

Socio-Economic Transformations
and Oasis Agriculture in Southern Morocco

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De Haas, Hein (1998) Socio-Economic Transformations and Oasis Agriculture in Southern Morocco. L. de Haan and P. Blaikie eds., Looking at Maps in the Dark: Directions for Geographical Research in Land Management and Sustainable Development in Rural and Urban Environments of the Third World. Utrecht/Amsterdam: KNAG/FRW UvA, 65-78.

Abstract

This paper examines the impact of recent socio-economic transformations on traditional oasis agriculture in southern Morocco. The study portrays current land and water management, as well as the activity patterns and income characteristics on household level, in the oasis of Agadir-Tissint in the Bani region of Southern Morocco.

Oases are highly artificial and sensible ecosystems, which enable sustainable agriculture under arid climatic conditions. However, due to recent socio-economic and political changes traditional oasis agriculture seems to be seriously threatened. The collapse of ancient caravan trade, nomadism and political and economic integration in the Moroccan state resulted in the economic marginalisation of oasis agriculture. The opening up of arid regions and increased mobility have provoked mass emigration to the urban areas and to Europe. Nowadays, migrants' remittances constitute the most important revenue for the oases. Presently, agriculture only provides supplementary revenue and is often subject of strong aversion.

Based on literature, these processes seem to have provoked a rapid decline of traditional oasis agriculture. Land use has become more extensive, in some cases fields are even entirely abandoned, and traditional common law is hardly enforced. The individualisation process has undermined the willingness to carry out collective soil and water conservation measures. The general neglect may lead to the breakdown of the agricultural infrastructure, particularly of the vital irrigation system, which seems to provoke increasing land degradation. Nevertheless, under particular circumstances money has been invested in the development of 'modern' irrigated agriculture.

The case study focuses on the question of how the recent changes that occurred in land and water management in oases can be explained and understood from the changing political-economical context at the local, national, and international level. Secondly it will deal with the question whether agricultural revitalisation is desirable and feasible.

This paper consists of three parts. Firstly, the general context of oasis agriculture in Morocco as well as its dynamics will be discussed. Secondly, the impact of socio-economic and political changes on oasis agriculture will be further analysed by a case study of the oasis of Agadir-Tissint. Finally, conclusion is given by referring to the problem statement.

1. Oasis Agriculture in Morocco in a Changing Political-Economical Context

The Moroccan Atlas mountains constitute a natural barrier between the northern Mediterranean zones and the southern arid zones of the country. In the arid zones, agriculture is concentrated on spots where water is reliably available. For many centuries inhabitants of these regions developed sophisticated techniques to extract water and exploit it for irrigated agriculture. In this way oases have emerged, and not only became agricultural production centres, but also trade centres, with a crucial strategic and political importance.

Notwithstanding the large variety in oasis types (e.g., mountain, river, lowland), most oases have some characteristics in common. Firstly, traditional oasis agriculture is generally characterised by its labour intensity and high productivity. The scarceness of natural resources (mainly water) and high population pressure provoked productivity optimisation by elaborating new irrigation techniques, cultivation of two or even three vegetation layers, and by high labour inputs. Secondly, traditional oases are characterised by a symbiosis between livestock breeding and tillage. Thirdly, there is a strong economic and political interdependency between the sedentary oasis population and nomadic desert inhabitants. Direct exchange of products as well as commerce through more extensive trade networks provided the oasis of animal products such as meat, wool and hides, as well as other commodities. For this trade the oasis inhabitants generally relied upon the nomadic or semi-nomadic tribes, who were generally military dominant vis-à-vis the sedentary inhabitants. For their protection, oases were dependent on these tribes. So we can only see the emergence and persistence of traditional oasis agriculture within the former political and economic context. Oases are anything but isolated, self-sufficient spots in the desert.

Traditional oases are highly artificial and sensitive ecosystems, which enable highly productive and sustainable agriculture under arid climatic conditions. They are further characterised by a generally high degree of collectivity of soil and water management. The collective maintenance of irrigation systems is labour intensive, and generally requires a high degree of central political organisation at the community level. A strong ethnic hierarchy was fundamental to the functioning of this system. Cheap labour was generally provided by slaves

or sharecroppers. Notwithstanding their artificiality, these ecosystems have proven to be sustainable. In fact, traditional oasis agriculture is an excellent example of an elaborate, highly productive, and sustainable environment for agricultural production, which is entirely based on so called 'indigenous' or local knowledge.

However, due to the recent socio-economic and political changes, and in particular migration, this traditional oasis agriculture seems to be seriously threatened. Rural areas in the Maghreb are generally characterised by mass migration to the urban centres and to Europe. Recent studies revealed that migration is generally strongest in the regions that are the most disadvantaged in terms of ecological conditions, such as aridity (Bencherifa 1991). This is particularly the case for oases, where the high demographic pressure and the limited means of subsistence have had a stimulating effect on migration. Migration has led to a rapid increase of the importance of non-agricultural revenues. Furthermore, oases previously had a crucial function in the regional economy, being a more or less monopolistic producer of edibles in a largely self-sufficient society. Due to the collapse of ancient caravan trade, the decline of nomadism, the formation of state-borders, and political and economic integration in the 'modern' national and international context, oasis agriculture has now been economically marginalised. For the oasis inhabitants, migration has created the possibility to gain a higher income outside agriculture, which has 'liberated' them from their former absolute dependence on this sector. Finally, migration provided a means to literally escape from the strong ethnic hierarchy.

Nowadays, migrants' remittances constitute the most important revenue for most oasis households. Agriculture is merely a supplementary revenue, and often subject of strong aversion, particularly among the rural youth. These processes appear to have provoked a rapid decline of traditional, intensive oasis agriculture. Land use has generally become more extensive, sometimes fields are even abandoned, traditional common law is hardly enforced and land degradation seems in progress (Ferry & Toutain 1990). In the case that traditional intensive oasis agriculture does persist, it would mainly concern an economically non-viable form, often ironically described as 'ritual' (De Mas 1990) or 'sentimental' (Bencherifa 1991).

The individualisation process, the disintegration of the power of the traditional community (*jemaâ*) and labour shortages (due to the absence of a substantial part of the male population) have undermined the willingness to carry out collective water and soil conservation measures. The general neglect and deteriorated land and water management lead to the breakdown of the agricultural infrastructure, particularly of the vital irrigation system. These developments provoke land degradation processes, in particular sand encroachment and soil salinity. As a consequence, it seems that traditional oasis agriculture falls into desuetude.

Paradoxically, one often simultaneously perceives an increasing overexploitation of the natural resources. Overgrazing and excessive pumping of ground water (due to mechanised pumping) seem to provoke soil erosion, sand encroachment and scarcity of ground and surface waters (Fassi 1982, Skouri 1990). Such overexploitation is often associated with disaffection with agriculture, individualisation and decrease of the (centrally imposed) 'solidarity' and control among peasants, due to the disintegration of ancient power structures.

So, according to the dominant views in scientific literature, oasis agriculture appears to be virtually dead, bereft of all its former vitality. It is striking is that scientists come to the same conclusions by using juxtaposed concepts. In the Moroccan scientific context, neo-malthusianistic scientists, explaining land degradation in oases by the high population pressure on resources, are still making their point. This is surprising, since it seems evident that land degradation in oases has primarily been caused by a less intensive maintenance of agricultural infrastructure. Also climatological determinism is still very dominant among government officials and other policy makers, as well as certain scientists, who are declaring 'war' on desertification (Larbi 1989, Rafii 1993). Especially the term '*sécheresse*' has become symbolic of their narratives, employed to explain and depolitize almost any agricultural problem in Morocco. Frequently, different perspectives are combined and presented in a Doomsday scenario where everything appears to go wrong.

However, recently some studies revealed that there exists a strong spatial differentiation in the impact of migration on oasis agriculture and ecology (Bencherifa 1993).

In some oases, migration remittances have been invested in the development of 'modern' agriculture. Moreover, livestock breeding and the cultivation of fodder crops seems to be subject of more and more investments. So, the interaction between migration and agriculture is not necessarily a negative one.

The impact of recent political and socio-economic transformations on land and water management in oasis agriculture will be further illustrated and analysed in the following case study, based on research carried out in the oasis of Agadir-Tissint in the Bani region of Southern Morocco in 1993 and 1994 (De Haas, 1995). The main question is to which extent the dramatic changes that occurred in land and water management in oases can be explained and understood from the changing political-economical context at the local, national and international level. Secondly, it will deal with the question whether agricultural revitalisation or 're-development' is desirable and feasible.

2. The Oasis of Agadir-Tissint

General context

The oasis of Agadir-Tissint is part of the Jbel Bani oasis zone in the Southern Moroccan province Tata south of the Anti-Atlas mountains. The climate of the region is hot and arid. Yearly precipitation is estimated at 70 mm., and is furthermore characterised by a high degree of irregularity. The narrow and steep Jbel Bani mountain chain is characterised by the occurrence of several fissures (*foums*). These *foums* constitute the single points where the subsurface waters, mainly originating from the Atlas mountains, can pass the physical barrier formed by the Jbel Bani, whereupon it can flow off further southwards. In these *foums* ground water comes close to the surface or is even welling. This water availability enabled the evolution of oases in this arid zone.

Approximately 4,075 people in 466 households, with an average size of 8,74 persons live in the five villages of the oasis. The presence of a perennial river, that rises in the *foum*

just upstream of the actual oasis, has enabled the cultivation of a permanently irrigated surface of about 450 hectare. The oasis is situated on the banks of the river in the alluvial plain just south of the Jbel Bani. The flow of this river is estimated at an average of 412 litres per second and, moreover, is characterised by a high stability. Regarding the arid climatic conditions, this is an exceptional situation. Having a relative flow of 0,91 litres per second per hectare, Agadir-Tissint is one of the most water-rich oases of Morocco. However, the salinity of the river water is estimated at an unfavourable level of 4-5 g/litre.

Just upstream of the oasis a dam conducts the water in two main irrigation furrows. From here on, a highly complex and branched irrigation system enables the irrigation of the whole oasis. Like land, water is subject of private property. Water quantities are measured in time periods, whereby one water right is the equivalent to 3 hours of irrigation. The maintenance of the irrigation system and the repartition of the water rights are controlled by the traditional village community (the *jemaâ*). Each water owner is responsible for the maintenance of a certain part of the irrigation system, corresponding to the number of water rights he or she possesses. The labour intensive and exigent traditional irrigation system, which requires detailed knowledge of the micro-morphology and relief, has been expanded many centuries ago and has preserved its functioning up to this century.

Almost all oasis inhabitants possess at least some land. The mean surface of an agricultural enterprise is 0,97 hectare, which is relatively large compared to other oases. However, the land is unequally distributed among the peasants. Moreover, due to the inheritance system, land is extremely dispersed. The average size of one plot is 0.058 hectare, i.e. 11.3 per household. This extreme small plot size hinders any form of mechanisation. In total there is a fixed number of 576 water rights, distributed over 72 days. However, like land, the water rights are unequally distributed among the peasants.

Even more than in other oases, agriculture in Agadir-Tissint has been dominated by the cultivation of the date palm. This archetypal desert palm is well adapted to the hot and arid climatic conditions and, moreover, to the relative high salinity of the irrigation water. Therefore, the oasis has the appearance of a palm-grove. Other crops are grown under the

palm trees or on small open spots. The main crops are alfalfa, barley, sorghum and millet. These crops only occupy 16,6% of the total surface of the oasis. Virtually every household keeps some domestic livestock. The average livestock size consists of 4,4 goats and 7,8 sheep per household. Cows and camels occur only rarely. Livestock constitutes a crucial element in traditional oasis agriculture as sole provider of manure and many other products such as milk and meat. Moreover, livestock keeping allows utilising domestic waste, weeds, palm leaves, etc., that otherwise would have been worthless.

Like all other Moroccan oases, Agadir-Tissint has been characterised by sharp ethnic divisions and hierarchical relations. About 80% of the oasis population belong to the ethnic group of the *haratin*, which is subdivided in several clans. This Berber speaking group, whose members generally have a dark skin, possesses traditionally the lowest status and used to cultivated the land (generally perceived as an inferior activity) as slaves, sharecroppers or small peasants. In most cases, they were not allowed to own land. Their ancient patrons were the *mrabtin* (descendants of local saints, often formerly *haratin*) and *shurfa* (descendants of the prophet Mohammed). Highest in rank were the Arabic-speaking nomads of the *Dou Blal* tribe which have dominated the region during the last century. However, due to the fundamental societal changes that occurred in the last century, these relations have entirely been altered.

Recent trends: migration and demographic development

Like many other oases in southern Morocco, Agadir-Tissint used to be an important centre of regional commerce (mainly concerning the exchange of products with nomads) and trans-Saharan long distance trade. Due to the abundance of water, its agricultural products, and its strategic position near the *foum* (constituting the only pass between the plains at both sides of the Jbel Bani), Agadir-Tissint was an important junction in the trade network between the Moroccan urban centres in the North and West-African centres such as Timbuktu and Jenné (Bellakhdar et al. 1992).

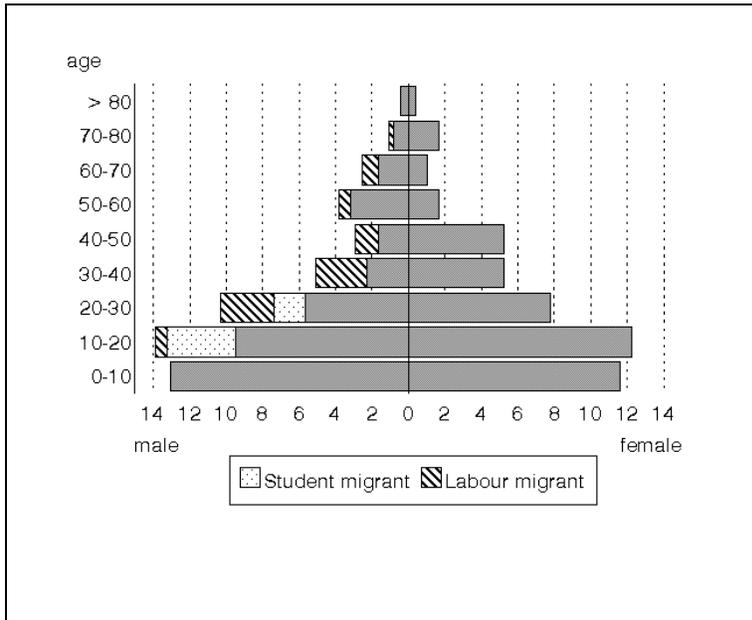
However, in consequence of the decline of nomadism, the collapse of ancient caravan trade, and the political and economic integration in the Moroccan state, the oasis has economically and politically been completely marginalised. On the other hand, the opening up of the regions (due to better infrastructure), the abolition of slavery, increased mobility, and the possibility to earn an income outside the oasis, have provoked mass migration to the urban centres of northern Morocco and to Europe since the early decades of the 20th century. For the majority of the oasis population, formerly slaves, sharecroppers or small peasants, migration has meant a dramatic economic advancement and has entailed the emancipation with respect to their former patrons. The migration has been so massive that, notwithstanding the high population growth¹, the population size has remained stable at a rate of about 4000 inhabitants. That is to say that the natural population growth has been entirely counterbalanced by migration.

About 67% of the household have one or more members participating in labour migration. These migrants are still considered as household members as long as they maintain strong economic and social ties with their family. The majority of these temporary migrants are young men between the age of 20 and 40. Women are generally not allowed to migrate individually on a temporary basis. Their only way out is marriage or permanent migration of the whole household. Altogether about 53% of the active male population between the age of 12 and 60 are participating in this migration. Consequently, a considerable part of the active male population is absent during at least part of the year. Therefore, the current oasis population is dominated by women and small children (figure 1).

The vast majority of the temporary migrants (93%) stay within Morocco. Most migrants stay in the urban centres Marrakech, Agadir and Casablanca. About 7% of the temporary migrants live abroad, mainly in France, Italy, the Netherlands, Libya, and Saudi-Arabia.

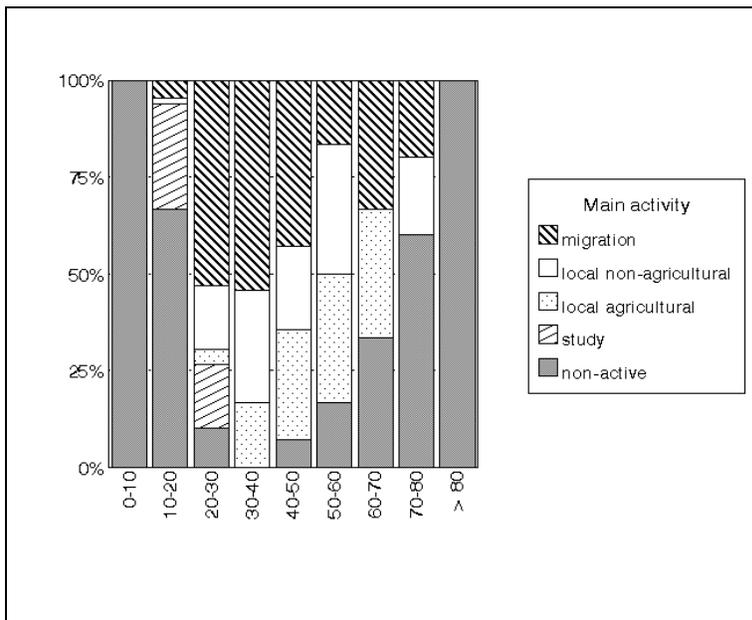
¹ The birth-rate between 1964 and 1982 was 4,8% versus a death-rate of 2,0%.

Figure 1: Age pyramid of Agadir-Tissint (1993)



Source: De Haas 1995

Figure 2: Main activity of men by age



Source: De Haas 1995

Activity patterns

As far as the migrants are concerned, a remarkable proportion of 36% is employed in the army. 24% of the other migrants is involved in formal and informal commercial activities, 18% work as labourers in factories or on farms and 10% is employed as government official (10%). The remaining 12% concerns students following secondary or higher education in the provincial capital Tata or larger urban centres.

About 50% of the non-migrated men between the age of 12 and 60 have no economic activity. Only 20% of this group had agriculture as main activity. Generally it concerns relatively older men; the average age of peasants is 45.8. The average age of sharecroppers, apparently a disappearing occupation, is even higher (54.8). Others are building worker (13%), merchants (8%), or are employed as civil servant at the local municipality or teacher at the oasis' primary school (8%). Figure 2 analyses the relation between the age and the principal activity of the male population of the oasis and reveals two facts: the exceptional high level of absence of young men as well as the secondary character of agriculture.

Since women are excluded from individual labour migration, the active oasis population is predominantly feminine. Moreover, 50% of the non-migrated men can be classified as non-active. The migration has caused a significant increase in the agricultural labour burden allotted to women. Besides their heavy domestic tasks, they are equally responsible for the majority of agricultural work, such as weeding, the daily maintenance of the date palms, harvesting and, above all, livestock-breeding. The oasis' women are working from early in the morning till late in the evening and owing to their labour the socio-economic reproduction and, hence, the whole physical persistence of the oasis is guaranteed.

It goes without saying that the economic and political changes of the last decades, and in particular migration, has profoundly transformed the oasis society, economically as well as socially and culturally. Nowadays, migrants' remittances constitute the most important revenue for most households. For most households agriculture is only a supplementary revenue. For the oasis inhabitants, migration has become an integral and indispensable

element of life, a matter of course. Especially for youngsters, the question is not so much whether to migrate, as when to leave the oasis. Virtually every adolescent, including women, aspires to leave the oasis and explore the wide world as soon as possible. The attraction of the great urban centres and Europe is enormous. This attraction should not only be seen in an economic context. Stimulated by today's omnipresent radio and television, young oasis inhabitants feel strongly attracted by a 'modern', western and more liberal life-style. In their opinion, the harsh and 'boring' oasis life cannot compete with the advantages of city life. This generally coincides with a complete disaffection with agriculture.

Therefore, the migration can be characterised as a modern 'rite de passage' (Massey et al. 1993: 453). Staying home is strongly associated with failure, stigmatising numskulls and the dullards. This cultural connotation is strengthening migration and generates its own dynamics. This mental 'revolution' coincides with a strong disaffection vis-à-vis agriculture.

The impact of changing livelihood patterns on agriculture

In order to analyse the relation between livelihood patterns of households and land use, we elaborated a typology based on migration and income earning characteristics on household level, the latter being the most appropriate unit of analysis. While 67% of the oasis' households participate in migration, it constitutes the primary source of income for 40% of the households. For 30% of the households the primary revenue is formed by non-agricultural local activities (such as local commerce and house construction), whereas agriculture still constitutes the main revenue for 30% of the households. When we look at the diversity of activities and income, we see that more than 90% of the households has more than one revenue. Only a minority of 10% is uniquely involved in agriculture. It appeared that this is a vanishing category, consisting of traditional households of sharecroppers or small peasants, usually characterised by an elevated age profile. All other households are involved in different economic sectors and have a strong tendency to migrate.

The research reveals that an increase of the importance of non-agricultural and

migration revenues clearly coincides with a diminution of labour and capital inputs in agriculture. Furthermore, increasing diversity of incomes coheres with a decreasing level of intensity of agriculture. Labour is increasingly extracted from agriculture, to be capitalised in other, more profitable economic sectors. This resulted generally in a more extensive land use. Particularly the migration households limit themselves to the extensive cultivation of date palms and, to a lesser extent, alfalfa and barley. In this mode of production, irrigation is the main activity. Necessary activities such as soil preparation (ploughing), manuring, fertilisation of the dioecious date palms, selection and planting out of palm offshoots are hardly executed by many of these households. The maintenance of date palms is generally minimised. The result of this neglect is the running wild of the palm-groves, densely grown with date palms, reducing harvests and, consequently, making it unsuitable for the cultivation of other crops. The general pattern is that irrigation is sustained, but all other activities are minimised. The date-palms are strong enough to persist even under such circumstances and even give some harvest of palm leaves (which are used as animal fodder), firewood and dates. Although there is a great variety in levels of intensity, the general pattern is similar to the portrayed agricultural inertia.

The disaffection vis-à-vis agriculture has even led to situations, in which the peasants do not use their water rights. In former times this would have been totally inconceivable. Mainly at the fringe of the oasis, some fields are abandoned. Nevertheless, total abandonment occurs rarely. Even when the economic importance of agriculture is minimal, the strong attachment to the ancestral land guarantees a minimum of maintenance, necessary to preserve the land for future generations. Land is an important status symbol as well. The positive cultural connotation attributed to land ownership also seems to explain why former sharecroppers and small peasants tend to purchase land once they have acquired some wealth, whereas they do not really capitalise on this land. This tendency is enforced by the negative cultural connotation attached to agricultural labour, which is considered as an inferior activity. Land ownership itself is more important than the actual use of the land.

As a consequence of the general neglect, the agro-hydraulic infrastructure has fallen into decay and land degradation has been provoked. Insufficient maintenance has provoked

the forming of sand accumulation in the irrigation furrows. Some furrows get even completely covered by sand. This hinders the optimal distribution of water and strongly reduces the capacity of the irrigation system. This decreased water availability has also increased the problem of soil salinity, since the leaching requirements can no longer be met. The walls and hedges that are used to surround the plots in order to protect them against (among others) sand encroachment are no longer maintained by most peasants and have largely disappeared. Therefore, large areas are increasingly threatened by sand encroachment. This has even enabled the formation of new sand dunes, which make agriculture in some parts of the oasis virtually impossible. These land degradation processes make agriculture less attractive for investments.

Nowadays, there is a general demoralisation of the oasis inhabitants with respect to collective maintenance activities, which used to be co-ordinated by the leaders of the village community. This unwillingness to cooperate appears to be caused by the decreased economic importance of agriculture as well as the individualisation of peasants and their growing independence with respect to the traditional hierarchical power structures, that is to say their former patrons. The disintegration of the power of the community makes it increasingly difficult to enforce traditional common law, which used to regulate maintenance activities and sanctioned free-riders' behaviour. The new central government authority, at local level represented by the *caïd* ('major'), that has formally replaced the traditional community, is generally not trusted. The absence of effective central authority explains that free-riders' behaviour is no longer sanctioned, which undermined the willingness to carry out collective soil and water conservation measures and constitutes one of the main underlying causes of current land degradation.

State intervention is minimal and concerns mainly technical measures to prevent land degradation, such as the plantation of *tamarix* trees and hedges in order to fix sand dunes. However, these measures only have a limited effect without simultaneously taking away the real underlying societal causes of land degradation.

As opposed to agriculture, domestic livestock-breeding has considerably gained

ground, especially among households involved in migration. In twelve years time the livestock size, predominantly mainly consisting of sheep and goats, has significantly increased. Two factors appear to be responsible for this development. Firstly the 'feminisation' of the oasis population has probably encouraged livestock-breeding. Considering the rigid labour division, domestic livestock-breeding is an activity that can be carried out entirely by women and children, without the help of men. Moreover, women are allowed to harvest the alfalfa, palm leaves and weeds, that serve as fodder. Secondly livestock-breeding can be carried out individually, independently from the agro-hydraulic structures. This trend of general agricultural decline on the one side and the rise of livestock breeding on the other hand seems to occur in several ecologically marginal regions in Morocco (Aït Hamza 1995; Bencherifa 1991; Steinmann 1993).

Structural impediments on agricultural development

How can the paradox of relative favourable conditions (the presence of a relatively abundant and perennial source) and the declining agriculture and increasing land degradation be explained? Migration and its socio-economic consequences in itself cannot provide for a genuine explanation since migration enables the abandonment of agriculture as well as it provides the necessary revenues to purchase land and invest in agricultural development.

In fact, in some oases money is being invested in the development and/or modernisation of oasis agriculture (Bencherifa 1993; De Haas 1995; Ferry & Toutain 1990). This is not the case in Agadir-Tissint, where money has mainly been invested in construction, purchase of luxury goods and the education of children. A growing number of studies reveal that there exists a strong spatial differentiation in the impact of migration on oasis agriculture and ecology (De Haas & De Mas 1996). Although migration seems to have had a primordial role in recent changes, it does not determine the direction of changes at such. Apparently some structural impediments exists for agricultural development. In order to explain this, a number of factors can be distinguished.

Firstly, the rigid labour division between both sexes constitutes a major impediment for agricultural development. Since most men prefer to earn higher revenues elsewhere they are no longer available for agriculture. However, particular cultural values prevent women from taking over their tasks. Since the labour division is very rigid, a number of essential agricultural activities are strictly reserved to men, namely irrigation, soil preparation (ploughing) and the selection and planting out of palm offshoots.

Secondly, the extreme dispersion of plots and the complexity of the hydrological structures obstruct any form of mechanisation or improvements such as the desired re-allotment of land and water possessions. Without such measures, agricultural productivity remains too low to be competitive and, likewise, unattractive to invest labour or money in its development.

The third obstacle is the process of 'collective demoralisation' that occurred in the oasis. The large number of households that make use of one single source (de river Oued Tissint) require a high level of collective organisation and central political authority on community level, in order to guarantee adequate water distribution and the maintenance of the irrigation system. Nowadays, the collective character of the agro-hydraulic system presents itself as a disadvantage and constitutes an impediment towards development. Whereas society has fundamentally transformed, the agro-hydraulic system is still based on bygone political, social, and economic structures. These collective structures form at present an obstacle for individual investors. This incompatibility of physical and societal structures hinders agricultural development.

Finally, the absence of suitable farmland in the direct surroundings of the oasis should be mentioned. In oases where recently money has been invested in agriculture, these initiatives are generally taking place outside the traditional oasis, on newly reclaimed land adjoining the oasis. In these areas the obstacles constituted by the complex traditional land tenure and water systems are largely absent (Bencherifa 1991). In Agadir-Tissint such an extension seems to be relatively difficult, since the oasis is situated in an alluvial plain, that is very stony and characterised by the presence of many river-beds (*wadi's*). Furthermore, the

high salinity of the irrigation water appears to discourage investments in agriculture.

3. Conclusion

This study revealed that resource management and its dynamics in oases cannot be understood without considering the wider socio-economic and political context in which they operate. The fundamental societal changes that occurred in the last century have profoundly affected local land use and resource management. Developments such as the disintegration of nomadism and the collapse of ancient trade networks, the integration of the oases in the 'modern' national and international economy entailed new income earning opportunities for the oasis inhabitants, such as migration. This shift in livelihood patterns directly influenced land use patterns. However, it is important to notice the differentiation that characterises the impact of these dynamics on local land use.

Furthermore, one may conclude that traditional oasis agriculture is no longer viable within the present socio-economic and political context. Traditional oasis agriculture had a clear function within the former context of caravan trade, nomadism, slavery and self-sufficiency. Nowadays, traditional oasis agriculture does not seem to be competitive anymore. Moreover, the power of the traditional community, the *jemaâ*, has been largely undermined.

Peasants possess valuable knowledge concerning the direct environment, local date-palm varieties, etc., which can be valuable for agricultural development. However, traditional oasis agriculture should not be idealised. The high complexity of land tenure and irrigation systems constitutes a major obstacle for agricultural development, hinders optimal irrigation regimes, and lowers productivity. Another example are the earthen irrigation furrows, which allow water leakage. Under present circumstances, re-development of oasis agriculture seems only possible if it will be 'modernised'. Nevertheless, each development effort should be adapted to the specific socio-economic and political local circumstances.

Moreover, it should not be forgotten that migration has entailed a considerable increase in welfare and independence for the vast majority of the oasis inhabitants, which used to live in abject poverty before. So, in their eyes the 'farewell' to agriculture is generally perceived as a positive development. From their stance the decline of sustainable agriculture and the breakdown of the traditional oasis is rather a (negative) side effect of modernity, no disaster. We should keep this notion clearly in mind, as through our contemporary scientific sustainability-glasses these developments are perceived and judged in a much more negative way. By clearly taking the (former) peasants' stance into account, and accepting the different realities and priorities of 'natives' and scientists, we can avoid unrealistic efforts to revitalise oasis agriculture and to restore sustainable resource management, which constitute primarily a reflection of the modern scientists' agenda.

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