



## Ingenious agricultural heritage in cold oases connected to collective grazing areas (Haut Atlas, Maroc)

<http://www.fao.org/giahs/giahs-sites/httpo3faoorgid31410/oases-system-in-atlas-mountains-morocco/fr/>

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## SUMMARY AND KEY WORDS

In the High Atlas mountains of Morocco, cold oases connected to rangelands and collective grazing areas have been created by Amazigh people despite extreme climate conditions. Throughout centuries of isolation, they have maintained their cultural heritage (agricultural, social, artisanal and linguistic). These people and their culture are today recognised by the Moroccan Constitution as an integral part of national identity.

Over many centuries, they have developed astute systems to manage natural resources, that are still in place today, to ensure food self sufficiency. Indeed, varieties of wheat, barley, corn, alfalfa, apricots, almonds... are exceptional, as well as varieties of aromatic and medicinal plants. There is also one bee species, and associated biodiversity (fishes (salmonids), mammals, reptiles...).

The rational use of rangelands for grazing is well established; fertile areas (agdals) are controlled by precise regulations dependent on rotational system (fallow time, and grazing pressure limitation). Water management is controlled by a local hydraulic and legal culture: century old conducts: khetaras, and customary right and institutions.

The authors are grateful to IFAD<sup>1</sup> (through OXFAM<sup>2</sup> Italia) to FAO<sup>3</sup> programme GIAHS<sup>4</sup>. They describe an “ingenious agricultural heritage system” in Imilchil & Amellago: biodiversity & associated biodiversity, water & soil resources, cultural heritage, income generation for women , and tourism potentialities.

Measures are proposed to dynamically conserve this culture and its associated biodiversity, in the present context of economic, cultural, technological globalisation.

This paper<sup>5</sup> is a result of a fruitful partnership between IFAD (financing this study to FAO through OXFAM Italia<sup>6</sup>), GIAHS programme, focal institution INRA<sup>7</sup> Maroc, the French ministry of Agriculture (CGAAER)<sup>8</sup>, local partners Adrar<sup>9</sup> and ORMVAT<sup>10</sup>: in itself, this partnership is already an achievement of cultural diversity, involving 6 languages, including Latin, and connected cultures and know how<sup>11</sup>. They would also like to thank the Conseil Général du développement agricole (Morocco), for its support and advices.

**Key words :** cold oases; agdal; khetara; seguia; ingenious agricultural heritage; cultural values; Amazigh identity ; customary rights; jmaa; urf

<sup>1</sup> International Fund for Agricultural Development

<sup>2</sup> Oxford Committee for Famine Relief

<sup>3</sup> Food and Agriculture Organisation of the United Nations

<sup>4</sup> Global Ingenious Agricultural Heritage Systems / Systèmes Ingénieux du Patrimoine Agricole Mondial, SIPAM

<sup>5</sup> in itself, this partnership is already an achievement of cultural diversity, involving 6 languages, including Latin, and connected cultures and know how . Some species names are in French , some varieties names are in Amazigh, all species names are in Latin.

<sup>6</sup> Initially UCODEP, Unité et Coopération pour le Développement des Peuples

<sup>7</sup> Institut National de la Recherche Agronomique

<sup>8</sup> CGAAER is a high level advisory body to the Minister, one author is presently member of CGAAER, Conseil Général de l'Alimentation, de l'Agriculture et des Espaces Ruraux.

<sup>9</sup> this means in Amazigh: mountains

<sup>10</sup> Office Régional de Mise en Valeur Agricole du Tafilalet , ministère marocain de l'Agriculture

<sup>11</sup> not to say : « Weltanschauung » , vision of the world

# 1. LOCATION, CONTEXT

## Location:

The Imilchil-Amellago site is located on the Eastern High Atlas of Morocco. It lies at 2000 m above sea level.

## Context:

It is submitted to extreme climatic conditions, as well as to scarce fertile soil resources. (Actually, arable soil is THE limiting factor).

## Population:

The people of tribes Ait Marghad and Ait Hdidou (38.000 inhabitants) live on 309.000 ha, whose only 2% are arable. These tribes are Amazigh (Berbers, pre Arabic inhabitants). Roles are strictly dispatched between men and women; this in turn implies that to address specific issues, it is necessary to target specific groups: for instance (women) seed management, fire at home, harvesting or (men) farming, house building, cattle husbandry.

### **Photo 1: Imilchil cold oasis in winter**

between mountains, rangelands and small fertile plots at the foreground (photo Dr Saïdi)



The Imilchil-Amellago cold oasis system integrates three special components:

- \* limited availability of small fertile plots along wadi (rivers), subject to specific connected water management
- \* arid rangelands accessible all year round,
- \* and pastures or fertile/wet rangelands subject to traditional old management and restricted access.

These indigenous people have overtime transformed the small cold oases and vast rangelands of Imilchil-Amellago into a model of sustainable and rational development. With the aid of knowledge, hard work, skills, they have been able to face the various uncertainties of a harsh environment.

With strong community of solidarity and discipline, these people have developed a self sufficient cold oasis system.

In addition to noteworthy agricultural diversity, lakes, mountains and plateaux, valleys, oases, caves and desert contribute to confer to this area an exceptional natural heritage. On the other hand, the cultural heritage includes expertise, architecture (ksour (compact cities)), customary rights, and associations to manage natural resources, grazing and water management.

This geographical area provides food and other necessities to local populations, as much as: water, wool, medicinal plants, fire wood, wood for construction, as well as others needs.

However, this system is threatened by globalisation and climate change at institutional, economic, cultural, physical and environmental level.

## 2. BIOLOGICAL DIVERSITY (AGRICULTURAL & CONNECTED)

### 2.1. Rich agricultural biodiversity

#### 2.1.1. Plants

Agricultural plant diversity is highly rich;

- According to an inventory by INRA Maroc, there are 80% local varieties among the 105 cultivated varieties, dispatched through 53 species:

**Table 1: Agricultural plant diversity**

Cultivation	Number of species	Number of varieties	
Cereals	7	14	<i>Triticum durum</i> , <i>T. aestivum</i> , <i>Hordeum vulgare</i> , <i>Zea maïs</i> , <i>Secale cereale</i> <sup>12</sup>
Legumes / pulses	7	25	<i>Vicia faba</i> , <i>Pisum sativum</i> , <i>Lens culinaris</i> , <i>Phaseolus vulg.</i> <sup>13</sup>
Vegetable	11	20	<i>Solanum tuberosum</i> , <i>Daucus carota</i> , <i>Brassica campestris</i> , <i>Cucurbita maxima</i> , <i>C. pepo</i> , <i>Lycopersicon esculentum</i> , <i>Capsicum annuum</i> , <i>Solanum melongena</i> , <i>Cucumis melo</i> , <i>Citrullus vulg.</i>
Fruit trees	13	31	<i>Juglans regia</i> , <i>Prunus dulcis amygdalus</i> , <i>Ficus carica</i> , <i>Malus pumila</i> <sup>14</sup> , <i>Prunus persica</i> , <i>Punica granatum</i> , <i>Vitis vinifera</i> , <i>Olea europea</i> <sup>15</sup>
Trees for wood	6	6	<i>Populus alba</i> , <i>P. nigra</i> , <i>Tamarix gallica</i> , <i>Nerium oleander</i> , <i>Salix spp.</i>
Condiments / spices	9	9	<i>Allium sativum</i> , <i>Cuminum cyminum</i> , <i>Trigonella foenum graecum</i> , <i>Mentha viridis</i>
<b>Total</b>	<b>53</b>	<b>105</b>	

Biodiversity is rich, because of a broad range of edapho-climatic conditions: dry and high rangelands, rivers beds... and very fragmented areas of cultivation.

In these cultivated areas, there are for example, 3 varieties of durum, produced by 3 'farmers diversity units':

<sup>12</sup> + 2 minor cereal species : ("tafsoute"): *Pennisetum typhoides*, & ("anelli") *Panicum milliaceum*

<sup>13</sup> + (« ikiker ») orobe *Vicia ervilia*

<sup>14</sup> Newly introduced in the cold oasis, bright extension

<sup>15</sup> Introduced during the '80ies: *Prunus armeniaca*, *Cydonia oblonga*, *Prunus domestica*, *Pyrus communis*

- = 'irks', a thin ear variety (4 rows)
- = 'Abrioun': short, white ear, with black ribs; 6 rows; high quality for bred and semolina
- = 'Tialaline': 6 rows, good quality, good yields (45 quintals /ha)

- Applied biodiversity: medicinal, and aromatic herbs are carefully known and recovered by women<sup>16</sup>, as well as herbs used for natural dyes



**Photo 2 : Juniper**

(photo Dr Saïdi)

**Table 2: Applied biodiversity**

Species	Common name
<i>Thymus commutatus</i>	Thyme
<i>Teucrium polium</i>	Germander
<i>Artemisia mesatlantica</i>	Wormwood
<i>Artemisia nigrei</i>	Wormwood
<i>Mentha rotundifoila</i>	Round leaf mint
<i>Calamintha grandiflora</i>	Calamint
<i>Teucrium polium</i>	Germander
<i>Rosa damascena</i>	Dades rose
<i>Juniperus thurifera</i>	Juniper
<i>Ruta montana</i>	Wild rue
<i>Citrulus colocynthis</i>	Coloquint
<i>Salvia lavandulifolia</i>	Sage
<i>Lavandula brevidens</i>	Wild lavender
<i>Capparis spinosa</i>	Capre
<i>Peganum harmala</i>	Harmel
<i>Ononix natrix</i>	Yellow bugrane
<i>Nerium oleander</i>	Oleander

<sup>16</sup> this local knowledge is being lost, because the younger generation tends to rely on modern technology



**Photo 3: Dades rose**

### 2.1.2. Animal husbandry:

**Table 3: Animal biodiversity**

Animal husbandry	Number of races	endemic
Sheep	2	D'man, Rahali
Goats	3	Tacherguite , Rahali
Cattle	2	Local breed and crossed
Donkeys, horses	2	
Camels	2	
Dogs	2	Atlas dog
Poultry	2	1 local breed
Honey Bees	2	<i>Apis mellifera sahariensis</i>

90 % of meat production



**Photo 4: Apis mellifera sahariensis**

Animal husbandry is primarily pastoral; over grazing is causing heavy deforestation: in only two generations, entire cedar and red juniper forests have disappeared. Erosion is accelerating, because water or wind can move heavy quantities of soil.

Consequently, there is a significant siltation in water dams, which in turn reduces the capacity of these dams to afford abundant or clean drinking and irrigation water. This ultimately challenges

national water policies<sup>17</sup>.  
 Deforestation is irreversible with the ongoing climate change.

## 2.2. Connected biodiversity

### 2.2.1. Plants:

There are 445 catalogued plant species, and 30% are endemic. Many of them are rare, or indangered. According to the strict dispatching of roles in the local community, it incombms to women to collect fire wood and brush wood; but their excessive collection leads to further degradation of the vegetation, and in turn to more severe erosion. This ultimately chalenges national policies for drinking & irrigation water.

Some species indicate this degradation:

in mid mountain range areas: *Peganum harmala*, *Hammada scoparia*, *Hertia maroccana* and *Ononis natrrix*...

on the plateaux: *Peganum harmala*, *Hamada scoparia*, *Reseda luteola* and *Reseda alba*.

High mountainous areas are very diversified, as they are home to 57 species. (*Ormenis scariosa*, *Retama dasycarpa*, *Prunus prostrata*, *Stipa nitens*, *Buxus balearica*, *Adenocarpus anagyrofolius*...) In wet areas (where soil is rich and the grazing potential is high) one finds: *Helianthemum sp.*, *Aristida sp.*, *Stipa parviflora*, *Artemisia herba alba* and *Retama sp.*

### 2.2.2. Animals

As the terrain is difficult to access, it is home to a varied animal population, which lives in relative security:

Vertebrates species inventory ( Southern High Atlas)

**Table 4: Endangered species**

Class	Nbr.	Endemic	In danger	Red List IUCN
Birds	115	5	20	2
Mammals	37	3	10	9
Rentiles	43	6	12	1

Among endemic vertebrates, may be mentioned:

- Birds: *Chlamydotis undulata*, *Picus vaillatii*, *Sylvia desentricola*, *Phoenicurus moussieri*
- Mammals : *Elephantilus rozeti*, *Atlantoxerus getulus*, *Gazella cuvieri*, *Ammotragus lervia*
- Reptiles : *Bufo brongersmai*, *Quedenfeltia moerens*, *Quedenfeltia trachyblepharus*, *Lacerta andreanszky*, *Chalcides montanus*, *Vipera monticola*

Biodiversity remains under threat, 12 vertebrates appear on the IUCN red list: among them:

- Mammals: *Panthera pardus*, *Hyaena hyaena* , *Ammotrogus*

<sup>17</sup> and, as consequence of a speed run between siltation and water demand, new water detention capacities are required

*lervia, Gazella dorcas, Gazella cuvieri*

**Conclusion:** Morocco is home to significant endemic biodiversity; this cold oasis and rangelands reflects this in every way, because of climatic, topographic, pedologic diversity of the environment.

### **3. INGENIOUS SYSTEMS AND CONNECTED CULTURES**

There are strong links between the above mentioned biodiversity and the associated culture of Imilchil Amellago; these can be summarised as “ingenious heritage systems”, and as such this site is now registered by the Food and Agriculture Organisation , on the list of “Globally Ingenious Agricultural Heritage Systems” (GIAHS) since 2011. (see: <http://www.fao.org/giahs/en/>, also in French (SIPAM), Arabic and Spanish)

#### **3.1. Biodiversity supports culture**

##### **3.1.1. Food security**

Agricultural production in Imilchil - Amellago agro-system contributes to the balanced diet of local populations.

== Meat: Sheep and goat grazing is the main activity in this area, and their forage is mainly provided by the rangelands. Some plant species are harvested by women in summer and stored for winter months. The meat is primarily mutton ( and goat).

== Cereals (mainly durum wheat and barley), are used for bread and couscous production, which are elements of utmost importance in the local diet. Durum wheat varieties have specific uses . Irks is the variety that is intended for local breads especially Tahtoucht (this bread can be stored for longer periods (long journeys on rangelands) and may soften when exposed to humidity). The Abrioune variety is of high quality, and is used for baking bread and for preparing semolina. Maize semolina is consumed with whey. It constitutes the daily meal for all the families during the period of cow lactation. Rye is prepared in soup for breakfast or dinner , especially in winter .

== Pulses are the main dietary source of protein for the local population.

== Potato is the second source of carbo hydrates energy.

== Fresh consumption is most sought after , especially for broad beans , peas and haricots. Other vegetables are important, and fruits constitute an important part of the diet equilibrium, such as figs, apricots, almonds.

== Thanks to many melliferous species, the honey production is significant in the region. Bee keeping is an ancient and widespread activity, and provides an important resource for the population. In recent years, dry weather conditions have affected this activity. The prevalent melliferous species are: *Thymus spp.* *Hertia maroccana* , *Zilla spp.* *Adenocarpus bacquei* , *Teucrium fruticans* , *Ononis natrix* , *Launea arborescens* and *Buxus Balearica* .

##### **3.1.2. Water**

Water percolation to groundwater is improved with plant biodiversity; the water filters through the soil to wadis and recharges the reservoirs.

It is vital to humans, their farming ... and wildlife.

##### **3.1.3. Habitat**

== earth : rammed earth construction has been the prevalent building technique until the arrival of

concrete. The unregulated and rapid development of concrete constructions also opposes the architectural traditions of the region and its cultural diversity.

Further more, concrete does not isolate from heat in summer, nor cold in winter (they can reach extrem values).

==Consequently, people use more fuel wood in concrete houses in winter, and needs for wood are rising sharply: today, these needs are covered mainly by polar wood and reed. It is necessary to encourage their planting: they also protects the dykes along wadi (water currents) against floods.

But however, in recent years, inhabitants are now convinced that despite their safety , buildings of concrete are not adapted to the climate of the region. Adobe construction allows to buffer the heat of summer and the bitter cold of winter without resorting to heating.

**Photo 5: traditional adobe building in High Atlas**



==Timber wood: the demand for timber is such, that illegal logging is increasing. As forestry used to provide quality timberwood for making ceilings of Adobe houses, they have been significantly degraded. Juniper or Adghmam (*Juniperus spp.* ) is a much rarer plant, and in some areas it is totally extincted. It is therefore necessary to regulate the use of these resources as the climatic conditions are not favorable for the regeneration of different local species that are under threat of extinction, or to promote substitutes like Eucalyptus from plantations in other regions, in order to provide timber for construcion.

#### **3.1.4. Wool for winter clothing in mountainous regions**

The availability of wool as sheep co-product, allows for woving winter clothes, mainly burnous and jilbab for men and, for women, tahandirt . The latter expresses through its colors and motifs, tribal identity . The wool is also used for the manufacture of blankets and carpets, they are essential in every home.



**Photo 6: Tahandirt patterns, according to tribes**

(photo: Dr Saïdi)

These clothes are the traditional dress and pride, they also are essential during the celebration of weddings (Mousseem), birth or any event at tribe or village level.

### 3.1.5. Medicinal use

The know-how of rural women about medicinal plants is highly bright and diverse. Knowledge vary with womens' age , plant richness of their immediate environment and probably also with the family income and distance to a health center. Rural women are today developping a new trust for pharmaceutical products, and their expertise is going lost; up to now, it is so far kept by some senior persons. Older women have in fact more information than their juniors, for girls know only about the most common species.

Over forty species of plants are used by local women for their medicinal properties. The abundance, intensity of use and the area of distribution vary from one species to another and also from one ecosystem to another. Alili (*Nerium oleander*) , Awjtam (*Erinaceae*) , Flyou (*Mentha pulegium*) , Izaghyoul (*Lavandula multifida*) , Iziknou (*Artemisia herba alba*), Lharmal (*Perganum harmala*) are widely used and are found in all ecosystems.

### 3.1.6. Firewood

Nearly sixty ligneous species are exploited in the area for domestic needs. Rural women hold unparalleled expertise about species of firewood. They distinguishes between species by morphological characters such as the shape and size of the plant, foliage, flower color, or smell, difficulty to cut or uproot. Women's preference is for slow combustion, no smoke, nice smell, lack of thorns and low humidification after the rains.

### 3.1.7. Immaterial, cultural heritage:

== Rites: When mowing sheep , the owner of the animals slaughters a mutton and prepares a meat meal he offers his guests and shearers . A similar practice marks the harvesting and threshing of wheat and barley : before starting work, the farmer cooks a meat meal (slaughtered muttons) for notables and workers. Also, symbolic meals are prepared during the repair of the irrigation system .

These feasts used to be held to thank those who helped in the work and who have demonstrated sacrifice for the community.



**Photo 7: Brides at Imilchil engagement moussem**

== Cultural heritage: multi tribal festive meeting: Imilchil engagement moussem or *Agudoud n'Sidi Ahmad Oulmghani*

Each year a moussem stands after the grain harvest and earning almonds in mountains (usually the third week of September). This period also corresponds to the return of herds to mountains agdals (see further down). This is an appointment of great economic importance for social and cultural ethnic groups and families. It attracts more than 20,000 people for 3 days. This is a unique opportunity each year for pastoralists, poets, farmers, to meet and organise marriages of their sons and daughters who have reached the age where its name “engagement moussem”. This is also an opportunity to exchange breeding animals, mules and other goods. Currently, the ' Engagement Moussem ' brings together mountain communities across the High Atlas and is a place of exchange and important communication at local, national and international level. Moussem is being proposed by Midelt prefecture to UNESCO office in Rabat, in partnership with Moroccan Culture ministry, to be registered as world cultural heritage.

== Tales : Ait Ihya village is well known for its famous poets nationwide. The population of Imilchil Amellago is reputed throughout the Kingdom by its attachment to their identity. For it was able to keep traditions and ancestral customs, as it remained, until recently, an enclave in the heart of the High Atlas. Their Berber tales and riddles is a rich and diverse cultural heritage.

== Music festival: Since 10 years, a festival of traditional music has been joined to the moussem, to promote songs and dances of Ait Hdidou and Ait Marghad tribes, for they are unique to Morocco; the presidents of Imilchil and Bouzmou commons wish that an eventual registration of Engagement Moussem at Unesco world heritage, integrates this festival.

### **3.2. Culture cares for biodiversity**

The following part presents how human activities may care for biodiversity.

#### **3.2.1. Seed storage and management**

Seed is the strategic input in cold oasis agriculture. Each farmer operating a given area, organises its own seed procurement from one year to the following, and local varieties grown under the same agricultural practices since decades, become specific to these places. This specific adaptation is

used by farmers to distinguish between areas of crop species, and also serves to name the species. The seed is removed from the production immediately after harvest (by women) and placed in the storage area called " Lakhzin " . This area bears a sacred character and is managed exclusively by the head of the family . Thanks to the cold and dry climate , seed conservation in this region does not pose any problem. Small seed other than cereals (alfalfa , turnip, onion) , are most often present in small quantities, they are contained in earthen pots. In each village , there is often a seed holder of one or more cultures in the area

### **3.2.2. Agri-Culture systems**

The adopted cultivation systems use techniques that are well adapted to the interconnected 3 components (oasis, open rangelands, restricted pastures). The practice of agro forestry (combination of tree and ground crops) , crop rotation ( crop succession in time and space ) contribute to improving soil fertility and conservation .

Animal husbandry, integrated to cropping, also uses the open arid rangelands all year round and the restricted pastures and rangelands . The practice of transhumance in exploiting these rangelands has the potential to ensure the continuous feed of livestock, while ensuring vegetation regeneration . Improving soil fertility contributes to soil conservation, and consequently to the maintenance and regeneration of the vegetation cover. Both contribute to the aquifer recharge, all which is the basis for the system sustainability, and essential to the preservation of natural resources and balance of basic natural cycles. succession in time and space ) contribute to improving soil fertility and conservation .

✓

The technique of " khattara " involves draining by gravity the aquifer through a tunnel . Every 50 to 100m, depending on the nature of the ground, a channel is dug vertically to communicate outside and facilitate khattara maintenance.

### **3.2.3. Management of soil and water**

==Fertile land is scarce (less than 2% of the land area ) , and builds THE limiting factor. Cultivated fields are located along the ephemeral rivers (ouadi) , and vulnerable to violent floods. Dykes are built against the current streams to protect plots. In recent years, due to climate change , summer storms are more violent and a majority of these dykes is not strong enough anymore to contain floods... Farmers carry out planting poplar , reed and willows along river beds to protect the banks against erosion.

== Water Management : In the area, irrigation system dates back to centuries. Beyond its vital importance to the oasis populations , it is a cultural heritage of inestimable value .

- ✓ Streams and springs are considered public goods of local communities
- ✓ Wells that are dug by individuals, are either open to public use or reserved for the exclusive use of the digger
- ✓ seguia or irrigation canals belong to smaller groups , but with a stronger right to control communities .
- ✓ khattara : As the flow of water currents is variable along the seasons, scarcity must be managed during the dry seasons. In the southern part of Amellago, abstraction of groundwater sources by the method of khattara is a common technique . There are currently seven functional khattara

### Photo 8: terraces to expand cultivated land

(photo: Dr Saïdi)



- ✓ Jmaa manages the common water : The Jmaa is the elders committee, representing all the ethnic units constituting an ethnic group or tribe. Its power is recognised morally and applies without physical force. In irrigation , the role of Jmaa had and still has an unparalleled importance . Regarding flowing water taken from a thalweg through a diversion dam (uggug ) and a supply channel ( targa ) or a source ( taghbalut ) , the water authority remains today the case of the local community.

The system governing the distribution of irrigation water is of customary type, called *urf* , ensuring the individual and collective rights for the use of water. The Jmaa may punish crimes relating to any offense regarding agreements settled (since centuries) about irrigation water. This tradition is still perpetuated today; obviously adaptations are necessary to the new political , economic, social and cultural context.

Indeed, the " modern" right is unfortunately not always compatible with the customary law ... and Moroccan Justice does not take into account *urf* (customary rights), which may lead to unextricable situations. In this context , associations of agricultural water users are set up in “modern” right, and settle internal detailed rules of procedure about possible offenses and sanctions.

#### 3.2.4. Managing animal husbandry : Agdal

Animal husbandry relies on transhumance, and feeding happens outdoor, based mainly on pastoral resources. This system occupies the foothills and regards the rearing of sheep and goats *Rahali* . It has been adopted by former nomads who have abandoned their long hikes and reduced the amplitude of movement to paths from the plains to plateaux and surrounding mountains, taking advantage of the complementarity between the mountains , foothills and lowlands. This joint operation is the best way to buffer the effects of weather conditions and ensures revegetation. As part of this system, rangelands generally have a collective traditional status. They are operated under customary law, *urf*

The oldest typical form, that characterises livestock keeping in the region is herd movements

between the three main ecological units called " Agdal " (grazing whose opening is regulated). There are three types of agdal:

- ✓ The agdal that are open all year and are set at rest by the needs of the beneficiary population; they fall within villages ( Agdal n'Ighram ) . Users of these courses are mainly sedentary people of the village and former nomads with less than 100 heads of small ruminants.
- ✓ The agdal closed to grazing between March and June (Example: Ait Brahim Izlan, Ait Iazza Izlan) . These are the most important agdals in terms of area . Each fraction operates its Agdal with transhumant ( contractors) from lower elevations to the customary time . In case of drought , this date can be changed.
- ✓ Smaller agdal (10 hectares) operated from July to March and are dedicated to cattle and horses . Only sedentary people from the ksour (villages) have the right to these courses .

As per water disputes, modern right has the worst difficulties to integrate urf, regarding animal husbandry management; judges may simply ignore customary right, and pronounce an inadequate sentence.

## **CHALLENGES, THREATS AND OPPORTUNITIES:**

With the opening experienced by Morocco from the late 19th century, the modern administration is completely or partially substituted for jmaa at managing multiple fields of life. Cohabitation between two forms of institutions becomes the rule, and this is often difficult. The organisation of the territory is deeply transformed under the influence of new endogenous and exogenous factors . Of these :

- == The establishment and forced settlement of the tribes, including nomads ;
- == The increase in quantitative and qualitative needs of the population due to the population explosion, and road building, or electricity connection (and consequently TV and radio);
- == Exodus , national migration to large low land cities, including international migration to Western Europe for example , and outward mental opening (monetisation of rural life, heavy presence of the media , school enrolment, increased urbanisation, cultural colonisation... ) ;
- == Climate change is marked by a higher occurrence of longer droughts , and more violent weather events.

This set of factors and pressure leads to a strong degradation of natural resources : water, soil, flora and fauna.

## **1. RESULTS AND OUTCOMES**

== The vegetation is improperly cleared, some rangelands being re cultivated, when they are not simply overgrazed; in 2 generations, deforestation has destroyed entire cedar and juniper forest areas

== This overexploitation of natural resources, combined with an increase in climate accidents, leads to an intensification of erosion : water reservoirs are being silted much faster than expected, and government faces the urgency of building new dams, to secure water provision to cities (where demand increases)

== The traditional social structures ( jmaa ) being weakened, they are less able to support the above mentioned management systems . The khattaras for example are poorly maintained

- == The collective wedding ( Moussem ) is being somewhat out fashioned, as well as the experience of traditional midwives and traditional gynecology
- == The local know-how relating to the conservation of biodiversity is being lost Conversely , new varieties are introduced ( cereals, vegetables, fruits ( apples) milk cows) and the local heritage lessens
- == In particular , the use of aromatic and medicinal plants is declining , and traditional medicine is used less and less
- == Local knowledge on adobe construction is also disappearing
- == The local oral cultural heritage is discredited ( stories, songs and rituals (connected to harvesting, grain milling and to family celebrations) )
- == Local folkloric groups are not included in major national festivals
- == The copyrights are not protected ( Piracy of local cultural heritage: poetry, dress, etc. . ) .

## 2. THE WAY FORWARD:

‘Ready to use’ packages of technical solutions, have long been put forward to solve the above diagnosed problems; they have failed because these technocratic approaches were conceived outside the sociocultural context of the targetted populations; they were not “bought in”. Various administrative systems are today conflicting often painfully, for modern and traditional local institutions are superimposed , they may assimilate each other or cohabit or simply reject each other. In this context , the protection of biological resources is relegated to second place: this raises questions about the future of new coming generations in areas as fragile as the mountains and oases.

*Thus, in order to preserve the rich flora and fauna in Atlas in general and in Imilchil Amellago specially, any initiative should primarily build on reconciliating institutions ( traditional and modern ) and should boost human resources. It is essential to promote social initiative and the emergence of project leaders: initiatives “bottom up” should be encouraged. Women’s role has been very important for the whole performance and endurance of this system: women’s initiative should be fostered, through adequate workshops and sensitisation.*

In particular , the authors recommend to support partnerships being built with :

- == Local NGOs, whether small or flawed they may be , in particular:
  - a union of poets is created , its activities should be supported, so that they defend their copyrights and better participate to national cultural events
  - the existing union of mountain guides should also be supported to provide better service in response to touristic demand

- == International NGOs (like Oxfam), that have been involved many years in local development
  - == Moroccan institutions (Office Régional de Mise en Valeur Agricole du Tafilalet, Haut Commissariat des Eaux et Forêts et de Lutte contre la Désertification, Agence du Sud, Agence des oasis...)
  - == International agencies including UNESCO, UNDP. In particular, Unesco should take into consideration the request of the prefect of Midelt, to register the engagement moussem as Unesco World Heritage . For its part, FAO has classified the site Imilchil Amellago among the pilot sites GIAHS.
- Parts of this site are also already ranked among the areas of UNESCO Biosphere and among wetlands in the Ramsar Convention.

The authors would also like to recommend to :

- == Reboost the local museum Imilchil, that presents heritage, and define its action within a sustainable process, including long term funding; edit CD and booklets presenting song and tales, legends, and dances
- == Better include the potentialities of this site among national priorities , which aim to promote small-scale agriculture (resources of plan Maroc Vert, Pillar II, are considerable): promote green tourism and better signal touristic roads and remarquable sites; broadcast leaflets on biodiversity;
- == Promote food handicraft (example: packaging of honey), woving of traditional carpets, blankets, coats; helping families (women) to breed small livestock (poultry);
- == Address energy demand and reduce pressure on local fire wood or ligneous products
- == Address overgrazing concerns, and identify solutions to safeguard the principles of present traditional animal husbandry, in reinforcing traditional law , and promoting in a participatory process new forrage production
- == Leverage the law on labeling local products : this will certify their origin and quality and add value to some typical products (Almonds? Honey? Bread? Semolina? Clothes?), or services (hiking, rock climbing)
- == Take better advantage of the on going regionalisation process, which is now enshrined in the new Constitution , and of the recognition of the Amazigh culture, which is now referred to as "component of the Moroccan identity": cultural globalisation may be fought through better recognition of this identity and its components

More generally, a dynamical conservation of this biological and cultural diversity cannot flourish under broad commercial and financial globalisation: the authors recommend to take advantage of waiver possibilities in international trade agreements, allowing regional trade areas, to facilitate the development of regional agriculture frames, and to promote food self sufficiency and to fight impoverishment.

Having regard to climate change, the authors recommend to facilitate cross cutting information exchange, so that the cold altitude oasis in Maghreb which are dispatched not only across the Moroccan Atlas , but also in Algeria mountain regions, exchange their success stories (or their failures): in this regard, the GIAHS programme may offer a useful workframe.

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