FOSTERING SUSTAINABLE DEVELOPMENT BY EMPOWERING INDIGENOUS ABILITIES: THE BORDER ZONE CASE OF RURAL SOUTH LEBANON

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ABSTRACT
In Lebanon, traditional customs and practices of water use evolved into lore still prevailing today. In south Lebanon, rural communities adapted to the characteristic scarcity in water resources of the region by harvesting and storing rainwater in *birket.* These open-air reservoirs constitute one of the many ancestral water practices that are the most appropriate for adaptation to uncertain changes and future water management. Despite the potential for more frequent and severe droughts in the future, and current sporadic formal access to water, *birket*-s are actually declining in numbers. In this paper I ask: what can be done to strengthen traditional social water arrangements and how can we reclaim them to better face the current and future water management problems? I first examine the set of laws, written and unwritten, at play. Then I analyse two cases of reclaimed *birket*-s to better understand the social and economic aspects of their functions in the community. I argue that this forms a palimpsest of legislative and administrative water competence that is better able to address uncertainty and water insecurity.
Keywords: Communal pools, Custom and practices, Rainwater harvesting, South Lebanon, Water Insecurity.

1 INTRODUCTION

Described as the most important natural resources of the 21st century, water management and water security have sparked debates surrounding the protection, conservation, and distribution of the resource. In the Middle East, where climate change and recurrent droughts increase strain on water, recent conflicts, wars and occupations further limit people's access to it. Yet, water conservation practices were performed since time immemorial [1]. The superposition of civilisation through time, have contributed to the art of water use and management, where ancient civilizations understood that water is a common good that needs to be regulated, protected and conserved [1,2]. Customs and practices of water use have brought together a set of procedures and rules that have organized land and water management for local societies and are the fruit of sociology and history [3]. Lebanon presents an interesting case study. The structures imposed by the geography of the sites, and the fine and diversified human relations elaborated and often institutionalized over the centuries, constitute the original features of Lebanon whose geographical and political unity is based on the richness of differences rather than on the strengthening of similarities. Humankind, in responding to the imperatives of nature has for thousands of years imprinted its mark on the Lebanese landscape to make it a centre of habitat and farming, patiently and hardly conquered against the physical elements and constraints of history. Although precipitation there is the highest in the region – 800 mm per year on average [4] –, the country is not able to fully exploit, develop and benefit from its hydraulic sources. Only 17% of the country's water resources are used, while more than half of the rainwater is wasted to the sea and about 40% is unaccounted for, due to the lack of maintenance of the water supply networks [5]. Yet rural communities, in particular in the region of South Lebanon, have historically adapted to the characteristic water scarcity by harvesting and storing rainwater in *birket*-s. These are ancestral communal rainwater-harvesting system, located in the village, and accessible to all. Such indigenous water

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practices are the result of the complex interactions of changing practices imposed over time, combined with lessons learned regarding successful techniques. Customs and practices of water use have brought together lore that organized land and water management, deeply anchored in the local systems.

Although extensive literature exists worldwide on the concepts of common pool management, participatory irrigation management, resilience and adaptation [6][7][8], and the governance considerations of climate change, less exist on water conservation practices, customary water laws, and social arrangements. In Lebanon, research on customs, practices, and informal water laws are even scarcer. In this paper, I aim to address some of these lacunae. Focusing on the role of ancestral indigenous water arrangements, customary laws and inherited practices, I ask: What can be done to strengthen traditional social water arrangements and how can we reclaim them to better face the current and future water management problems? I advance that strengthening customary, locally developed traditional rainwater-harvesting practices will contribute to reach some level of autonomy on community resilience and adaptation to future water problems and climate risks. I argue that this forms a palimpsest of legislative and administrative water competence that are potentially better able to address uncertainty and water insecurity. Based on understanding social water arrangements in rural areas of Lebanon, I aim at exploring their future potential in the management of water, and reclaiming local autonomy, as well as playing a role in achieving water security for towns in South Lebanon. This work researches the influences and effects that strengthening customary, locally developed water arrangements could have on community resilience and adaptation to climate change. It posits that fostering sustainable development could be achieved by empowering indigenous abilities. It is based on understanding social water arrangements in rural areas of the border zone of South Lebanon, exploring their future potential in the management of water and reclaiming local autonomy.

For this purpose, I first examine the set of laws, written and unwritten, at play, in an effort to make sense of the palimpsest of legislative and administrative water competence. Then, based on a rapid appraisal method, I selected two cases – the Dirdara and Marwaheen – of reclaimed *birket*-s in the border region of South Lebanon. This region has been at the nexus of war, occupation, and governmental neglect. It presents a unique case where the empowering of indigenous knowledge have led to positive local water management practices and reclaiming local autonomy.

2 METHODOLOGY AND CONTEXT

Adopting a rapid appraisal method and based on secondary data, I reviewed existing information on the social, institutional and political environment of water in Lebanon. In an effort to gain a holistic understanding of the legal water system I consulted both governmental legal documents – laws and decrees – as well as publication and academic article on the topic. I further conducted interview with water management experts to gain knowledge on the unwritten law. Then I used visual analysis of aerial photographs from Google Earth® (2017), and published maps (Survey of Western Palestine 1881, Lebanese Army $^{1/20,000}$map) to map and locate the presence of *birket*-s in south Lebanon. A few visits to the village were conducted to verify the presence and status of the *birket*, and gain insight on its usage. As such, discussion with villagers and members of the municipality were conducted. Finally, I conducted interview with senior public servants, water management experts and engineers as well as professors, students, lawmakers and journalists. I also conducted field visits and participatory observation to the usage and functioning of the *birket*-s. Then, oral narratives (life testimonies from local population), field verification of visual analysis of maps and aerial photography, and case studies were also conducted.

2.1 The context of South Lebanon

South Lebanon has in a tormented Lebanon and Levant, a vast field of observation, research and analysis both in terms of the structures imposed by the geographical nature of the sites and by the fine and diversified human relations, which have been elaborated and institutionalized in the course of the centuries. Fig. 1 shows the general region of the study.

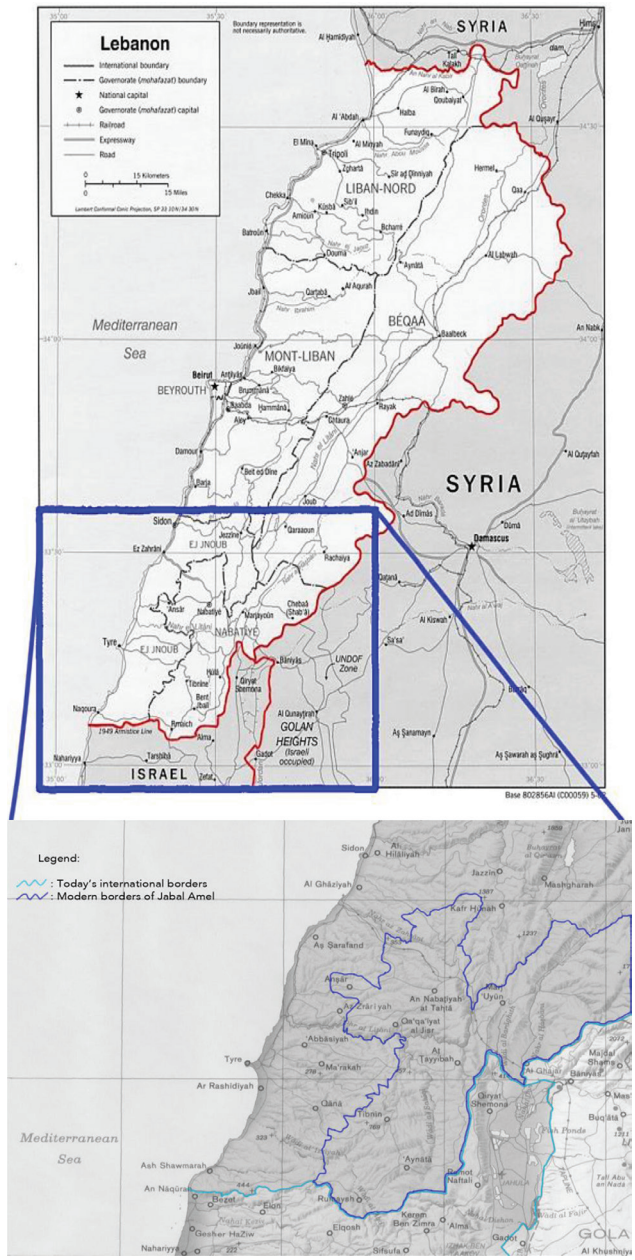

Figure 1: The context of the study (CIA, 1976 [9]).

This region, also known as Jabal Amel until the end of the Ottoman Empire, is geographically described as an ecosystem of intermittent rivers or *wadi*-s. Indeed, Jabal Amel is a set of plateaus, interspersed with temporary rivers casings, perpendicular to a narrow coastal plain. The underdevelopment of intermittent rivers by the central government and water agencies has led to a generalized marginalization of agriculture and irrigation in the whole area and the resorting of the local populations to traditional systems such as *birket*-s. Moreover, As a result of the heavy militarization of this borderline, the old Security Belt area witnessed very modest achievements that were realized by the central government as a result of prohibitive security measures, disconnectedness from grassroots needs, weak institutional and management setups or parochial developmental views. All these issues makes from this specific area, a laboratory of research in social ecology of border landscapes. For the purpose of this study, I will focus on the area of the former Security Zone area of South Lebanon. With the new border carving Jabal Amel in Lebanon from Galilee in Palestine and Mount-Hermon in Syria, the hilly terrain and fertile coastal plains of the Litany River's southern watershed, currently known as South Lebanon, were transformed from a marginalized residual rural setting into a geostrategic abode of war [10]. The withdrawal on 24 May 2000 of Israeli troops from southern Lebanon following a 22-year occupation left several minefields, uncultivated arable lands, deforested areas, vast burned fields and deserted terrain and buildings [11]. In rural South Lebanon, the development of agriculture required careful conservation of water resources. Rural communities in the region have historically adapted to the characteristic water scarcity by harvesting and storing rainwater. Indigenous water practices are the result of the complex interactions of changing practices imposed over time, combined with lessons learned regarding successful techniques, forming a palimpsest of legislative and administrative water competence that are potentially better able to address uncertainty because of their tested adaptive capacities.

3 WRITTEN AND UNWRITTEN WATER LAWS

Mesopotamian, Roman, Ottoman and French water laws were superimposed on Moslem customs and practices and traditional Arab social water arrangements in Lebanon, throughout a long history of conquests or mandates. French and Ottoman civil laws, as well as codified and customary *sharia*-based laws constitute the foundation of the current Lebanese water laws. It was with the Ottoman laws that codified the different rules taught by the Muslim doctrinaires, that we find the basis of a juridical regime of waters in Lebanon. The basic rule in Lebanese law is the public domaniality of the entire waters, as described by the two orders no. 144-S and 326, published respectively in 1925 and 1926, and that are still valid until today. This basic rule is subject only to four specific restrictions that are provided by private rights of civil nature: acquired rights on water, pluvial waters, low-flow springs and water wells. The only waters which, by reason of their physical nature, escape the public domain, are rainwater. Individuals can appropriate these waters by various means. In this paper, I am interested with the non-domaniality of pluvial waters in order to understand the importance of rainwater harvesting in communal pools – *birket*-s.

As the succession of the civilisation dominated the region, new water texts were imported and superimposed on anterior ones creating a unique water legal pluralism. This palimpsest of water laws goes hand in hand with a multitude of ancestral social water arrangements. The latter were developed for the conservation of property and for the periodic distribution of water between interested parties. They also served as customary laws for the mediation of disagreements and conflicts. Custom constitutes the continued repetition of certain actions or practices by a community in the conviction that they are legally binding [12]. Whereas social arrangements are socially determined rules spontaneously and commonly developed [13]. Irrigation water management occupies a central place in the customary rights of rural

Table 1: This table represent the social water arrangements identified in this study.

'*Urf*	Customs and Habits in the Islamic world
Hima	Ancestral Charter for the Protection of Nature
Musha'	Communal land tenure
Sabil	Water endowment for religious *waqf*
Birket	Ancestral communal rainwater harvesting
Jall	Indigenous water conservation and soil protection agricultural practices
Aouna	Rural mutual aid
Sulha	Traditional Arab tribal dispute resolution
Mudaraba	Profit and loss sharing system in landlord-farmer partnership
Chaoui	Informal water users' associations

indigenous communities. Indeed, the diversity of local communities and their modes of management has produced a vast body of law and knowledge and know-how from which lessons must be drawn for any analysis in terms of 'good governance' and 'sustainability'. The communal model of irrigation water management, by its nature and the diversity of practices of its customary rules, constitutes an extensive legal heritage [14]. The most illustrative example of interaction is the water conservation practices performed since time immemorial. In these regions, rainfall is considered the major source of water supply and thus rainwater harvesting is the only option to make precipitation water more available for use on crops. We were able to identify several ancestral social water arrangements that were developed in the region for the conservation of property and for the periodic distribution of water between interested parties that allowed for the mediation of disagreements between users and assured each of the equitable allocation of water to match needs. They are summarized in Table 1. Following the application of a series of criteria relevant to resilience and climate change adaptation (e.g.: democracy, equity, equality, fairness, spontaneity, transparency, participatory, replicability, adaptability, flexibility, efficiency, effectiveness) particular focus was made on communal irrigation pools (*birket*).

4 BIRKET-S OF SOUTH LEBANON

In rural South Lebanon, rainwater-harvesting systems for residential purposes were very common. In fact, village houses that were side by side were grouped around an undeveloped semicircle called *hawch*. This *hawch* is a place that everyone uses and in which one often found a pond where rainwater is collected [15]. As most rain falls on Jabal Amel during the period from November till March, wells and springs dry-up during the summer months. It was therefore important for the inhabitants to conserve accumulated waters. The annual rainfall paints the agricultural picture of the summer season and is the semi-formal measure of the amount of rainfall that has fallen in the absence of official measurement measures in villages and towns. Water harvesting was done in underground cisterns and in reservoirs above ground with techniques varying across scales from housing units to village communities and village farmlands [16], [10]. At the household level, rainwater is harvested from the roof of all the houses, from where it is channelled to subterranean waterproof gypsum-plastered cisterns [16], [10]). The water collected there was for potable and sanitation water usage. Rainwater is also harvested in open-air communally owned village-scale

reservoirs (*birket*-s) that collect water for communal use in agriculture and for the use of herds and cattle [16], [10]. Their former usage included drinking, irrigating, swimming, washing (clothes, wool, grains, kitchenware, housewares, cars, etc.), though their modern usage is limited to irrigation, tourism, construction and water tanker businesses. Finally, rainwater is harvested in farmlands where irrigation water is needed [10]. Seasonal watercourses as well as rainwater end in open-air mud reservoirs also called *birket istina'iyeh,* or artificial hill lake [17]. Whereas *birket*-s are usually located within the village periphery in a depression where the water can readily be channeled into them, they can also be constructed around springs to contain the water such as Ain Zerka, Dirdara, Hammam or Ras el-Ain. The ones located in farmlands were called *birket barriyeh* (wild pools), and were mainly dedicated to watering livestock and horses, and for irrigation purposes. Their number is important and can be found distributed all around Jabal Amel such as Richeh pool in Boustane, Halaweh pool in Debel, el-Nqaiz pool in Aita el-Chaab, el-Mahfara pool in Aalma el-Chaab, Hafour el-Ahmar pool in Maroun el-Ras, Ram Shigha pool in Yaroun or Chalaaboune pool in Bint Jbeil.

4.1 Survey

By the dawn of the 21st century, almost all the houses in Lebanon had been connected to the central water supply network. The usage of underground cisterns had completely vanished and their settings abandoned or buried. The communal irrigation pools, or *birket*-s, are a rural landscape feature that is still clearly visible in most villages of rural South Lebanon where more than a hundred pools have been located and listed in this research. Unfortunately, many traditional water reservoirs were damaged or under severe threat due to the impact of wars or rapid urban sprawl, and as a result, some have been filled with debris from demolished houses and converted into 'village parks' (Grichting & Zebich-Knos, 2017 [18]). The analysis of aerial photograph and maps shows that more than one hundred *birket*-s exist in the region, and located in 86 villages and towns, as shown in Fig. 2. Only 32 pools were

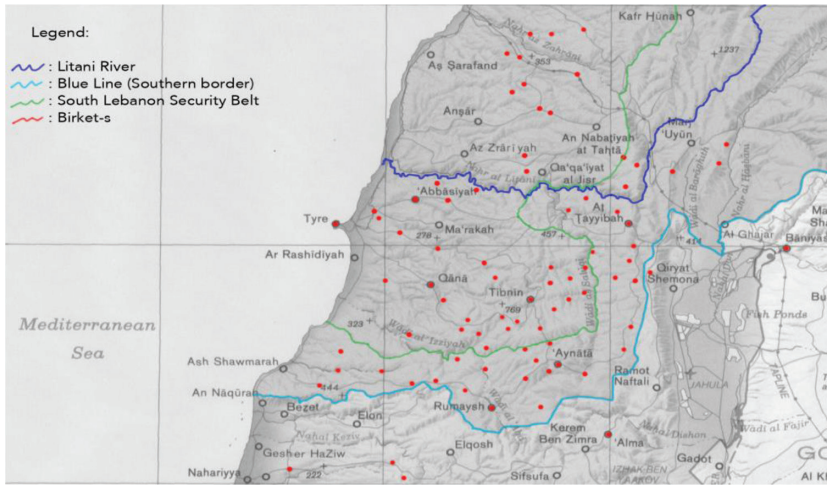

Figure 2: Map showing the location of the historical birket-s (Author's adaptation from [9]).

found out to be functioning, the rest being no longer in use. Unfortunately, 30% of the rest were converted into municipal facilities – buildings, offices, parking, sport courts, or village parks. Most of these transformations happened in the aftermath of the July 2006 bombings since a lot of pools were used to transfer the houses debris. The remaining *birket*-s were found to be either non-existent, abandoned or empty. In this survey, we were also able to locate at least 23 ancestral *birket*-s in Northern Galilee, just behind the international 'Blue Line' borders. These findings highlights the similarities in the struggle against water scarcity between Jabal Amel and Galilee during history, giving the fact that, from the Israeli side, they all vanished after the construction of the National Water Carrier in 1964, that obliged all the villages and settlements to forego the ancestral *birket*-s and in preference to the new water project.

With public network coverage reaching 85% of the houses of South Lebanon (including Jabal Amel) [19], the traditional usages of the *birket,* such as cleaning and washing, almost vanished. The access of villagers to washing machines and dishwashers at relatively affordable prices put a complete end to the washing activities (clothes, bed sheets, cooking utensils, mats and dirty beds) that used to happen at the *birket.* Moreover, the decline in numbers of herds and cattle, and their gradual distancing from urban centers, rendered unusable the *birket* for drinking. However, other new activities emerged around the *birket*-s that survived the course of time, such as using water for construction and water tankers business, and utilize it for recreational activities (opening restaurants and cafes facing the pool, creating a sidewalk promenade around the perimeter, or developing sports activities – jet ski, pedal boat, fishing, etc.). The villagers used to be very proud of their *birket*-s and used to compare it to other villages by its size and depth [20]. According to Mounzer Jaber [10], *birket*-s are never, in principle, developed between houses, but rather at the most downstream places of the village. However, with the urban sprawl of the villages in the 21st century, *birket-s* often found themselves in the middle of the urban landscape. The only activity that remained steady and travelled over time is irrigation.

4.2 Functioning and usage

Birket-s are one type of depression irrigation and watering pools that are communally owned and collectively managed, from construction to operations and maintenance. First of all, it is important to state that all of the ancestral *birket*-s located within the villages perimeters have been built on communally owned lands – *musha'*. As such, their construction and later on their management is vested upon all the community, males and females, young and adults. The digging, wall-building and technical rehabilitation parts were entrusted however to specialized craftsmen, upon cost participation of all the right holders, whereas the cleaning and running part were the obligation everyone. The pools were mainly dug at geological depression areas in soft soils for convenience purposes, then encircled with stonewall, and lined with impermeable mud. When permitted, pools were sometimes dug in the rock, although they require more effort to build them. Building *birket*-s at low depressed areas of the villages helped in their conservation and direction of floodwater from highlands.

Because of siltation in *birket*-s during runoff, villagers used to carry out cleaning the *birket*-s at the beginning of autumn when the *birket* has dried out and after the end of wheat harvesting [20]. All men and women of the village used to work for more than a week to remove silt from the pool. All the different families of the village used to participate in this activity in an atmosphere of singing (*dalouna*), dancing (*dabkeh*) and laughing [20]. This period of time was

considered a truce between opponents and feuding families [20]. Family leaders and elders used to bring their people to work, because throwing mud in front of their houses punished latecomers and absentees. Water collected in the *birket*-s were used in a variety of ways from agriculture and irrigation to animal watering, construction and domestic use. Therefore, they were very much linked to the development of the villages, and when population increases, the pools had to be expanded such as in the cases of Bin Jbeil, Kounine, or Maroun el-Ras, or new pools were built such as in Rmaich, Aaita el-Chaab, or Aitaroun. The different religious groups present in a village would have the same rights and duties at the *birket*, except in the case of the *birket* of Meiss el-Jabal, which was subsequently divided into two *birket*-s (one for the Muslims and one for the Christians: either because of religious dues, of just for economic reasons) before its reunification in 1966 [20]. Indeed, the *birket* used to be the economic and social gathering place of the village for all its inhabitants [21]: women used to meet for talking, gossiping and washing, herders used to meet when animals were drinking, labourers used to have their lunch by the shores, shepherds used to wash the sheep's wool, dyers used to wash the textile before and after dying. Sometimes, women used to transport water from the *birket* to their houses for cleaning purposes using *karnib*, a type of dried cucurbit [21]. However, this process needed a lot of effort, and many preferred to do the way around: taking their clothes and home ware to the *birket* itself [21]. In order to reduce excessive use of expensive soap, women used to mix it with wood ash and water [21]. Peasants used to water horses and cattle from the *birket,* irrigate their tobacco leaf plantations, and sometimes wash their cars or indulge in fishing activities. Today, the *birket*-s are still standing here but their usages has slightly changed: irrigation is still the main users but the pools are turning more and more into touristic landmarks where parks, monuments, statues, walkways, fountains, and water activities are happening around. Water used for construction purposes is also being withdrawn from the *birket*-s.

4.3 Dirdara spring

The Dirdara natural pool is fed by groundwater springs, rainwater harvesting and runoff channeling, and has an area of 4,000 m^2 [17]. It is considered as the most important water source for irrigation in the Marj area in South Lebanon. The pool is round in shape and is belted by a wall made up of rocks, looking very similar to the communal *birket*-s*,* only differing in its land and water ownership. Before 1978, the irrigation scheme flowing of the Dirdara was constituted by gravitational concrete canalizations and the Lebanese government was managing this network and used to nominate the caretaker responsible for the scheduling and distribution of water [17]. When the Israeli troops withdrew in 2000, after 22 years of occupation, the system was no longer operational, and the land was neglected [17]. Farmers exploited unlicensed wells and some of them put their pumps directly into the pool [22]. The Marj has suffered during the last forty years from recurrent military occupation; wars and bombings that wreaked havoc on the irrigation infrastructure and slowed down the development of agriculture [17].

International cooperation intervened in 2008 to the area to restore the Dirdara scheme [22]. The rehabilitation of the network started by replacing the old open canals (8 km) with underground pipelines (at −1.5 m), installing drip irrigation systems and placing flow meters to measure the quantity of water distributed [17]. Estimation of the water requirement for each plot was made available through the use of a mathematical model and available territorial data: topography, meteorology, and crop parameters [17]. A Water Users' Association (WUA) was created to manage the newly built system and monitor compliance with the rules adopted. Farmers could soon shift to more profitable crops and water was available also to the

tail-enders [22]. It opened the way to the shifting of agriculture from low-income seasonal crops (such as tomatoes, beans, cucumbers, etc.) to highly remunerative perennial plants (such as apples, pecan nuts, plums, pears, peaches, etc.) [23]. Moreover, the creation of this WUA was able to forbid illegal wells and pumping from the pool by fencing the pool and enforcing the application of the law. A caretaker is responsible for water scheduling and distribution, and farmers are involved in the association management [22].

4.4 The *birket* of Marwaheen

The case of the pool in the village of Marwaheen is of particular interest: it was abandoned 30 years ago and transformed into a dump site, but was then restored by the municipality and currently functions as a communal water reservoir to which all farmers have access to irrigate their fields. Before reclamation, its capacity was around 13,000 m^3, with considerable losses to infiltration [9], and its evaporation rate was estimated at 5,511 m^3/year [24]. It used to be filled at a maximum of 60% of its capacity, and would dry out by July [24]. Although municipal wells secured additional fresh water into the pond during the dry season to compensate for the increased demand [18], the pond had become a source of nuisance and a site for sore eyes to the village [11].

In 2009, the restoration project focused on rehabilitating the *birket* of Marwaheen as a mean to initiate an alternative agriculture project and securing sustainable rural economic development [11]. The pond rehabilitation included removal of dirt from its bottom to double its capacity [11]. This was followed by making its floor impermeable to reduce loss of water through infiltration using concrete, which would also facilitate future access to the pond and maintenance [11]. The final stage of rehabilitation included strengthening the perimeter walls and raising them to improve visual impact and reduce the risk of falling in [11]. The results of the project included the increase of the *birket* volume from 12,770 m^3 to 26,000 m^3 following the restoration [11]. The rehabilitation of the runoff channels secured additional 4,575 m^3 of water for irrigation [24]. Furthermore, installing a liner would result in an additional yearly net available water of 6,075 m^3, which is equivalent to a 33% increase in the yearly net available water for irrigation [24]. This fact has contributed to a remarkable increase in vegetable

Figure 3: The *birket* of Marwaheen located at the center of the village (author's picture).

farming which, according to the mayor of the village, Mohammad Obeid, has expanded from 12,000 to 25,000 square meters in one year [24].

5 CONCLUSION

The Dirdara waters have been uncontrolled for more than 25 years and this resulted in a total chaotic situation in the Marj plain. The reclamation of the waters of this pool (illegal wells forbidden, shaft pumps removed, irrigation pipes installed, etc.), and the restoration of its irrigation network has impacted positively the agricultural productivity in the region. Undeniably, the strong willingness of participation demonstrated by the farmers and water right holders is a key point in the success of the restoration of the Dirdara [17]. Farmer-managed irrigation systems have demonstrated the potential for improvements in system efficiency through active participation of users in system operation, maintenance and financing [23]. Similarly, the intangible results from the restoration of the *birket* of Marwaheen are many. These include the re-instilling pride in traditional means of water conservation such as rainwater-harvesting, an opportunity for increased income from vegetable farming in place of fixed-income tobacco farming, strengthening the bond to the rural community by providing viable means of survival in the village setting, and providing a model for other communities in the south [11]. The project model can be easily replicated in several other villages in the south and other parts of the country as it is based on traditional practices with low technology and maintenance needs or costs, resulting in prolonged project sustainability [11]. The analysis of these two birkets showed a positive impact on the water management process and acknowledges that the reclamation of the waters and restoration of the pools. Such irrigation networks may potentially play a role in achieving water security for towns in southern Lebanon.

In conclusion, the role of indigenous water arrangements, customary law and inherited practices in developing water resources in Lebanon in a sustainable and precautionary manner were studied as well as the reform of the legislative texts in Lebanon from a sustainable and adaptive, community-based, bottom-up approach taking into consideration the local customs and habits in agricultural water uses. Solutions inspired and supported by nature have been adapted by indigenous populations because of its use or mimic, natural processes to address contemporary water management challenges, improve water security and deliver co-benefits vital to all aspects of sustainable development. In many countries, the number and intensity of extreme weather events such as hurricanes, floods and droughts is increasing, and the sea level is rising, threatening territories, economic and social development as well as the environment. In this context, there is a growing interest for a range of solutions inspired by local knowledge and indigenous practices that have proven to protect and sustainably manage water resources effectively and adaptively, and simultaneously increase the resilience of the territories to future water problems and climate risks.

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