Chapter 13

Recommendations

The IMAROM research project has clearly demonstrated the potentials of migration for agricultural development. Although migration can impossibly be the only agent promoting development in oases, and its role should not be overstated, it has at least the potential to contribute substantially to agricultural development, by providing the necessary investment capital in a context where credit and insurance markets are hardly accessible for most households. The investments enabling role of migration is particularly important in areas where most households are rather poor. Moreover, the research clearly demonstrated that households involved in international migration do not tend to retreat from agriculture, but instead tend to invest more in agriculture than in other productive economic sectors. However, the development potential of migration does not seem fully exploited. Although migration seems to have contributed to the agricultural development of all oases under investigation, there are several obstacles on the way.

Encouraging investments in oasis agriculture without at the same time threatening its sustainability, requires the implementation of an integrated package of measures. Both aims should go hand in hand, as measures increasing the efficiency of resource exploitation can at the same time reduce the costs of agricultural enterprise. Nevertheless, in order to solve the current problems oasis agriculture is experiencing, a firm and sensitive intervention of the state seems necessary, as *laissez faire* policies, as has been demonstrated in most Moroccan oases, leaves local resource management in a power vacuum and entails resource-inefficient and expensive competition between individual water users, or even abandonment of agriculture. State interventions to stimulate investments in sustainable oasis agriculture should therefore comprise a combination of technical and economic measures facilitating the access of peasants to land and water resources, as well as organisational measures to improve, that is, reorganise land and water management by local institutions.

Sensitive interventions aimed at a *re-allocation of land resources and a re-organisation of water distribution* could have a beneficial impact on agricultural development in the ancient oasis perimeters. The often extreme fragmentation and scattering of agricultural plots and the enormous complexity and non-flexibility of inherited water distribution regulations, obstructs agricultural modernisation. This discourages agricultural investments, and forces investors to effectuate high investments in motor pumping or to buy land outside the traditional oasis. Especially in the Moroccan research oases, the allocation of water resources between oases is often unbalanced, with some (upstream) oases receiving an excess of water, and other suffering from water shortages, forcing farmers to invest in pumps, which would have been less necessary if water distribution was based on actual agricultural needs, and not on historical, unchanging, rights, mainly reflecting ancient power relations.

Wherever it is possible, the state should also intervene to *restore and/or guarantee the maintenance of the ancient agro-hydrological infrastructure* (*khettaras*, dams, irrigation channels, etc.), which are now often badly managed as a result of the breakdown of traditional village institutions. The fact that traditional village institutions are less and less able to maintain the hydrological infrastructure, is not an excuse to accept their decline, which is <u>not</u> inevitable at all. These traditional systems have proven to be highly sustainable, tap natural 'gravity' water sources, and are low in cost. Safeguarding the traditional traditional hydrological infrastructure has two advantages: The access to relatively low-cost

water resources by all farmers and less pressure on underground water resources through pumping.

In the 1970s and 1980s, the Moroccan state has successfully preserved a number of *khettaras* by inserting concrete pipes in the underground channels of the *khettaras*. Those renovated *khettaras* are still functional, demonstrating the potential success of such interventions. Unfortunately such interventions have been rather incidental, leading to the breakdown of most other *khettaras*, and, hence, the waste of an inherited irrigation infrastructure. Preferably, such interventions should be initiated by the traditional communities or water users' associations themselves, which could then subsequently be financially supported by the government. It seems essential that the farmers themselves contribute partially in the costs, for example by providing their labour or directly contributing in the costs, as this generally increase their commitment to the maintenance and the feeling of 'ownership' and responsibility.

The root causes of the crisis of such ancient systems are not technical but institutional, that is, the bad functioning of traditional village institutions and the concomitant increasing conflicts between water users. In the traditional system, access to water is based on historical rights and basically free. This system can only function if all users contribute to the maintenance of the hydrological infrastructure. This is not the case anymore. Common law is difficult to enforce, ancient socio-ethnic hierarchies have been eroded, individualisation is increasing and 'free riders' behaviour is on the rise. Less and less people feel responsible for the collective system, leading to inefficient water use and the eventual breakdown of the hydrological infrastructure.

Therefore, the state could intervene to *support existing or create alternative communal institutions for water management*, for example through the creation of water users' associations, as has been done in Tunisia. Although such an operation is enormously complex, and can easily fail if the state is does not take the specific local circumstances into account, there seems to be no alternative than to change the institutional basis of irrigation management. In Tunisia, modern water users' associations have been created to distribute water pumped up by central pumps. Access to this water is not defined on inherited, 'historical' rights, but on actual agricultural needs. Moreover, the farmers pay small fees for each volume of water, which has the advantage of rendering farmers more cost-sensitive conscious, which might contribute to more economical water use. Collective pumping has considerable scale advantages, lowering mean costs of irrigation. Moreover, the risk can be shared among farmers or carried entirely by the state. It therefore seems a better solution than to rely solely on individual motor pumping, which is a high-risk and costly investment.

There is no reason why such a modern association, which manage motorised pumping and irrigation in Tunisia, could not manage the maintenance of *khettaras* or river dams. The state should intervene in order to create modernised, well-adapted local institutions regulating the management of those systems. This could be done through the creation of water users' association such has been done in Tunisia, or by encapsulating associations created by farmers themselves in the state's institutional framework. The IMAROM research project clearly demonstrated the willingness among farmers to invest in agriculture. State interventions aiming at improving and consolidating the institutional basis could lower the costs and risks of agricultural investments and increasing sustainability of water exploitation at the same time, and are highly necessary.

Increasing reliance on pumping may negatively affect the long-term sustainability of oasis agriculture in both Morocco and Tunisia. It therefore not clear to what extent current developments will lead to the gradual depletion of water resources. Detailed studies of underground water resources are generally lacking. Nevertheless, such *hydrological studies* are necessary to make an assessment of water resources available and overall aquifer recharge. Research on the hydrology of oasis areas is necessary in order to assess the risk of overexploitation, and is an absolute prerequisite for sound water policies in general.

In oases with high water salinity levels and shallow water tables, the establishment of adequate *drainage systems* seems necessary. Laying land fallow is not adequate for saline soils as both soil salinity and sodicity can increase and reach levels where reclamation might not be economically feasible. In some oases, such as Fatnassa in Tunisia, measures are needed to avoid compaction and/or subsidence due to over-irrigation and subsequent gypsum solubilisation.

Both in Morocco and Tunisia, *water pumping should be better regulated and controlled in order not to deplete water resources*. Existing laws regulating motor pumping is hardly implemented in practice, so it is necessary to develop realistic policies, which do not categorically forbid – which is unrealistic as pumping is needed in many cases, and can be sustainable – but to regularise motor pumping, taking into account individual needs of farmers as well as hydrological concerns (which should be based on sound studies).

Besides a better control on pumping as well as interventions aiming at establishing an institutional environment that is well adapted to the contemporary wishes of farmers, the state could support technical interventions which greatly reduce the labour intensity both traditional and modern irrigation systems on the one hand, and improve efficiency and decrease costs of water use on the other hand.

Both in Morocco and Tunisia, significant improvements in efficiency of water use can be achieved. The technical potentials are enormous. Through a more efficient use of the currently available natural water resources, a much larger surface could be irrigated than is presently being cultivated, or the same surface could be irrigated with much less water. The main problem of oasis systems is not rooted in water and land resources as such, but in the way they are exploited, that is, their management.

In the first place, better maintenance of the current hydrological infrastructure (irrigation channels, pipes, drains, valves, dams, *khettaras*, etc) will highly contribute to more efficient water use. In all oases under scrutiny, current maintenance of the hydrological infrastructure is not optimal, related to organisational problems on the collective level. Secondly, important improvements in water efficiency can be achieved through technical innovations. The most simple and urgent of these measures is the *construction of concrete irrigation channels*, which will prevent water losses through leakage, and make them less vulnerable to erosion.

The traditional flood basin irrigation method entails huge water losses. Therefore, *promoting drip irrigation* could decrease the needs in water and decrease soil degradation. Also the cultivation in *greenhouses* has been proven to be highly successful in both commercial and water-saving terms (reduced evapotranspiration, minimisation of losses). Cultivation of early vegetables under plastic (tunnel) is still an agricultural practice little used in the Tunisian oases, and virtually non-existent in Morocco. However, the potential of greenhouses along with drip irrigation seems high, as water needs are considerably improved to almost third of the current needs.

In order to decrease the high operational costs (purchase of fuel) of motorised water pumping, the *use of renewable energy resources*, such as photo-voltaic and wind energy,

should be promoted as well. Nevertheless, the costs of such operations are high, require technical expertise, and are difficult to imply.

In order to promote such technical interventions, government intervention should be targeted at advising and assisting farmers to install such installations on the one hand, and facilitating such investments by providing subsidies or (preferably) cheap loans to farmers on the other hand, which will decrease the risks of failure and lower financial obstacles to investments as. Nevertheless, it seems essential that the farmers themselves provide labour and capital inputs as well, and that such interventions should be initiated by themselves preferably. Such 'public private partnerships', which are more likely to increase the commitment and interaction among farmers and government institutions, seem more likely to succeed than the more classical top-down government interventions, which were often badly adapted to the farmers' knowledge, perceptions and wishes.

Difficult *access to agricultural credits* is an important obstacle for farmers aspiring to invest in oasis agriculture. This is especially true for non-migrant households, which generally do not have access to a sufficiently large, stable income to effectuate investments. The creation of small-scale, low-rent credit schemes or local agricultural investment funds could promote such investments.

Agricultural development are sometimes hampered if farmers do not possess title deeds for their land, especially for newly acquired lands in the desert. This is especially a problem in Morocco. This legal insecurity does not only leave farmers in fundamental insecurity, but also hinders access to agricultural credit, as banks require title deeds as a collateral on loans. Better land security through the *formalising of land possessions* could further incite people to invest in agriculture. Examples from Algeria and Tunisia have showed that legislation enabling the controlled privatisation of communal land can incite farmers to invest in agricultural extensions. However, this should be harmonised with legislature on access to water, in order to prevent situations where farmers possess title deeds, without the formal right to pump water. This situation exists both in Moroccan and Tunisian oases.

Besides technical interventions and better access to credit as well as land and water rights, the state should implement measures to create a better environment for agricultural investments in general. Agriculture seems to develop better in oases which are well connected to markets. This is partially dependent on infrastructure, in particular the existence of paved roads. Especially some of the Moroccan oases are rather isolated, and badly connected to the urban centres. This is not only an obstacle for agricultural development, but isolation, bad infrastructure and the absence of basic services such as primary schools, provokes many farmers to leave the village. Therefore, agricultural policies should ideally be integrated with agricultural development policies in general.

Besides infrastructure, other institutional measures which can improve the investments environment for agriculture lie beyond the scope of local and regional authorities. This relates first of all to general macro-economic policies: Sustainable economic growth, low inflation, low rent rates and general economic and political stability will increase confidence among farmers and incite investments. These indicators seem slightly better for Tunisia than in Morocco, but could be improved in both countries. Besides that, the state could be active in the creation of better linkages between oasis' farmers and national and international markets. For instance, the success of date agriculture in the Tunisian oasis of

Fatnassa, is a result of their access to export channels. This could also be done in other oases and for other products. Viewing increasing urban demand for vegetables and fruits, there is considerable scope for profitable cash cropping in oases. Viewing the high temperatures prevailing in the oasis regions, they could particularly profit from the high prices for early vegetables and fruits.

More in general, a more active role of 'dormant' local authorities and agricultural extension services is desired. Especially in the Moroccan research oases, there seems to be a lack of general commitment. It is difficult to imagine successful government intervention if the state officials themselves have lost hopes and consider oasis agriculture themselves as 'lost' or 'marginal', and blame the climate or the 'lazy peasants' for the lack of agricultural development. Given the proven potential of desert agriculture in many countries, and the regarding the proven willingness to invest among many peasants, a more active role of government – responding to the farmers' needs and problems and *enabling* investments – might have considerable pay-off. The state should awake: Oases are no 'lost territories'.

Past government interventions have often not been successful in Morocco and only partially successful in Tunisia, as 'high-tech' and top-down developmental agendas did not take the institutional environment into account, and did not correspond with the knowledge, ambitions, and financial possiblities of the farmers. Interventions were often based on the idea of 'technical knowledge dissemination'. This led obviously to disappointment and frustration among agricultural officers, their decreasing presence in the field, and a lack of confidence among peasants.

There is often no real interest and belief in the viability of traditional oasis agriculture, which explains the one-sided orientation of many officers on what they consider as 'real agriculture', i.e. modern, highly capitalised 'agri-business'. This image is mostly far from the realities of oasis agriculture, which generally consists of a combination of traditional and modern elements. In the eyes of many officers, however, more traditional forms of agriculture are 'no agriculture', and tend to be neglected. This neglect should be lamented, as ancient oasis systems can be highly sustainable and very cost-efficient.

The functioning of collective land and water management as well as the complex relationships and rivalries between different water and land users', ethnic groups, different oases, regions and sometimes even countries, are extremely complex. Therefore, operations such as land re-allocation, defining property rights, re-organising water distribution, improving irrigation techniques, are extremely difficult from the organisational point of view, and can only be successful with a highly sensitive intervention of the state, by taking into account the specific local circumstances as well as the opinions and wishes of oasis inhabitants themselves. A purely technical intervention, without considering the fundamental organisational and socio-economic dimensions of oasis agriculture, is destined to fail. After all, oases are man-made environments par excellence.