

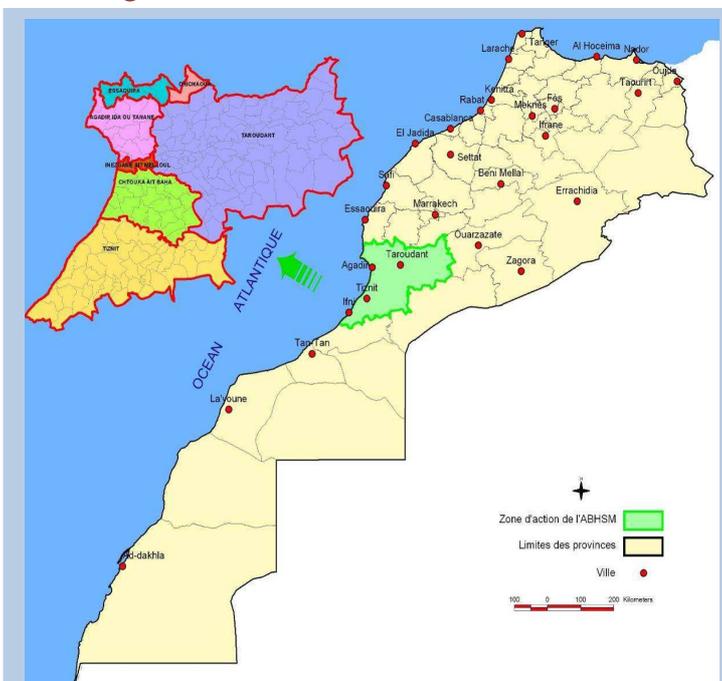
MANAGING THE WATER DEMAND IN THE MEDITERRANEAN

An example in Morocco

The Souss Massa Basin

Executive Summary

Water resources under strain from the agricultural sector...



Source: ABHSM

The water resources in the Souss Massa Basin involve a multitude of different stakeholders and usages. Agriculture is nevertheless the primary driver of the water demand in the area of influence of the Souss Massa Basin Water Agency, ABHSM (Agence de Bassin Hydraulique du Souss Massa). **Both plains specialise in agricultural activities, the Massa plain with its early vegetables and the Souss plain with its citrus fruit.** They also enjoy favourable conditions for the export market, but it is hard to keep control over the agricultural sector, which is responsible for the unrestrained proliferation of wells tapping the aquifer. The amount of land irrigated has thus increased despite the area's prevailing water shortages.

In the area of influence of the ABHSM, the total demand for water is 1074 Mm³ (which includes 994 Mm³ for agriculture alone).

... upsetting the balance between supply and demand and overexploiting the aquifer

Despite policy advocating the intensive use of surface water resources (six large dams with a total storage capacity between 345 and 364 Mm³) and studies to use non-conventional sources of water (desalination, reusing waste water), water availabilities are limited. The Souss and Massa aquifers can hardly offer more than 318 and 41 Mm³/year respectively in terms of sustainable abstractions. As a result, the balance between supply and demand has toppled; underground water resources are overexploited and the **annual drawdown of the aquifers ranges from 100 to 350 Mm³/year in the Souss aquifer and reaches almost 60 Mm³/year in Chtouka aquifer.**

Consequently, the piezometric water line has dropped by several metres; there are severe risks of salt water intrusion in the coastal zone; water quality has deteriorated; there are threats in areas of environmental interest, and the users are changing their attitudes. The effect of aquifer drawdown on the agricultural demand is imperceptible in the current situation due to the dichotomy between large, high added value earning farms and smallholdings, since the expansion and intensification of the larger holdings is to the detriment of the smaller ones.

The need for a new development framework

In response to these problems, the **policy of the authorities has been to provide additional water resources** while limiting their management of the demand principally to the generalization of drip irrigation.

The scenario to be achieved by the ABHSM Integrated Water Resources Management and Development Plan (IWRM-DP) is based on restoring the balance between the supply and demand, mainly by increasing water availabilities, whether from underground, surface or non-conventional sources.

This strategy confirms that on the one hand the same conceptual framework is sustained despite the problems encountered and the failure of previous IWRM-DP strategy to restore the balance, and on the other hand, that emphasis is being placed on the offer without really controlling the demand.

Understanding the dynamics to identify the drivers behind the demand for water

In the past, the agricultural sector in the **Souss Massa area experienced a boom in irrigated farming** with rapid development from the 1940s onwards based on economic growth rationale to justify slack regulation of abstractions. The intensive development of irrigation led to the first symptoms of overexploitation.

Indeed, the benefits for the economy provided justification for such intensive use of groundwater. During the early stages of the development of irrigated agriculture by pumping water from the aquifers, such justification was legitimate. At this stage, the main concern was to promote the profitable use of water resources to create wealth and alleviate poverty. **Yet the same rationale persists even after the appearance of the first symptoms of overexploitation.**

The economic development logic in response to the crisis was to provide more water in order to preserve agricultural activities at all costs.

Types of farm, strategy and drivers

The **farmers** in the Souss and Massa plains belong to very **different categories**. Irrigation scheme standards (traditional, rehabilitated, modern schemes, etc.) do not reflect the local realities.

Types of farm	Estimated proportion in the Souss Massa Basin
Type 1: Traditional farms	28.1%
Type 2: Diversified family farms	18.8%
Type 3: Large fruit tree farms	19.0%
Type 4: Greenhouses	4.4%
Type 5: Field vegetables	5.8%
Type 6: Large livestock rearing farms	10.8%
Type 7: Fruit tree farm investment ventures	13.1%

Source: Agroconcept / Brl

As water became scarcer, the various strategies diverged. Disinterest in farming (resilience or abandonment of crop land) or the modification of cropping patterns (reduction of irrigated surface area and changes in production systems) occurred and alternative water resources were sought, leading to massive over-scaled investment in a race to pump water from the aquifer, or to shifting land tenure.

Due to such diversity among the types of farm, specific mechanisms are necessary to implement efficient drivers that will control the demand.

Moroccan water policy and antagonism between the agricultural and construction sectors

Since 1913, the tutelage of the water sector has oscillated from the department of construction (today the Ministry of Energy, Mining, Water and the Environment) in charge of public water infrastructure, to the department of agriculture, in charge of irrigation policy. The tension between the two departments is no doubt the reason why it is difficult to coordinate action in the water sector. The adoption of the water code in 1995 and the creation of the Interministry Water Commission chaired by the prime minister did not suffice for the introduction of coherent policy for both partners. Thus, despite the huge stakes, the Supreme Council for Water created in 1981 but with legal existence since 1995 only, has not convened since 2001, which prevents the validation of strategic data.

The analysis of water policy, whether national or regional, shows that the present institutional framework is unable to bring the pumping rush to a halt, despite a regional pact between councillors, farmers and state representatives to re-balance regional water resources.

Prerequisites for all economic measures aiming to control the demand

Confronted with such a dramatic situation, the use of economic mechanisms to manage the water demand can help steer clear of the inevitable regional economic crisis brought about by uncontrolled exploitation of the aquifers. However, a number of prerequisites exist.

It is not worth introducing taxes if the taxpayers are not identified and the cost base is not measurable. The three prerequisites for the implementation of economic mechanisms to manage the water demand are intricately linked. They consist of (i) stopping the pumping rush, (ii) identifying abstraction locations and their managers, and (iii) measuring the amounts of water withdrawn at each location.

In terms of aquifer protection, these three points follow on from each other in priority; the most important thing is to stop the expansion of irrigated areas (i.e. point (i) above). Points (ii) and (iii) go even further since they lay the foundations for demand management, which can later on aim to reduce abstractions.

Stopping the pumping rush means stopping the drilling of new wells.



Source: Agroconcept / BRL

This stage is crucial because it concerns the very essence of the pumping rush. The number of abstraction locations must be restricted and the development of more irrigated land must be controlled. These are the conditions to be met to begin restricting the amounts of water abstracted.

Several tangible measures have been contemplated:

- ▶ **Direct measures** such as regulations on wells, including by marking out protection areas and prohibited areas and making the reuse of abandoned wells subject to conditions (measures to avoid land transactions accompanied by well-deepening applications), closer control of land rentals (especially community land), or even subjecting citrus tree planting to authorization.
- ▶ **Indirect measures** such as regulations for drilling companies (e.g. introducing chartered companies), controlling connections to the electricity grid or even re-designing the basis of agricultural subsidies.
- ▶ **Using satellite data** to identify and monitor the irrigated area; strengthening the enforcement of water rights and regulations, or creating local water resource management districts... are all ways of easing the problems related to controlling the irrigated surface area.

To ensure that such provisions are complied with, a transparent **sanctioning system** based on the closing down of wells or the uprooting of unauthorized crops must be contemplated.

The second prerequisite is to identify all water abstractions, their characteristics, usage, managers and owners. This reverts to regularizing the situation of all the users of the aquifer. At the end of the process, all the users are legally authorized to use the aquifer.

Thanks to this prerequisite, individual control measures can be implemented (quotas, fees...). It also secures farmers' rights and unites them and the departments in charge of applying the regulations against unruly, illegal use of water resources.

As such, the regularization process should be a high priority one among the Water Agency's actions and must be credible. It is important to avoid a series of postponed deadlines for regularization as this will discourage the farmers, who will procrastinate until the next season, not to mention that it could even amplify the number of illegal wells, drilled during the postponements, to be regularized when the time comes.

In the past, such actions have come up against two particular obstacles: cumbersome administrative procedure in order to regularize and the disinterest of the small holders in regularizing at all. The procedures should therefore be simplified and differentiated for small farmers, basing them on local district water resource management.

The third and last prerequisite is the installation of water meters to measure the amounts of water abstracted by each pumping system, along with a reliable mechanism for collecting and disseminating the information. It is only possible to switch from the management of aquifer-tapping locations to the management of the amounts of water abstracted if metering is introduced.

The Aquifer Contract gives the Water Agency's action full legitimacy when it comes to meeting these prerequisites to allow the introduction of economic mechanisms that will reconcile efficiency with equity in the sustainable use of underground water.

Some of the preliminary measures are cross-cutting to all the farms and the Souss Massa Basin, while others are specific to certain types of farm and certain areas. That is why it is necessary to define what might be called "management units" based on both resource and governance related criteria.

Economic mechanisms for better control of the water demand

Three types of mechanism exist:

1/ "No trade" mechanisms

The idea is to introduce a "usage fee" in Dhs/m³ established by the Water Agency, the government authority in charge of the water sector or the aquifer contract management committee. As regards aquifer management, the levying of such fees increases the cost per cubic metre of water available for use by a farmer. The cost is from now on equal to the cost of pumping plus the fee. Increasing the cost of water for the farmers reduces or cancels out the profit they make on certain crops and encourages the farmers to stop growing them. The abandonment of such crops or merely the reduction in the amount of water used due to the increased cost has a favourable effect on the aquifer.

The main limit of charging fees to manage the aquifer is that the method is not precise. It is very difficult to set goals for reducing abstractions when fixing the amount of the fees. It is even possible for just the opposite to happen if the increase in the marginal value due to the price escalation exceeds the increase in the marginal costs, fees included. In these circumstances, the farmers feel incited to abstract more water to produce more.

The limitations of fees have encouraged economists to apply **quotas**, an alternative economic tool for managing aquifers.

A **quota-based management system** means establishing the maximum amount of water to be drawn from each aquifer-tapping point. Each farmer is free to use his quota as he wishes. Quotas have a direct effect on the management of the aquifer. They can be established annually, depending on the state of the aquifer, or revised less frequently, e.g. every five years.

It is legally feasible because it reverts to issuing limited permission to use public water resources, either in terms of volume or in terms of discharge per hectare. Such authorization is specific to a farm or to a plot of cropland. The concept of associating quotas with a well (or an aquifer-tapping point) is already present in existing regulations. However, the quotas are not stringent enough to reduce the amounts of water abstracted from the aquifer because they are too high. They must therefore be reduced, which cannot be ordered without declaring protected or prohibited aquifer zones for the Chtouka and Souss aquifers.

Unlike the use of fees to reduce abstractions, the imposition of quotas is much more easily acceptable to farmers. There is no payment, therefore no immediately obvious detriment to gross profits.

However, the introduction of quotas raises the issues of how to fix them for the first time and how they should change.

While the limitation of fee-based systems is the uncertainty of their effects on the aquifer, that of quota-based systems is linked to the loss of economic efficiency. Once the quotas have been allocated, there is nothing to ensure the best use of them in terms of overall production. In other words, compared to a competition-based situation, quotas restrict access to water for those farmers who are the most capable of the best economic utilization instead of for the "less efficient" farmers; hence a reduction in the overall production. Although in theory fees encourage the most efficient use of water because there are no restrictions imposed on the most efficient farmers, the farmers can still maximise their production while paying their fees. This economic loss is evidently compensated by the obvious superiority of the quota system to control the total quantities of water withdrawn from the aquifer.

The very fact justifies the association of the quota system with trading mechanisms in order to obtain the benefit of reducing abstractions and the benefit of limiting the economic losses.

2/ Intra-sector trading mechanisms

Allowing **quotas to be traded** solves the economic loss problem (as long as the cost of the transaction does not exceed the economic gains) in the following manner: efficient users can obtain more water by purchasing it from less efficient users. The economic loss associated with the drop in production for efficient users thus disappears thanks to the trading of quotas.

The combination of a quota-based management system with the trading of quotas ensures that less water is withdrawn from the aquifer while allowing a voluntary allocation of water resources to the best possible uses which benefit the regional economy (in as far as the best possible use regarding the regional economy is maximising the earnings of each cubic metre of water).

Of the three types of mechanism considered here, this one is probably the one that the farmers will be the most willing to opt for, therefore the most politically feasible one. However, not everyone will be inclined to accept such mechanisms without resistance. It will be a reform that will not be easy to implement. Even so, considering the extreme pressure on water resources that prevails, it offers the possibility of progressive adjustment and those who relinquish their quotas receive direct compensation.

3/ Inter-sector trading mechanisms

The idea is to introduce an alternative to the allocation of water resources described in the integrated development plan by encouraging voluntary transactions concerning the quotas allocated, between agricultural and non-agricultural activities (e.g. drinking water).

Both simulations and theory converge in the recommendation of tradable quotas as demand managing economic mechanisms.

The initial quotas should not be too restrictive; they should be adjusted progressively as the farmers gradually adjust to the system. Dissuasive, progressive fines for exceeding quotas need to be introduced.

Whatever the mechanism, the reform will be impossible without the involvement of the regional authorities who decided to establish and sign the "Aquifer Contract". The coordinated consultation and the effective participation of the users (through their representatives) in the decision-making dotted the authorities' actions with full legitimacy at local level, without which nothing is possible. When the Aquifer Contract is next revised, it will be an opportunity to reinstate the process of managing the demand for water.