

# Hey, my Berber friend, draw me a rural forest!

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**Abstract:** In the Moroccan Berber rural environment, forests play an important role in sustaining people's livelihoods. They provide diversified products, such as timber, firewood, handicraft, fodder foliage and fruit, and have critical production, conservation, safety or cosmogony functions. Local populations have established endogenous management systems in which forests resources are managed at different scales: 1) at the individual tree level by differential cutting or trimming which lead to specific conformations of the tree, 2) at the tree stand level which provides spatial patterns and determines the type, structure and level of resources, and 3) at the landscape level in which complementary patches of forest areas with particular functions are consciously organized within the overall territory. On the basis of two case studies, one in a mountainous area of the Central High Atlas and the other in the argan tree area of the southwest Atlantic coast, we show how local people have shaped their forest areas in order to provide complementary resources for a wide range of uses. A given tree species can be managed in diverse ways depending on the type of resources to be exploited, and thus can give rise to diversified and interconnected tree stands in the local landscape. These practices are strongly linked with the overall functioning of the local societies, and mix individual with common (village, inter-village, tribal, inter-tribal) rights of access and uses. Forests are viewed as part of the domestic and intimate sphere of local livelihoods. Hence, they constitute typically what we can call rural or domestic forests, since they integrate production and conservation with social, political and spiritual dimensions. These features have important consequences for revisiting forester-local community relationships, and for developing alternative forest management policies.

Key words: local practices, forest shaping, rural forest, High Atlas, Argan forest, Morocco

## Introduction

Forests and rural livelihood have a long historical interconnection. Forests classically provide goods for food, firewood, construction, handicraft, medicinal and ritual purposes. In Southern Morocco, forests grow under semi-arid conditions, and form more or less extensive areas of dry forests that are intensively exploited by rural societies, and are usually under pressure. Notwithstanding, they still constitute a critical element of farming systems and contribute to the structure of landscapes and to the definition of rural territories. Berber communities have developed refined local knowledge and practices related to their use and perpetuation, particularly that known as *agdal*, a term which refers to specific areas, resources and access rules laid down by the local population in order to manage the territory (Auclair & Alifriqui, 2007). At first sight, this secular endogenous forest management system appears to almost fulfil all the accepted institutional principles that are considered to be important for sustainable resource management (Ostrom, 1990; Armitage, 2005): groups, resources and boundaries well-defined; participation of all actors in defining rules; a graduated scale of sanctions for contraveners; mechanisms for conflict resolution, an existing self monitoring system whereby resource users are accountable for their own actions. However, this endogenous forest management system is seldom recognized by the forestry authorities who are officially in charge of forest management. Furthermore, little is known about how local

people perceive their forest areas in terms of improving their livelihood and ensuring resource availability.

On the basis of two contrasting situations (high altitude area in the High Atlas and argan tree area), the aim of this paper is to show how Berber rural societies have taken control of their forest resources, and hence have shaped their forest landscapes into diversified patches in order to satisfy material, social, cultural and long-term needs. However, this vision of forest management often enters into conflict with that of the forestry authorities. Our aim is therefore to attempt to identify the main points of conflict and to explore ways to reconcile them.

## **Two areas, two ecologies, but in both cases a highly shaped forest landscape**

In Morocco, the Berber world includes an extensive area from the mountains of the High Atlas to the southern parts of Anti-Atlas chain and pre-Saharan zone.

For the purposes of two interdisciplinary research programs related to traditional natural resources management and relationships between local forest management and public policies<sup>1</sup>, we focused on two contrasting sites located in the Berber area: one in the Central High Atlas (The Aït Bouguemez valley), the other near the south-western Atlantic coast (Imint'lit).

The Ait Bouguemez valley is located in the province of Azilal at an altitude ranging from 1800 to 2200 m, and is surrounded by high mountain ranges reaching altitudes of 3700 m (*Azourki, Waougoulzat*). It shelters approximately thirty villages stretching along the bottom of the valley. This valley has a Mediterranean highland-type climate, with a semi-arid variant in the bottom and sub-humid on the most well-watered mountainsides (Couvreur 1968; Lecestre-Rollier 1992). The extreme temperatures range from -15 to +45°C. The annual rainfall varies between 500 and 750 mm, and precipitation is irregularly distributed in time and space, but is more abundant during autumn and spring.

The bottom of the valley includes annual and tree (apple, walnut) crops irrigated by traditional channels (*seguias*) diverting water from the rivers. The village boundary is arranged perpendicularly to the axis of the mountains. There can be found, from the bottom to the top, irrigated crops, villages (*douars*), and some plots of dry cultivation (*bour*). The mid- and upper parts of the slopes are occupied by communal wooded areas supplying firewood, leaf fodder and supporting grazing flocks. The lower parts of the wooded area close to the villages are often managed as *agdal*, while the high forest areas (outside the *agdal*) are subjected to free forest utilization. The asylvatic areas at high altitude constitute collective rangelands for flocks of sheep and goats. Some parts of these pastoral areas are also managed as *agdal* (Genin et al., 2010). The local economy is dominated by agro-pastoral activities. Forests and shrublands cover the north and south sides up to 2400-2700m, and show contrasted density and degradation levels. The wooded vegetation is arranged in levels according to the altitudinal gradient, exposition and management, with three species of Juniper: (*Juniperus phoenicea*, *J. oxycedrus*, *J. thurifera*), and holm Oak (*Quercus ilex*)

Imint'lit is a rural Commune belonging to Essaouira Province. It is situated in the northern part of the argan tree range, and located about 15 km from the Atlantic coast, at an altitude between 100 and 800 m. It presents a Mediterranean semi-arid climate, with annual

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<sup>1</sup> The *agdal* Program (2003-2007) "Les *agdals* du Haut Atlas marocain: biodiversité et gestion communautaire de l'accès aux ressources forestières et pastorales », supported by the French Institute for Biodiversity (IFB) ; and POPULAR Program (2007-2010) "Politiques publiques et gestion paysanne de l'arbre et de la forêt: alliance durable ou dialogue de dupes?", supported by the French National Research Agency (ANR-06-PADD-014).

precipitation of about 300 mm, and mean monthly temperatures between 12 and 26°C. The local economy is mainly based on agriculture (cereal crops, fruit growing: argan and olive trees, and smallstock rearing). Forests cover about 38% of the total surface of the Commune area, with two main tree species: the argan tree (*Argania spinosa*) and thuya (*Tetraclinis articulata*) at the upper parts. The argan tree is the emblematic tree of the region. It is an endemic species of the Sapotacea family whose fruit provides high quality oil used for cosmetic and alimentary purposes, and with a market that has developed very strongly internationally during the last decade. It is also heavily browsed by goats which are able to climb up it. Finally, it provides hardwood for fuel. Landscapes are strongly influenced by the woody component dominated by the argan tree. It occurs everywhere: among the crops found at the bottom of the valley where individual trees are well developed, but at low density in order to allow cereal cultivation under canopy; on the slopes, at higher density but with a more fragmented growth pattern; at the top, mixed with thuya. Different individual and collective management modes are locally found in private or public areas: privately-owned wooded crop areas, *agdals* (see below), *ourtis* (privately-owned areas dedicated to fruit production), *mouchaas* (public areas managed by forestry administration, and used as pastoral commons by local populations). This has resulted in a highly diversified wooded landscape.

### **Forest *agdals*: an original endogenous forest management system**

*Agdal* is a Berber generic term designating areas where access rights and uses of natural resources are governed by a local institution – usually the village, inter-village or intertribal assembly- which fixes rules concerning periods and modalities of natural resource exploitation. *Agdal* management mainly concerns pastoral areas in the asylvatic upper parts of mountains (Mahdi, 1999; Ilahiane, 1999), but other specific territories such as forests or sacred areas are also governed by this type of collective land management system. It always involves a temporary respite from use, aiming at preserving or collecting resources, and constituting stocks for critical periods. Customary laws limit the boundaries of the *Agdal* and fix its closing and opening dates. *Agdal* is an endogenous socio-spatial concept including a territory, resources and rules and institutions fixing access and uses regulation (Auclair & Alifriqui, 2007). The *agdal* system can be considered as the basis of how Berber communities conceive their relationships with Nature (Simenel, 2010). Here, our study will be focused on forest *agdals*.

In the High Atlas, forest *agdals* are located at the immediate vicinity of villages, because their main function is to provide firewood for the communal mosque, and fodder for livestock during winter if heavy snowfalls occur and impede movements. While legally all forested areas belong to and are managed by the state authorities (Aubert et al., 2009), the village's forest territory in the High Atlas is usually divided into two parts: a poorly regulated area where the major extractions of firewood and fodder occur, and one or two *agdal* areas (between 20 and 200 Ha). In both cases, they consist of open forested areas composed of pure or mixed tree stands of holm oak and junipers. The dominance of particular tree species will depend on exposure, altitude, soils and management. The structure of tree stands will depend on the type of management (*agdal* or outside *agdal*), and on functions they perform within livelihood systems (areas dedicated to timber production, fodder production, etc.) (Cordier & Genin, 2008). At the village scale, forest *agdals* usually represent in the Central High Atlas between 10 and 40% of total available forest territory, depending on localisation of villages and human pressure.

Rules usually apply to the cutting of standing wood and foliage, while grazing is authorized year-round. During the period of cutting prohibition, people get in their supplies from outside *agdal* forest areas which are thus subjected to higher harvest pressure. In the face of this

situation, some villages have also established rules concerning these outside *agdal* areas, but with weaker restrictions.

Concerning the collection of tree foliage, which constitutes a proportion of the annual diet of non-transhumant local small stock of up to 20% (Genin et al., 2009), four types of rules can be applied, which vary from village to village:

- Period of cutting. In the villages we studied this includes the periods when snow covers the area. Cutting may be authorized for all days or only during specific days of the week;
- Quantities of harvest. Different cases may occur: no quotas, quotas depending on the size of the family flock or fixed equal quotas for each family;
- Division of *agdal* in sectors in order to allow rota cuttings. This is the case for example of the village of Ighirine where a large forest *agdal* is divided into 6 sectors and cutting alternately authorized only in two sectors each year;
- Tree species to be cut. In some villages only holm oak is authorised for foliage cutting while cutting junipers is strictly forbidden.

This corpus of rules can fluctuate depending on the size of available forest *agdals*, the annual climate, which affect the state of natural resources and on perceptions and battles of wills within village assemblies (Lecestre-Rollier, 1986).

The other extractable products from forest *agdals*, such as firewood – which is usually allowed only for the needs of the mosque -, or timber for roof construction, are subject to prior authorization by the village assembly which determines modalities of use.

Custodians of the *agdals* are sometimes designated locally and contraveners fined or handed over to the local authorities.

In the argan tree area, there is a specific legislation concerning argan forest management where users' rights are more recognised. The *agdal* system is widespread in all the region, associated with other wooded lands submitted to diversified land tenures and uses. Two types of *agdal* are commonly found:

- Sacred *agdals*, which are argan forests where the rights of use are exclusively reserved for the descendants of patron saints who are the custodians of these forests. These areas are often given long periods of respite from use in order to regulate anthropic pressure and favour argan regeneration by means of their "sacralisation" (Simenel, 2010).
- Seasonal *agdals* where the main aim is to limit grazing during the period of fructification of argan and ensure fruit harvesting. This customary practice consists in prohibiting access to the forest by livestock usually from May to August. After fruit harvesting, carried out family by family, the forest *agdal* is opened again for free access for all the tribe's flocks. Hence, this customary institution completes and enhances the forestry law because it allows the spatio-temporal association of two types of rights: 1) collective grazing rights for all the members of the tribe or fraction, and 2) family rights for fruit harvesting (Simenel et al., 2009). The *agdal* patterns of use thus dictate the rhythm for the agro-sylvo pastoral activities throughout the agricultural annual cycle.

Each village usually has a seasonal *adgal*, and each tribe a sacred *agdal*. The seasonal *agdal* is located on public lands, above the agricultural area. It is divided into plots on the basis of the crop plot distribution patterns (figure 1). Entitled beneficiaries are usually from the same extended family, but sometimes rights are rented to non-family stakeholders.



Figure 1 : forest *agdal* as customary extension of crop plots.

### **Rural forests of Southern Morocco: man-induced diversity**

The importance of forests for rural livelihood, and the highly refined corpus of individual and collective practices involved locally, requires a non-monolithic approach to forest management. Our purpose is to show that, though presented as natural formations, the forests of the Southern Morocco have been deeply and consciously shaped by human action at different scales, from individual trees to landscape physiognomy. This feature, which will be illustrated by taking examples both from the mountain and the argan area case studies, has to be analysed in relation to functions trees and forests perform within the overall functioning and livelihood of local peasant populations.

#### **- At individual tree scale**

In these open forests, trees can easily be individualized by locals in order to be manipulated toward a particular productive function. Hence, one can find areas where a single tree species is managed for the exploitation of different resources. This is the case of Spanish Juniper (*J. thurifera*) in the High Atlas, which is known to provide high quality timber due to the hardness of its wood and its capacity to reach diameters big enough for framework construction. Its foliage also constitutes relatively good forage for the winter diet of small stock. Local people mentioned that they clearly distinguished Spanish juniper individuals depending on the timber or fodder/firewood function they attributed to them. On the basis of a sample of 52 Spanish junipers presenting a basal diameter over 20 cm, Cordier and Genin (2008) found marked differences in tree structure parameters, depending on their production function (table 1). This feature is also found in the Andalusian Dehesa where oaks are intentionally pruned in order to favour mast production or timber (Joffre et al., 1999).

	Height (m)	Tree cover (m <sup>2</sup> /tree)	Basal area	Crown area (m <sup>3</sup> /tree)	Number of cuts per m <sup>2</sup> of cover	Crown areas per m <sup>2</sup> of cover (m <sup>3</sup> /m <sup>2</sup> )
Framework tree (n=34)	<b>5.4</b>	<b>46.2</b>	<b>0.54</b>	<b>105.1</b>	0.34	<b>2.1</b>
Fodder and firewood (n=18)	<b>1.0</b>	<b>23.1</b>	<b>0.29</b>	<b>34.1</b>	0.43	<b>1.2</b>
Probability of Student's test	<b>0.001</b>	<b>0.001</b>	<b>0.018</b>	<b>0.001</b>	0.291	<b>0.001</b>

Table 1: Comparison of individual tree conformation of Spanish Juniper (*J. Thurifera*) in relation to their main use (timber or fodder/firewood) (Aït Bouguemez valley). Bold numbers indicate significant differences of means ( $p < 0.05$ ).

In Imint'lit, Argan trees present a highly diversified tree structure according to their localization and customary functions. Ba (2009) proposed at least 17 types of individual tree structure and related them to the main use for which they were dedicated (figure 2). For example, Argan trees show typical umbrella or Y conformation in field areas. These structures are induced by differential pruning in order to reconcile fruit production and shadow limitation for cereal development. Another typical tree structure found in field areas was called "low wall" by the author, and plays a role in the marking out of land plots. In *agdals*, trees predominantly present structures which reconcile fruit production and accessibility for goat browsing. It is noteworthy that this man-induced diversity in argan tree conformation is highly valorised in the discourse of local people, and there is a peasant classification for tree physiognomy, though not exactly fitting the scientific one, which testifies to local people's deep concern for this aspect. (cf. plate 1).

Tree structure is classically viewed as an indicator of good or mismanagement in term of degradation of the forest ecosystem, and in relation to the natural habit of trees; it can also be analysed as an indicator of a certain tree's domestication and functional utility.

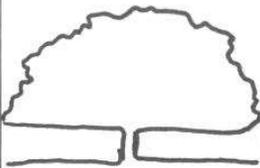
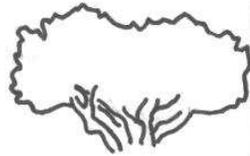
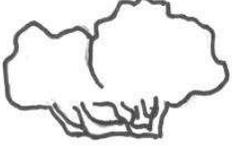
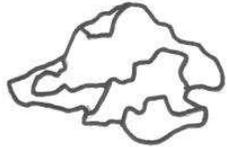
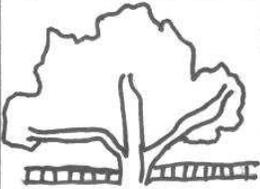
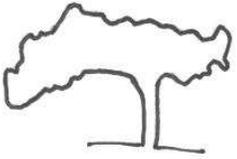
Fields (Fruits and crops)	Ourtis (fruit oriented production)	Agdals (fruits and browsing)	Pastoral mouchaas (browsing and firewood)
 Umbrella 26.5%	 scat. multistem 56%	 multicaule 69%	 Green stone 54.5%
 « Small wall » 41%	 receptacle 44%	 Agdal highwood 31%	 Staircase 29.5%
 Y type 32.5%			 Parasol 16%

Figure 2: Broad typology of argan tree physiognomy in relation to their localisation in the different wooded areas found at the village level (adapted from Ba, 2009).

- At tree stand scale

This scale is the classical scale for foresters corresponding to a relatively homogenous surface unit where forest characteristics and management are undertaken on the basis of parameters such as timber cubage per hectare or tree cover, and amount of forest resources available. It is also a pertinent scale for locals who manage forested portions of their rural forests.

In the High Atlas, a comparative study was conducted on 57 plots (400m<sup>2</sup> each) representative of holm oak dominated forests in order to assess the impact of *agdal* management on dendrometric characteristics of tree stands (35 *agdal* plots, 22 outside *agdal* plots) (Cordier, 2007). Results showed that, though presenting similar tree cover, these two types of tree stands did not offer the same forest resources (table 2). The food reserve function of *agdal* areas for livestock winter feeding is illustrated by almost twice the available amount of foliage (2995m<sup>3</sup>/ha vs 1670 m<sup>3</sup>/ha outside *agdal*). Outside *agdal* areas, on the other hand present shorter trees easily available for firewood extraction, and a significantly high proportion of matorral cover (holm oak <1.5m height) directly browsed by sheep and goats. Cordier (2007) presented a detailed analysis of the structure of these tree stands and their capacity for regeneration, and offered conclusions that introduced some nuances with regard to the interpretation of the ecological value of these tree stands

	Total cover (%)	Cover of Holm oak matorral (%)	Cover of herbaceous strata (%)	Holm oak basal area (m <sup>2</sup> /ha)	Holm oak Crown volume (m <sup>3</sup> /ha)	Spanish juniper basal area (m <sup>3</sup> /ha)	Spanish juniper crown volume (m <sup>3</sup> /ha)
Outside agdal (n=22)	25	<b>13</b>	11	<b>10.3</b>	<b>1670</b>	4.7	549
Agdal (n=35)	26	<b>3</b>	13	<b>14.7</b>	<b>2995</b>	3.8	779
Probability of Student's test	0.814	<b>0.001</b>	0.468	<b>0.047</b>	<b>0.002</b>	0.634	0.139

Table 2: Comparison of tree characteristics of holm oak and Spanish juniper stands subjected or not to *agdal* forest management (Aït Bouguemez valley). Bold numbers indicate significant differences of means ( $p < 0.05$ ).

In the argan tree area, structures of tree stands are highly diversified depending on the type of tenure and management. Table 3 shows wide differences in tree density between the different patches of land found in the area. A low argan density field allows development of annual crops under canopy. Argan trees in fields are also pruned in order to favor main branches and hence size of argan nuts. They have also other functions such as land plot delimitation and in some cases ritual attributes. In ourtis and *agdals*, tree height is intermediate, and is to be related to their specific uses (forested rangelands associated with a preoccupation of fruit crop). In mouchaa areas, high tree density is linked to low tree height, as a result of intense browsing and wood collection.

Local people have also developed a deep knowledge concerning fruit classification, and can classify fruit conformation at least within twelve types, and indicate predominance of certain types in particular areas. Moreover, this classification has practical applications, since trees are individually cropped depending on nut quality. For example, trees with nuts easily broken for extraction of the almond are frequently cropped first and rapidly treated for oil processing, in order to benefit from high prices on the local market before peak production.

Even though they claim not to modify the natural distribution of these types, it could be interesting to analyse in more detail the selection made by peasant farmers and possible domestication practices involved in individual tree selection operated in field and ourtis areas.

	Fields	Ourtis	<i>Agdals</i>	mouchaas
Tree density/ha	56 ± 21	127 ± 89	167 ± 39	170 ± 52
Tree height (m)	6,1 ± 1,7	4,5 ± 0.8	4,3 ± 1,9	2,8 ± 2,9

Table 3: Main characteristics of argan tree stands depending on the type of forest management in Imint'lit (Province of Essaouira).

- At landscape level

A careful observation of landscapes shows that wooded areas are compartmentalised into a complex mosaic of particular zones each with its own physiognomy and history.

For example, the village of Iqabaliun, in the Bouguemez valley, presents at least six forest compartments (figure 3):

- on the south-facing slope, an *agdal* composed of red Juniper exclusively dedicated to pole extraction for roof building (in pink);
- on the north-facing slope where the main part of village forest is found, another *agdal* is divided into five compartments alternatively exploited in pairs for fodder foliage and firewood extraction in winter (in blue), the fifth compartment (in green) is exclusively dedicated to firewood for the mosque (ablutions and heating); in the outside *agdal* zone, until recent years wood and foliage extraction was free, but in the face of a perceived degradation of the forest's resources, the village assembly decided ten years ago to divide the area into two and introduce a four-year rotational system for its exploitation (in red); a specific remote outside *agdal* area is dedicated to sporadic use of Spanish Juniper beams due to the presence of large old trees (in dark brown); the rest of the outside *agdal* area is open for free utilisation (light brown).

These forest formations on the one hand contribute to the ecosystemic diversity which is one component of the overall biodiversity (with genetic and species diversity), and on the other hand constitute true integrated resource-spaces with complementary functions for rural livelihood.

In the argan forest area, the landscape is also well compartmentalised into different types of argan stands corresponding to different levels of argan tree exploitation:

- On south-facing slopes, there is a large seasonal *agdal*, where plots are extensions of private crop plots. Officially argan *agdal* is public land, but in each plot fruit harvesting is performed collectively by the whole extended family, and divided between its different members.
- North-facing slopes, not constituted by an *agdal* but by several privately-owned plots, called *ourti*, and enclosed by small stone walls. In these areas, argan trees are mixed with other fruit tree species, such as olive trees, almond trees, prickly pears and henna trees. Argan nuts and firewood are collected individually by owners.
- At the bottom of the valley, wooded crop plots occupy the land. There is also a banded *mouchaa* area, primarily grazed by livestock during the closed period of the seasonal *agdal*; it also includes a pond for watering livestock.
- At the top is the public forest domain, used collectively as rangeland and for dead wood collection, and submitted to forestry administration management.

Hence, each argan tree area has a sound geographic localisation in the territory, and has particular functions, as a result of well-conceived and diversified secular shaping of tree stands and individual trees by locals.

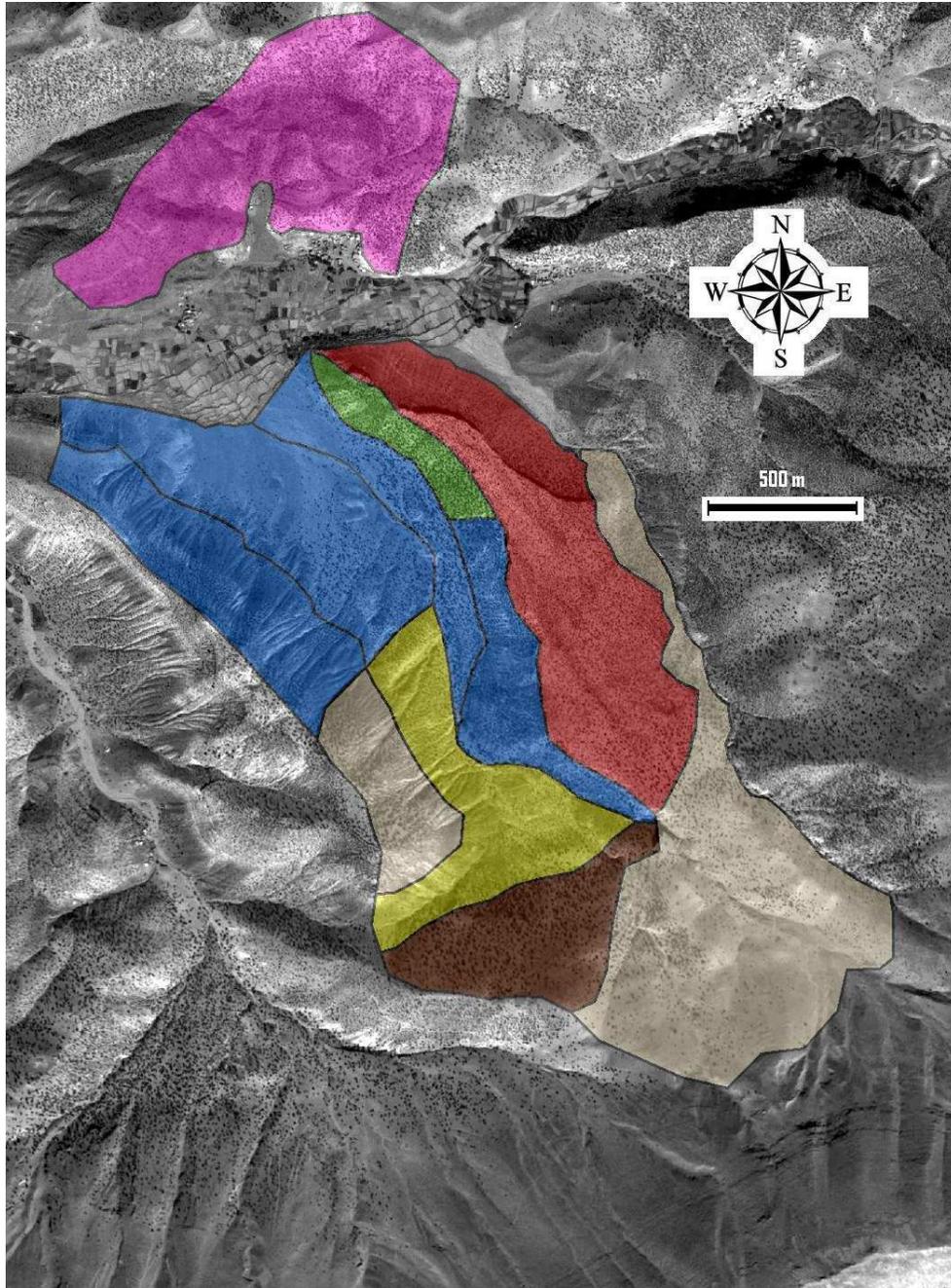


Figure 3: mosaic of diversified forested areas with differential functions in the village of Ibaqaliun (Central High Atlas). Image : SPOT/HOA-QUI/EYEDEA. See text for significance of color chart.

## Peasants' and foresters' forest management systems: towards reconciliation?

- An obviously contrasting vision

Traditionally, peasant farmers and foresters throughout the world have a long history of confrontation. This is also true in the Berber region, where conflicts between rural communities and forest administration authorities have sometimes turned violent (Lecestre-Rollier, 1982). The reasons for that have to do with contrasting visions of what constitutes "good forest management" and ways to achieve it.

Classically, foresters have two main objectives for forest management: resource conservation and timber production, associated with an almost exclusive scale of perception: the tree stand. In contrast, Berber country people perceive forests as a "diversified resources source" and an integrated element for the overall functioning of the human community in an environment where natural and socio economic risks are high. We have seen that their scales of perceptions of rural forest management range from individual trees to the overall landscape of the village territory.

Fundamental discrepancies can be highlighted: pluri-annual cycles of forest exploitation with occasional intensive yields for foresters, against a more diffuse, but annual, forest resources exploitation pattern for peasant farmers. This leads to a more preconceived rigid management approach by forest administration authorities, associated with strongly vertical relationships between the stakeholders. In contrast, the village assembly constitutes a form of forum of discussion for forest management decisions, where each family is represented, and where a certain flexibility of rules and uses can be collectively decided. This trait seems to be shared by a lot of traditional forest management systems found around the world (Upreti, 2002).

Two examples illustrate this discrepancy of approaches. The first concerns holm oak matorral formations in the high Atlas, which are considered by technicians as highly degraded ecosystems; for locals they constitute interesting resource-spaces easily valorized by direct browsing and firewood extraction, and this pressure does not seem to have an irreversible negative impact on Holm oak regeneration dynamics (Cordier, 2007).

The second refers to regeneration of the argan tree. Foresters undertake regeneration by complete felling of the overall tree stand, transplantation of new argan trees from nurseries, followed by a complete respite from use for 8 to 12 years (M'Hirit et al., 2002). As a consequence, all agro sylvo pastoral activities remain prohibited for several years. These practices do not take into account any concern for local genetic diversity, since scientific knowledge and techniques are relatively weak in this domain. Smallholders on their own have developed different practices in order to protect re-sprouts, natural seedlings, to throw out suckers, and to conserve areas favourable to regeneration (hedges, outcrops, etc.). Hence, local regeneration management is performed tree by tree, sprout by sprout, and without considering the overall tree stand. It should also be underlined that the concomitance of agricultural and forestry practices in the same area is propitious to argan regeneration, particularly germination, due to presence of protecting areas such as hedges, small walls, and terraces. This opportunistic management of natural regeneration leads 1) to favour heterogeneity of tree age classes within tree stands, and 2) to a kind of genetic laying out (tracability) and choice of trees to be conserved. Regeneration and exploitation are conceived concomitantly.

As well as the holm oak matorral case, peasant farmers in the argan forest do not perceive the overgrazed areas with dwarf argan as degraded or sacrificed areas, but as temporary useful resource-spaces with intact potential to eventually return to more strongly forested states if the need or necessity arose for the local population, because of the a strong malleability of the species.

- Forest *agdal*, a possible basis for shared management objectives?

The Moroccan Forestry Administration has now explicitly recognized the importance of taking into account local populations' constraints and wishes in order to achieve efficient forest management. Participation and concertation are also emphasized, as claimed in the National Forest Program adopted in 1999 which promotes "a new approach which combines strategic planning, and long term, decentralized and participative processes [which are] necessary to improve the success rate of projects... and to improve livelihood and incomes of rural populations through a rational, sustainable, and participatory management of natural resources" (MCEF, 1999).

The main problem is still how to put these good intentions into practice, and to accept a better sharing of competency and power in matter of forest management (Genin et al., 2007). We believe that the development of participatory actions based on the *agdal* concept could be a useful instrument in order to bring together the traditional and foresters' visions of forest management. In fact, there is already a certain synergy in *agdal* management, particularly in the argan forest region. Firstly, because local people are increasingly considered as institutional partners by forest authorities, through local associations and Communal Authorities which have decision-making powers for *agdal* opening and closing dates. Secondly, because in some parts of the argan region foresters are considered as customary stakeholders, associated with the image of patron saints who were historically the actual mediators of forest management (Simenel, 2010). In fact, certain forms of compromise and collaboration take place informally on the basis of *agdal* management. In some cases, argan forest is divided into two parts: the foresters' *agdal* (*agdal Iboughaba*) and the Ancestors' *agdal* (*agdal id babn's*) with differentiated uses rights. Moreover, foresters are sometimes asked to involve themselves in tree management in private fields, and *agdal* practices tend to extend out of the state-owned forest towards the overall territory covered by argan trees. Furthermore, these dynamics tend to promote informal co-management and a certain sharing out of responsibilities for the argan forest's future.

Hence, the *agdal* concept fulfils a common main objective - resource conservation -, a shared condition - a clear identification of users -, and a shared elementary action - temporary respite from use. In this sense, it could a basis for finding original solutions for better coordination between the stakeholders, and for more efficient environmental governance (Paavola, 2007).

## **Conclusion**

Traditional forest management in South Morocco presents specific traits which have demonstrated to have a positive impact on the biodiversity of landscapes and the perpetuation of high quality ecosystems in this semi-arid region. However, this diversity is always related to its functions for satisfying different types of needs for local livelihood. In this sense we can introduce the notion of "biodiversity of functions" which could be a useful indicator as a basis for assessing practices and their impact in these typical domestic or rural forests. Moreover, the role of these rural forests, their environmental and socio-economic services cannot be understood outside the overall functioning of the local agro-pastoral system and the socio-territorial organization of Berber society. Traditional territorial structures, and their associated underlying logic inherited from history and long term nature-culture interactions (Berque, 1978; Ilahiane, 1999), are too often poorly understood and undervalued by experts and rural development specialists. Notwithstanding, they have continued to exist for centuries and could be very instructive for developing renewed strategies for sustainable development of the Berber rural and forest management system.

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