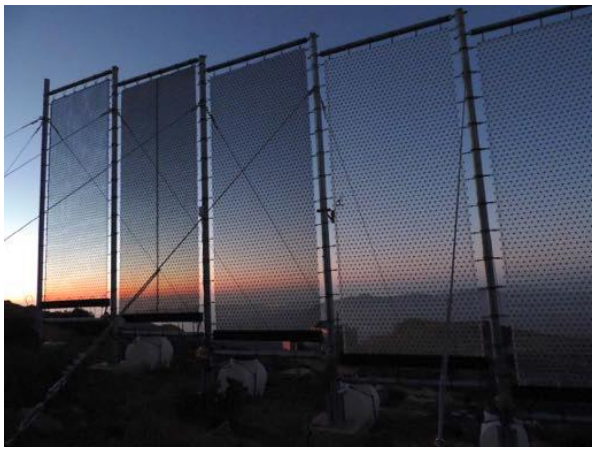
SUEZ – Institut de France Awards

Winner of the **"Access to Essential Services"** category

2017-2018 edition

"From a deserted to a reforested landscape",
Morocco

Dar Si Hmad Association for Development, Education and Culture



Structure

Dar Si Hmad, created in 2010, is a Moroccan non-governmental, non-profit organization whose missions are geared towards education, integration and the use of technological ingenuity. Its approach: to promote local culture in low-income communities in South West Morocco and create sustainable initiatives in order to help populations to learn and prosper.

Context

The Aït Baamrane Provinces form one of the most underprivileged regions in Morocco: omitted from state plans for economic development, very few natural resources and an aberrant lack of infrastructure. Made worse by poor governance, the General Development Index is extremely low. The climatic situation constitutes an additional source of stress with recurrent drought, and rare, yet life-threatening torrential rains which destroy everything in their wake. Since the 1960s, massive rural exodus has caused total havoc in the countryside. Farming terraces, essential for agriculture in arid, mountainous environments, seguias, water supply systems in the mountains, or khettaras, traditional horizontal wells for water supply, have all been abandoned. This neglect of traditional agricultural and water practices is resulting in techniques which are essential in order to adapt to desertification being forgotten and lost, whilst poverty indicators are constantly on the rise.

Subsistence farming is practically non-existent, households namely surviving thanks to money sent home by men working in the city or even outside of Morocco. From a social viewpoint, this deprives children of a masculine presence, and is at the origin of family abandonment and other related tensions. Land degradation, desertification as defined by the FAO, is consequently contributing towards a vicious circle which is inevitably leading to the social desertification of the countryside. Unworked land is seeing its humus decrease, trees are dying off and undergrowth is drying out. Numerous villages have become sparsely populated in the face of these harsh conditions. Only the poorest, mostly women, children and the

elderly remain, unable to leave or work the land owing to a lack of funds. According to the last national census in 2014, 732 households around Jbel Boutmezguida were concerned by this situation.

These households, which find themselves in a situation of constant precariousness, are severely affected by the lack of water during the dry season (generally from June until September). This population, traditionally cattle breeders, has seen itself forced to sell its herds during the most severe droughts (1996, 2002, 2008). This loss of cattle, linked to the loss of vegetation and land, has resulted in the drastic impoverishment of these last remaining families, leading them to emigrate towards cities (namely men).

According to regional habits and customs, women are the guardians of water and are responsible for drawing all of the water required. This arduous task requires an average of 3.5 hours / day. According to the WHO, the consumption of just 7 liters of water per person and per day by local populations constitutes the "water stress threshold" (50 liters per day being the recommended standard).

In spite of a significant decrease in rainfall over recent years (less than 138 mm), Sidi Ifni, the provincial capital, is regularly covered with a thick fog over a 7 month period, generally from October to May. In effect, oceanic air masses, cooled by cold currents from the Canary Islands, collide with dry and hot air masses from the desert. An occluded front then forms on the sea coast, whilst stratocumulus clouds form against the mountainous barrier of the Anti-Atlas mountains.

These clouds are loaded in large water droplets which can be condensed on simple contact.

In this region, the summer which is very dry and sunny, is lasting for longer and longer. A cycle of recurrent drought since the 1960s has reduced access to water. Conventionally, drinking water is taken from boreholes in water tables, whilst irrigation makes use of rainwater which has been collected and stored. Currently, boreholes are drilled ever-deeper with increasing uncertainty as to whether this precious resource will even be found. The level of water tables is not assessed and too few studies exist on water precariousness. In addition, open wells are sometimes soiled. Having become unfit for human consumption, their water has contaminated inhabitants.

In the face of this alarming observation, and spurred on by his study of the Chilean example, in June 2006, the President put in place a meteorological observation system. The launch of a pioneering project in 2010 involved 5 hamlets. Today, 14 hamlets and villages, equating to a total of almost 119 households, receive drinking water in their homes. This water, which constitutes a mixture of water from fog harvesting and borehole water, complies with the standards in force in Morocco. In addition, several test sites are in place throughout Morocco following requests from other local associations or companies looking to improve their environmental and social responsibility.

The key stake of making available a continuous clean water supply has led to a desire to pursue efforts to create dignified living conditions for communities and inhabitants around a common project, whilst disregarding their fears, rejection of foreigners or tribal splits. The need to recreate an oasis to generate the fruits of gainful employment is urgent. The improvement of the fog harvesting technique is today giving us a chance to create new hope as opposed to an old pipe dream: to reforest land destroyed by the wind, rain and sun and turn it into a federating project and pilot study for educational training programs in a landlocked region.

Objectives

General objective:

To supply drinking water to the arid hamlets of South West Morocco thanks to fog harvesting.

Specific objectives:

- **Resurrect the tradition of subsistence farming**: we want to show that like oases, damp zones can also be extended. Further still, the new CloudFisher® nets we are installing will enable us to considerably increase the amount of water collected. By guiding populations towards **agro-sylvo-pastoralism** the region's wealth will be unveiled. Fruit, aromatic and medicinal plants, honey and other products can be an opportunity for both land and economic revival.
- It is now possible to envisage the **active promotion of the region's sources of subsistence,** such as cattle breeding, apiculture, argan tree orchards and prickly pear farming, to name those that we

are currently aware of.

- **Attract increasing numbers of researchers** as regards fog harvesting, in order to find new means of maximizing water collection.

Project description

Today, this fog harvesting project is unique in North Africa. In effect, several aspects of it are innovative:

- In **technical terms,** as it consists in implementing CloudFisher® units whose yield stands at 22 liters per day per m^2, giving us a daily average of 20 tons of water harvested from fog, with a surface harvesting area of just 870m^2, on a difficult mountainous terrain, and which in spite of this, **only requires minimum maintenance.**
- In **social terms**, as **women are the guardians of this resource**. Women receive training at plumbing workshops and learn how to inform the association in the event of a malfunction or when the water supply is interrupted. These women, who are illiterate and monolingual, are trained in order to communicate with the association via text message. In addition, the water chore normally being attributed to them, their new functions and the CloudFisher® systems offer them a time gain of 3.5 hours every day.
- Since 2014 **water programs** have been put in place and taught to primary school children in schools which are not generally well provided for in terms of water and which suffer from a low attendance rate among girls.
- In **cultural terms**, traditional beliefs and ways of villagers have been shaken up: the fog, which until now was considered to be a negative natural entity, is now seen in a positive light.

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Description of the innovation

Fog harvesting nets are installed at the summit of Mount Boutmezguida, the highest mountain in the Anti-Atlas region. Boreholes serve to mineralize the pure water harvested from fog in order to respect Moroccan drinking water standards. By using a single borehole to mix fog water and by putting in place a veritable distribution system, the pressure placed on the water resource by communities is significantly lower. Innovations include work with local partners such as agents for change, putting them in contact with university academics in order to link fundamental research and rural spaces.

The objectives are to curb rural desertification by creating better opportunities and to stop land degradation by replanting trees and recreating damp zones for fruit and aromatic and medicinal plant production. Secondary objectives include giving inhabitants their confidence back by pointing out the knowledge that they already possess as regards their eco-system and ancestral techniques.

Results

14 villages today benefit from water harvested from fog. They are spread over a surface area of 32.8 km^2, for 119 households and approximately 660 permanent residents. There are a further 600 persons in a situation of “transhumance”. They return to the region to harvest argan, prickly pears, or during the school holidays in the case of city workers. In spite of a few passable tracks for vehicles, the region remains extremely landlocked.

The results achieved:

- A total of 119 households have increased their drinking water consumption from an average of 7 liters per day to 26 liters per day. They also benefit from continuous access to water.
- Gains in terms of time for women, young women and children; from 3.5 hours per day previously given over to the water chore, today the only time spent is that required to fill the troughs connected to the wells whose water level is rising.

- Access to water has triggered a return movement among populations during the argan and prickly pear harvesting seasons. Some households have paid their fixed monthly water rates (20 MAD- 2 Euro) in a single payment. The situation of beneficiary groups seems to have improved given that we can observe a return home on the part of neo-urban residents. The area is once again becoming attractive as it benefits from basic services.
- The movement underway is federating inhabitants: creation of new associations, namely managed by youngsters, even if they are not present in the region. Collective request made to rural councils to create tracks and a road, and choice of a more active / younger political representation shaped by the civil society movement, where DSH is locally recognized.

Project reproducibility

The engineer Peter Trautwein, inventor of CloudFisher® created the company Aqualonis in order to market his fog harvesting innovation. However, CloudFisher® is a trademark registered by Wasserstiftung who consequently reaps the profits from sales. As a company, Aqualonis manages all fog harvesting production, distribution and sales chains. Its clients are namely non-profit projects. As a non-profit foundation, Wasserstiftung is not able to manage commercial activities. The Aqualonis site clearly explains each of their roles.

Conditions of reproducibility

1- **Meteorological conditions**: the main pre-requisite for the reproduction of a fog harvesting project is the continuous presence of fog throughout the year (October to May in the case of this project). There are entire zones of the planet where fog could be harvested in order to "subsidize" the millions of m^3 of water used in this region of the world. Installation conditions require fine weather with no fog or wind. Fog wets the nets, weighs them down and makes them difficult to manipulate. Wind pushes the nets like the sails of a boat and simply prevents the structure being put in place.
In terms of operation, fog and wind constitute the *sine qua non* conditions for site selection. However, the meteorological definition of fog is solely linked to visibility. For its harvesting, an additional criterion consists in the size of water droplets.

2- **Geographical conditions**: prefer mountainous regions, close to the sea, landlocked and where the construction of a modern water supply system is extremely difficult, costly and makes no ecological sense. These are also regions in which the water chore constitutes an important investment in terms of time, particularly for women, and where water quality is poor and can even be a vector for illness.

3- **Cultural conditions**: the real need among populations to want to try this unprecedented source of water. The desire to join forces / have the funds to buy the nets requires a significant communication effort with respect to communities.

4- **Social conditions:** a group / association or a leader is necessary to organize, manage, establish schedules and federate energies in order to ensure the success of the initiative.

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