in

Middle Eastern countries. Integrated social-ecological research is absent and where it exists has been unable to inform political decisions so far (Ayyad 2003).

Potential for conservation

The hima is probably the most important conservation instrument that has developed historically in the Middle East. It has potential to provide the conceptual basis for protected area systems that integrate people and nature. However, adaptations of the traditional hima system are necessary to reflect the societal changes that have taken place in the region. Today, young tribal members work no longer in pastoralism, residential areas are more heterogeneous in their population composition, and people now show loyalty to their communities rather than to their tribes (Gari 2006). Such adaptations of the hima system may need new local organizations the blend components of the traditional system with contemporary conservation and development paradigms (Eben Saleh 1997). Key features of such newly interpreted hima system include strengthened community participation, creating of social-ecological benefits that correspond to the current needs of local people, an equitable allocation of use rights and maintenance duties (not oriented along tribal lines), establishment of co-management among local stakeholders and state agencies, introduction for compensation measures, linkages to international protected area discourses, and coordination of protected area management with that of adjacent private lands at landscape scales (Llewellyn 2003). All this needs to be fed into an adequate system of environmental laws, land tenure arrangements and other instruments to ensure the continuity of the hima system (Ayyad 2003).

In the Levant, hima has been successfully revitalized due to an initiative of the Society for the Protection of Nature in Lebanon (SPNL), motivated by the protection of habitats along an important flyway for migrating birds. Analysis of historical maps identified former hima sites. With this discovery of common lands, a number of Important Bird Areas and Key Biodiversity Sites were established with involvement of local communities. In the course of these activities, hima was reinvented to a contemporary conservation approach. For instance, the hima of Ebel es Saqi that formerly served for pasture, pine-seed collection and beekeeping was reestablished for use mainly for ecotourism based bird-watching and hiking. Local jobs were created to reduce previously widespread hunting of wildlife. The idea of the hima system promoted by SPNL is to contribute to sustainable development in economic, social, and environmental dimensions (Kilani et al. 2007). Altogether 16 himas have been reestablished in Lebanon in collaboration between local municipalities and SPNL (Serhal et al. 2011). While conservation priorities are determined by SPNL, responsibility for hima management is mostly devolved to local community groups following a participatory planning, capacity-building and awareness-raising process. SPNL promotes hima reserves as a complementary approach to top-down protected area planning that has often led to unequal benefits for local communities. It particularly aims to create nature reserves that are socially inclusive (Serhal et al. 2011). Furthermore, and as a result of SPNL work, the hima has been designated as a one of the designated categories of protected land within Lebanese Law.

References

- Al-Ajlani D (2006) Towards a Twenty-first Century Hima System. Natural Resource and Wildlife Conservation Policy in Saudi Arabia. American University Beirut
- Al-Rowaily SLR (1999) Rangeland of Saudi Arabia and the Tragedy of Commons. *Rangelands* 21(3):27-29
- Ayyad MA (2003) Case studies in the conservation of biodiversity: Degradation and threats. *Journal of Arid Environments* 54(1):165-182

Chatty D (2001) Pastoral tribes in the Middle East and wildlife conservation schemes: The endangered species? *Nomadic Peoples*:104-124

Dukhan H (2014) 'They talk to us but never listen to us': Development-induced displacement among Syria's bedouin. *Nomadic Peoples* 18(1):61-79

Eben Saleh MA (1997) Toward a sustainable land management of vernacular landscape in the highlands of south-western Saudi Arabia: Indigenous and statutory experiences. *Landscape Research* 22(3):283-302

Gari L (2006) A history of the hima conservation system. *Environment and History* 12(2):213-228

Ibrahim I, Hua KP, Aziz NA, Hanifah NA (2013) Hima as 'living sanctuaries': An approach to wetlands conservation from the perspective of Shari'a Law. *Procedia – Social and Behavioral Sciences* 105:476-483

Kilani H, Serhal A, Llewelyn O (2007) Al-Hima: A Way of Life. IUCN West Asia Regional. <https://www.iucn.org/node/21486>

Llewellyn OA (2003) The basis for a discipline of Islamic environmental law. In: Foltz, R. (ed) *Islam and Ecology*, Center for the Study of World Religions Harvard Divinity School, Cambridge, pp 185-247

Marsuki MZB (2009) *The Practice of Islamic Environmental Ethics: A case study of Ḥarīm and Ḥimā*. University of Wales Trinity Saint David

Saleh MAE (1998) Alternative land management approaches in the highlands of south-western Saudi Arabia. *Environmental Conservation* 25(4):295-304

Serhal A, Saidi AR, Khatib B, Jawhary D, Farah N, Khatib T (2011) The Hima: An ancient conservation system from the Arabian Peninsula for the future. In: Papayannis T. and Pritchard D. (eds), *Culture and Wetlands in the Mediterranean: An Evolving Story*. Mediterranean Institute for Nature and Anthropos, Athens, pp. 372-384

Shoup JA (1990) *Hima: A Traditional Bedouin Land Use System in Contemporary Syria and Jordan*. Washington University in St. Louis

Triulzi L (2002) The Bedouin between development and state: A Syrian case-study. *The Arab World Geographer* 5(2):85-101

Verde T (2010) Allah commands. *Earth Island Journal* 24(4):51-55

Zahran M, Younes H (1990) Hema system: traditional conservation of plant life in Saudi Arabia. *JKAU Sci* 2:19-41