HYBRIDISATION OF MODES OF ACCESS TO LAND AND WATER IN THE MAGHREB: A HISTORICAL PERSPECTIVE

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LIST OF ACRONYMS

APFA	Law on access to agricultural land ownership (Accès à la propriété foncière agricole)
CAPRA	Agricultural production cooperatives of the agrarian revolution (Coopératives agricoles de Production de la Révolution agraire)
CRA	Agrarian reform cooperative (Coopératives de Réforme agraire)
DAS	Socialist agricultural domains (Domaines agricoles socialistes)
EAC	Collective farms (Exploitations agricoles collectives)
ODAS	Saharan Agricultural Development Office (Office de Développement de l'Agriculture saharienne)
OTD	Office for State-owned Land (Office des Terres domaniales)
ONAGRI	National Agricultural Observatory (Observatoire National de l'Agriculture)
PNDA	National Agricultural Development Plan (Plan national de Développement agricole)
PNDAR	National Agricultural and Rural Development Plan (Plan national de Développement agricole et rural)
PPI	Public irrigation schemes (périmètres publics d'irrigation)
PIP	Private irrigation schemes (périmètres d'irrigation privée)
PPP	Public-private partnership
SMVDA	Agricultural development company (société de mise en valeur et de développement agricole)

1. INTRODUCTION

Recent studies and research on access to irrigated land in the Maghreb refer to the privatisation of land, the individualisation of rights and land grabbing or concentration. The multiple terminologies used to describe these evolutions show the diversity of the productive dynamics that can be observed on these lands and the processes through which rights over these lands and their transfer evolve. These processes are often insufficiently explained. Privatisation implies access to full and complete ownership and the development of a land market. Privatisation also refers to a transfer of ownership, often from public to private. Finally, the term is also used for the transition from collective to individual ownership; it is also a matter of individualisation. Privatisation can, in some cases, lead to a phenomenon of land grabbing or concentration. This terminology covers a variety of processes resulting from past and recent developments. The evolution of land rights is in fact a long-term process resulting from 'hybridisation' between normative heritages (legal pluralism)[1].

In the Maghreb, the land reforms of the last decades took place in a context where the improvement of macroeconomic indicators in the 2000s offered greater room for manoeuvre than the structural adjustment period of the 1980s and 1990s. This resulted in the 'return of the planning State' (Mayaux and Massot, 2019) and support for private investment in what was referred to as 'modern' agriculture in Morocco and Algeria.

In Algeria, where public support for the agricultural sector had fallen considerably during the 1990s following the implementation of the structural adjustment plan, the State launched the national agricultural development plan (PNDA) in 2000, which became the national agricultural and rural development plan (PNDAR) in 2002. One of the axes of this plan was the public financing of the construction of boreholes and water-saving irrigation systems, and of fruit plantations in particular. Other programmes were subsequently launched to promote production (agricultural and rural renewal 2008-2012, the Filaha Plan 2014, etc.), particularly of widely consumed products (wheat, raw milk, pulses, potatoes, olives, etc.). The flagship actions of these programmes included massive aid for on-farm investments (PNDA, 2000-2006), the increase in 2009 of guaranteed producer prices for wheat, and premiums for milk and industrial tomato farmers and processing companies engaged in integration contracts (Daoudi et al., 2017a). In 2021, the guaranteed producer prices for wheat, barley and legumes were increased again.

In Morocco, where the agricultural sector has always been a priority in terms of public investment, the 2008 Green Morocco Plan aims to make agriculture a major driver of economic and social development based on two pillars: Pillar I of 'modern' agriculture and Pillar II of solidarity agriculture (Akesbi, 2012). Pillar I aims in particular to develop modern high value-added agriculture by promoting private investment supported by public subsidies from the Agricultural Development Fund. The solidarity pillar is financed by public funds within the framework of the Agricultural Investment Code and programme contracts.

Tunisia stands out because the public investment effort in the agricultural sector mainly concerned the years 1980-90. It reflects the relative importance of the sector compared to other sectoral priorities (education, tourism and the industrial sub-contracting sector). Public investment has allowed the development of hydro-agricultural infrastructures, public irrigation schemes and private schemes. The State did not invest massively in the agricultural sector in the 2000s but encouraged private initiative in the mobilisation of groundwater resources and the management of irrigated schemes.

The agricultural policies are based on land access reforms allowing the provision or transfer of land under State administration, and on facilitating access to groundwater. The land reforms target land over which the State still has strong control due to its historical legacy: state-owned land and land of ethnic communities placed under State administration. The reforms take specific forms depending on the country, based on previous political choices and the configuration of the actors in particular. As the strongest land dynamics are observed in groundwater irrigation zones, the study of the three Maghreb countries focuses on irrigated land in this context. This has the advantage of putting into perspective evolutions in land tenure that are marked by a common heritage and specificities that will determine the countries' trajectories.

This regional synthesis is based on national studies carried out in Algeria, Morocco and Tunisia[2]. In the first part, we analyse how the States have constituted holdings of public land or of state-administered land inherited from colonisation, which they manage as land reserves in the service of agricultural policy. We identify the specific features that explain subsequent orientations or trajectories. We then explain recent land reforms and analyse how land rights are redefined in relation to land tenure and the new 'social contract'. In the third part, we illustrate the agricultural and land tenure dynamics based on case studies in the three countries. In the fourth part, we conclude on the performance of agriculture and the water crisis it faces. Finally, we discuss and propose avenues of reflection for debate.

2. INDEPENDENCE AND THE CREATION OF PUBLIC LAND DOMAINS

Upon independence, the States reappropriated land as state property or placed some of it under state administration to be used for political projects in the following decades. The reforms of the 2000s followed the same logic although they took a liberal turn that differed significantly from the socialist phase that followed independence in the three countries.

1. 'As soon as we take the focus off private property rights alone, the diversity of land tenure systems obvious: most of them are characterised by a hybridisation of norms and institutions inherited from colonisation and customary rights, producing an entrenchment of ownership systems that lends itself to multiple interpretations and, sometimes, to the unleashing of violence.' (Technical Committee 'Foncier & développement' [Land Tenure and Development], 2017).

2. See the national reports for more details on the country reviews and case studies.

The States also own the water resources, and this state ownership is reaffirmed in the water laws, with the exception of a few cases[3].

2.1 Common tenure heritages

The Maghreb countries share an ancient land tenure heritage marked by the introduction of so-called modern law by colonisation, which defined and fixed tenure systems[4] on land whose rules of appropriation, use and farming were based on relationships between the populations and their territories. The colonisation process involved land whose status was based on previous rights, notably Muslim law and/or customary law, being brought into the domain of the State to a more or less extensive extent, referred to as domanialisation. It was also based on securing ownership rights through land registration.

'The 'domanialisation' was based on the disqualification of traditional rights and the primacy of modern law introduced into Tunisia by the Protectorate, inspired by the Torrens Act established in Australia by the English colonial administration, and retaining, in Muslim law, everything that was likely to facilitate land colonisation' (Elloumi, 2013).

This domanialisation allowed it to be attributed to colonists, referred to as 'formal colonisation'. At the same time, tribal land rights were more or less 'invented' by creating the collective land system in Morocco and Tunisia or 'arch' lands in Algeria (Guignard, 2013).

The colonial administration introduced the so-called 'modern' or 'positive' law based on the Torrens Act in order to secure ownership rights through land registration. Since colonisation, the registration of melk land[5] has thus established individual private ownership based on an imprescriptible land title. The colonial administration's agricultural 'modernisation' project instituted secure individual ownership rights over land as a necessary condition for investment in mechanisation, production intensification through inputs and irrigation. However, registration was only partial, and unregistered melk land is still governed by the rules of Muslim law.

2.2 Reverse domanialisation, placing of land under state administration, and unfinished land reforms

Upon independence, during the 1960s and 1970s, the States experienced 'a historical period marked by an exceptional climate of political and social ferment influenced by the implementation of agrarian reforms', whose pace, intensity and modalities varied from one country to another (Bessaoud, 2016). This period enabled the States to build up their landholdings more or less extensively depending on the country, and to consolidate their administration over part of the former tribal lands or melk lands, as shown by the current distribution of land by tenure system (Table 1).

Table 1: Distribution of land by tenure system (million ha)

	Algeria	Morocco	Tunisia
Melk of which registered	6 2.4	6.9 1.7	4.7
Private state domain	2.4	0.27	0.5
Collective agricultural land		1.6	1.5 privatisées
Collective rangeland		~10	1.6 (*)
Private state land, rangeland	**32.9**		

Sources: see country reports (*) of which 0.6 million ha under the forestry regime.

Significant state-owned land in Algeria

In Algeria, from 1962 to 1983, land and agricultural policies were geared towards building a strong public sector through nationalisation and collectivisation (Benmihoub, 2015). These policies were based on two basic principles: public ownership of land and the collective organisation of production. They were based on two major reforms (nationalisation of 1963 and the agrarian revolution of 1971) which ultimately enabled the State to become the owner of two types of agricultural land (Daoudi and Colin, 2017).

On the one hand, state-owned land was made up of 'self-managed' estates, mainly resulting from the nationalisation of former colonial lands, whose surface area had reached 2.3 million hectares at independence (Ait Amara, 1999). It also includes land nationalised by the Agrarian Revolution that was previously owned by Algerians, but above all arch land for agricultural purposes, communal land and public habous[6]. The nationalisation of the arch rangelands in 1975 did not call into question the tribes' ancestral right of use, but established the separation of the right of ownership of these rangelands, held by the State, and the right of use collectively recognised with respect to the tribe members. Within the tribes, local rules governed access to and use of the rangelands, and even their private appropriation (in the sense of possession).

At the end of the nationalisation operation of the Agrarian Revolution, approximately 2 million hectares were transferred to the national agrarian revolution fund (FNRA, Fonds national de la Révolution agraire), of which 1.1 million hectares were usable agricultural area (UAA), with the rest corresponding to agricultural land that remained to be developed (Ait Amara, 1999). The agricultural land nationalised under the Agrarian Revolution was mainly reallocated to agricultural workers and landless farmers organised into 35 000 cooperatives (coopératives agricoles de production de la révolution agraire, French acronym CAPRA), whose average size was 200 hectares (Chaulet, 1991). As with

3. Private water rights are recognised in the oases in Morocco, for example.
4. We adopt the FAO's definition of tenure as the 'relationship, defined by law or custom, among people, as individuals and groups, with respect to land'. We also use the terminology of tenure status in the same sense.
5. According to Muslim law, the term melk refers to peaceful possession, although the debate does not completely resolve the ambiguity between possession and ownership. The land registration of melk thus enshrines individual private ownership. Registration also applies to state land whose ownership is established in the name of the State.
6. Habous: land of religious foundations originating from property that owners decide to allocate to a pious, charitable or social cause, either absolutely (public habous) or after a period of enjoyment reserved for certain people, particularly family members (private or family habous).

the self-managed estates, the choice of a large-scale cooperative model was motivated, beyond the objective of social justice, by the productivist argument.

Despite significant technical and financial support from the State, the self-managed estates and cooperatives achieved poor results. In 1982, the State put an end to the dualism of the public sector, as the self-managed estates and some cooperatives merged into 3 400 'socialist agricultural estates' (domaines agricoles socialistes, French acronym DAS) totalling more than 2 481 000 ha, with an average size of 730 ha (Baci, 1999; Bessaoud, 2004), still closely monitored and supervised by the administration. Most of the CAPRA cooperatives (nearly 700 000 ha), especially those located in the steppe wilayas, were individually allocated to the members of the cooperatives, with individual use rights (Chaulet, 1991).

Partial state ownership and administration in Morocco

In Morocco, the authorities opted to place the colonial land (1 million hectares) under public administration. This was done slowly and with a certain time lag (Pascon, 1977a) in order to preserve the productive potential and export agreements, amongst others (Swearingen, 1987). Approximately 256 000 ha of formal colonial land were recuperated. The recovery of private colonial land, corresponding to the colonisation of melk land with an estimated surface area of approximately 700 000 ha, had to wait until 1973 with the 'Moroccanisation' law. In the meantime, some of the large colonial farms passed into the hands of Moroccan owners through more or less illicit transactions (Pascon, 1977b; Lazarev 2012)[7]. This Moroccan agrarian capitalism, which took over from the large mechanised melk ownership, would be decisive for the subsequent development of the agricultural sector.

The agrarian reform demanded by the political parties and trade unions remained unfinished and was transformed into a 'redistribution programme' (Lazarev, 2012). The first five-year plan of 1960-65 finally marked the end of the agrarian reform, which was transformed into an agricultural reform. The recovered colonial lands were subject to sporadic redistributions from 1956 to 1966; land ownership was then highly concentrated (Le Coz, 1968) and the agrarian reform was described as neutral (Akesbi, 2006). From 1966[8], in a context of social and political tensions, land was partly redistributed to members of agrarian reform cooperatives (coopératives de réforme agraire, French acronym CRA) without transferring ownership[9]. Approximately 30% of the one million hectares of colonial land had been redistributed to the CRAs by the end of the distributions in 1980 (Pascon, 1977b). The rest of the recovered land continues to be directly managed by public companies, in what can be described as state capitalism.

The State also reasserted its control over collective lands by terminating long-term rental contracts and perpetual use rights concessions[10]. The areas of collective land remained relatively large due to the political choice to limit the colonisation of tribal land by creating the collective land system and placing it under state administration through the 1919 decree, which was not fundamentally modified until 2019.

State ownership and discharge of land in Tunisia

In Tunisia, the independent State constituted its land heritage through three processes: purchase-sale protocols before independence, nationalisation of land in 1964 and the liquidation of public and mixed habous. The nationalisation of colonial lands allowed the State to appropriate a land heritage of primary importance. While the colonisation had taken advantage of the confusion between the private domain of the bey and the public domain that existed under the Ottoman regency to increase the private domain of the State (PDS) with a view to allocating it to the colonists, the 'reverse domanialisation' allowed the State to appropriate a significant heritage of 800 000 ha (Elloumi, M. 2013). This included 600 000 ha of colonial land, consisting in particular of the large estates of private colonisation – of which there were some 50 covering 450 000 ha. Upon independence, the State set up an office for state-owned land (Office des Terres domaniales, French acronym OTD) in order to 'ensure continuous management of the colonial farms' and 'preserve state control'. The private domain of the State also included 'dead lands' corresponding to uncultivated and desert land without 'vivification' and owned by the State. They can be 'appropriated' by private individuals following their vivification and in return for a tax. They are managed by a text still in force dating from the beginning of the protectorate (decree of 1896).

However, independent Tunisia differs from Algeria and Morocco in its choices on collective land. In 1964, collective ownership was formally recognised for the communities exploiting these lands (located mainly in steppe and pre-desert areas). Privatisation aimed to individualise ownership rights on agricultural land. This concerned about 1.5 million hectares of collective land out of more than 3 million hectares of collective land at independence. Collective land for pastoral purposes cannot be privatised and remains collective property that is unseizable, inalienable and imprescriptible.

3. LAND REFORMS SEPARATING OWNERSHIP AND USE

The land reforms of the developing States aimed to mobilise public land or land under state administration for the purposes of agricultural intensification (land already cultivated) or the extension of irrigated agriculture (pastoral or desert land). Unlike the previous periods, these reforms were based on separating ownership and use.

On the one hand, the aim was to make better use of the public agricultural land recovered from colonisation, which was encountering a number of difficulties linked to collective self-management (Algeria), to development by cooperatives, or to the direct public management of the former large colonial

7. The figures vary according to the sources: 35% of land according to Pascon and 60% (approximately 600 000 ha) according to Lazarev.
8. Law on the agrarian reform.
9. Distributions in Gharb were 'anarchic' due to the social situation. In 1972, nearly 14 000 ha were distributed, i.e. twice as many as in the whole 1966-1971 period (Berrady, undated).
10. Dahir of 9 May 1959 on the termination of concessions of perpetual use rights and the revision of long-term rental contracts granted on collective land.

farms (Morocco, Tunisia). On the other hand, it was a matter of developing uncultivated or pastoral land: public land (former arch land in Algeria) or land under state administration (collective land in Morocco and Tunisia). The sequence and implementation methods of these policies are analysed by country.

3.1 Algeria

The liberal turn in the 1980s occurred against the background of the relative failure of the past public land management reforms in economic terms and the decline in oil revenues, which led to the country's increasing indebtedness. Faced with the urban supply crisis of the 1970s and political opposition to the agrarian revolution, the State suspended its implementation (especially in the steppe) and gave a greater place to the private sector (Bessaoud, 2004; Daoudi and Colin, 2017).

A new phase of reforms was undertaken from the 1980s onwards, with the overall objective of gradually rehabilitating private farming, but without going as far as the total privatisation of public agricultural land. None of the laws of this liberal phase directly targeted the agricultural land of the private sector.

The land reforms of this new phase can be grouped into two categories according to the type of public agricultural land targeted:

- reforms targeting the privatisation of the right to use public land of the former socialist agricultural domains (domaines agricoles socialistes, French acronym DAS),
- reforms targeting the development of previously uncultivated public land.

Granting of the right to use public land from the former colonial sector

At the end of 1987, a law was passed to put an end to 25 years of policy of nationalisation of part of the agricultural sector. Law 87/19 restructured the DASs into smaller collective farms (EACs) or individual farms (EAIs) under private law, with ownership of the land remaining public. The beneficiaries of the EACs had, in equal shares, a collective permanent right to use the land, but this right was highly regulated: the members were obliged to work the land directly and jointly, the subdivision of portions leading to the fragmentation and individualisation of farms was prohibited, as was any form of rental. The right to use the land could only be transferred to those involved in the agricultural sector, with priority given to members of the EAC and young people having received agricultural training. The difficulties of collective self-management led in particular to partial or total decollectivisation. Faced with the extent of this phenomenon, a decree was promulgated in 1997 in order to set the conditions for the implementation of partial parcelling of agricultural land and to recognise local processes and legalise de facto sharing (Colin et al., 2021).

In 2008, the agricultural orientation law (law 08-16) extended the developments undertaken to resolve the difficulties of the collective management of public land by opting for concession as the only mode of access to public land. The permanent right of use granted to EAC and EAI beneficiaries was then converted into a 40-year individual concession contract; a new law was adopted to this effect in 2010. The State still owned the land, but this law allowed for the decollectivisation of EACs (subject to the minimum area threshold established for each region and production system) and the commercialisation of the right of use.

The law also allowed beneficiaries to enter into partnerships with domestic investors to facilitate more intensive production but fixed lease contracts remained prohibited. The commercial transfer of concession rights is still currently not authorised by the administration, despite its inclusion in law 10-03.

Development and privatisation of public land from the 1980s

The gradual discovery of the significant water potential of the country's arid zones and the gradual decrease in the cost of accessing and mobilising groundwater resources opened up new opportunities for agriculture in these areas. The development of land previously not used for agriculture, or used for very extensive farming (as opposed to intensive), became an increasingly credible option for agricultural development. Faced with a growing agricultural deficit due to increasing domestic demand, the State has made development a strategic focus of its agricultural policies over the past four decades. The development policy is based on facilitating access to land and water.

Access to ownership through development

In 1983, the law on access to agricultural land ownership, known as the APFA (Accès à la Propriété Foncière Agricole) law, marked the birth of the development policy. The State granted private property rights to any individual who developed (in the sense of irrigated cultivation) previously unexploited public desert or steppe land (Daoudi et al., 2017). This law gave national citizens, without any distinction, access to private ownership of land from the State's private domain, located mainly in Saharan and steppe areas, for a symbolic dinar, after development by the beneficiary (Daoudi et al., 2021). This law was inspired by the principle of 'vivification' (ihyâ) on which private ownership is based in Muslim law (Ahmed Ali, 2011) but differs from it by granting a definitive property right. The legislator defined two forms of development within the framework of this law: at the initiative of local authorities and at the initiative of applicants for development. The latter had to hold a prior and locally uncontested right to use the land thus developed (Baroud et al, 2018; Daoudi, 2021). From 2008, access to private ownership under the APFA law was restricted to land 'vivified' by individuals (Ahmed Ali, 2011). This last possibility was then restricted to the Saharan regions. In steppe areas, concessions were then the only means of accessing public land through development.

Concessions in schemes developed by the State

In 1997, the State decreed a new form of access to public land through a concession right that could be converted into a definitive transfer. This formula was launched through the development programme known as 'programme GCA' , named after the public company in charge of the development works on the irrigated schemes. The State granted significant financial aid to development candidates. This development programme (GCA) targeted steppe areas and marginal lands in the north of the country (mountains and foothills) as a priority. In 2008, law 08-16 retained concession as the only mode of allocating

public land with an agricultural vocation developed by the State; the concession thus explicitly stopped being conceived as a transitional phase before access to full ownership.

Four types of development programme were initiated by the State depending on the size of the plot allocated: small-scale development (<10 ha), medium-scale development (10-100 ha), large-scale development (100-1000 ha) and very large-scale development (several thousand ha, referred to as mega-development). Large and mega-development have been promoted more in the context of concession programmes, much less under the APFA. Moreover, mega-development was only introduced in 2011 and concerns only a few wilayas (Ghardaïa, Adrar and Ouargla) and exceptionally one steppe wilaya, El Bayadh.

Due to inadequate results, mega-projects are now being implicitly questioned and the focus is on large-scale development. In 2020, a Saharan agricultural development office (Office de Développement de l'Agriculture Saharienne, French acronym ODAS) was created to promote large-scale development (+ 500 ha) in Saharan wilayas. A first land portfolio of 500 000 hectares is being distributed since 2021. Part of this portfolio is made up of land recovered from former candidates whose projects were unsuccessful. In order to provide a better framework for development, a new executive decree was promulgated at the end of 2021, specifying the rights and duties of land beneficiaries under the development through concession scheme. A set of specifications was also adopted to regulate the use of land and water. This new large-scale development programme managed by ODAS is primarily geared towards industrial crops (oil and sugar crops) and strategic products (wheat, corn, milk).

BOX 1:
APFA CONCESSIONS IN FIGURES

From 1983 to 2018 (MADR, 2018):
157 861 candidates
1.3 million ha conceded
262 264 ha actually developed
In the southern wilayas (ODAS, 2022): 134 000 ha attributed to 140 investors

3.2 Morocco

In Morocco, the 'planning rationale' and the centralisation of decisions are reflected in the agricultural sector in the Green Morocco Plan (2008). It is based on long-term leasing of state and collective land. This evolution was confirmed by the land strategy, which set the objectives of reforming collective land tenure systems in order to stimulate agricultural investment, the appropriation of collective land located in irrigation schemes (melkisation) for the benefit of rights holders, and the valorisation of agricultural land under the private domain of the State[11]. The land reforms also took place in the context of the failure of the previous public land management policies of the 1970s. The public companies in charge of managing state-owned agricultural land were in an unsustainable financial situation characterised by significant social debt. The transfer of collective land took place to a backdrop of strong demand for land, particularly in areas where the exploitation of groundwater offered new agricultural opportunities, resulting in transactions not in line with the legal framework, such as long-term leases, transfer of rights of use ('tanazoul').

With regard to water resources, this resulted in 'laissez-faire' policies for access (to groundwater), through very flexible authorisation and regularisation procedures, but also in policies supporting private drilling and 'drip' equipment. However, this liberal approach did not completely turn the page on the development period of mobilising water resources and increasing supply (Del Vecchio and Mayaux, 2017), as demonstrated by the project to safeguard the Saïss water table by transferring surface water or the desalination to safeguard the Chtouka water table in Souss-Massa.

Public-private partnerships on the private domain of the State

Faced with the difficulties encountered by state companies and the constraints of the legal framework, the reform of state-owned land aimed to promote agricultural investment and employment on state-owned land through long-term leasing to private actors. Between 2002 and 2013, 95 000 ha of state-owned land were thus allocated under public private partnerships (PPPs) as part of the implementation of the Green Morocco Plan. In total, more than 99 000 ha were mobilised for 600 projects with a projected investment of 19 billion dirhams and more than 47 000 jobs to be created (Court of Auditors, 2015).

'*The leasing concerns land with farming potential allowing investments in advanced technology, production improvement and job creation. To this end, the State Domains Directorate (Direction des Domaines de l'Etat), in coordination with the Agricultural Development Agency (ADA, Agence de Développement Agricole), is proceeding with the leasing by invitation to tender of the State's private estate in support of the operationalisation of the Green Morocco Plan.*' [12]

The leasing of land by invitation to tender initially concerned large farms of several hundred hectares that were managed by a public structure for agricultural development, Société de Développement Agricole (SODEA)[13]. The bidding documents had to explain the investment plan and yield objectives in relation to the priorities of the Green Morocco Plan for the region concerned. In cases where the farms already employed staff, the projects had to propose a plan to take them on and the corresponding expenses, which could amount to several million dirhams. Given the specifications, only large investors could bid for this type of tender. These socially selective specifications are reminiscent of the specifications of the colonisation lots that steered investment towards large, highly capitalistic so-called modern farms (Gadille, 1955). It is as if the concern to preserve

11. Anonymous, not dated. *Etude relative à l'élaboration de la stratégie foncière nationale et du plan d'action pour sa mise en œuvre. Rapport Synthétique de la stratégie. Maroc, Rabat.*
12. https://www.domaines.gov.ma/fr/Proc%C3%A9dures/Locations/Pages/Location-agricole-par-appel-doffres.aspx
13. Mutually agreed leasing procedures can be mobilised in the case, for example, of plots adjoining existing projects

post-independence investments and the pursuit of the model of modern capitalist agriculture inspired by the Californian model of high value-added crops - fruit farming (Swearingen, 1987), were being perpetuated despite the management difficulties of these large farms.

In a second phase, the tenders were for smaller areas of agricultural land, allowing smaller investors to bid.

Melkisation of collective land and mobilisation of one million hectares

Melkisation of land located in the irrigation schemes

The process of melkisation of collective lands as provided for by Dahir (royal decree) 1-69-30 of 25 July 1969[14], which provided for the melkisation of the lands of ethnic communities located on irrigation schemes, has been 'reactivated' within the framework of a project financed by the Millennium Challenge Corporation in the Gharb and Haouz schemes. The complexity of the procedure, requiring lists of right holders to be drawn up while setting a minimum size of properties, leads to the establishment of undivided property rights on lots. The process is also confronted with the difficulty of managing 'grey' transactions, in particular previous transfers of rights of use ('tanazoul'). In the absence of recognition of the occupant, ownership is registered in the name of the ethnic community.

Extension of melkisation to bour (unirrigated) land

The 2019 reform extends melkisation to collective lands in favourable bour through the enactment of two laws[15]. The melkisation process involves drawing up lists of right holders who become owners, usually in joint ownership, of plots of land whose minimum size is set by law. The criteria for entitlement are specified by decree: belonging to the ethnic community, being an adult and being a resident, but they remain a source of contestation and interpretation.

The 2019 legislative reform maintains the State's administration and confirms the limits with regard to exercising ownership rights. Article 4 of law 62-17 stipulates that ethnic communities 'may dispose of their property in accordance with the customs and traditions relating to the management and use of such property, in conformity with the legislative and regulatory texts in force, under the aegis of the State and under the conditions provided for by this law'. In this sense, the communities' right of ownership is in contradiction with the definition of ownership in the Real Property Code (Code de Droits reels), which postulates that the owner of the property has the exclusive power to dispose of it. The reform confirms the State's authority over ethnic community lands but delegates certain prerogatives to the Conseil Provincial de Tutelle (provincial supervisory board), in particular the establishment of lists of rightful claimants.

The 2019 reform introduces an important change by allowing the leasing of collective land. These provisions bring the legal framework into line with major agricultural investment projects such as the date palm programme contract, which mobilises collective land for large plantations in Tafilalet.

The reform has recently been reoriented to lease smaller plots through calls for projects, without abandoning projects intended for investors[16]. Of a total of approximately 130 000 ha currently being allocated, 55 000 ha are being proposed to investors[17]. The projects are evaluated in particular on the basis of the rental income proposed by the bidder, which accounts for 40% of the project's final score. Other criteria taken into account include employment and the project's coherency.

Women's access to collective land

In the context of the transfer of collective land for economic projects or urbanisation, in the early 2000s, women demanded to be recognised as having rights and to benefit from the right to use land (Ait Mous & Berriane, 2016). The women's movement, known as 'Soulaliyates' in reference to their membership of the tribal group, the soulala, led to changes in the legal framework in 2009 and 2012 to include these 'persons without rights' (Berriane, 2015). Indeed, according to the customary rules, women have only a very limited right to use the land. The right holders of collective land are traditionally men, although rules and practices are changing. Some families or groups recognise rights of use for widowed women who have no sons, for example, whereas in theory, the husband's share from the collective division is supposed to come back to the community in the absence of a male descendant. Similarly, inheritance practices are evolving and may include women, particularly on the basis of Muslim law (FIT Conseil & Agroconcept, 2017). Finally, women benefit indirectly from their husbands' rights of use (Ait Mous & Berriane, 2016).

The reform of women's rights to communal land is particularly interesting to illustrate legal pluralism[18] and how sources of rights or legal reasons are mobilised to negotiate new rules. The claims of the soulaliyat movement mobilised several sources of law, sometimes with an evolution in the argument. While membership of the Soulala refers to customary law, membership of a family is also claimed through civil law (registration in the family record book). The reference mobilised can also be used in a contradictory manner both to include and to exclude. Reference to the patrilineal link of customary law is the basis of the claims: 'the land of the fathers and ancestors belongs to the sons and daughters' (Ait Mous and Berriane, 2016)[19]. But this link is also used to exclude daughters who are only linked to the clan by their mother, the 'false soulaliyates', from the list of right holders.

14. O.B. 29 July 1969, p. 789 and O.B. corrigendum 19 November 1969, p. 1414.
15. Law 62-17 of 09/08/2019 on the administrative management pertaining to ethnic communities and the management of their property and law 63-17 on the administrative delineation of soulaliyat community lands.
16. Call for projects published on the new website www.terrescollectives.ma.
17. 'Terres Soulaliyate : 55.000 ha proposés en location pour des projets d'investissement.' Le Matin, 30 September 2022. lematin.ma/express/2022/abdelouafi-laftit-lexploitation-gestion-terres-soulaliyates/381441.html
18. (Mouaqit, 2016) speaks of compositive legal reason to describe the recompositions based on the composite social reality integrating Muslim law, customary law and local practices.
19. One of the slogans cited, p 123.

At the national level, the legal frame of reference refers more to international law. The demand for equal rights with men is based on positive law, in particular the Constitution, but also on international law through the international conventions that Morocco has ratified, and notably the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) promulgated by the United Nations in 1979 and ratified by Morocco in 1993. The reference to international law and to the equal treatment of men and women appears to be a way of circumventing the reference to inheritance, which would imply the application of Muslim law and therefore unequal treatment of women. The reference to Muslim law in one of the circulars finally disappeared in the 2012 circular that sets out the rules regarding women's rights to collective lands. The circular thus grants equal rights to men and women, an advance for women in relation to inheritance rules based on Muslim law.

This recognition of women's rights has resulted in their inclusion in the lists of right holders when collective land is transferred, as was the case in Gharb for urbanisation, and their compensation in kind or in cash. The reform is also reflected in the integration of women in the lists of right holders for the melkisation operations underway. Furthermore, it has enabled their integration in agricultural extension projects in oasis areas[20].

The 'main levée' reform on the CRAs

The 2006 agrarian reform referred to as the main levée aimed to remove the investment constraints in agrarian reform cooperatives that had been undermined by conflicts and the decapitalisation of infrastructure and community facilities. In urban areas and their outskirts, however, the massive use of derogations made it possible to bypass the constraints on mobilising land (CESE, 2014). The urbanisation of the city of Fez took place at the expense of CRA land, which was nonetheless inalienable and non-constructible, located within the urban scheme and on its outskirts (Es-Sallak, 2016).

The main levée reform on CRA land authorised the dissolution of cooperatives and allowed members to obtain full ownership of their land. It thus altered the rules governing access to land, in particular by authorising transfers and lifting the constraints on leasing or association, as well as the derogation on inheritance. The reform also changed inheritance practices, particularly for women (Bossenbroek, 2017; Bossenbroek & Zwarteveen, 2015).

3.3 Tunisia

Land policy took a liberal turn focused on the privatisation of collective land and the transfer then concession of state-owned land. The privatisation of public land dates back to the early 1980s but was marked by the 2011 revolution which called into question the management of state-owned land. The excesses of the privatisation of collective land also led to a new reform in 2016.

Accelerated privatisation of collective land

The public authorities' proactive policy privileged the privatisation of collective lands, thus continuing the process initiated by the colonial authorities. The post-independence reforms set out the procedures for granting any member of a community a plot of land that had been developed (mainly though plantation). However, the process remained relatively slow and it was only from the 1970s that the accelerated privatisation reform (1971-1988) was implemented. A possession survey carried out with the management board was then all that was needed for collective land to be allocated in a private capacity. The process was completed in 1988 with the reform establishing a local supervisory council (conseil de tutelle local) at delegation level which reinforced the regional institutions. The objective was to complete the sharing of collective non-pastoral agricultural land and to accelerate the submission of collective rangeland to the forestry regime.

In 2016, following a national consultation, a new law amended the 1964 law to confirm the privatisation process. The possibility of recognising vivification had led to abuses, with appropriation by non-rights holders and the vivification of marginal land for non-agricultural purposes. The reform aims to better protect collective land from being appropriated under the pretext of El Ihya (vivification) and to update the distinction between the types of collective land. It differentiates between land for agricultural purposes which is intended to be privatised for the benefit of community members, land for pastoral purposes and land whose cultivation entails risks of desertification. The law also grants more important and extensive prerogatives to the management boards (Nefzaoui et al., 2020).

Public land transfers and concessions

In the early 1970s, the reform provided for the transfer of state-owned land to young farmers and by public auction. In the mid-1980s, the State opted for concession.

From the cooperative experience to concessions on public land

In Tunisia, state-owned land played an important role in the establishment of the first production cooperatives during the decade 1961-1969. The relative failure of this collectivisation policy resulted in the dissolution of most of the cooperatives and the restructuring of state-owned land. A relatively large share of state-owned land (around 165 000 ha in the 1970s and 1980s) was then transferred or sold to members of cooperatives and graduates of agricultural schools, among others (Elloumi, 2013).

With the more liberal turn of the 1980s, the State's withdrawal from production was achieved through the creation of private law agricultural development companies (sociétés de mise en valeur et de développement Agricole, French acronyme, SMVDA). The state-owned land allocated to the cooperative production units in the 1960s was given to the SMVDAs as a concession for periods of up to 40 years. The SMVDAs were bound by development specifications and obliged to re-employ the staff of

20. See the case of Boudnib, Tafilalet.

the former cooperatives. The concessions gained momentum in the 1990s with restructuring and widespread leasing to SMVDAs, agricultural technicians and young farmers.

Separation of property and management

The 1990s were marked by an important decision. The law of February 1995, which prohibited the State from selling the land it owned, established the principle of separating the appropriation of property by the State and the delegation of its management. At the time, there were approximately 500 000 ha of state-owned land left out of the 800 000 ha. The leasing of state-own land to private actors, in various forms, reached 40% of state land (Table 2). The OTD retained about 30% of the land under direct management.

The allocation of state-owned land to private investors through long-term leases (20 to 40 years) increased the SMVDAs' share to the detriment of the former cooperatives. In irrigated areas, plots of 10 to 20 ha were also allocated to agricultural technicians or engineers for periods of 15 to 40 years. Finally, young farmers and former co-operators could benefit from plots of 3 to 5 ha maximum in irrigated areas for periods of 15 to 40 years.

Table 2: Procedures for the allocation of state-owned land

Management method	Type of use	Surface area (ha)	Share (%)
State-owned land managed by the State	OTD	157 000	31
	Agricultural cooperatives: the cooperators are usufructuaries, the State remains the owner of the bare land	16 042	3
State-owned land managed by the private sector under lease	SMVDAs	127 907	39
	Agricultural technicians or engineers	52 346	
	Young farmers and former cooperators	31 248	
	Scattered plots of land leased to private individuals	30 394	
Other	Forest, compensation land (infrastructure)	70 464	14
	State training and research institutions	14 598	3
	Total	**500 000**	**100**

Source : MARHP, 2015

Recovery of state-owned land and ownership disputes

Since the 2011 revolution, the successive governments have adopted a policy of recovering state-owned land that is poorly or illegally managed: the recovered land results from a process of disqualification of rights, abandonment of exploitation, expiry of the lease period or confiscation for non-compliance with the specifications or for undue allocation. The land thus recovered is assigned to the OTD to be managed provisionally while awaiting allocation according to the procedures in force. This procedure has mainly affected SMVDAs whose beneficiaries have been deprived of their rights for failing to comply with the specifications, and plots or parts of farms that have been taken over by individuals or groups of individuals under various pretexts in contradiction with the law.

While the State's right of ownership over the land is not questioned in the majority of cases, numerous disputes and attacks have taken place following the revolution of 14 January 2011, and have led to occupations by the descendants of ancestral owners under the pretext that their ancestors were despoiled by colonisation (Elloumi, 2013).

The situation becomes more complicated in cases where the State is unable to prove its full ownership of the land: see the case of the Jemna Oasis and the difficulties of its exploitation by an association for the safeguard of the oasis since the revolution of 14 January 2011. Moreover, this association filed a complaint against the Tunisian State to recover the land, which was originally collective land (Jouili & Elloumi, 2021).

4. THE EXTENSION OF IRRIGATION IN THE MAGHREB: TRAJECTORIES RUNNING OUT OF STEAM AT DIFFERENT PACES

The analysis of the processes of privatisation, ownership or use of land in the three countries and of their impacts in terms of agricultural dynamics, or even territorial reconfigurations (actors, tenure, water resources), shows that the territories and countries follow similar trajectories which lead to a more or less advanced water crisis and to risks of insecurity for the rural populations in contexts where the agricultural dynamics do not benefit the local actors. In certain contexts, the modernisation of agriculture can be part of an extractive logic based on the exploitation of water resources and soil fertility.

The trajectories of the irrigated areas and of the countries can be placed in the chronology of the different stages of the evolution of groundwater-irrigated agriculture in arid zones described by Shah (Shah 2010) (Table 3): (i) a first phase with the emergence of new pumping technologies without regulation of access to water; (ii) a boom in pumped irrigation agriculture, justified or encouraged by the objective of economic development, resulting in an increase in withdrawals; (iii) the first signs of overexploitation with the beginning of a drop in the piezometric level of the water table, but which remains justified by the imperative of economic development and the possibilities of mobilising additional water resources; operating costs increase and exclude those who cannot keep up with the race for the biggest pump; (iv) a decline in areas, where irrigated crops are abandoned due to a lack of water resources leading to the marginalisation and impoverishment of the most vulnerable.

4.1 Modernisation and intensification through the race for water in the agricultural plains

The modernisation and intensification of agriculture in the groundwater-irrigated plains resulted in an overexploitation of water resources and a near universal drop in groundwater levels. The risk of economic and job losses in these systems that are often highly intensive in paid labour warranted public safeguard

Table 3: Trajectories of groundwater-irrigated agriculture

	Stage 1: New technologies	Stage 2: Boom in irrigated farming	Stage 3: Overexploitation, exclusion and mobilisation of additional resources(*)	Stage 4: Decline, impoverishment and marginalisation
Algeria	Canary greenhouses and widespread drip irrigation (Biskra) Mini-pivot (El Oued)	Wilayas of the south (Biskra, El Oued, Ghardaïa, etc.)	Biskra (Ouled Djellal, Mziraa) Tiaret (Rechaïga)	
Morocco	In vitro date palm Majhoul (Tafilalet) Solar pumping	Tafilalet, Meski-Boudnib: date palm extensions on collective land	Guerdane (1990), Chtouka (2020), Saïss (2020) Boudnib (2020)	Souss Massa
Tunisia	Widespread drip irrigation	Nefzaoua: date palm extension Kairouanais: market gardening and arboriculture	Cape Bon (surface water transfer from the north) Zaghouan (lack of additional resources, recharge attempted)	Regueb (Sidi Bouzid), Zaghouan (Nadhour-Saouef)

(*) Dates of additional resource mobilisation projects in brackets (dams, desalination)

projects: deep public boreholes (southern Tunisia, Souss Amont in Morocco), recharging with surface water in the Guerdane scheme and the Saïss plain in Morocco (AFD, Plan Bleu, Agroconcept, BRLi, 2013), mobilisation of non-conventional water (desalinated water in the coastal area of Chtouka in Morocco), transfer of water from the north in the Cape Bon area in Tunisia to safeguard citrus plantations or market gardening.

Despite these increasingly costly safeguard policies, some areas experienced a decline marked by the abandonment or reduction of irrigation, the marginalisation of farms unable to keep up with the race to pump water and risks of the impoverishment of the most vulnerable populations. This decline was also reflected in the decapitalisation and devaluation of investments where plantations were uprooted due to insufficient water resources combined with insufficient profitability (case of citrus fruits in Souss in Morocco). On the contrary, in Algeria, in the Mitidja plain, the agricultural dynamic still benefits from relatively favourable conditions.

Itinerant market gardening in the Mitidja plain in Algeria

The commune of Rouiba has a total of approximately 2 426 hectares of useful agricultural area, more than 75% of which is public land of the former DASs restructured into EACs and EAIs, and most of which are irrigated. A significant proportion (40% according to our estimate) of this land is transferred on the very active, albeit officially unauthorised, indirect farming market (tenant farming). The demand on these markets is driven by market gardeners for whom renting allows access to land and groundwater from collective or individual boreholes. The market garden tenants are professional producers who have chosen to specialise in open field market gardening. This choice of specialisation combined with the instability of the tenant farming market results in itinerancy. Annual rental contracts are renegotiated each year and renewed for a total average duration of four years.

This itinerancy can also be motivated by the search for land that is not contaminated by disease. Indeed, this open field market gardening is hyper-intensive, with crops following one another without a rest period for several years (three years on average) and a rotation with wheat to limit the disease cycle and let the land rest. This intensive exploitation of the soil and the intensive use of chemical inputs raises questions as to the health of the soil and its sustainability in terms of its capacity to regenerate its natural fertility.

For the concessionaires of public land, this land market and the market gardening dynamics that it has enabled in the region are a boon. It allows them to obtain a rental income from land that they are unable to exploit directly for a variety of reasons.

The land dynamics show a relative concentration of market garden areas by the largest market gardeners who manage to cultivate up to some 20 hectares on average on four plots. However, this does not seem to exclude small-scale tenants who consider that the areas that can be cultivated for market gardening are limited not only by financial capacity but above all by the need to have a reliable workforce.

Mobility of capitalist agriculture and new actors

In Morocco, the intensive exploitation of water tables led to trajectories of depletion characterised by the mobilisation of additional resources and the displacement of intensive agriculture (early-season market gardening and fruit growing) towards areas with better water resources. Capitalist export agriculture, which was highly developed in the 1980s and 1990s in the coastal zone south of Casablanca (Oualidia, Azemmour), was abandoned and moved to the Souss Massa zone (Agadir region) and then to the coastal zone of Menasra, north of Rabat. More recently, the large agricultural groups have left the plains that are relatively well endowed with water resources and invested in the pre-Saharan territories of the south of the country (early-season market gardening in Dakhla, date palms in Boudnib in Tafilalet).

The mobility of operators towards areas better endowed with resources or presenting other potentials did not put an end to the search for additional water resources to face the crises. The water crises affecting the Souss Massa since the 1960s led to the desalination of sea water for irrigation in order to reduce the pressure on groundwater.

The reforms of the 2000s, marked by the provision of public land and significant financial support, were a turning point. They attracted new actors, in particular large investors from other

sectors and some investment funds seeking financial profitability, particularly in the highly capitalistic fruit tree and date palm sectors.

In the Saïss plain, the provision of state land and the main levée reform on the CRAs attracted new actors who invested in market gardening (tenants of the melk land of the former CRAs) and arboriculture (PPP investors on state-owned land or on land purchased further to the agrarian reform). The calls for tenders for long-term leases (PPP) allowed the actors historically established in the area - large tree and wine estates, to continue their group growth dynamics. However, they also opened the door to investment funds such as Olea Capital or Dahra, with the capital needed to meet the requirements of the specifications and looking for projects with high financial profitability. They also attracted non-agricultural investors from other sectors, notably industry, seeking to diversify their activity.

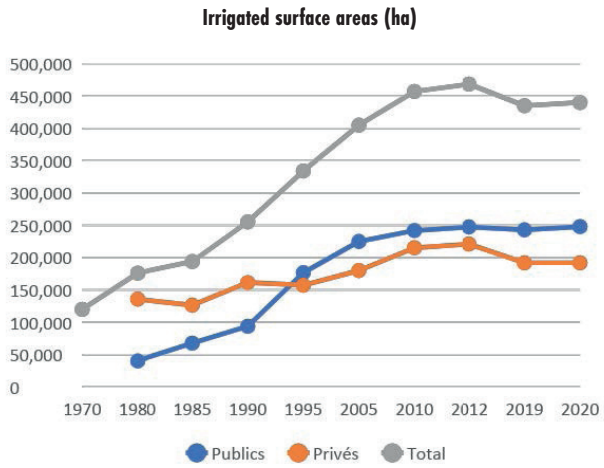
The main-levée reform in relation to the CRAs resulted in more sales and leases. The former CRA members adopted a variety of strategies to survive, expand or leave farming: full transfer, partial transfer in order to invest in the farm, rental, association (Ameur et al., 2017). The importance of renting resulted in the development of intensive open-field market gardening with high water consumption.

The race for water resources also resulted in the first signs of depletion, affecting not only the smallest farms but also new investors. Some large PPP investment projects that had mobilised substantial public funding for irrigation equipment (boreholes, basins, drip equipment) have come to a halt due to insufficient water resources.

Towards a decrease in irrigated areas in Tunisia?

In Tunisia, from the 1970s, Economic and Social Development Plans focused on the development of irrigation through public investment in the development of public irrigation schemes and subsidies for digging wells and equipping private irrigated schemes (Figure 1).

Figure 1: Evolution of the surface areas of irrigated schemes in Tunisia



Source: DGEDA-MARH irrigated scheme surveys quoted in Elloumi (2016) and updated by the authors

In the Governorate of Zaghouan, the development of irrigated agriculture began in the 1980s with the development of public irrigation schemes, particularly on state-owned land, before private initiatives took over to develop private irrigated schemes with the financial support of the public authorities. Irrigated agriculture has spread to new areas over the last fifteen years under the impetus of state programmes aiming to develop market gardening, fruit growing and cattle breeding (Gana, 2008).

This dynamic of agricultural intensification has led to a race for irrigation by farmers in the private irrigation schemes and some beneficiaries of the public irrigation schemes who have resorted to new 'illicit' boreholes. The digging of boreholes within the public irrigation schemes is partly the result of the weak capacity for action of the GDAs in charge of managing these schemes in terms of deepening boreholes, adapting the surface areas, etc. More than one in two boreholes is illicit and they represent almost a third of the total pumping capacity in the Nadhour area. The intensive exploitation of the water table, one of the main water tables in central Tunisia (the Saouef-Nadhour-Sisseb-El Alem hydrological complex), has reached the stage of overexploitation and the signs of exhaustion are visible: a drop in piezometry

Table 4: Stakeholder profiles and land tenure logics

Dynamic	Own land, internal growth		Mobilisation of capital and own resources		Mobilisation of external capital	
Actors	**Large estates**	**Family farms**	**Entrepreneurs, small-scale investors**	**Liberal professions, urban**	**Tenants**	**Investors other sectors**
Land access	Large melk estates, PPP PDS	Direct farming and indirect (tenant) farming Melk purchase possible	Purchase of melk land Rental of collective land & PDS	Purchase of former CRA land	Rental of former CRA, melk land	PPP PDS
Water access	Deep boreholes (>100m), large basins	Wells, boreholes possible (less than 100 m)	Boreholes	Wells/ boreholes	Boreholes, wells	Deep boreholes, large basins
Production systems	Arboriculture, vines	Diversified agriculture, bour and irrigated	Diversified arboriculture	Partial arboriculture	Intensive market gardening	Large plantations
Logic	Group growth	Consolidation, maintenance, resilience.	Capitalising on own resources	Patrimonial, fiscal	Profitability	Diversification, capital mobilisation

and a drop in the flow rate of the boreholes. The attempts to recharge the Nadhour-Saouef water table do not seem to be commensurate with the deficit. The area was declared a water resource safeguard zone in 2018.

In the Nadhour area, the irrigation crisis has resulted in the gradual return to unirrigated farming for family farms that cannot keep up with the pumping race: abandonment of the most demanding crops (melon, watermelon), then irrigated crops that consume relatively less water (dried tomato, chilli pepper), and finally the gradual adoption of arboriculture (olive and semi-extensive almond trees). In addition to its relatively low water consumption, arboriculture is an attractive investment for new urban investors who are not present in the area. The decrease in water resources is also reflected in agricultural intensification and the concentration of land in farms of a few dozen hectares. These farmers manage to consolidate an inherited nucleus by renting plots or, more rarely, by purchasing them. The buy-sell market is limited due to the absence of land titles, indivision, and restrictions on the subdivision of the schemes by the Agence Foncière Agricole (agricultural land tenure agency).

In the area of El Amaiem (Delegation of Fahs), the farms differ significantly in terms of size but also trajectory. Some 3% of farms, which exceed 100 ha, account for more than half of the surface area. SMVDAs of several hundred hectares and a technical plot benefit from lease contracts on state-owned land. But farmers have also been able to build up large farms through reverse tenancy. In this way, leasing, and to a lesser extent buying, allow multi-activity farmers who have inherited land to gradually build up a large farm. While investment in irrigated arboriculture has made it possible to develop production (olive oil in particular) and to create employment in an SMVDA of almost 1000 ha, this could not have been done without recourse to illicit drilling. On the contrary, other farms with less access to groundwater and suffering from the drop in the water table are reducing market gardening and irrigation and limiting themselves to crops that demand less water, unirrigated farming and livestock. The exclusion from irrigation affects not only small farms but also an SMVDA and the technical plot.

The delegation of Regueb (Governorate of Sidi Bouzid) has developed rapidly since the 1990s. The availability of water resources and high agronomic potential of the area has attracted various actors – entrepreneurs and investors, who purchase or rent land. The land market, characterised by the predominance of melk land, was very dynamic at the time and some entrepreneurs acquired several hundred hectares. A few decades later, the area is already facing a water crisis and the exclusion of farmers who cannot keep up with the race and who, for a lack of alternatives in other sectors, find themselves in a precarious situation. Indeed, the agricultural specialisation of the area limits the supply of alternative activities, which themselves depend heavily on the agricultural dynamic. It is in this context of growing social inequalities that the social protests of spring 2011 emerged (Fautras, 2021). In contrast, in the Cape Bon area, irrigated agriculture has been at the origin of a regional development process. The diversification of the economy (tourism, agri-food industry, etc.) has helped to mitigate the consequences of overexploitation and exclusion. However, the overexploitation of water resources (underground and surface) in the Cape Bon area has endangered the main citrus-growing scheme in Tunisia, which could only be saved through a safeguard programme based on surface water transfers from the north and in particular from the Medjerda and Ichkeul basins, thanks in particular to the Medjerda Cape Bon canal. This transfer relies on the Sidi Salem dam on the Medjerda (500 million m3), which is currently almost empty following a series of dry years. Similarly, the safeguarding of the market garden schemes that were irrigated with water from the aquifers has also relied on resources transferred from the north by the same canal and injected into the aquifers to counter the devastating effect of the intrusion of marine water due to overexploitation. In the Kairouanais, the aquifers are all overexploited, even if there are significant resources. The area is also constrained by the transfer of groundwater and surface water resources to the coastal areas. But controversy persists over the resilience of the deep aquifers due to the size of the reservoir of some of them (one billion m3 has been put forward for the Kairouan plain).

4.2 Extension of irrigated areas in Saharan zones

'*The smallholder phase, which mainly corresponded to the 1970-80 decades, has been succeeded by a new formula that takes account of two contradictory elements of recent national policies: the will to extend development to large new areas, and the will to disengage the States. The solution is to turn to large capitalist farms that make their own investments and take charge of vast areas.*' (Côte, 2002)

The development of Saharan zones is based on the threefold principle of groundwater resources perceived as 'abundant', public investment support programmes and the facilitation of access to land and water.

The relative abundance of groundwater resources led Tunisia to implement the water development plan of the south (Plan de Développement des Eaux du Sud) from the start of the 1980s onwards. Reforms of access to public land in Algeria (early 1980s) or of collective land in Morocco (late 2000s) contributed to a new boom in groundwater-irrigated agriculture in arid Saharan zones.

The results were to take various forms depending on the configurations of the actors and the knowledge and innovations mobilised: large agri-food groups and financial capital in Morocco, entrepreneurial agriculture in Algeria and Tunisia.

The pioneer fronts of southern Algeria on public land

In Algeria, Saharan agriculture has developed thanks to the discovery of immense groundwater reserves[21] and the democratisation of drilling (Daoudi and Lejars, 2016). The relative decrease in the cost of drilling has facilitated access to

21. 'The Intercalary Continental, also known as the Albian Aquifer, is very large and extends over an area of 600 000 km² [...] The Terminal Complex, which is smaller, extends over nearly 350 000 km² and encompasses a series of aquifers. (Mihoub et al., 2016)

these groundwater tables and the development of a new form of Saharan agriculture that is completely different from traditional oasis agriculture (Côte, 2002). Drilling has completely changed the relationship to water and therefore to land in Saharan agriculture. Farmers are no longer limited to areas where water is easily accessible as they were in the past, but instead go deep into the whole water table to find it. The development policy has unlocked access to land and water through the reform of access to land - APFA or concession, and financial support for investment (public investments and subsidies for on-farm investments).

Some wilayas in the south of the country (Biskra, El Oued, Adrar, Ouargla and Ghardaïa, etc.) are experiencing an unprecedented agricultural dynamic. New actors, small- and medium-scale agricultural entrepreneurs from different regions of the country and from different sectors of activity, are contributing to the new agricultural dynamic. Real informal land markets have developed which are now both the driving force and the result of this dynamic (Dereri et al., 2015; Daoudi & al., 2017; Daoudi, 2021; Ouendeno, 2022).

El Oued, an agricultural dynamic driven by local knowledge

The development of Saharan agriculture in the wilaya of El Oued, located in the northern centre of the Eastern Erg, relies above all on rich water reserves at depths varying from 3 to 40 m from the north to the south of the Erg (Côte, 2009).

The agricultural dynamic is driven by local Sufi knowledge and major technical innovations that have enabled the transition from excavation agriculture (ghouts) to surface agriculture. The drilling technique and rural electrification first allowed easier access to abundant groundwater. The introduction of the mini-pivot and the reduction of the labour time involved in irrigation is a major innovation. The locally manufactured, cheap and efficient mini-pivot explains the rapid expansion of irrigated areas. A second innovation was to allow the management of fertility in sand-based agriculture through the massive use of poultry droppings brought in by large trucks from the northern wilayas of the country. '*The design and implementation of the artisanal pivot is the result of an incremental innovation starting from the large conventional pivots introduced by the State, which were expensive and not adapted to the objectives and technical capacities of the farmers. From this came the production and dissemination by local artisans of an accessible irrigation system adapted to the socio-economic realities of the region*' (Ould Rebai et al, 2017). With mini-pivots averaging 1 hectare each, local farmers[22] have thus developed labour- and capital-intensive mixed crop farms with potato in rotation with groundnut, tomato and garlic. A farm usually has several mini-pivots, each of which is supplied by a well. This model is not static, new crops are regularly introduced ('extra-early season' watermelon, industrial tomato, etc.) as well as new techniques (canary greenhouses, soilless cultivation, etc.). A whole economic ecosystem has gradually developed around this intensive agriculture, contributing to the improvement of its performance (artisanal mini-pivot industry, wholesale fruit and vegetable markets, markets for agricultural inputs and equipment, poultry manure market, etc.).

Access to land in the wilaya was first unlocked by the land reforms inherent to development, but also by private initiative without land regularisation. Indeed, in the communes where agriculture is most dynamic, such as Hassi Khalifa, a trend towards the private appropriation of land bordering the first development schemes created by the State can be observed. Expansion began around these schemes, which were themselves generally created near urban areas. The high profitability of market garden crops encouraged farmers to extend their cultivated areas into the most remote and sandy parts of the commune. Often on these remote extensions, farmers did not initiate the administrative procedures to regularise their right to the land. On the contrary, for the first extensions made on land close to urban agglomerations and roads, the formalisation of rights through the APFA procedure was the norm. On these extensions, access to water is provided by illicit wells and boreholes (without authorisation), and electrification is provided by personal means.

The increasing reliance on deep groundwater to supply towns with drinking water and the region's topography have encouraged the phenomenon of water levels rising up in at least 18 of the wilaya's thirty communes (Côte, 2009). The development of irrigation has exacerbated this phenomenon, which primarily affects traditional oases (ghouts), where palm trees are dying of asphyxiation. The intensive agriculture developed over the last twenty years on sand using large quantities of poultry droppings from very intensive poultry farming raises questions as to the pollution of the water table by biological residues.

Biskra, an agricultural dynamic driven by greenhouse market gardening and Deglet Nour dates

The dominant technical and economic model in Biskra differs from that of El Oued, even if it is still based on cash crops (market gardening and Deglet Nour dates). Since the mid-1990s, the wilaya of Biskra has gradually specialised in the production of vegetables in greenhouses (known locally as 'plasticulture'). It has become the leading national production centre of this and has consolidated its position as national leader in the production of the most popular variety of dates on the domestic market and for export (Deglet Nour). This wilaya alone accounts for nearly 25% of the national production of tomatoes and dates and nearly 50% of the national production of early-season vegetables grown in greenhouses.

This wilaya has 104 000 irrigated hectares, part of which has been the subject of various development programmes. Small-scale development is largely dominant in this wilaya. A dynamic land rental market allows different categories of farmers to invest: landless farmers, itinerant tenants, indigenous and non-indigenous investors (Daoudi et al., 2017 ; Ouendeno, 2022).

The sustainability of this water- and capital-intensive model is largely questioned (Petit et al., 2017). The drawdown of the water table is reaching worrying levels in some places (Ouled Djellal, Mziraa, Doucen). In a survey conducted in 2017 among a sample of 120 farmers in the commune of Doucen, the problem

22. In some communes where the development dynamic is more recent, such as the commune of Ben Guecha, some of the investors come from other communes in the wilaya, as the inhabitants of this commune are more agropastoralists than farmers.

of drawdown of the water table was reported by 27.5% of respondents; 5% reported the total drying up of their borehole (Benhadj Tahar, 2018).

While the development models' diversity in size seems to be a pragmatic response adapted to the different capacities of the actors, the areas reserved for large-scale development are tending to increase. This inequality of allocations calls into question the fairness of the policy, as the multiplication of very large allocations ultimately risks depleting the land reserves and limiting the opportunities of access to land for the thousands of young people coming of age to develop an autonomous productive activity (Daoudi et al., 2021).

The spatial and economic scope of the development dynamic gives rise to different reactions from the actors depending on the interests at stake. In the steppe and Saharan communes which have land reserves that can potentially be farmed, the multiplication of small-scale development schemes is a response to a growing local demand. However, large-scale development is much less accepted in areas where land reserves are increasingly limited, as is the case in many steppe wilayas.

Extensions on collective pastoral land in south-east Morocco

The agricultural policy of developing high added-value irrigated crops in the arid areas of the south-east of the country is driven by the relative abundance of groundwater resources, the extent of rangeland, the new technological package - digging and fertilisation for planting drip-irrigated date palm in vitro plants, and the export opportunities.

Capitalist agriculture and small-scale projects of right holders

The implementation of the date value chain programme contract in 2010 (17 000 ha of date palms including approximately 6 000 ha in the Meski Boudnib area, fed by a deep aquifer whose renewal is limited) led to the arrival of new investors in the Meski-Boudnib area in Tafilalet. The investors - large agricultural capitalist groups present in other regions, notably Souss Massa, but also investors from other sectors and foreign investors - gain access to land and water through long-term rental contracts on collective land along with specifications for date production. In response to the risk of investors monopolising the income, 5 ha plots are allocated to persons entitled to collective land in the Meski-Boudnib area for a symbolic rent. These new extensions benefit from financial support from the State for investment in plantations, drilling in the deep water table and the irrigation system. They represent a break from the small, diversified extensions that oasis households have developed outside the traditional oases, as has been the case in other areas of Tafilalet-Tinjdad, Ghellil in the Todgha valley, where income from migration has contributed to extensions. Access to land is a matter of collective sharing and vivification through groundwater. It can give rise to ex-post administrative recognition.

BOX 2: PROFILES OF THE ACTORS IN THE EXTENSIONS, TAFILALET, MOROCCO

Investisseurs : plantations palmier dattier sur TC en location

Allocation of 5 ha plots to rights holders

Extensions of entrepreneurs on collective land

Source : Aloui & Chohin-Kuper

The beginning of the boom but ...

The new date palm extensions of investors on collective lands supplied by the deep water table whose renewal is limited are still at the boom stage (Aloui et al., 2019). In the Meski-Boudnib zone, the planted area increased from 5 000 ha to 12 800 ha between 2016 and 2022, but the leased area reached 27 800 ha[23]. The area could see signs of exhaustion, particularly if efforts to limit the planted area and withdrawals, notably through the groundwater contract in the process of being validated, are unsuccessful. Sustainability will also depend on the anticipated mobilisation of additional resources by a dam on Wadi Guir that will replenish the extensions from 2023.

23. Estimate made on the basis of satellite images as part of a mid-term evaluation of the project to irrigate from the dam on Wadi Guir.

The question of equity may arise when rights holders or small endogenous extensions are unable to keep up with the race for resources. While access to land has been possible for a variety of actors, including women rights holders, those who cannot make a new borehole risk being excluded in a second phase, as happened in the Ghellil water table where plots were abandoned following its drawdown (Kuper, 2022). The resilience of households then depends on the diversification of activities or transfers. At the territorial level, the issue of equity raises questions as to the sharing of the income from this irrigated agriculture based on a resource that is not very renewable.

BOX 3: ACCESS MODES IN EXTENSIONS, TAFILALET, MOROCCO

Legal status, modes of access and practices: Morocco, the case of Tafilalet

Status	Modes of access	practices	Case of Tafilalet-Boudnib
Collective land	- Rental, specifications, date palm programme contract - Rental to ADs	- 'Privatisation under administration' - Amount of rent fixed by the State - +/- legal secondary rights market - State 'guarantor' of the contractual conditions: water	
Collective land		- De facto melkisation - Collective sharing, vivification, ex-post recognition	
Untitled melk land		- Oasis: heritage, indivision, indirect (tenant) farming, arrangements	

Source : Aloui & Chohin-Kuper

Extensions of the Nefzaoua date palms in Tunisia

In southern Tunisia, the public authorities initiated the extension of what were referred to as 'modern' oases in the 1980s, but the dynamics of date palm development subsequently attracted private actors. The Nefzaoua oases cover 48% of the total area of all Tunisian oases (55 000 ha in 2015) with nearly 15 300 ha of traditional oases and 40 000 ha of 'modern' oases with single-crop farming of Deglet Nour (Sghaier, 1999).

The investments in Nefzaoua are old and date back to the colonial period when the aim was to encourage the sedentarisation of nomads by creating new oases around boreholes; the first borehole was built in 1904. Several oases were created (Douz, Faouar, Gattaya, etc.) during the colonial period of the development of collective lands. From this time, single-crop farming plantations of degla were established for colonists (Kassah, 2010).

In the 1980s, the abundance of groundwater resources led to the implementation of the Southern Water Master Plan (*Plan Directeur des Eaux du Sud*), which included a programme to rehabilitate old oases and create new, 'modern' oases irrigated from public boreholes. In contrast to the traditional oases, which were diversified with date palms, arboriculture, market gardening, etc., the new oases were geared towards single-crop farming and the production of high added-value Deglet Nour dates for export.

From the 1990s onwards, the dynamic accelerated. The area under date palm in Nefzaoua increased twofold between 1976 and 1996. Oasis farmers and private actors took over from public programmes to invest in extensions. The oasis farmers, particularly those on the outskirts, contributed to extending the date palm areas by integrating them into the irrigated schemes.

Extensions were also developed by actors with external sources of income (civil servants, liberal professionals, etc.) using individual boreholes qualified as 'illicit'. The development dynamics of date palm extensions are based on the availability of and access to water resources through drilling, the abundance of collective land and the global demand for dates. Private actors have individual access to collective lands based on the 'El Ihya' law of vivification or development and on the Tunisian state's encouragement of the privatisation of collective lands. If access to deep water resources by drilling is considered 'illicit' (from the point of view of the technical agricultural services) the situation is regularised afterwards. Once planted, the land is automatically privatised and much of it is allocated by management boards.

5. IMPACTS

The latest land reforms have led to the separation of land ownership and use. This separation does not only concern state-owned and state-administered land, but also melk land, for various reasons (indivision, restrictions on ownership rights in irrigation schemes, etc.). This synthesis presents an overview of the impacts and results based on reviews and case studies. Although agricultural reforms and policies have enabled agricultural development that has undoubtedly never been so significant, some social and environmental impacts show the limits of the models.

Investments in water mobilisation and the provision of public or state-administered land have contributed to agricultural growth according to macroeconomic indicators, but the impacts in terms of benefit sharing are more complicated to assess. Agricultural growth has been very intensive in terms of water resources and the agricultural policies appear to be out of sync with the water policies.

Finally, in a context of triple crisis - drought, high costs of agricultural products and inputs linked to the war in Ukraine, disruption of economies due to the Covid health crisis, agricultural

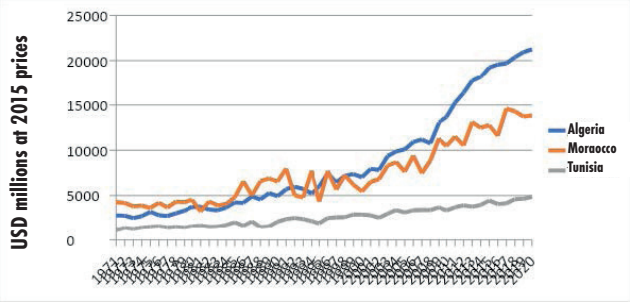
models are being called into question, particularly in terms of their capacity to contribute to the food sovereignty of countries and their resilience.

5.1 Agricultural growth

Policies to invest in modernising agriculture have led to an increase in agricultural production and GDP over the past decades.

In Algeria, domestic agricultural production has risen significantly over the last 20 years. The value of agricultural produce has reached an unprecedented level (3 083 billion dinars, nearly 25 billion dollars, in 2019) (ONS, 2019). Agricultural GDP and agricultural GDP per capita have thus increased considerably since the 2000s, although a slowdown in GDP/capita growth has been observed since 2015 (Figure 2). Morocco has also experienced sustained growth in agricultural GDP since the early 2000s. Agricultural GDP growth in Tunisia has been more modest but steady since the 1990s.

Figure 2: Evolution of agricultural GDP in the Maghreb countries



Source: Faostat, 2022. Note: Agriculture, forestry and fishing GDP

5.2 Growing pressure on water resources

Countries facing structural water stress

The various indicators of pressure on water resources show that the three countries are facing structural water scarcity. They have reached or are approaching the critical threshold of 500 m^3/inhabitant available annually. In Algeria, the annual availability per inhabitant is 380 m^3 and 500 m^3 if we add the non-renewable resources mainly located in the south. In Tunisia, with population growth and the increase in water demand, the water supply per capita will be around 350 m^3/year by 2030 (Hamdane, 2019). Morocco is approaching the critical threshold of 500 m^3.

The countries are characterised by a high level of water stress according to the World Resource Institute indicator[24]. The national water stress level ranking places the Maghreb countries among the countries with the highest stress: Morocco ranks 22 and Algeria and Tunisia rank 29 and 30 respectively out of 189 countries. In Morocco, the majority of water basins are under high water stress (Sebou, Saïss, Souss Massa Draâ, etc.) or even extremely high water stress (Bouregreg, Oum Er Rbia, Haouz). In Tunisia, the basins are in a situation of high water stress (Medjerda) and very high water stress (Tunisia east coast). In Algeria, the coastal basins are also in a high or very high stress situation. The Saharan basins, however, have a lower stress level.

In Tunisia, this results in a deficit in the volume of water stored in the country's main dams, the situation of which is extremely critical according to ONAGRI (the national agricultural observatory)[25]. The filling rate of all of the dams as at 15 February 2023 was only 31.3% (according to data from the Directorate-General of Dams and Large Hydraulic Works). Similarly, in Morocco, the filling rate of dams was approximately 30% during the winter of 2022.

Trends in the overexploitation of groundwater resources

The extension of irrigated areas and agricultural intensification in the plains have led to increased pressure on groundwater, which remains difficult to quantify precisely due to data availability and reliability. Nevertheless, the available data allows the main trends to be identified. The areas irrigated from groundwater in Algeria, Morocco and Tunisia are estimated at 1.75 million hectares and concern more than 500 000 farms (Kuper et al., 2016).

Table 5: Groundwater used for irrigation in the Maghreb

	Algeria	Morocco	Tunisia
Irrigated surface area (million ha)	1.4	1.5	0.44
Groundwater-irrigated surface area	0.9 (64%)	0.6 (42%)	0.326 (60 %)
Number of boreholes	74 000	100 000	34 467 of which 20 350 non authorised or illicit
Number of wells	147 310		151 850 of which 111 431 equipped
Number of overexploited water tables	23/38 in the north, all in the south	57/99	71/273

Sources: Algeria (MRE, 2015); Tunisia (MARHP, 2020); Morocco, year 2012 (Kuper et al., 2016), (Kuper et al., 2016) for the number of overexploited aquifers.

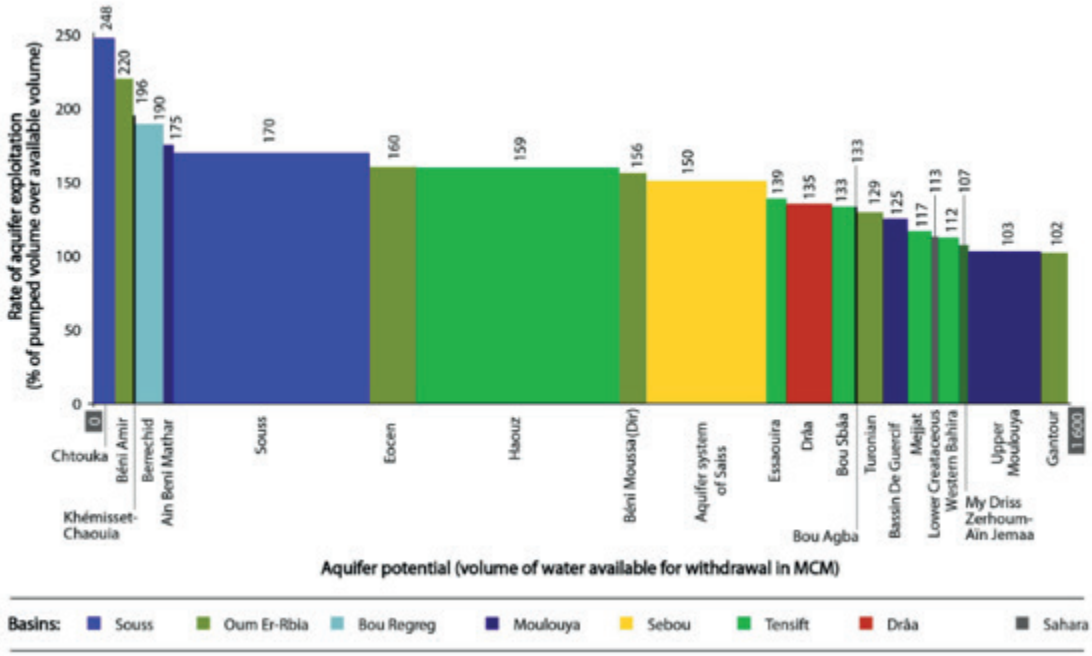
In Algeria, groundwater represents nearly 64% of the irrigated agricultural area (nearly 900 000 ha). Groundwater is accessed through boreholes and wells, which are generally drilled and managed by individual farmers. However, their number is not very well known due to unauthorised wells and boreholes. The latest available statistics date from 2015 and list 74 000 boreholes and 14 731 wells (MRE, 2015).

Access to water tables and the use of water for irrigation purposes is subject to prior authorisation and to the payment of a fee to the State or to the organisation managing the water on its behalf, except in special cases specified in the water law. In practice, however, groundwater use is not yet paid for; only water from dams managed directly by the public authorities is charged to users.

24. The water stress indicator corresponds to the ratio of renewable surface and groundwater withdrawals and availability. A ratio above 80% corresponds to extremely high water stress. www.wri.org/data/aqueduct-30-country-rankings

25. www.onagri.nat.tn/uploads/barrages/15-2-2023.pdf

Figure 3: Rate of aquifer exploitation in Morocco



Source: Hssaisoune et al. (2020)

Figures on the overuse of groundwater are scarce and patchy; data from the public body in charge of monitoring groundwater (ANRH) are not published. However, empirical observations indicate that groundwater is being drawn down in several agricultural regions of the country (Petit et al., 2017; Derderi et al., 2022).

In Morocco, the area under perennial crops has doubled over the last decades and groundwater abstraction has increased significantly. In 2012, the irrigated area was estimated at 1.5 million ha and the share of land irrigated from groundwater at 42% (Kuper et al., 2016). Most of the water tables are overexploited and are experiencing a continuous decline in piezometric levels (Figure 3).

The pressure on groundwater resources leads to an estimated annual deficit of 1.1 billion m3 according to a group of experts (Groupe Eau, Laureates IAV Hassan II, 2022). This figure, based on the available official data, is probably largely underestimated.

'*Groundwater resources are overexploited in almost all known water tables. In the absence of control of extractions of these resources, the development of irrigation combined with the impacts of the droughts of the last twenty years has led to increased overexploitation of groundwater. This has resulted in a general drop in piezometric levels. The global balance of groundwater tables shows an estimated deficit of around 1.1 billion m^3/year.*' (Groupe Eau, Lauréats IAV Hassan II, 2022)

The quality of groundwater resources is also deteriorating due to overexploitation and agricultural pollution.

'*Not only are groundwater reserves becoming scarcer, but their quality is deteriorating due to overexploitation, pollution, rampant urbanisation, agricultural pollution, tourism development and seawater infiltration due to sea level rise and intensive pumping.*' (Groupe Eau, Lauréats IAV Hassan II, 2022)

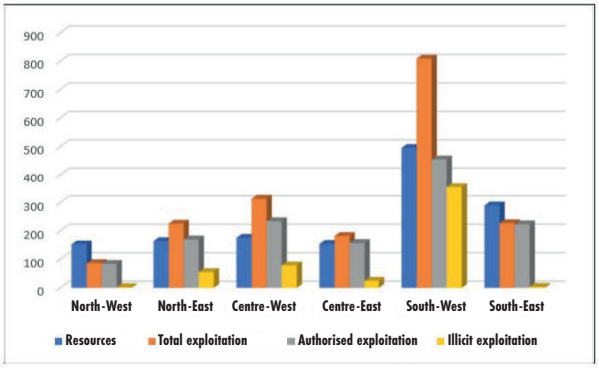
In Tunisia, groundwater accounts for 80% of irrigation water and enables the irrigation of 60% of all irrigated schemes. All of these resources are subject to strong withdrawal pressure, with an overall exploitation rate of 128% (MARHP, 2020). The upper aquifers account for approximately 32% of the total withdrawal from these resources. In 2020, these withdrawals were made through 115 001 equipped wells. Although the number of extraction points remains relatively stable (111 431 in 2015), the pressure on these resources is considered to be high with an average exploitation rate of 119%.

'*31% of all of the country's water tables have an exploitation rate exceeding 110%. They have an overall deficit in relation to their exploitable resources of around 265 million m3/year with an average rate of 165%. Vast farming regions are now under serious threat of water shortages as well as risks of brackish water intrusion in coastal areas.*' (MARHP, 2020, p. 79).

It is the deep water tables, including the fossil water tables of the North Western Sahara Aquifer System (NWSAS) common to Algeria and Libya, that provide the largest share of the resources, i.e. 1904 million m3 and 68% of the potential underground resources. The number of boreholes increased from 21 675 in 2015 to 34 467 in 2020: 'The exploitation rate of the deep aquifers is estimated at 129%, and takes place from about 32 323 water points. It is likely to result in placing most of the aquifers under water stress.' (MARHP, 2020, p. 80)

The proliferation of illicit boreholes only exacerbates the situation. It was estimated that there were approximately 20 000 illicit boreholes in 2020 (MARHP, 2020), or 59% of existing boreholes.

Figure 4: Distribution of the exploitation of deep groundwater resources in Tunisia (2019)



Source : MARHP, 2020, page 81.

This race to extract water from the aquifers in the absence of strict control by the public authorities endangers the entire irrigated system, as acknowledged by those in charge of the sector: '*The situation of uncontrolled over-exploitation of several water tables is increasingly worrying. Withdrawals from these water tables are largely uncontrolled. In the coastal regions, their overexploitation has led to an excessive drop in their level and to salinisation of the water due to marine intrusion, thus altering the chemical quality of the water...*' (MARHP, 2020, page 87)

5.3 Discrepancy between agricultural policy and water resources

In all three countries, the agricultural policies are conducted at odds with the objectives of the water policy and the regulations of the water laws. The agricultural policy strongly encourages the development of irrigated agriculture using groundwater (development programmes in Algeria, the Green Morocco Plan, the Environmental and Social Development Plan in Tunisia) without guaranteeing the implementation of the provisions of the water laws based mainly[26] on the state ownership of water resources - pumping authorisations, installation of meters and compliance with authorised volumes, payment of fees, etc. This discrepancy is at the heart of the debates on the water crisis and agricultural models at a time when the three countries are in a situation of structural water stress.

In Algeria, there is a discrepancy between the policies of the agricultural sector and the water resource sector. The Ministry of Agriculture, which is committed to increasing agricultural production, continues to multiply land allocation programmes within the framework of agricultural development and to send signals in favour of the development of irrigation (support for the construction of boreholes and the purchase of irrigation equipment, subsidies for the energy used in pumping, etc.). In some development schemes, all of the allocated areas cannot be irrigated as the number of authorised boreholes is insufficient.

Without developing a systematic monitoring system of all of the water tables exploited in the country (pumping, recharge and piezometric level), and without having the means to limit the pumping of existing boreholes, the Ministry of Water Resources only has one instrument to regulate access to water tables, the prohibition of drilling. In many regions of the country, the non-issuance of drilling permits considerably blocks the extension of irrigated areas, but in some places, can threaten the sustainability of areas already irrigated when the bans also concern permits to deepen drilling or to replace dried-up boreholes. Decisions to ban drilling are not explained to farmers let alone backed up by figures and other conclusive analyses. They are often interpreted by these farmers as an abuse of authority, even though in many cases, the decisions are justified by a drawdown level that threatens the aquifer's sustainability.

Despite these discrepancies, the Ministry of Water Resources has put in place a long-term policy based on mobilising additional water resources for the agricultural sector. This mainly involves multiplying the number of dams, but also, and above all, carrying out an ambitious programme to build seawater desalination plants to supply cities with drinking water, thus reducing the use of the aquifers and giving priority to irrigation for groundwater.

In Tunisia, in the public irrigation schemes where public boreholes could have enabled the collective management of groundwater resources, the race to pump could not be avoided. With the multiplication of illicit drilling, access to groundwater, which was initially collective, gradually became individualised in many public irrigation schemes.

In Morocco, concessions on public land do not allow the regulation and control of the exploitation of groundwater resources either. The concessions are accompanied by an almost automatic right of access, and the exploitation of the resources and withdrawals are rarely controlled, even if meters are announced in some groundwater contracts. This 'privatisation' of water resources in the sense of access and barely regulated individual exploitation is not specific to public land but concerns all agricultural land. However, the tenure system and modalities of access to land offer different options for the joint management of land and water. Recent initiatives point to new forms of regulation. In the Zagora region in the south of the country, the conflict over groundwater resources between irrigated watermelon and drinking water has led to the implementation of new rules for access to land and water. Following a negotiation between right holders and local authorities, watermelon areas have been limited and fixed at a few hectares per right holder to restrict access to investors without rights (Bossenbroek et al., 2023).

5.4 Mining logic and resource degradation

The land dynamics characterised by the development of short-term leasing raise questions about their environmental impact. Rentals for the cultivation of highly profitable market garden produce on public land in the Mitidja in Algeria or on former land of agrarian reform cooperatives in the Saïss in Morocco are

26. In Morocco, in the oasis areas of the south, private water rights are recognised by law 10-95 on water.

based on a short-term logic. Itinerant indirect (tenant) farming thus allows farmers to address the phytosanitary and 'soil fatigue' problems associated with intensive single crop farming by moving their crops to new land (Amichi et al., 2016).

5.5 Distribution of income

The issue of the distribution of income from irrigated agriculture is partly linked to the configurations resulting from land reforms.

In Morocco, capitalist agriculture has been able to consolidate its land base, but new investment actors from other sectors and investment funds have benefited from recent projects. In the absence of taxation on the agricultural sector, the sharing of income is essentially determined by the remuneration of the workforce and by the conditions of work and employment. In the case of the rental of collective land, part of the income goes to the ethnic communities that are the owners, but the procedures for managing this rent still depend on the administration. As for family farms, they have not disappeared, but have turned towards agricultural activities that make the most of family labour or integrate low-tech innovations, such as livestock breeding or small-scale drip-fed open-field market gardening, for example. The significant potential of Moroccan agriculture (Côte, 2002) has not been lost. However, agricultural activity is rarely sufficient and not very attractive for the new generations. Having multiple activities, circular migration and transfers are the main factors of resilience.

In Algeria, despite recent attempts to develop very large-scale farming, political choices have favoured collective farming by former DAS workers. Restructuring eventually led to an individualisation of farming by a variety of small entrepreneurs. The pioneer fronts also attracted new actors - urban entrepreneurs and investors from other sectors.

In Tunisia, the land issue came back into focus during the 2011 revolution. In particular, it sparked a debate on the possible role of state-owned land in the interior regions most affected by unemployment (Gharbi et al., 2018).

5.6 Trade-off between food sovereignty and exports

In the context of unstable world markets and rising food prices, national policies are confronted with the limits of the model of importing basic food products against exporting high value-added agricultural products (Morocco, Tunisia) or petroleum products (Algeria).

In Algeria, the new Saharan agriculture is already contributing to the supply of agricultural products on the national market. This contribution can still significantly increase. However, the extension of this new Saharan agriculture raises many questions about its ecological sustainability, technical efficiency and economic profitability (if the real costs of the production factors are included). The volume of the water stock of the Albian Aquifer, whose renewability is limited, suggests that it is inexhaustible and can therefore be used countlessly and without constraints[27]. Although policies have focused on basic products (notably cereals), the increase in agricultural production at national level appears to be contrasted. The production of wheat, pulses and milk has grown at a much lower rate than that of other agricultural products. The growth in the production of these widely consumed agricultural goods has not been sufficient to make up the deficit in relation to national demand, which has continued to deepen as a result of increased national demand driven by population growth and boosted by consumer prices that have been kept administratively very low.

In Morocco, in a context of soaring prices on international markets and shortages in the drinking water sector due to the drought that has been affecting the country since 2019, irrigated production for export is being criticised. In the national and international media, scientists, politicians and civil society actors are debating the relevance of the agro-export model and its virtual water exports[28]. Will the water crisis facing the agricultural sector put an end to the persistence of the Californian agricultural dream that has been influencing irrigation policies since the 1930s? (Kuper et al., 2023).

In Tunisia, the successive crises on the international markets for agricultural and food products (2008, Covid 19, war in Ukraine) combined with the State's inability to finance the import of basic products (cereals, sugar, livestock feed, seed oil, etc.) and to subsidise consumer prices, have led to shortages in the retail trade of these products. This deterioration in trading conditions has also aggravated the agricultural and food balance deficit. These crises have highlighted the limits of the food security policy based on comparative advantages favouring high value-added exportable products (olive oil, dates, market garden produce) to the detriment of basic products in which the irrigated schemes play a leading role. The water crisis caused by the overexploitation of groundwater and successive years of drought have only exacerbated the situation and shown the urgency of an alternative strategy that more and more voices (researchers and civil society) are calling for.

5.7 Urban sprawl on agricultural land

Urban pressure and the absence or failure of land use regulation has resulted in the urbanisation of agricultural land located on the outskirts of towns and in urban sprawl on rural land. State-owned land has constituted reserves for urbanisation but this sprawl also concerns melk land.

In Morocco, the main levée reform concerning the CRAs led to an increase in sales for urbanisation purposes on the outskirts of cities (Fez, Meknes in particular) (Valette et al., 2013). The very high prices of land linked to the change of purpose make it difficult to maintain their agricultural vocation. The transfers also

27. The theoretical stock is very substantial (more than 50 000 billion m3) but the conditions for its exploitation remain uncertain.
28. Debates covered by the international press: 'In Morocco, we export the water we lack in the form of fruit', Le Monde, 10 October 2022.

concern the state-owned land of the former large farms located on the urban outskirts that represent an opportunity for the State in the face of these farms' financial and management difficulties.

On the outskirts of Algiers, urban sprawl takes place at the expense of the rich agricultural land of the Mitidja plain. In the commune of Rouïba alone, no less than 180 hectares of agricultural land, of the commune's total agricultural area of 2 457 hectares, were diverted to housing and public infrastructure projects during the decade of 2000, according to the agents of the agricultural subdivision of Rouïba. The construction of housing by members of the EAC/EAI land and their descendants is the other process by which agricultural land is diverted from its productive vocation. No official figures are available on this subject although the phenomenon and its magnitude are plain to see.

In Tunisia, the numerous recent studies conducted in the peri-urban areas of Tunisia (Tunis, Mahdia, Testour, etc.) highlight the interest for small market gardeners who have long been established on these lands - many of which are still or have been state-owned, of not giving in to the demands of property developers involved in the urbanisation movement (Hermi Sayari et al., 2020; Cherif, 2013). In their city belt situation, they find an opportunity to stabilise their operations by serving urban markets. Their sons are associated with their small businesses where they carry out transport and collection activities. They keep themselves informed about the market situation and innovations through the jobs they find in companies and projects in agriculture, forestry, nurseries and the maintenance of green spaces, while the women more often and more willingly work in factories and services. In this country, where urbanisation took place at a very early stage (state programmes to regulate it have been ongoing since the beginning of the 20th century), these market gardeners can be seen from the optimistic perspective of maintaining local smallholder farming that has been able to integrate into the market conditions, while at the same time, due to their small size, ensuring a balance between production and demand and alleviating the burden on water and land resources. Moreover, this system reduces the distances and costs of transport between sites of production and concentration of consumption.

6. FUTURE CHALLENGES

6.1 Maintaining or increasing agricultural production in a context of scarce and variable water resources

The Maghreb countries face the same challenge as many regions of the world (California, India, China, etc.) - increasing or maintaining agricultural production while reducing the pressure on groundwater resources marked by a drop in water tables (Balasubramanya et al., 2022). Different measures to regulate access to and/or the use of groundwater have been implemented in several of the regions and countries concerned (price and volume regulations, changes in energy subsidies, sanctions or positive incentives, community governance, etc.) according to the specificities of the contexts. The implementation of these measures is often limited by their political, technical or economic feasibility. In many cases, they are not sufficient to curb the overexploitation of water tables and result in a transfer of water demand to other countries through imports of agricultural products and therefore virtual water. The Maghreb countries are also faced with this trade-off between mobilising water resources for agricultural production for local consumption, production for export and recourse to imports.

This global challenge means ways need to be found to increase productivity while improving people's living standards and preserving the environment.

'This challenge might be described also as seeking the optimal balance between productivity gains and environmental costs. It is likely unhelpful to consider only one aspect of interventions in agricultural water management. We must consider the farm-level and societal costs and benefits, and we must evaluate inevitable tradeoffs as we seek the optimal forms and levels of public interventions' (De Fraiture et al., 2010).

Seeking new productivity gains

Agricultural policies to support irrigated agriculture are geared towards the expected productivity gains. Productivity can be measured in physical terms (agricultural output per unit of water) or economic terms (value of output per unit of water). Agricultural policies have focused on the increase in physical productivity 'more crop per drop' and/or increases in economic productivity, notably through the argument of the resultant added value and direct or indirect jobs.

Varietal improvements (especially in wheat and rice) have led to significant physical productivity gains (output per volume of water evapotranspired), but the marginal productivity gains decrease with increasing yields. Nevertheless, future productivity gains are possible through agronomic and irrigation practices (Molden et al., 2010). In areas that are already relatively productive, bio-physical productivity gains can be achieved by limiting evaporation through agronomic practices that conserve water in the soil. Productivity gains are also possible through supplemental or deficit irrigation of low-yielding crops for which the productivity gains are the highest. For example, in Syria, the supplemental irrigation of wheat leads to improved productivity (Oweis & Hachum, 2003). The synergistic effect of improving soil fertility can also offer additional productivity gains. The potential for varietal improvement in cereal yields seems limited, although some see room for improvement in millet and sorghum, which have been less studied.

Molden et al (2010) estimate that potential productivity gains (physical and economic) could also come from livestock farming, which accounts for 20% of evapotranspiration overall.

While the physical productivity gains appear limited, economic productivity gains could be achieved through changes in agricultural commodity prices and dietary adaptations, among others.

6.2 Aligning agricultural policy objectives with the characteristics and potential of water resources in the territories

The implementation of agricultural and land policies requires better consideration of the characteristics of the territories in terms of stakeholder configurations and water resources: not very renewable water table, renewable water table, combined access to surface water and groundwater, risk of irreversibility (saline intrusion), level of overexploitation and drop in the water table level, risk for drinking water, etc. The irrigated territory remains to be defined depending on local specificities. It could be the area irrigated from a water table or a complex of aquifers, an area of irrigation scheme, etc. The territories and their governance also depend on the configuration of the actors and therefore on the choices and balances in terms of type of farming: entrepreneurial, family or subsistence...

The scale of the catchment area remains relevant to arbitrate the different intra- and inter-sectoral allocations. In the three Maghreb countries, the levels of mobilisation of water resources in the catchment areas are often very high and exceed the renewable water resources leading to the closure of basins (Molle et al., 2010). In closed or closing basins, the new allocations or reallocations of water need to take into account the losers and winners and the possible compensations (De Fraiture et al., 2010). In some closed catchment areas, water resources are already over-allocated and require trade-offs, particularly in drought years.

6.3 Taking better account of resilience to risks

In a context of increasing vulnerability, it seems necessary to better understand and take into account the resilience of households and socio-ecological systems.

The Maghreb countries are particularly vulnerable to climate change due to the depletion of water resources, climate variability, rising temperatures and risks linked to extreme events (storms and floods in particular). For agriculture, climate change results in a decrease in water resources, while rising temperatures increase evapotranspiration. It thus leads to a reduction of the geographical area favourable to rain-fed cereal cultivation.

The countries are also confronted with external risks on the world markets on which they depend heavily for food imports in particular. The rise in prices linked to the double crisis - health crisis and war in Ukraine, have highlighted the insecurity of this mode of food supply.

For some authors, dealing with this vulnerability involves putting the resilience of individuals at the heart of public policies to achieve sustainable social development (Lallau, 2011). Individual resilience can be defined as 'the capacity to anticipate what can be anticipated (guarding against 'adversity'), to respond to what happens unexpectedly (taking advantage of 'adversity'), but also to aspire to a feasible improvement in one's situation'. Research on the resilience strategies of individuals in rural households and the impacts on the sustainability of the system provide food for thought that may be useful for the formulation of public policies.

6.4 Engaging in agroecological transformation to preserve biodiversity

The global environmental agenda sets new objectives related to global warming and the preservation of biodiversity. They complement and condition the objectives of sustainable development.

The target of limiting global warming to 1.5°C by 2100 set at COP 21 in Paris in 2015 requires a transformation of production methods and lifestyles in order to reduce the concentration of carbon in the atmosphere and other greenhouse gases. Although this target may not be met and the 2°C target seems more realistic, every effort must be made to limit the temperature increase as much as possible.

In the face of accelerated biodiversity loss, the December 2022 Biodiversity Conference (COP 15) resulted in the adoption of the Kunming-Montreal Global Biodiversity Framework in Montreal. This framework proposes a roadmap for biodiversity conservation and restoration to achieve the vision of 'living in harmony with nature by 2050':

'*By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.*'[29]

The framework thus defines 'an ambitious plan to implement broadbased action to bring about a transformation in our societies' relationship with biodiversity by 2030, in line with the 2030 Agenda for Sustainable Development and its Sustainable Development Goals, and ensure that, by 2050, the shared vision of living in harmony with nature is fulfilled'.

To achieve this 2050 vision, the States undertake, for the period up to 2030, to 'To take urgent action to halt and reverse biodiversity loss to put nature on a path to recovery for the benefit of people and planet by conserving and sustainably using biodiversity and by ensuring the fair and equitable sharing of benefits from the use of genetic resources, while providing the necessary means of implementation'.

To achieve the long-term goals, the framework defines 23 targets, some of which are specific to agriculture. The reduction of threats to biodiversity entails the reduction of risks from pollution and its impacts (Target 7), in particular the reduction of risks from pesticides and other chemical inputs by 50% and the reduction of nutrient losses by 50%. Excessive nitrogen and phosphorus nutrients and risks from pesticides are particularly targeted in intensive agriculture. 'Meeting people's needs through sustainable use and benefit-sharing' targets agriculture more specifically through 'a substantial increase of the application of

29. UN Conference of the Parties to the Convention on Biological Diversity (2022). www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf.

biodiversity friendly practices, such as sustainable intensification [and] agroecological [...] approaches (Target 10). Agriculture, including livestock, also has important links to many other aspects of ecosystem functioning (the water cycle and soil health in particular) which are targeted by emergency measures (Target 11).

The new biodiversity framework adopts some indicators but the countries will have to define their own indicators. The methodology sometimes needs to be refined, for example for the indicator of pesticide concentration in the environment of Target 7. For Target 10, the indicators include the share of agricultural land devoted to productive and sustainable agriculture or progress towards sustainable forest management.

BOX 4:
KUNMING-MONTREAL GLOBAL BIODIVERSITY FRAMEWORK

Reducing threats to biodiversity

TARGET 7 Reduce pollution risks and the negative impact of pollution from all sources by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: (a) by reducing excess nutrients lost to the environment by at least half, including through more efficient nutrient cycling and use; (b) by reducing the overall risk from pesticides and highly hazardous chemicals by at least half, including through integrated pest management, based on science, taking into account food security and livelihoods; and (c) by preventing, reducing, and working towards eliminating plastic pollution.

Meeting people's needs through sustainable use and benefit-sharing

TARGET 10 Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such as sustainable intensification, agroecological and other innovative approaches, contributing to the resilience and long-term efficiency and productivity of these production systems, and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services.

TARGET 11

Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as the regulation of air, water and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature.

Source: Extract of the Kunming-Montreal Global Biodiversity Framework. CBD/COP/DEC/15/4.

These environmental goals impose a new agenda on food and agriculture policies, which must aim to develop low-carbon production and consumption patterns on the one hand, and to safeguard and restore ecosystems in order to preserve biodiversity and ecosystem services on the other.

7. CONCLUSION

The introduction of positive law during the colonial period did not succeed in establishing itself as the sole source of law despite some attempts by the post-colonial States. Positive law thus became a new source of law in a legal system already characterised by its pluralism. Successive land reforms finally reinforced the hybridisation of rules by updating older forms of access to land from various sources of law depending on the country (Muslim law, customary law, etc.).

After the independences, the land heritage made it possible to create state-owned or state-administered land reserves that nevertheless already contained the seeds of the future differentiation. The three countries have all been tempted by agrarian reform (with a debate on the private ownership of nationals in Algeria) but this was quickly abandoned or put on hold. It was not until the 2000s in Morocco that the main levée reform came into play, and some beneficiaries are still waiting for the famous 'blue title' (land title) in Tunisia[30]. After this cooperative interlude, the States took over through direct management (OTD in Tunisia), collective management supervised by the administration (DASs in Algeria) or regulation by the state administration (Terres collectives [collective land] in Morocco). During this period, they also transferred part of the land, which can be considered as privatisation in the sense of transferring public land to private actors.

However, the countries put an end to the transfer of public land and opted (definitively?) for the separation of ownership and use, which can be referred to generically as 'concession'. This option, which enables land to be made available to different types of actors, takes different forms depending on the country. Indeed, faced with the difficulties of state or administrative management of this important public agricultural land heritage, political choices diverged. In Algeria, in 1987, the DASs were restructured into smaller units while retaining the idea of collective farming. The perpetual right of use was transformed into a concession right in 2010. The concession became the only mode of access to public land in Algeria from 2008. In Tunisia, the transfer of public land was prohibited from 1995. Morocco and Tunisia retained the large colonial farms, leasing them on a long-term basis according to specifications (SMVDAs in Tunisia from the 1980s, PPPs in Morocco in the 2000s). Morocco extended long-term leasing to collective lands.

The recent forms of land management are thus similar to the concession of land from the state domain to operators. They take up older forms that can be found in all three countries with some nuances. Until the establishment of the colonial order, part of the land (very limited in Algeria) was considered to be the eminent

30. Some authors make a more nuanced assessment of the cooperative period (Collard, et al., 2019).

property of the central authority[31] and was granted as concessions, essentially to large operators who employed traditional farmers. Far from the credo of the right of ownership for those who worked the land, which guided the agrarian revolutions, a right of concession for the manager of the land prevailed, with, of course, a diversity of managers depending on the countries' political choices. With regard to those working the land, the traditional farmer has sometimes been replaced by an agricultural labourer, a seasonal worker, a tenant, etc.

The hybridisation of rules and institutional creativity multiply the modes of access to land and water by reactivating former rights that are incompatible with ownership in the sense of Roman law. Indeed, the rules of land management are highly diverse and enable the rules of access to water to be integrated. This dismemberment from ownership also reflects the importance of water resources, which are becoming a scarce factor for agricultural production in a context where irrigated agriculture has become the priority.

The other process that characterises the reforms is the recognition of possession, which here too takes up older forms from Muslim or customary law. This is the case in Tunisia for the implementation of the privatisation of collective lands after independence. This process ratifies or recognises the antecedent exploitation of the land in relation to legislation according to the principle of vivification, development, plantation and long-term peaceful occupation. The melkisation of collective land in Morocco is also partly based on this recognition of possession.

Land reforms are therefore both 'top-down reforms' that modify the legal framework according to public policy objectives and 'bottom-up reforms' when practical norms become social norms and then official norms integrated into the body of legislation[32]. While 'top-down reform' still seems to be the favoured route, the importance and proliferation of practical norms raises the question of changing the approach. Should not future reforms, by identifying practical norms, encourage the emergence of social norms that could become official norms? This convergence is made possible by the real property codes (Codes de Droits reels).

Focusing on the rules that determine the rights of use and exploitation of land and water at the relevant territorial scales could contribute to the emergence of a new form of governance for irrigated land.

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31. This approach to ownership is similar to the Doctrine of Estates that underlies the common law of English-speaking countries, according to which there is 'an intermediate degree in the relationship between the person and the thing, with only the Crown being deemed to be the true owner'. In other words, 'a person does not own land but rather has a (legally protected) interest or 'estate in land' which he or she holds from the Crown'. (Emerich, 2008).

32. According to the terminology of J.P. Olivier de Sardan.

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