WATER SUPPLY AND WASTEWATER SYSTEMS MASTER PLAN FOR THE BEKAA WATER ESTABLISHMENT

IRRIGATION ASSESSMENT REPORT

September 2014

THIS DOCUMENT IS PREPARED BY DAI/KREDO UNDER THE LEBANON WATER AND WASTEWATER SECTOR SUPPORT PROGRAM (LWWSS) FUNDED BY USAID

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EXECUTIVE SUMMARY

KREDO has been commissioned by DAI to carry out a project entitled “Development of a Water Supply and Wastewater Systems Master Plan within the Service Area of the Bekaa Water Establishment” as part of the USAID – Lebanon Water Wastewater Sector Support Program (LWWSS). As part of this project an irrigation services assessment was carried out. All information available on existing irrigation systems falling under the jurisdiction of the BWE was collected and integrated in the GIS database. Previous studies and reports were reviewed as well as the work of the different governmental institutions and international agencies involved in the development of irrigation and agricultural infrastructures. Field visits were carried out to a sample of irrigation schemes showing the general need for maintenance and rehabilitation works or for total reconstruction. Information collected from a sample of irrigation water users confirmed the insufficient water resources available for irrigation, the need for improving the irrigation infrastructures, and the need for improving the overall efficiency of the agricultural activities. Actions to maximize the efficiency of the existing irrigation systems were suggested and recommendations made for the preparation of terms of reference for an irrigation master plan.

list of ACRONYMS

BWE	Bekaa Water Establishment
CDR	Council for Development and Reconstruction
DAI	Development Alternatives, Inc.
ESFD	Economic and Social Fund for Development
FAO	Food and Agricultural Organization of the United Nations
GIS	Geographic Information System
GPS	Geographic Positioning System
IWRM	Integrated Water Resources Management
IRMP	Irrigation Rehabilitation and Modernization Project
LRA	Litani River Authority
LRBMS	Litani River Basin Management Support
LWWSS	Lebanon Water and Wastewater Sector Support
Mcm	Million Cubic Meters
MEW	Ministry of Energy and Water
MOA	Ministry of Agriculture
NWSS	National Water Sector Strategy
USAID	United States Agency for International Development

1 INTRODUCTION

1.1 Background

On December 1st, 2012 KREDO has been commissioned by DAI to carry out the project entitled "Development of a Water Supply and Wastewater Systems Master Plan within the Service Area of the Bekaa Water Establishment" as part of the USAID – Lebanon Water Wastewater Sector Support Program (LWWSS). The scope of the current study is to establish water supply and wastewater master plans in order to support the Bekaa Water Establishment (BWE) decision-makers in the preparation of a rational infrastructure development and capital investment plan for water supply, water distribution, wastewater collection and wastewater treatment systems, as well as elements of an irrigation system. More specifically, the irrigation services assessment report encompasses the following activities as per Objective C of the terms of reference:

Objective C. Framework for Irrigation Services

Task C.1: Collect existing irrigation water system information.

C.1.1 Collect existing irrigation water system information, working in close collaboration with the BWE staff and enter into the BWE GIS to allow for a better understanding of the areas that rightly have a claim to this service.

C.1.2 Collect and review all studies, reports ad available data that have been prepared regarding irrigation systems and services under the authority of the BWE.

C.1.2 Meet with MEW and bilateral donors working on irrigation system related projects in the Bekaa to gather data, and document programs and projects that are planned or underway.

Task C.2: Define the current situation relative to irrigation needs and services provided in the areas mandated to be served by the BWE.

C.2.1 Conduct field investigations and irrigation water user interviews to define the current need, whether it is being met or unmet, for irrigation waters in the areas that can be particularly served by the existing irrigation systems.

Task C.3 Identify major current physical deficiencies in the existing irrigation system.

C.3.1 Identify major current physical deficiencies in the existing irrigation water system that prevent these existing systems to operate at their maximum potential.

This report presents the results of the activities presented above. Appendix A presents photographic documentation of the field investigations of a large sample of springs and irrigation channels. Appendix B presents allthesprings that were identified in the area of the study with the flow data that could be found about them. Appendix C presents a summary of the results from the interviews that were carried with a sample of farmers in the study area. Appendix D presents GIS maps showing the irrigation networks that fall under the jurisdiction of the BWE. Appendix E presents an updated land use map showing the extent of agricultural lands in the Bekaa.

1.2 Agriculture and Irrigation in the Areas underthe Jurisdiction of the BWE

Law 221/2000 on the organization of the water sector in Lebanon created four regional water authorities, among which the BWE, covering the whole territory of the Lebanese Republic. The BWE service area included the cazas of what was then the Mohafazat of the Bekaa, namely: Baalbeck, Hermel, Zahle, West Bekaa, and Rachaiya. The cazas of Baalbeck and Hermel have been separated at a later stage in 2008 to form a new Mohafazat by itself.

Article 4.1 of this law defined the mission of these water establishments as follows:

a) To study, build, operate, maintain and renewal water projects for the distribution of potable water and irrigation water; and to collect, treat and dispose of all wastewater according to the master plan for water and wastewater or the approval of the MEW pertaining to the use of public water resources, the location of water and wastewater treatment plants and the location of wastewater discharge points.
b) To suggest tariffs for the service provision of potable water, irrigation water, and the disposal of wastewater in light of the prevailing socio-economic conditions.
c) To monitor the quality of distributed potable and irrigation water and the discharged effluent from wastewater treatment.

Pursuant to this law all water offices, local water committees, and regional waterauthorities existing at the time the law was enacted in the service area of a given water establishment were all merged into the establishment. It is important to note that many areas and small localities were not covered by the patch work of local water authorities and one of the benefits of the creation of the regional establishments was to ensure that all areas would be serviced equally and fairly.

The new law gave the water establishments jurisdiction over water, wastewater and irrigation in their geographic service areas but for one exception: the irrigation networks and irrigation infrastructure

falling within the Litani river basin were assigned to the Litani River Authority (LRA) created back in 1954. Hence the BWE whose geographic service area contains the upper part of the Litani basin received jurisdiction over the remaining parts of the Bekaa, i.e. those that fall north and east of the Litani basin, mostly in the Assi basin to the north in Baalbeck-Hermel, in Rachaiya to the south-east in the Anti-Lebanon, and in Ham-Maaraboun and Tfail to the southeast of Baalbeck and across the Anti-Lebanon.

Decree 14522 dated 16 May 1970 defined the service area of the LRA in the South Bekaa as that area extending from the dam of Qaraoun in the south up until the Beirut-Damascus road north and between the course of the Litani river and the irrigation channel at altitude 900m north until Riyaq. Decree 9631 dated 13 December 1996 extended the geographic jurisdiction of the LRA to the remaining parts of the Litani basin and merged into it all existing irrigation water committees.

FIGURE 1-1: LITANI BASIN

(Translation of the Arabic annotation: 1-Litani source;2-Litani river;3-Ghzayel river;4-Berdawni river;5-Qaraoun Lake;6-Ain Zarqa Spring ;7-Litani River Basin limits). Source: http://www.litani.gov.lb/en/?page_id=63

Figure 1 shows the limits of the Litani Basin in Lebanon, and a map is appended in Appendix D showing the limits of the Litani river basin in the BWE service area.

Agriculture is the main user of water in any economy. It is estimated that agricultural activities in Lebanon consume between 64% and 70% of the total water needs. In the agricultural census carried by MOA and the FAO with Italian funding in 2010 it is estimated that the total useful agricultural surface in Lebanon is close to 231,000 hectares out of which about 113,000 are irrigated. 65% of these irrigated surfaces are fully irrigated while the other 35% are partially irrigated depending on the amount of yearly precipitation and the types of cultures.

The Baalbeck-Hermel mohafazat has an estimated total useful agricultural area of 57,265 hectares out of which 31,700 are irrigated. 48% of irrigated lands are fully irrigated and the remainder 52% partially irrigated. 57% of the irrigated areas in Baalbeck-Hermel use modern sprinkler or drip irrigation technologies, these areas however correspond more frequently to large farming properties that rely on private wells for irrigation water rather than to the farming properties that rely on public irrigation networks. The average irrigated area per farm in the Bekaa and Baalbeck-Hermel is 3.4 hectares, the largest average in Lebanon. It is also important to note the presence of a few large dairy farms with their associated dairy industries. Surface waters contribute an estimated 40% to 45% of all the waters needed for irrigation, the rest of the water is obtained from the groundwater through private wells, the number of which is estimated in the thousands.

The lower reaches of the caza of Rachaiya fall into the Litani basin while the rest of it falls on the westward side of Anti Lebanon and Mount Hermon reaching all the way to the top of the mountains. The total useful agricultural area in Rachaiya is about 5,900 hectares out of which 16% are irrigated. No large irrigation schemes have been developed in Rachaiya due to the nature of the terrain and the limited availability of water resources.

2 IRRIGATION SYSTEMS INFORMATION

2.1 Physical Information on Existing Systems

Irrigation with water from springs and rivers has been practiced in Lebanon since historical times. Irrigation infrastructures have been developed in different sizes and extents depending on the size of the water source and the availability of arable land. Many of these infrastructures are owned and managed by private individuals, families, or communities. Public interest irrigation schemes consisting of spring catchment or river derivation structures, main canals, distribution networks have been developed and managed by local authorities to develop agriculture and serve the economic interests of the community.

Public irrigation networks or schemes in Lebanon have been historically managed by regional water authorities or local water committees all of which were consolidated in the four regional water establishments by Law 221/2000. These are traditional low efficiency irrigation schemes originating mostly at spring intakes or small water courses and constituted of open channels, mostly concrete channels for the main lines and a mix of concrete and dirt channels in some of the smaller branches. Some pipe systems have also been installed. The list of the irrigation schemes that fall under the BWE as identified in the World Bank Policy Note on Irrigation Sector Sustainability (Report No. 28766-LE, 2003) are as follows:

TABLE 2-1:IRRIGATION SCHEMES AS IDENTIFIED IN WB REPORT NO. 28766-LE, 2003

Code	*Scheme name*	*Equipped area (ha)*	*Net irrigated area (ha)*
1	Hermel High land Farms (JurdHermel)	1,100	990
2	Merjhine	160	140
3	Hermel Watershed	650	590
4	Assi Plain	400	360
5	El Qaa	3,000	2,700
6	OyounTaqtaq	100	90
7	RasBaalbeck	300	270
8	Laboue	2,080	1,870
9	Chaat and Surroundings	800	720
10	Younine	100	90
11	OyounOrghosh - Barqa-Nabha and Surroundings	400	360
12	Yammoune	5,600	5,040
13	WadiNahle and Surroundings	150	140
14	Iaat Plain	270	240
15	Baalbeck Plain-Douris and Surroundings	2,000	1,800
16	Maaraboun and Ham	120	110
	Total	**17,230**	**15,510**

The information available about existing irrigation water systems was collected from the BWE and the MEW and digitized for integration into the GIS database as a separate layer. Appendix D presents GIS maps showing the irrigation networks that fall under the jurisdiction of the BWE. The main networks are shown for whose systems for which plans were found. The remaining systems are identified by location only. Detailed plans for many systems as well as secondary and tertiary parts of other systems are missing and will need to be completed once a field topographical survey is carried out.

Table 2 presents the systems entered in the GIS database with their characteristics, noting that 88% of all primary and secondary networks entered are concrete channels, 10% are pipes, and only 2% are earthen channels. Yammoune and Laboue are by far the largest two with more than a 100km of length each for a total 291km of identified networks. All the entries in Table 2 should have appeared in Table 1. This discrepancy may be due to the identification made of those schemes by different informants. It is possible that some of the smaller networks may have been included by the WB in the general geographic location of larger schemes and hence do not appear independently in the GIS database, while other small networks have been missed or not been included for lack of information.

TABLE 2-2: IRRIGATION SYSTEMS IN GIS DATABASE FOR BAALBECK - HERMEL

Caza	Name of Irrigation Scheme	Type				Total Length (m)
		Primary Concrete Channel (m)	Secondary Concrete Channel (m)	Earth Channel Length (m)	Pipe Length (m)	
Baalbeck	Yammoune[1]	58,887	30,282	---	19,416	*108,585*
	Baalbeck[1]	15,008	15,384	---	---	*30,392*
	Laboue[1]	33,178	77,480	2,116	---	*112,773*
	Nabi Osman[2]	190	---	---	---	*190*
	El Ain[2]	675	---	211	---	*886*
	Fekeh[2]	2,252	---	---	---	*2,252*
	Ras Baalbeck[2]	1,359	---	---	---	*1,359*
	Qaa (El) [1]	---	32,500	---	---	*32,500*
	Ras El Assi[3]	---	---	---	8,984	*8,984*
Hermel	Merjhine[1]	7,348	---	---	---	*7,348*
	Hermel[1]	11,633	---	2,831	---	*14,464*
	Qasr[2]	2,507	---	1,612	---	*4,119*
Total		**133,037**	**155,646**	**6,770**	**28,400**	**323,852**

[1] Scheme identified in WB Report No. 28766-LE, 2003
[2] Smaller schemes not identified in WB Report No. 28766-LE, 2003 or lumped by error in larger neighboring ones
[3] New scheme under development by the MEW under the Assi Dam Phase I project

A map showing the location of the identified public irrigation schemes under the jurisdiction of the BWE is appended in Appendix D as well as the details of those digitized in the GIS database (Plans 1 to 8 in Appendix D).

In addition to those identified sizable public irrigation schemes much smaller irrigation schemes or small networks of canals serving multiple beneficiaries may exist across the BWE jurisdiction area but have notbeen accounted for as they may historically have been under the responsibility of a local municipality and not a water committee or regional authority.

2.2 Existing Studies, Reports and Projects on Irrigation Water Systems

Previous and current contributions to studies, reports, and projects relating to irrigation in the area of jurisdiction of the BWE is reviewed by governmental institution, noting that irrigation remains a shared responsibility between the BWE the Ministries of Energy and Water and of Agriculture and the Council for Development and Reconstruction.

2.2.1 Bekaa Water Establishment

The BWE has faced tremendous administrative, technical and financial challenges since its creation. With limited financial and human resources capabilities it has given priority to the operation and maintenance of existing potable water infrastructure in order to secure safe and sufficient supply to the rapidly growing population in the Bekaa and has also engaged in the extension of networks to areas that were not serviced yet. Hence, the BWE has not yet had the opportunity to carry out any studies or development projects in irrigation. Its role has been limited to taking over existing infrastructure and integrating existing local water committees in what may be described as a crisis management approach, intervening only in extremis. Its efforts are concentrated on the operations and maintenance of the larger schemes with minimal budgets if at all and the collection of tariffs if possible. The current drought conditions have exacerbated water management conflicts and highlighted the importance of the role of the BWE in irrigation. Ministry of Energy and Water (MEW)

The MEW was in charge of maintenance and development of the systems and the last project before transferring jurisdiction was the Irrigation Rehabilitation and Modernization Project (IRMP) funded by the World Bank through IFAD. The IRMP was launched in 1996 to help communities in rural areas overcome two major constraints: the unsuitability of hilly land for cultivation and the isolation of the villages. The objectives of the project were to increase the agricultural incomes, welfare and employment of small farm households in previously neglected areas where irrigation schemes were being rehabilitated and to achieve sustainable and improved management of water resources. Additional complementary objectives included: strengthening essential agricultural services that would maximize the benefits of increased availability of irrigation water; assisting isolated farming families in improving their incomes through the provision of sustainable water resources (i.e. upland lakes); and improving the socio-economic prospects of rural women through the systematic expansion of services targeted at women. The project area covered five major irrigation schemes in Lebanon namely: Yammoune (North Bekaa), Quasmieh Ras El Ain, Danniye, Akkar El Bared and Bekaa South and many other small irrigation schemes as well as the construction of a few hill lakes. The IRMP targeted about 33,000 farm households, of which 21,000 were in the five major schemes and 12,000 in the small and medium schemes. Of those major irrigation schemes the Yammoune system falls under the jurisdiction of the BWE.

The MEW has since the year 2000 concentrated on the development of large water reservoirs for irrigation and potable water and has launched a ten years plan for the design and construction of dams. This plan has suffered from delays but is proceeding nevertheless. The MEW strategic review report of 2010 (December 2010) and the National Water Sector Strategy (NWSS) issued in 27/12/2010 and adopted by Council of Ministers' Resolution no.2 dated 9/3/2012have projected the total annual water demand versus the total supply for the whole of the Bekaa (cazas of Baalbeck, Hermel, Zahle, West Bekaa and Rachaiya) to establish a water balance in million cubic meters as follows:

TABLE 2-3: MEW WATER BALANCE PROJECTIONS FOR THE BEKAA IN (MCM)

Water Balance	2010	2015	2020	2025	2035
Total Projected Annual Demand	493	513	533	563	612
Total Projected Annual Supply	308	329	310	296	296
Projected Deficit	-184	-184	-222	-267	-316

Noting that about 70% of the total demand is related to irrigation the deficit will reach 221 Mcm in 2035. Assuming that the areas under the jurisdiction of the BWE do not differ much from those under the jurisdiction of the LRA then the projected deficit to total projected annual demand will reach 50% by 2035 if no new water resources development projects are engaged.

The MEW proposes to respond to this projected deficit by developing large dam and reservoir projects

The status of the dams and storage lakes planned by the MEW in the northern Bekaa is as of 2014:

TABLE 2-4: STATUS OF DAMS AND LAKES PLANNED BY THE MEW IN NORTHERN BEKAA

Dams & Lakes	Caza	Status	Storage (Mcm)	
			Static[1]	Dynamic[2]
Assi Dam - Phase I	Hermel	Under construction	0.00	63.00
Yammoune Lake	Baalbeck	Under construction	1.45	1.45
Younine Dam	Baalbeck	Ready for tendering	5.80	5.80
Assi Dam Phase II	Hermel	Ready for tendering	37.00	15.00
OuadiSbat Dam	Hermel	Under study	1.50	1.50

[1] Static storage corresponds to one time per year fill up and discharge volume
[2] Dynamic storage corresponds to flow through volume during one year in addition to collecting the static storage volume for one time use during the dry season

The surface waters to be collected and stored in these dams and lakes are destined mostly for irrigation with the exception of Younine which can also provide a strategic potable water reserve for the future use of the city of Baalbeck. The phase I of the Assi Dam consists of a small diversion dam and a pumping station that draws water directly from the river flow and lifts it to large reservoirs east and west of the basin to be used for irrigation. The reservoirs and transmission lines are shown on the GIS database, but the project has been halted since the Israeli bombing of the site in 2006.

2.2.2 Council for Development and Reconstruction (CDR)

The CDR has had relatively limited interventions during the last twenty years (1992-2012) in the fields of irrigation and agriculture when compared to the size and value of the works it has carried out across the country. Within the scope of the National Emergency Rehabilitation Plan (NERP) and in collaboration with the concerned ministries the CDR has undertaken in the nineties the implementation of urgent projects that would contribute to the development of the infrastructure of agriculture and irrigation. Projects were distributed across the country's agricultural areas with a large part dedicated to Baalbeck-Hermel. The CDR participated in the World Bank funded IRMP and carried out some additional studies for developing irrigation perimeters in the areas Nahle, Raayane, Fekehe, Younine and Al Moqraq.

The CDR has secured a grant from the European Union for technical assistance to the Ministry of Agriculture (MOA) for developing elements of the agricultural policy and its master plan. The CDR has also assisted with the agricultural census through a contract with the FAO partially financed by the World Bank. The result was setting the agricultural strategy and MOA's agenda for five years (2005-2009) and carrying out an agricultural census in 2010.

In addition to the above, CDR has contributed to the provision of external funding for the implementation of the Agricultural Infrastructure Rehabilitation project in favor of the Green Plan/MOA, which includes land reclamation, agricultural roads and terraces, and hill lakes one of which in Hermel. CDR also participated, through coordination committees, in the implementation of agricultural support projects provided in the framework of the Italian/Lebanese Protocol (1997) and (1998-2000) signed with the CDR, of which a part was allocated to the Baalbeck-Hermel agriculture development project and to the certified plant production project.

The CDR has also secured about two years ago US $4 million of an IFAD loan and US $8.4 million of an OPEC loan to finance the Hilly Areas Sustainable Agricultural Development project "HASAD" aiming at constructing mountain lakes for agricultural development as an additional irrigation source during summer in poor rural areas where water is scarce. Targeted areas are North of Baalbeck, Akkar-Danniyeh, and South of Litani.

Moreover, the CDR continues the implementation of the "Local Development Project in Northern Lebanon", ADELNORD, financed with a grant from the European Union, which it had initiated in 2009.The project includes various development studies and activities as well as the design and supervision of agricultural roads projects, irrigation channels and mountain lakes, in areas covered by the project in the Cazas of Akkar, Diniyeh, and Hermel. The local development component of the EU project is currently being carried out under the supervision of the CDR's ESFD.

2.2.3 Ministry of Agriculture (MOA)

The MOA in its national strategy for 2010-2014 has identified nine critical areas of intervention which are:

1. Updating the legislation organizing the agricultural sector
2. Improving the capabilities of the Ministry
3. Infrastructures development through the Green Plan
4. Extension Services and Training
5. Monitoring and Control
6. Production Chains
7. Credit to small farmers
8. Protection of Natural Resources
9. Marketing

The third and fourth areas of intervention are directly related to the development and use of irrigation infrastructures. The Green Plan has traditionally carried out projects of terracing, construction of small water reservoirs for individual farmers, construction of agricultural roads, and the construction of hill lakes of capacities under 100,000 m^3.

Recent and ongoing projects at the MOA that have components or areas of intervention that may have an impact on irrigation in the BWE jurisdiction can be summarized as follows:

1. ACLIMAS, Adaptation to Climate change of the Mediterranean Agricultural Systems, funded by the EU: research on drought-resistant crops through demonstration projects in six countries of the Mediterranean. The demonstration project in Lebanon targets the wheat and barley crops of the Bekaa including the Hermel area.
2. ARDP, Agricultural and Rural Development Program, funded by the EU within which the MOA has signed a Euro 1.9 million grant contract with the Green Plan to build 8 to 10 hill lakes.Hermel and Baalbeck areas are included in the target areas.
3. HASAD, Hilly Areas Sustainable Agricultural Development, which is funded by the IFAD ($7 million) and the WB ($14 million). In the context of this project, 30 to 45 hill lakes (capacity 20,000 to 100,000 m^3) are to be built. Targeted areas are North of Baalbeck, Akkar-Danniyeh, and South of Litani.

4. Coping with Water Scarcity: Strengthening national capacities" funded by the FAO focuses on strengthening national capacities regarding possible interventions for improved water management in general, and dealing with the agricultural component of water scarcity in particular. In the context of this project, treated wastewater from the Iaat wastewater treatment plant in Baalbeckis being used to irrigate trees and wheat. Six farmers are involved in this pilot project with three others as control group.
5. Improving the Environmental Sustainability of Irrigated Agricultural Production in Lebanon and Jordan funded by the European Union and valued at2 million Euros focuses on the promotion of environmental sustainability at the Mediterranean Basin level and the reduction of the negative environmental impact of agriculture on natural resources (water and soil) and climate change, through among others the introduction of irrigation methods with increased water-use efficiency. The targeted farmers in Lebanon are in the central and northern Bekaa.
6. SALMA, Sustainable Agriculture Livelihoods in Marginal Areas, project funded by the WB and valued at $28 million. This project is in the preparation and formulation phase and Dr. Chadi Mehanna (director of Rural Development at the Ministry) is responsible for the project. The project's geographical coverage would include Akkar-Danniyeh in North Lebanon, North Baalbeck and Hermel in North Bekaa, and South Litani below Lake Qaraoun in South Lebanon. Other geographic areas would also be considered to maintain inter-regional balance.
7. UNDP has recently carried out several flood control projects in North Bekaa and Ras Baalbeck more specifically that included the construction of bunds, planting of trees, terracing, and small ponds.
8. AgriCAL, Climate Smart Agriculture: Enhancing Adaptive Capacity of the Rural Communities in Lebanon, project funded by the IFAD for a total value of $7.86 million. The Project slated to start in 2014 shall benefit poor smallholders at national level but more specifically those living in: (i) Akkar-Danniyeh; (ii) North Baalbeck and Hermel; and (iii) South Litani below Lake Qaraoun. Increased water availability and efficient use through water harvesting and irrigation is among the objectives of this of the Project.

2.2.4 Reference Sector Reports

Four important reports or documents produced during the last ten years have been referred to in the paragraphs above. They are listed here for full reference:

- Republic of Lebanon- Policy Note on Irrigation Sector Sustainability (World Bank Report No. 28766-LE, November 2003) in English.
- Agricultural Census of 2010 Report (Recensement de l'Agriculture 2010) published in 2012 by the Ministry of Agriculture, FAO and Italian Cooperation in French.
- Ministry of Agriculture National Strategy for 2010-2014 *in Arabic.*
- National Water Sector Strategy (NWSS) issued in 27/12/2010 and adopted by Council of Ministers' Resolution no.2 dated 9/3/2012 *in Arabic and English.*

3 CURRENT SITUATION RELATIVE TO IRRIGATION NEEDS AND SERVICES

3.1 Field Visits to Representative Irrigation Schemes

Field visits were carried out to a sample of irrigation schemes that is representative both in size and in geographic distribution. These visits consisted of sampling the existing network where accessible andvisiting the spring catchments or spring heads which constitute the feeder sources of these networks. Open channels constitute the vast majority of the networks and their status is highly variable going from the recently rehabilitated to the poorest possible state. The springs are mostly unprotected and many of the catchment structures are in need of rehabilitation to operate efficiently. Overall the networks visited showed many signs of aging, the accumulation of structural damage and the lack of regular maintenance. Accessibility tomany sites was severely hampered by the prevailing general security conditions. Commented photographs are presented in Appendix A.

Figures 3-1, 3-2, 3-3 and 3-4 on the following pages show the geographic distribution of these photographs on regional maps.

Appendix B presents reference data for the springs in the northern Bekaa area which are used for irrigation. Many of these springs are also being used for potable water.

Of a total of 13 springs visited 8 (60%) catchment structures were in fair or good condition while 5 (40%) catchment structures require rehabilitation or total reconstruction in order to contain the gushing waters and direct them into the channel system with minor losses.

Of a total 38 channel section inspected 24 (63%) sections were in fair or good condition while 14 (37%) were in poor condition requiring major maintenance or rehabilitation works. The larger irrigation schemes which had received public monies during the last 20 years were in better condition than the smaller localized irrigation schemes that suffer from cumulative neglect and damage.

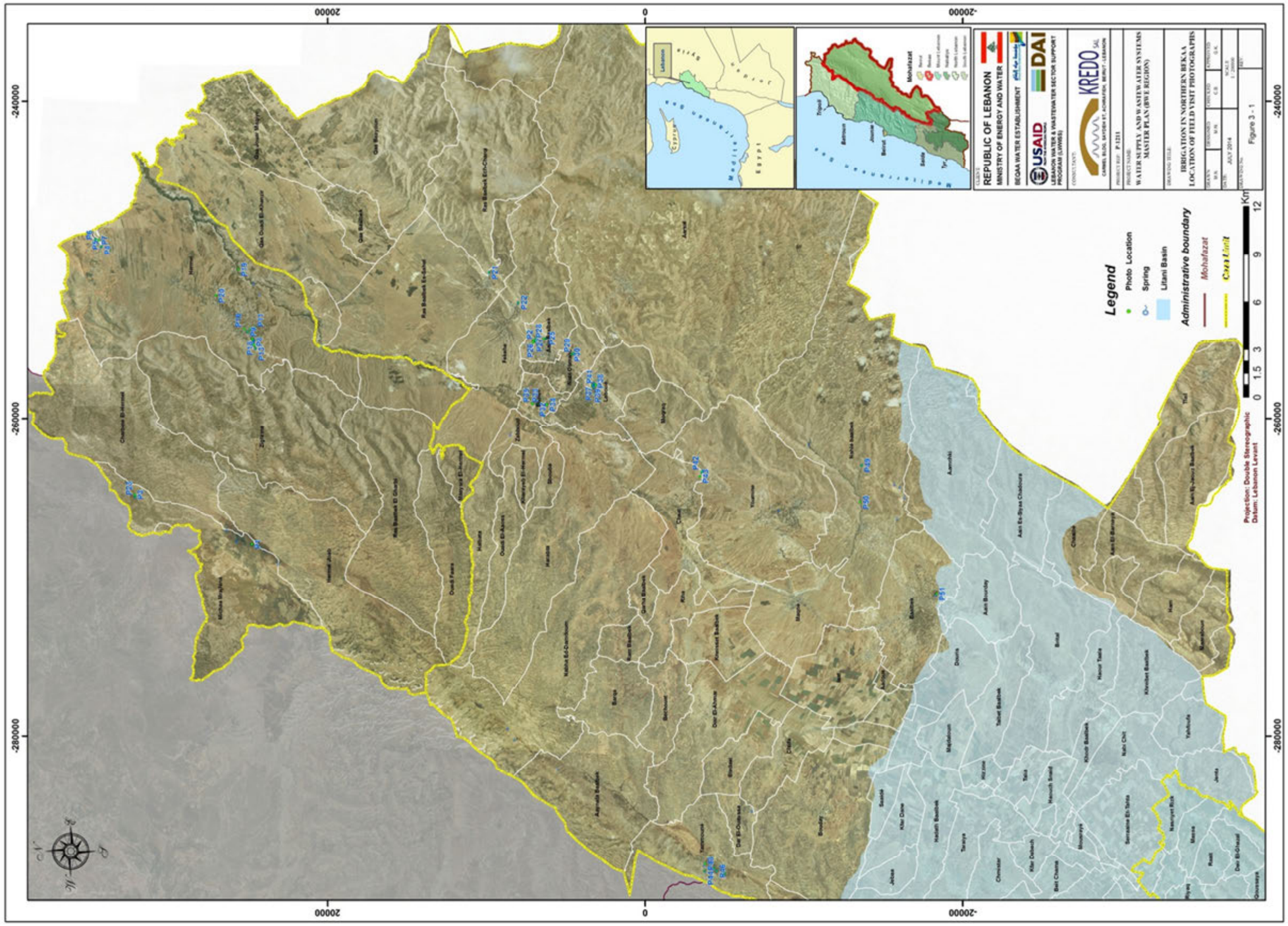


FIGURE 3-1: LOCATION OF FIELD VISIT PHOTOGRAPHS IN CAZAS OF BAALBECK AND HERMEL

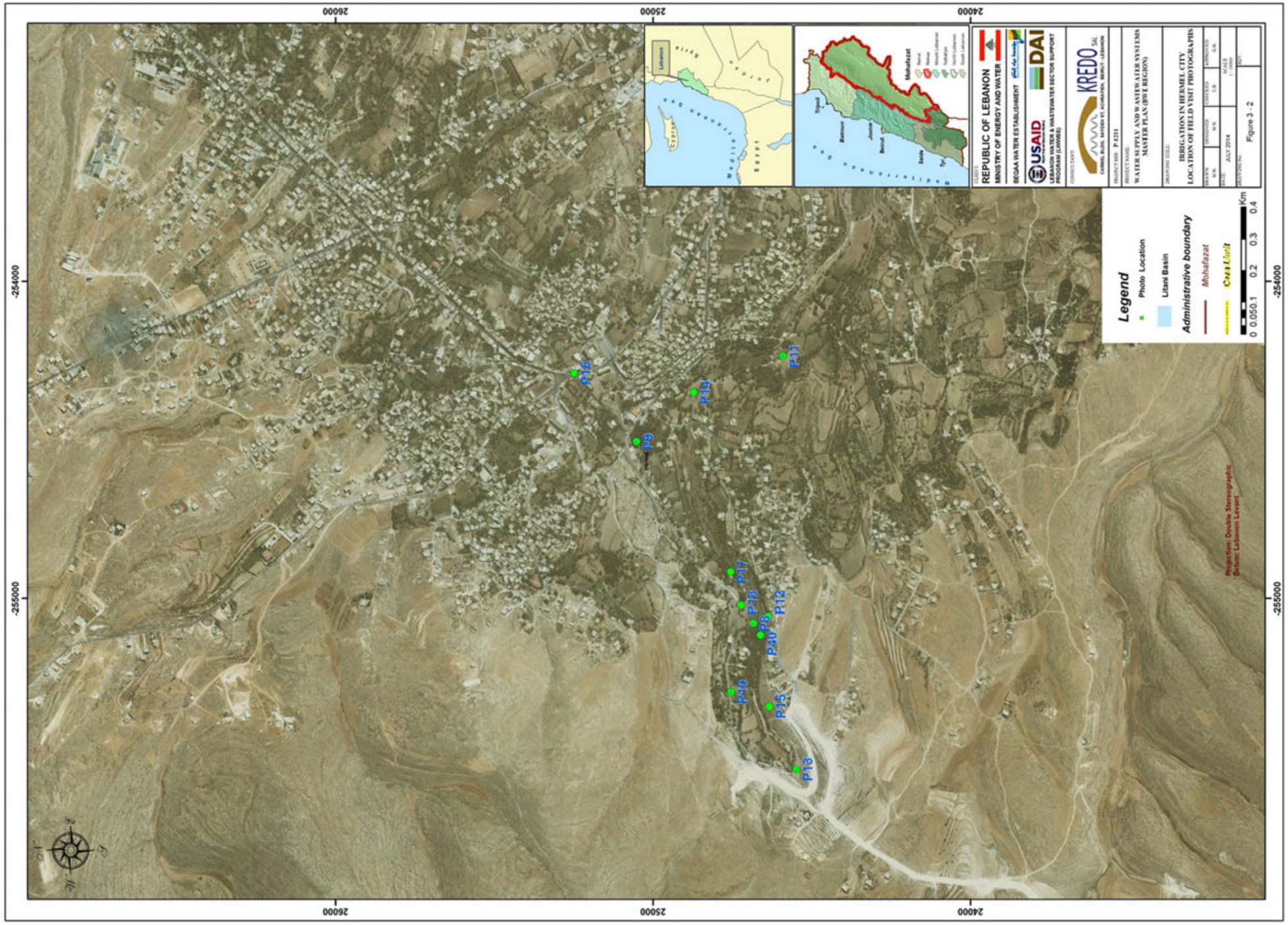


FIGURE 3-2: LOCATION OF FIELD VISIT PHOTOGRAPHS IN HERMEL CITY

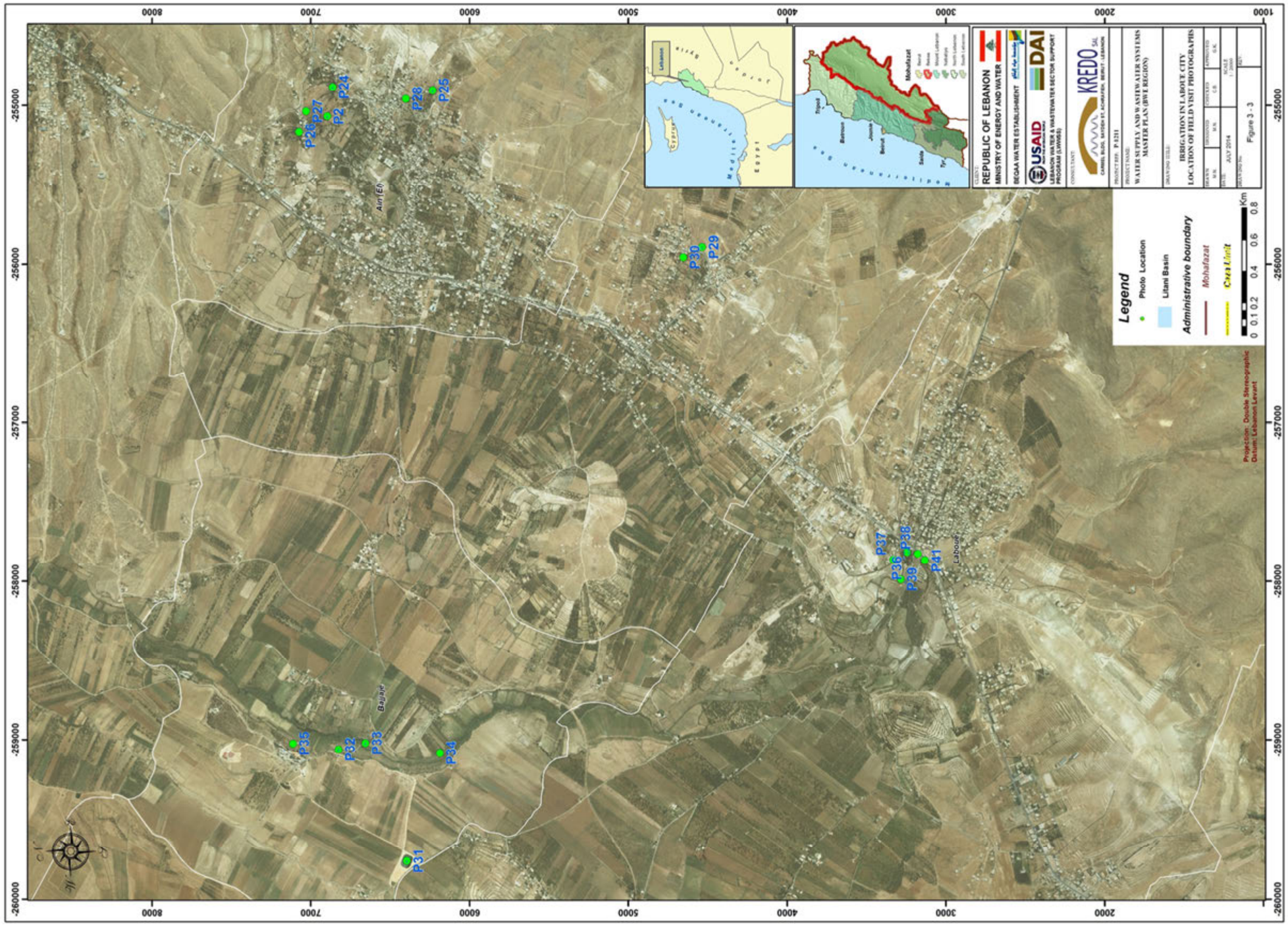


FIGURE 3-3: LOCATION OF FIELD VISIT PHOTOGRAPHS IN LABOUE CITY

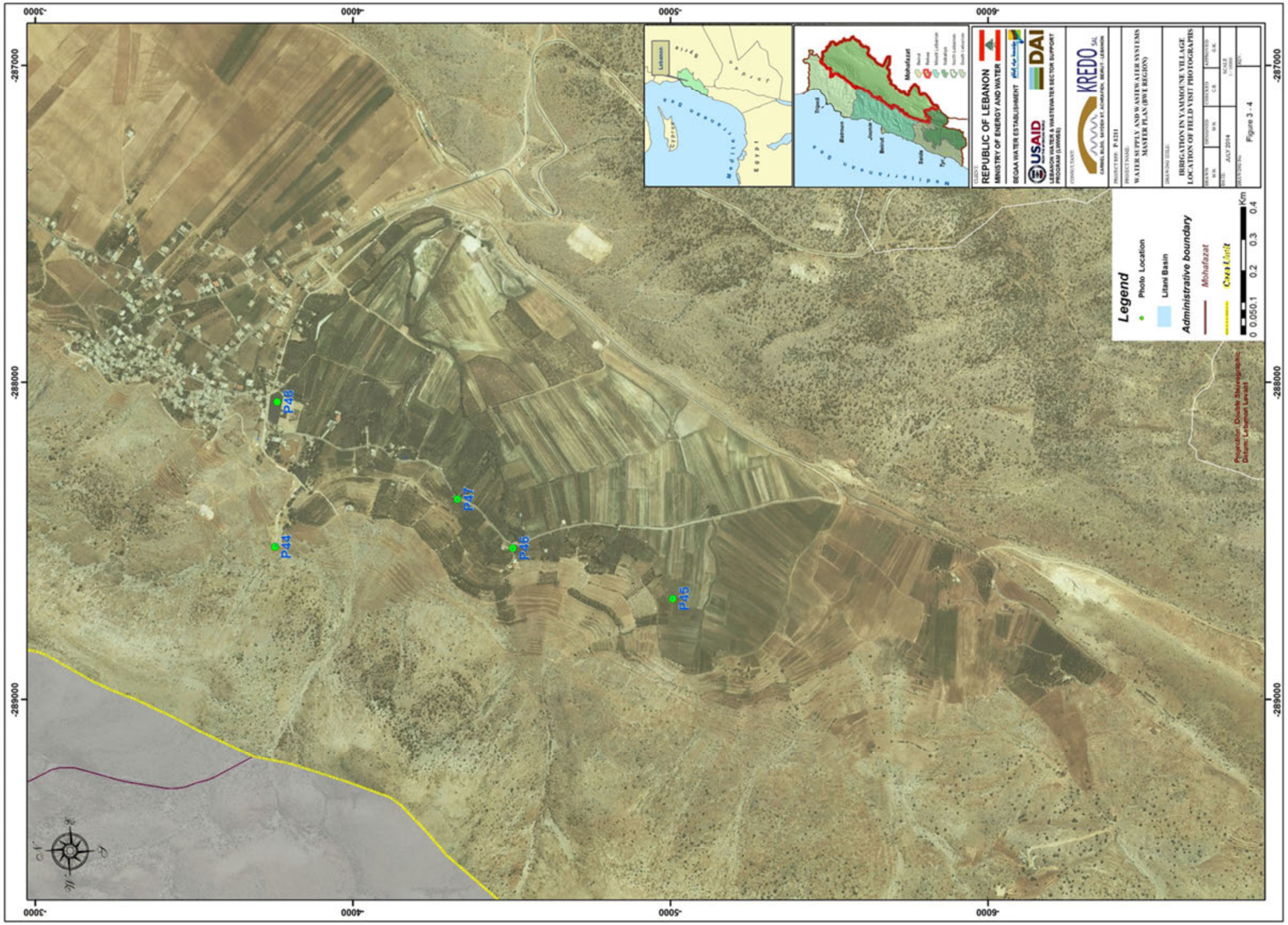


FIGURE 3-4: LOCATION OF FIELD VISIT PHOTOGRAPHS IN YAMMOUNE VILLAGE

3.2 Interviews with Farmers / Water Users

A sample of farmers/water users in the concerned region were interviewed. These farmers were selected in areas of interest and queried in free format and with questionnaires as to their activities, the status of their use of irrigation water and their general concerns.out of about 40 questionnaires administered, 19 were retained for relevance and geographic locationand processed. A map showing the geographic distribution of the interviewees is attached in Appendix D, Plan 10. All interviews were conducted in Arabic and the results summarized in English in the table attached in Appendix C.

Farm Size and Useful Agricultural Surface

The size of the useful agricultural surfaces per farm, varied from 10 to 1000 decare (1 decare= 1 dunom= 1000m^2), with an average size of 180 decare. The total additional area not currently used for agriculture available per farm varied from 5 to 1500 decare with an average of 153 decare.

Type of Crops

63% of the farmers interviewed have permanent cultures such as tree orchards and seasonal crops such as potatoes and wheat, the remainder have only seasonal crops.

Source of Irrigation Water/ Volume and Schedule

58% receive irrigation water through channels from a public irrigation scheme fed from a spring or a river, 5% rely on public irrigation scheme and a private well, 5% rely on a hill lake, and 37% rely on water from a well drilled solely for irrigation even though they are located in an area close by a public irrigation scheme.

One farmer, 5%, reported knowing the volume of water he uses, all others did not measure or know. 100% of those farmers receiving water from a public scheme reported a water availability schedule that varied from one day per weekto many hours per day, typically 12 hours. One farmer reported availability at all times.

Tariffs and Costs

Five out of eleven farmers benefiting from irrigation water through a public scheme admitted paying a tariff for the service and channel cleaning. All those using pumped water from wells complained about the high cost of fuel and energy to operate the pumps.

Water Committees Work

90% of those farmers receiving water from a public scheme reported the existence of a local water committee. 44% rated the committee's work as poor or ineffective, the rest reported satisfaction with the committees work. One committee was reported to be operated under the municipality outside the BWE oversight.

Main Irrigation Problems and Infrastructure

90% of those farmers receiving water from a public scheme identified water losses in the channels as their main problem and suggested replacing the earthen channels and the damaged concrete channels with pipes. 10% suggested the construction of hill lakes.

100% of all interviewees whether currently using irrigation scheme water or drilled well water reported the situation of the irrigation networks as unacceptable suggesting the construction of new networks, their extension, and even the construction of dams.

84% of all interviewees reported that the quantities of water available were insufficient to irrigate all the land available

Other Main Problems Facing Farmers

Main problems facing farmers were identified as low prices (25%), lack of agricultural guidance and fertilizers (30%), limited availability of credit (10%), high production costs (5%), and inclement weather (15%).

3.3 Review of Pertinent Data from the Agricultural Census of 2010

As mentioned before, the Ministry of Agriculture has conducted in 2010 an extensive agricultural survey which it has published in 2012. The most pertinent tables containing data on irrigation in the Cazas of Hermel, Baalbeck, and Rachaiya, namely Tables 2.1; 2.7; 2.8; 2.9; 2.10; 2.11 of the appendices to the census report were excerpted from the census database and translated to English and attached by Caza in Appendix F. Their data is commented in the following.

Tables 2.1 present the distribution of the useful agricultural surfaces per farm size between non-irrigated, partially irrigated during the dry season, and fully irrigated. 56% of Hermel agricultural lands, 55% of Baalbeck's, and 16% or Rachaiya's are irrigated. Roughly half of the irrigated lands are irrigated partially, i.e. only during the drier months of the season when needed.

Tables 2.7 present the source of irrigation waters used per farm size and land areas. 38% of irrigated lands in Hermel, 29% in Baalbeck, and 30% in Rachaiya receive their waters from a spring or river. The remainder of the irrigated surfaces get their water from drilled wells, 56% for Hermel, 61% for Baalbeck, and 21% for Rachaiya, or from other sources such as rain water reservoirs and hill lakes. Roughly one third of all irrigated lands are from a surface water source directly under the jurisdiction of the BWE. It must be noted here that most of the wells used in irrigation, more than 90%, are illegal wells without the

required permit from the MEW. These wells draw water from groundwater aquifers in an uncontrolled fashion drawing down irreversibly the water table year after year and threatening springs, and potable water resources.

Tables 2.8 present the irrigation mode used per farm size and land areas. Irrigation by gravity, i.e. by surface flow over the land, is the most practiced with drip irrigation almost at an equal level and aspersion a distant third. 63% of the irrigated lands in Hermel are by gravity, 34% by drip, and 3% by aspersion; these numbers are 38.5%, 35.3% and 26.2% for Baalbeck and 59%. 36%, and 5% for Rachaiya. These numbers depend of course on the type of crops and techniques used but they are nevertheless indicative of the level of agricultural technology reached and the education of the farmers with respect to water usage.

Tables 2.9, 2.10, and 2.11 present the distribution of irrigated surfaces per source of irrigation (spring/river, drilled well, reservoir, Hill Lake, etc...) and type of crop. Table 2.9 presents data for seasonal crops, Table 2.10 presents data for greenhouse crops and Table 2.11 presents data for permanent crops such as orchards, vineyards and the like.

In addition to data on irrigation, two pertinent tables about the obstacles to development faced by the farmers, namely Tables 8.1 and 8.2 to were excerpted from the census database and translated to English and attached by Caza to Appendix C.

These tables present a classification of the different types of obstacles to development faced by the farmers per farm in Table 8.1 and per useful agricultural surface in Table 8.2.

Agricultural guidance, marketing, credit, infrastructure, cost of production, land fragmentation, and source or scarcity of irrigation water were all identified as major impediments to the development of agriculture. With reference to useful agricultural surfaces, infrastructure is reported as an obstacle 3.3% of the time in Hermel, 3.5% in Baalbeck, and 7.2% in Rachaiya. On the other hand the source or scarcity of irrigation water is reported as an obstacle 12.4% of the time in Hermel, 12.5% in Baalbeck, and 14.8% in Rachaiya.

Albeit Rachaiya does not contain any public irrigation scheme whose responsibility befalls directly to the BWE, its surface waters fall within the jurisdiction of the BWE which could eventually propose and develop such schemes.

The data collected from the field visits on the status of the irrigation public schemes' infrastructure and from the limited number of interviews with water users agrees well with the aggregated results from the Agricultural Census of 2010 confirming the general picture.

4 MAJOR CURRENT PHYSICAL DEFICIENCIES IN EXISTING SYSTEMS

In keeping with the terms of reference and based on the field data collected and reported the major current physical deficiencies in the existing irrigation water system that prevent these existing systems from operating at their maximum potential and that could be acted upon immediately by the BWE can be summarized as follows in order or priority:

- Spring catchments and intakes that need to be maintained in full operating condition to feed as much water as possible in the irrigation networks. Damaged catchment structures need to be replaced and existing ones improved and protected from debris and obstructions.
- Main or primary channels that need to be maintained and cleaned systematically in order to allow full hydraulic capacity to be reached.
- Distribution or secondary channels that need to be surveyed to identify low flow points or obstruction points due to debris, channel wall failures or excessive scour; these would need to be repaired locally.
- Removal/ reduction of illegal intakes through breaking the channel edge wall or by pumping directly from the channel.
- Replacement / repair of existing distribution gates as these tend to be damaged and leak a lot of water.

The beneficiaries or water users can be involved in correcting many of these physical deficiencies especially for the location and removal of illegal intakes, clean up and local repairs, and locating and flagging defective gates.

It was also noted from interviews with water users, although not reported explicitly in Appendix C, that water committees work could be improved resulting in a greater efficiency in the use of water resources. In spite of the apparent burden that this may put on the BWE the real cost of training and educating the local water committees is very limited in terms of money. Many international agencies have noted that fact and have concentrated their initiatives on the creation and training of local water users associations who would eventually become the partners of the Water Establishments in managing the irrigation schemes in question. The Litani River Basin Management Support Program (LRBMS) funded by the USAID which has concluded its activities in 2013 has worked on the creation of Water Users Associations in the LRA areas of jurisdiction and has recommended the creation of a Water Federation of Municipalities in an effort to get the beneficiaries to shoulder more of the responsibilities of the irrigation systems in partnership with the LRA. A similar approach is needed within the area of jurisdiction of the BWE. In fact the bulk of that area, North Baalbeck and Hermel, constitutes the upper Assi river basin and may require the creation of a basin management authority under the BWE in order to engage in full-fledged Integrated Water Resources Management mode. The CDR's Local Development Project in Northern Lebanon, ADELNORD, financed with a grant from the European Union, and has also carried out activities aimed at setting up local water user committees in remote areas of Hermel among others.

On the long run, and depending on the availability of funds the following physical infrastructure improvements are required:

- Earth channels would need to be replaced with concrete channels or pipes.
- Open concrete channel systemswith gates would need to be replaced by a pipes network with metered hydrants.
- Systematic flow metering would need to be implemented system wide in order to monitor consumption and eventually develop a rational tariff structure.

5 CONCLUDING REMARKS AND RECOMMENDATIONS

The development of an Irrigation Water Master Plan for the BWE would be of course the next proper step before engaging in any major development activities. This activity would require first an effort in data collection then the definition of a strategic approach along which the master plan would be articulated.

In preparation for the master plan the BWE should:

- Monitor the production of water and its current distribution by monitoring the flow of springs on a regular and statistically significant basis and the flows in the main irrigation channels in order to provide reliable data for any planning work. This effort could be done in coordination with the LRA.
- Complete and updatethe database of its irrigation assetsand carry out complementary topographic survey works to map out all networks and irrigation infrastructures that fall under its jurisdiction and
- Collect and update all available data on the current management structure of schemes (BWE, local water committee, or municipality), their operating costs, tariffs paid, and customer or beneficiaries databases.

On the other hand a general strategic approach should be defined in order to frame the activities of an Irrigation Water master plan for the BWE by considering the following:

The geographic integration of all the areas that fall under the jurisdiction of the BWE

The major agricultural areas under the jurisdiction of the BWE fall in North Baalbeck and Hermel in the northern half of the Bekaa valley constituting the Upper Basin of the Assi or Orontes River. All the public irrigation schemes and infrastructures but for one scheme fall in that region. In addition to the northern Bekaa area three smaller separate geographic areas fall under the jurisdiction of the BWE:

i. The Ham-Maaraboun valley in the caza of Baalbeckcontaining one identified public irrigation scheme and constituting the upper part of the Barada river basin which drains through the Zabadani plateau in Syria flowing into the Damascus oasis.
ii. The Tfail area in the caza of Baalbeck extending to the east of the Anti-Lebanon crests into the Nabek plateau in Syria.
iii. The caza of Rachaiya extending on the western slopes of the Anti-Lebanon and Mount Hermon and constituting the eastern part of the upper Hasbani river basin.

The reuse of treated wastewater

The national water and wastewater strategy calls for the full reuse of treated wastewaters in all inland areas. The recommendations of the wastewater systems master plan being carried out under the current study, once adopted by the BWE, should be integrated in the irrigation water master plan as a source of irrigation water to be accounted for the development of schemes and their extension.

Joint development effort with the Ministry of Agriculture

Noting the overlap between the responsibilities of the BWE and the MOA when it comes to the determination of irrigation water needs and their efficient use by the farmer, the master plan should be developed in partnership or with active participation by the MOA. The BWE irrigation master plan and the MOA strategy should be aligned and harmonized in order to improve and rationalize the use of irrigation water noting for example that irrigation and agricultural practices need to be improved, water saving irrigation systems implemented, and low water needs crops selected.

Irrigation water demand management

The BWE and the MOA would need to develop a joint water demand monitoring and management program in order to optimize the production, distribution and consumption of water in order to maximize the economic returns of agricultural activities in the areas of jurisdiction of the BWE. This would highlight the necessity to determine ***the economic value of water*** in the areas concerned in order to manage the demand efficiently.

Integrated Water Resources Management and Basin Management

Ideally the irrigation master plan would need to be integrated with the results of the potable water and wastewater master plans being carried out under the current study especially in the area of the upper Assi basin paving the way ultimately to an Upper Assi Basin management unit under the BWE.

Thousands of illegal wells extract irrigation water from the groundwater in the northern Bekaa affecting potable water resources and drawing down the water table in uncontrollable ways affecting the whole hydrological equilibrium of the area. However, the development of an IWRM approach under the irrigation master plan may be premature and may have to delay to a later stage by the BWE.

Lesson learned from the LRA basin management

In spite of the artificial split of responsibilities between the LRA and BWE in the southern Bekaa that could hamper in a sense an IWRM approach for the Litani river, the LRA has engaged in many activities leading to IWRM most notably under the LRBMS USAID funded project. Lessons learned from those activities should be considered within the framework of the development of an Irrigation master plan for northern Bekaa under BWE. Findings and lessons learned from the Ground Water Assessment and Database Project in Lebanon funded by the UNDP should also be integrated.

APPENDIX A: SPRINGS AND CHANNELS PHOTOS FROM SITE VISITS

Table of Photos

HERMEL

1. MERJHINE: LOCATION A

PHOTO 1: CHANNEL COMING FROM AIN EL HAOUR

Structure	Condition	Requirement
Channel	Very Good	Nothing

2. JAWZ (EL): LOCATION B

PHOTO 2: WADI EL JAWZ CHANNEL

Structure	Condition	Requirement
Channel	Good	Nothing

3. QASR: LOCATION C

PHOTO 3: EL MOUNKATEH CHANNEL

Structure	Condition	Requirement
Channel	Bad	Needs Rehabilitation

PHOTO 4: AL OUYOUN SPRING

Structure	Condition	Requirement
Catchment	Bad	Needs Rehabilitation

4. HERMEL: LOCATION D

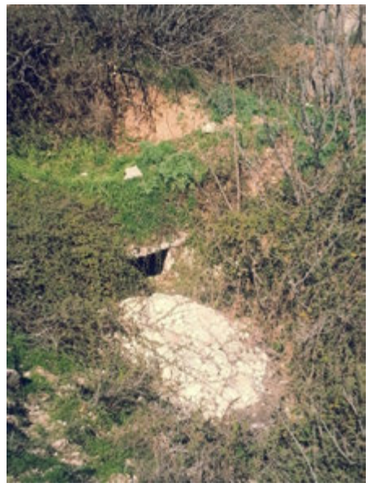


PHOTO 5: EHDA AACHARIYAS SPRING –HERMEL

Structure	Condition	Requirement
Catchment	Bad	Needs Rehabilitation

PHOTO 6: EHDA AACHARIYA CHANNEL - HERMEL

Structure	Condition	Requirement
Channel	Good	Nothing

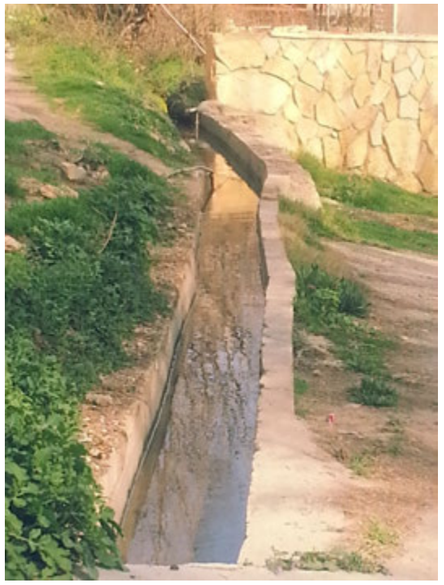


PHOTO 7: EL OUAKF CHANNEL –HERMEL

Structure	Condition	Requirement
Channel	Fair	Nothing

PHOTO 8: ELTOUTI SPRING - HERMEL

Structure	Condition	Requirement
Catchment	Bad	Needs Rehabilitation

PHOTO 9: EL JAWZE - AIN (EL) SPRING – HERMEL

Structure	Condition	Requirement
Catchment	Bad	Needs Rehabilitation

PHOTO 10: EL RISSI SPRING – HERMEL

Structure	Condition	Requirement
Intake	dirty	Needs Protection Against Debris

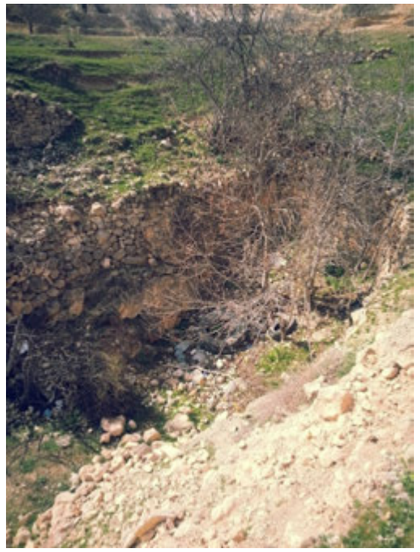


PHOTO 11: BDITA SPRING –HERMEL

Structure	Condition	Requirement
Catchment	Bad	Needs Rehabilitation

PHOTO 12: RAS EL MEIL SPRING –HERMEL

Structure	Condition	Requirement
Catchment	Good	Nothing

PHOTO 13: RAS EL MEIL CHANNEL –HERMEL

Structure	Condition	Requirement
Channel	Fair	Needs local repairs at bends

PHOTO 14: EL HAWA CHANNEL - HERMEL

Structure	Condition	Requirement
Channel	Fair	Nothing

PHOTO 15: HERMEL CHANNEL

Structure	Condition	Requirement
Channel	Very Good	Nothing

5. CHOUAGHIR: LOCATION E

PHOTO 16: CHOUAGHIR EL ASSI CHANNEL

Structure	Condition	Requirement
Channel	Very Good	Nothing

BAALBECK

6. RAS BAALBECK: LOCATION G

PHOTO 17: RAS BAALBECK SPRING

Structure	Condition	Requirement
Main Channel	Fair	Needs to be cleaned

7. FEKEHE: LOCATION H

PHOTO 18: FEKEHE SPRING

Structure	Condition	Requirement
Channel	Good	Nothing

8. AIN (EL): LOCATION I

PHOTO 19: RAS EL MAY SPRING – AIN (EL)

Structure	Condition	Requirement
Channel & Catchment	Bad	Need Rehabilitation

PHOTO 20: RAS EL MAY CHANNEL - EL AIN

Structure	Condition	Requirement
Channel	Fair	Needs local repairs at bends

PHOTO 21: RAMIYA SPRING – AIN (EL)

Structure	Condition	Requirement
Channel & Catchment	Bad	Need Rehabilitation

PHOTO 22: RAMIYA CHANNEL - EL AIN

Structure	Condition	Requirement
Channel	Good	Nothing

PHOTO 23: JAWZE EL AIN CHANNEL

Structure	Condition	Requirement
Channel	Good	Nothing

9. NABI OSMANE (EN): LOCATION J

PHOTO 24: NABI OSMANE (EN) SPRING

Structure	Condition	Requirement
Catchment	Dirty	Needs to be cleaned up

PHOTO 25: LABOUE – NABI OSMANE CHANNEL

Structure	Condition	Requirement
Channel	Fair	Needs minor maintenance

10. JABBOULE: LOCATION K

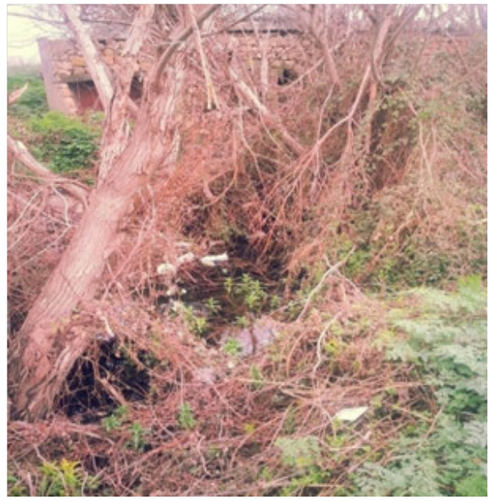


PHOTO 26: JABBOULÉ-BAJJAJÉ (EL) SPRING 1

Structure	Condition	Requirement
Catchment	Bad	Needs maintenance and rehabilitation

PHOTO 27: JABBOULÉ-BAJJAJÉ (EL) SPRING 2

Structure	Condition	Requirement
Catchment	Fair	Nothing

PHOTO 28: JABBOULE CHANNEL

Structure	Condition	Requirement
Channel	Good	Nothing

PHOTO 29: BAJJAJÉ (EL) CHANNEL –BAALBECK

Structure	Condition	Requirement
Channel	Fair	Nothing

11. LABOUE: LOCATION L

PHOTO 30: LABOUÉ SPRING

PHOTO 31: LABOUÉ SPRING –SOUAYKA

Structure	Condition	Requirement
Main channel	Good	Nothing

PHOTO 32: LABOUÉ SPRING - QAA (EL) CHANNEL

Structure	Condition	Requirement
Main channel	Fair	Needs minor maintenance

12. CHAAT: LOCATION M

PHOTO 33: CHAAT SPRING

Structure	Condition	Requirement
Main channel	Fair	Needs minor maintenance

PHOTO 34: CHAAT CHANNEL

Structure	Condition	Requirement
Channel	Good	Nothing

13. YAMMOUNE: LOCATION N

PHOTO 35: ARBAIIN SPRING – YAMMOUNÉ

Structure	Condition	Requirement
Main Channel and Catchment	Bad	Need rehabilitation

PHOTO 36: EL KAZEB SPRING –YAMMOUNÉ

Structure	Condition	Requirement
Main Channel and Catchment	Bad	Need rehabilitation

PHOTO 37: EL MOGHER SPRING –YAMMOUNÉ

Structure	Condition	Requirement
Main Channel and Catchment	Bad	Need rehabilitation

PHOTO 38: AIN ELTEFAHASPRING –YAMMOUNÉ

Structure	Condition	Requirement
Main Channel and Catchment	Fair	Need minor maintenance

14. NAHLE: LOCATION O

PHOTO 39: EL CHAGHOUR SPRING – NAHLE

Structure	Condition	Requirement
Channel	Fair	Need minor maintenance

PHOTO 40: CHAGHOUR CHANNEL – NAHLE

Structure	Condition	Requirement
Channel	Good	Nothing

15. BAALBECK: LOCATION P

PHOTO 41: RAS EL AIN SPRING - BAALBECK

Structure	Condition	Requirement
Main Channel	Good	Nothing

APPENDIX B: SPRINGS TABLES

Table of Tables

TABLE 5: SPRINGS IN HERMEL CAZA

Casa	Spring	Village	Location Known	Elevation	Min.Flow (l/s)	Max. Flow (l/s)	Avg. Flow (l/s)	Comments
Hermel	Ain El Jalsiye	Merjhine	No	1718m	N.A	N.A	53.8	Measured in March and April 2011
	Ain El Zarka	Hermel	Yes	N.A	N.A	N.A	N.A	
	Aroubeh & Maabour	Hermel	No	1632m	N.A	N.A	N.A	
	Bdita	Hermel	Yes	770m	N.A	N.A	52	Measured in March and April 2011
	El Ouyoun	Hermel	Yes	565	N.A	N.A	17.4	Measured in March and April 2011
	Ein El Hemi	Merjhine	No	1718m	N.A	N.A	22	Measured in March and April 2011
	Ein El Jameeh	Merjhine	Yes	1724m	N.A	N.A	29	Measured in March and April 2011
				N.A	18	40	26.33	Measured 4 times between 1971-1988 (MEW)
	Ein Om Charaf	Nabeeh El Jisr	Yes	710m	N.A	N.A	74	Measured in March and April 2011
	El bayda	Merjhine	No	1712m	N.A	N.A	27.8	Measured in March and April 2011
	El Hawa	Hermel	Yes	750m	N.A	N.A	13.9	Measured in March and April 2011
	El Hawr - Merjhine	Merjhine	Yes	1720m	N.A	N.A	92.6	Measured in March and April 2011
	El Iraniya & Ehda Aachariya	Hermel	Yes	768m	N.A	N.A	29	Measured in March and April 2011
	El Jamsiyeh	Merjhine	Yes	N.A	0.93	18	7.6	Measured 10 times between 1955-1988 (MEW)
	El Mounkateh	Qasr	Yes	679m	N.A	N.A	42.8	Measured in March and April 2011/ It dries in some months of the year
				N.A	0	650	232	Measured 7 times between 1960-1968 (MEW)
	El Rissi	Hermel	Yes	772m	N.A	N.A	32	Measured in March and April 2011
				N.A	16.4	48	26.61	Measured 31 times between 1960-1979 (MEW)
	El Touti	Hermel	Yes	758m	N.A	N.A	17.3	Measured in March and April 2011
	El Ouakf	Hermel	No	N.A	N.A	N.A	N.A	
	Nabaa El Jeser (Nabaa El Jeser)	El Hermel	No	N.A	45.64	261	153..32	Measured 2 times between 1966-1967 (MEW)
	Ras El Meil	Boueida	No	766m/785m	10	100	264	BWE Database
		Hermel	No	N.A	246	400	304.34	Measured 19 times between 1962-1974 (MEW)
			No	N.A	16.6	19	17.8	Measured 2 times in 1968 (MEW)
	Wadi El Ein	Hermel	No	725m	N.A	N.A	5.8	Measured in March and April 2011
	Wadi El Jawz	Hermel	No	N.A	N.A	N.A	N.A	
	Wadi Taqtaq	Hermel	Yes	N.A	N.A	N.A	N.A	

*** N.A = NOT AVAILABLE**

TABLE 6: SPRINGS IN BAALBECK CAZA

Casa	Spring	Village	Location Known	Elevation	Min.Flow (l/s)	Max.Flow (l/s)	Avg.Flow (l/s)	Comments
Baalbeck	Ain Es Sikeh	Yahfoufa	Yes	1163m	12	12,842 [SIC]	935	LRA (2002-2009)
	Ahla - Rasm El Hadath	Chaat	Yes	990m	N.A	N.A	66	Measured in March and April 2011
		Rasm El Hadath	Yes	N.A	50.5	270	106.07	Measured 7 times between 1975-1978 (MEW)
	Ain Daher	Aaynata	Yes	1955m	N.A	N.A	N.A	
	Ain El Assal	Bednayel	Yes	N.A	N.A	N.A	N.A	Exact Location Unknown
	Ain El Debayneh	Mazraat Beit Sleibi	Yes	N.A	N.A	N.A	N.A	Exact Location Unknown
	Ain El Delbe	Aamichki	Yes	1549m	0.1	1.4	0.5	Not in use, based on BWE current data, Nazih Braidi (8-2010 till 1-2011)
	Ain El Qalaa (Nabaa Mamlouq)	Hawr Taala	No	N.A	0.44	1.5	0.97	Measured 2 times in 1966 (MEW)
	Ain El Qalaa	Hawr Taala	No	N.A	0.35	36	2.38	Measured 20 times between 1966-1968 (MEW)
	Ain El Wosta (Nabaa El Wosta)	Oudous & Tal Safiye	No	N.A	1	5.2	2.24	Measured 7 times between 1960-1970 (MEW)
	Ain Oudous (Nabaa Tal Safiye)	Tal Safiye	No	N.A	0.12	7	1.48	Measured 10 times between 1956-1975 (MEW)
	Amoun (Nabaa Amoun Kharaj Maaraboun)	Kharaj Maaraboun	No	N.A	0.32	0.6	0.46	Measured 2 times in 1966 (MEW)
	Amoun (Nabaa Jboula)	Kharaj Maaraboun	No	N.A	4.4	22	13.2	Measured 2 times between 1965-1969 (MEW)
	Derdarah	Amachiki	Yes	1582m	0.2	1.7	0.7	Not in use, based on BWE current data, Nazih Braidi (8-2010 till 1-2011)
	El Chaghour	Younine/Nahle	Yes	1573m	3.8	10	N.A	Flows obtained from BWE Database
				1565m	0	120	45.67	Measured 3 times
		Nahle - Baalbeck		N.A	1.7	1024	190.06	Measured 29 times between 1960-1968 (MEW)
	El Bérké Monkhafad	Ouyoun Orghoch	No	2090m	N.A	N.A	196.8	Measured in March and April 2011
	El Chmali	Ouyoun Orghoch	No	2130m	N.A	N.A	81	Measured in March and April 2011
	El Ghab (For Irrigation)	Aaynata	No	1585m	N.A	N.A	78.7	Measured in March and April 2011
	El Ghab (Potable)	Aaynata	No	1580m	N.A	N.A	54.4	Measured in March and April 2011
	El Ghale	Aaynata	Yes	N.A	N.A	N.A	N.A	
	El Ghouwar (Potable)	Ouyoun Orghoch	No	2060m	N.A	N.A	46.3	Measured in March and April 2011

*** N.A = NOT AVAILABLE**

Casa	Spring	Village	Location Known	Elevation	Min.Flow (l/s)	Max.Flow (l/s)	Avg.Flow (l/s)	Comments
Baalbeck	El Kaws Mahallat El Ghouwar	Ouyoun Orghoch	No	2085m	N.A	N.A	28.9	Measured in March and April 2011
	El Quamar (For irrigation)	Aaynata/ Ouyoun Orghoch	No	2110m	N.A	N.A	23.1	Measured in March and April 2011
	El Reeyan	Moqraq	No	1495m	N.A	N.A	138.9	Measured in March and April 2011
	Fekehe (Potable & Irrigation)	Fekehe	Yes	1025m/1045m	N.A	N.A	60.2	Measured in March and April 2011
			No		61	105	71.92	Measured 12 times between 1962-1980 (MEW)
	Fouar (For irrigation)	Aaynata	Yes	2135m /1550m	N.A	N.A	22	Exact Location Unknown, Measured in March and April 2011
				N.A	11	90	50.5	Measured 2 times
	Hawch Tal Oudous	Tal Oudous	No	N.A	0	149	40.29	Measured 15 times between 1970-1978 (MEW)
	Jaouzeh	Amachiki	Yes	1545m	N.A	N.A	N.A	Not in use, based on BWE current data
	Jabboulé - Bajjaje (Irrigation)	Laboué	Yes	820m	N.A	N.A	11.6	Measured in March and April 2011
	Jabboulé - Bajjaje 2 (Irrigation)	Laboué	Yes	820m	N.A	N.A	N.A	
	Lajouje (Potable & Drink)	Nahle	Yes	1581m/1658m	28.6	39.5	32.6	Nazih Braidi (8-2010 till 1-2011)
					30	100	N.A	BWE Database
				1658m	37	37	37	Measured 1 time
	Laboué (Potable and Irrigation)	Laboué	Yes	903m	N.A	N.A	520.8	Measured in March and April 2011
				N.A	114	1495	1114.33	Measured 6 times between 1956-1972 (MEW)
	Nabaa EL Laboué (Kanat El Zaraya)	Laboué	Yes	N.A	59	776	184.85	Measured 7 times between 1967-1972 (MEW)
	Nabaa EL Laboué (Takat Al Chalal)	Laboué	Yes	N.A	36.4	117.26	85.16	Measured 4 times between 1967-1968 (MEW)
	El Rways	Laboué	Yes	N.A	N.A	N.A	N.A	
	El Nabi	Laboué	Yes	N.A	N.A	N.A	N.A	
	Nabaa Al Qaboueh (For irrigation)	Aaynata	Yes	2135m/2100m	N.A	N.A	81	Measured in March and April 2011
	Nabeh Al-Ftaira		No	N.A	16	64	40	Measured 2 times
	Nabeh Ez-Zayzafouné		No	N.A	35	35	35	Measured 1 time
	Nabi Chit- Baalbeck (Nabeh Sbat Source)		No	N.A	23.5	34.72	29.11	Measured 2 times

*** N.A = NOT AVAILABLE**

Casa	Spring	Village	Location Known	Elevation	Min.Flow (l/s)	Max.Flow (l/s)	Avg.Flow (l/s)	Comments
Baalbeck	Nabi Osmane (En) (For irrigation)	Nabi Osmane (En)	Yes	975m	N.A	N.A	9.3	Measured in March and April 2011
				N.A	1	4	2.64	Measured 5 times between 1960-1969 (MEW)
	Naher Yahfoufa	Jenta	No	N.A	34	1235	634.5	Measured 2 times in 1966 (MEW)
	Nahle	Nahle	No	1230m	N.A	N.A	120.4	Measured in March and April 2011
	Ramiya	Near El Ain	Yes	N.A	0.5	15	6.11	Measured 11 times between 1966-1975 (MEW)
	Ras Baalbeck (Irrigation)	Ras Baalbeck	Yes	985m	N.A	N.A	55.5	Measured in March and April 2011
	Ras Baalbeck (Potable)	Ras Baalbeck	Yes	1025m	N.A	N.A	40.5	Measured in March and April 2011
	Ras Baalbeck (Nabaa Ras Baalbeck)	Ras Baalbeck	No	N.A	45	66	55.5	Measured 2 times between 1962-1964 (MEW)
	Nabaa El Jebb	Temnine El Fawqa	No	N.A	0	54	27	Measured 2 times in 1981 (MEW)
	Ras El Ain	Baalbeck	Yes	1160m	0	279	104	Exact Location Unknown, Used only for irrigation LRA (2009-2011)
				N.A	144	716	421	Measured 6 times between 1968-1975 (MEW)
				N.A	129	958	503	Measured 13 times between 1961-1970 (MEW)
	Ras El May	Ain (El)	Yes	N.A	20.7	59.5	31.74	Measured 10 times between 1967-1981 (MEW)
	Rasm El Hadath (Potable)	Rasm El Hadath	No	960m	N.A	N.A	74.1	Measured in March and April 2011
			No	N.A	0	236	50.68	Measured 7 times between 1967-1975 (MEW)
	Rasm El Hadath (Aainata)	Rasm El Hadath	No	N.A	2	55.3	27.76	Measured 3 times between 1962-1975 (MEW)
	Sbat (Nabi Chbat)	Nabi Chbat	Yes	1575m	16.1	20.5	18.5	Nazih Braidi (8-2010 till 1-2011)
					15	1,000	N.A	BWE Database
	Tallet El Deir	Laboué	No	820m	N.A	N.A	6.9	Measured in March and April 2011
	Tal El Ghassil	Safri	No	N.A	0	112.23	33.18	Measured 16 times between 1973-1979 (MEW)
	Yammouné- Arbaiin	Yammouné	Yes	1362m/1389m	5	5,000	2650.5	BWE Database / Measured in March and April 2011
					0	4,370	912	LRA (2009-2011)
	Yammouné- El Mogher	Yammouné	Yes	1359m/1352m	20	40	N.A	BWE Database
					20	220	87	LRA (2009-2011)

*** N.A = NOT AVAILABLE**

Casa	Spring	Village	Location Known	Elevation	Min.Flow (l/s)	Max. Flow (l/s)	Avg. Flow (l/s)	Comments
Baalbeck	Yammouné- Ain El Tefaha	Yammouné	Yes	1359m	30	80	N.A	BWE Database
					0	226	63	LRA (2009-2011)
				N.A	20	70	45	Measured 2 times
				N.A	22.6	230.4	126.5	Measured 2 times in 1967 (MEW)
	Yammouné- Nabaa El Mafar	Yammouné	No	N.A	233.5	759	385.15	Measured 4 times in 1967 (MEW)
	Yammouné - Nabaa El Aarous	Yammouné	No	N.A	489.3	1540	901.58	Measured 7 times in 1967 (MEW)
	Yammouné- Dar El Wasiaa / Kezzab	Yammouné	Yes	1350m	N.A	N.A	1041.7	Measured in March and April 2011
				N.A	73	560	284.66	Measured 3 times in 1967
	Younine (Ain Wadi El Maine)	Younine	Yes	1200m	N.A	N.A	110	Measured in March and April 2011
				N.A	25	49	40	Measured 3 times between 1970-1978 (MEW)
	Yanabii Ham & Maaraboun	Baalbeck	No	N.A	0.5	6.62	2.61	Measured 6 times in 1973 (MEW)
	Zabboud Old Spring	Zabboud	Yes	N.A	N.A	N.A	N.A	

*** N.A = NOT AVAILABLE**

APPENDIX C: QUESTIONNAIRE

Table of Tables

TABLE 7: ANSWERS OF THE QUESTIONNAIRES IN SOME NORTHERN BEKAA AREAS

Definition	1.1	*Village Name*	**Fissane - El Naanaha (Hermel) 1***	**Hermel 2***	**Haouch es Sayed Aali (Hermel) 3***	**El Jawz (Hermel) 4***	**El Rajem - Qasr (Hermel) 5***
	1.2	*Farmer Name*	Ahmad Jaafar	Abdo El Jawhari	Ali El Hajj Hassan	Nafez Jaafar	Badri Nasr El Din
	1.3	*Address& and Phone number*	Fissane - 03/547966	Hermel - Dawra - 71/423157	Haouch es Sayed Aali - 03/875882	Al Midane (Hermel) - 03/496636	Qasr - 03/603602
Agricultural Production	2.1	*Agricultural Area (Decarel**)*	50	4	200	70	1000
	2.2	*Non Agricultural Area (Decare**)*	150	16	200	300	100
	2.3	*Agriculture Type* *Season 1 / Season 2/ Season 3*	Beans, Apple trees	Bean, Malt, Wheat, Potato, Beans, Tomato , Cucumber	Malt and Wheat	Cherries, Apple, and Nut trees	Corn, Wheat, vegetables, Potato
Irrigation	3.1	*Source of Irrigation (Channels, Wells…)*	Channels in Naanaha	Ras El Meil spring through channel	El Assi River	Wadi El Tabour Spring	El Assi River
	3.2	*Volume of Water used per Season*	Once every 12 hours		6 inch Pipe diameter takes water from El Assi River	4 inch Pipe diameter take water from Wadi El Tabour Spring	800 m³ per season
	3.3	*Water Distribution Schedule*	12 hours per week	12 hours every 15 days	Always Available	once every 24 hours	
	3.4	*Water Tariff*	No Cost, Water is supplied by gravity	300,000 L.L per year	No cost	No cost	800,000 L.L per 24 hours
Questions	4	*What's your opinion regarding the Water Committee?*	It is doing a good job	Water committee doesn't exist	Water committee doesn't exist	It is doing a good job	
	5	*What are the irrigation problems?*	Lack of concrete channels and pipes.		Huge quantity of Water losses	Huge quantity of Water losses and the existing of old channels	This sector needs water pipes, pumps and reservoirs
	6	*Are the infrastructure and channels in acceptable condition and what are the required improvements?*	Earth channels shall be replaced by concrete ones	Channels need periodic rehabilitation	The village needs new channels	Not acceptable	Not acceptable. There is a need for more channels and pipes
	7	*What are the main problems facing the farmers?*	Recession Period - Absence of high prices during crops	Channels are not cleaned from time to time	The absence of financial support and guidance. No available fertilizers	No available fertilizers. Difficulty to sell the produce	difficulty to sell the productions and natural disasters
	8	*Is the available quantity of water sufficient? And if there is more quantity, do you need it?*	Not sufficient - Water is needed to irrigate the agricultural lands	Not sufficient - More water quantity leads to more agricultural areas	Yes- More water quantity leads to more agricultural areas	Not sufficient - More water quantity leads to more agricultural areas	Not sufficient - More water quantity leads to more agricultural areas

* The identification number designates the location of the questionnaire on the attached plan

** Decare = 1000m^2

*** All Questionnaires were filled up during February and March 2014

Definition	1.1	*Village Name*	**Ras El Mal (Hermel) 6***	**Kroum (Hermel) 7***	**El Hara (Hermel) 8***	**Merjhine (Hermel) 9***	**Merjhine (Hermel) 10***
	1.2	*Farmer Name*	Youssef Mahfouz	Abed El Halim Sakr	Mousaed Sakr(Mayor)	Mefleh Ellaw	Mefleh Ellaw
	1.3	*Address& and Phone number*	Ras El Mal	Hermel- 08/200772	El Hara – 03 725 930	Merjhine – 03 / 088812	Merjhine - 03/088812
Agricultural Production	2.1	*Agricultural Area (Decare**)*	10	15	50	45	20
	2.2	*Non Agricultural Area (Decare**)*	5	10	100	30	60
	2.3	*Agriculture Type Season 1 / Season 2/ Season 3*	Fruitful Trees, Cranberries	Grapes, Figs	Fruit and olive trees, Grape	Vegetables (one season)	Potato, Bean, Vegetables, Cucumber
Irrigation	3.1	*Source of Irrigation (Channels, Wells…)*	Bdita Spring	Private well	Ras El Mal channel	Merjhine springs	Ain El Jawz Lake
	3.2	*Volume of Water used per Season*	---	Not quantified	Not quantified	Not quantified	
	3.3	*Water Distribution Schedule*	Free schedule	Free schedule	Every 15 days	unlimited	Once per day
	3.4	*Water Tariff*	No Cost	High cost (Fuel cost)	Fees and cleaning costs.	No costs	No Cost, Water is supplied by gravity
Questions	4	*What's your opinion regarding the Water Committee?*	Needs to intensify its work	Its work didn't succeed.	Committee is working under the supervision of the municipality		Its doing a good job
	5	*What are the irrigation problems?*	Needs for lakes	No water sources	Lack of water and water losses		This sector needs water pipes to transmit water to the irrigated area
	6	*Are the infrastructure and channels in acceptable condition and what are the required improvements?*	The village needs new channels and pipes	Not acceptable and need rehabilitation and supervision	Channels need rehabilitation. Need to find another source of water.	Some channels need rehabilitation	Not acceptable. There is a need for more channels
	7	*What are the main problems facing the farmers?*	The absence of financial support and guidance	High cost	The absence of financial support and guidance	The absence of financial support and guidance	No available fertilizers.
	8	*Is the available quantity of water sufficient? And if there is more quantity, do you need it?*	Sufficient but more water quantity leads to more agricultural areas	Not sufficient - More water quantity leads to more agricultural areas	There is a problem in sharing the Ras El Mal water between domestic and irrigation.	Available quantity of water is acceptable. More water quantity leads to more agricultural areas	Not sufficient - More water quantity leads to more agricultural areas

* The identification number designates the location of the questionnaire on the attached plan

** Decare = 1000m^2

*** All Questionnaires were filled up during February and March 2014

Definition	1.1	*Village Name*	**Sahlet el May (Jouar el Hachiche) (Hermel) 11***	**Mrah El Zekbe (Hermel) 12***
	1.2	*Farmer Name*	Yassine Ali Jaber	Daher Jaafar
	1.3	*Address & and Phone number*	Jouar el Hachiche	El Zekbe- 03/280843
Agricultural Production	2.1	*Agricultural Area (Decare**)*	600	50
	2.2	*Non Agricultural Area (Decare**)*	1500	40
	2.3	*Agriculture Type* *Season 1 / Season 2/ Season 3*	Grapes. Olive trees, cherries, almonds, apple, different vegetables	Nuts, Olives
Irrigation	3.1	*Source of Irrigation (Channels, Wells…)*	Springs/ Wells	3 wells
	3.2	*Volume of Water used per Season*	Not quantified	
	3.3	*Water Distribution Schedule*		
	3.4	*Water Tariff*	Electricity and fuel costs	Electricity and fuel costs
Questions	4	*What's your opinion regarding the Water Committee?*	Water committee doesn't exist	Water committee doesn't exist
	5	*What are the irrigation problems?*	Absence of water lakes construction	High cost of water
	6	*Are the infrastructure and channels in acceptable condition and what are the required improvements?*	Acceptable but need continuous maintenance and need to build a Dam on Maabour river	Not acceptable. Need to put plans for agricultural areas and irrigation channels
	7	*What are the main problems facing the farmers?*	The absence of all financial aids and loans	Low prices of crops
	8	*Is the available quantity of water sufficient? And if there is more quantity, do you need it?*	Not Sufficient	Not sufficient

* The identification number designates the location of the questionnaire on the attached plan

** Decare = 1000m^2

*** All Questionnaires were filled up during February and March 2014

Definition	1.1	*Village Name*	**El Souwwaniyi (Baalbeck) 13***	**Maaraboun (Baalbeck) 14***	**Al Nabi Othman (Baalbeck) 15***	**Baalbeck 16***	**El Ain (Baalbeck) 17***
	1.2	*Farmer Name*	Mohammad Sawwan	Ali Haidar	Hussein Seif el Dine	Mohammad el Makbour	Khodor Younes
	1.3	*Address & and Phone number*	El Souwwaniyi	Maaraboun 03-744312	Al Nabi Othman 71-717091	El Ain- 71-556272	El Ain- 03/434404
Agricultural Production	2.1	*Agricultural Area (Decare**)*	10	30	1000	10	10
	2.2	*Non Agricultural Area (Decare**)*	35	30	100	30	4
	2.3	*Agriculture Type Season 1 / Season 2/ Season 3*	Fruit, Olive, Almonds and Grapes trees	Fruit Trees, Apple and olives		Olives, Almond, Apricot, cherries, Plum	Barley, Apricot (1 season)
Irrigation	3.1	*Source of Irrigation (Channels, Wells…)*	Private Well	Individual Wells	Individual well/ Springs	Individual Wells	Ras El May Spring
	3.2	*Volume of Water used per Season*		Not Quantified	Quantity used depends on the water quantity extracted	Not quantified	
	3.3	*Water Distribution Schedule*	Free schedule	Not Schedule	By hours	Not scheduled	12 hours per week
	3.4	*Water Tariff*	High cost (Electricity and fuel costs)	High cost (Electricity and fuel costs)	High cost (Electricity and fuel costs)	2M LL	Nominal fee
Questions	4	*What's your opinion regarding the Water Committee?*	Water committee doesn't exist	No water Committee	No water Committee	Committee active and essential	Its work didn't succeed
	5	*What are the irrigation problems?*	Lake of channels and the good solution for irrigation	No water	Need for new channels and pipes	High cost to extract water	Broken channels
	6	*Are the infrastructure and channels in acceptable condition and what are the required improvements?*	Not acceptable. There is a lack of concrete channels and high water losses	Channels need rehabilitation	Not Acceptable very old and not functioning	All channels very old need to implement new network	All Channels need rehabilitation
	7	*What are the main problems facing the farmers?*	Low price of fruit during the whole season	No support for Farmers	Cold winter season kills all plants thus no production	Severe weather conditions and	The absence of financial support and guidance
	8	*Is the available quantity of water sufficient? And if there is more quantity, do you need it?*	Not sufficient - More water quantity leads to more agricultural areas	Not Sufficient	Not Sufficient	Not Sufficient	Not sufficient - More water quantity leads to more agricultural areas

* The identification number designates the location of the questionnaire on the attached plan

** Decare = 1000m^2

*** All Questionnaires were filled up during February and March 2014

Definition	1.1	*Village Name*	**El Ain (Baalbeck) 18***	**El Qaa (Baalbeck) 19***
	1.2	*Farmer Name*	Youssef Jaafar	Milad Rizk
	1.3	*Address & and Phone number*	El Ain – North Bekaa	El Qaa 03-502512
Agricultural Production	2.1	*Agricultural Area (Decare**)*	200	50
	2.2	*Non Agricultural Area (Decare**)*	150	50
	2.3	*Agriculture Type* *Season 1 / Season 2/ Season 3*	Fruit Trees: Apricot, plum, peach, olive, vegetables	Vegetables
Irrigation	3.1	*Source of Irrigation (Channels, Wells…)*	Local Spring	Well el Qanna (Labwe)
	3.2	*Volume of Water used per Season*	Not quantified	Very high Quantity
	3.3	*Water Distribution Schedule*	Each 12 days	Free Schedule
	3.4	*Water Tariff*	Fees and cleaning costs.	High cost (Electricity and fuel costs)
Questions	4	*What's your opinion regarding the Water Committee?*	Water committee doesn't exist	There is a Water Committee in the village but it's not working
	5	*What are the irrigation problems?*	Old Irrigation techniques. Irrigation system is subjected to loses	Very poor quantity of water in the Qaa region
	6	*Are the infrastructure and channels in acceptable condition and what are the required improvements?*	Not acceptable. Channels need rehabilitation and reconstruction	Not acceptable. Channels need rehabilitation
	7	*What are the main problems facing the farmers?*	Each farmer solves his own problems.	Individual solutions due to lack of planning to developmental programs
	8	*Is the available quantity of water sufficient? And if there is more quantity, do you need it?*	Not sufficient	Not Sufficient

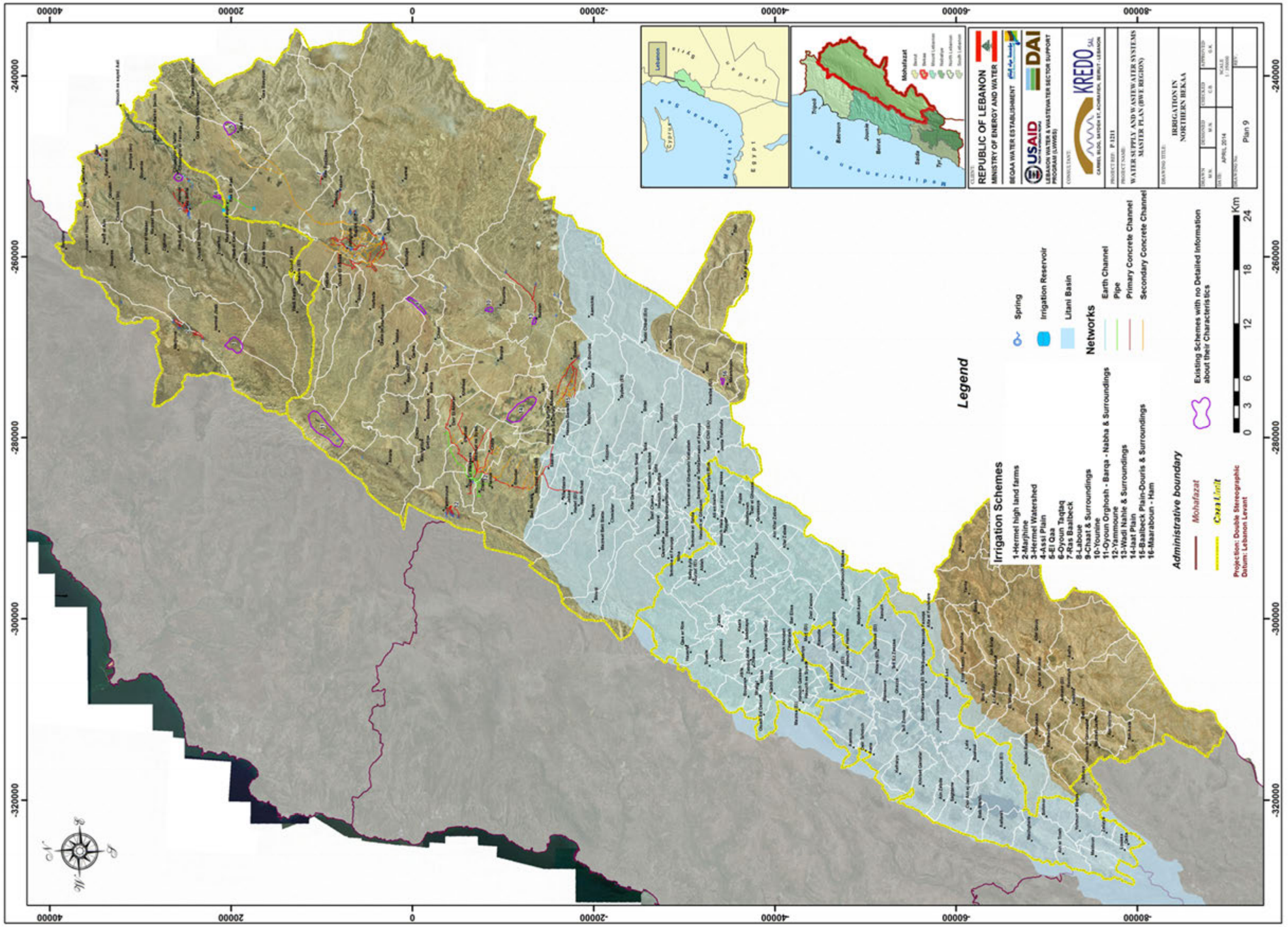
* The identification number designates the location of the questionnaire on the attached plan

** Decare = 1000m^2

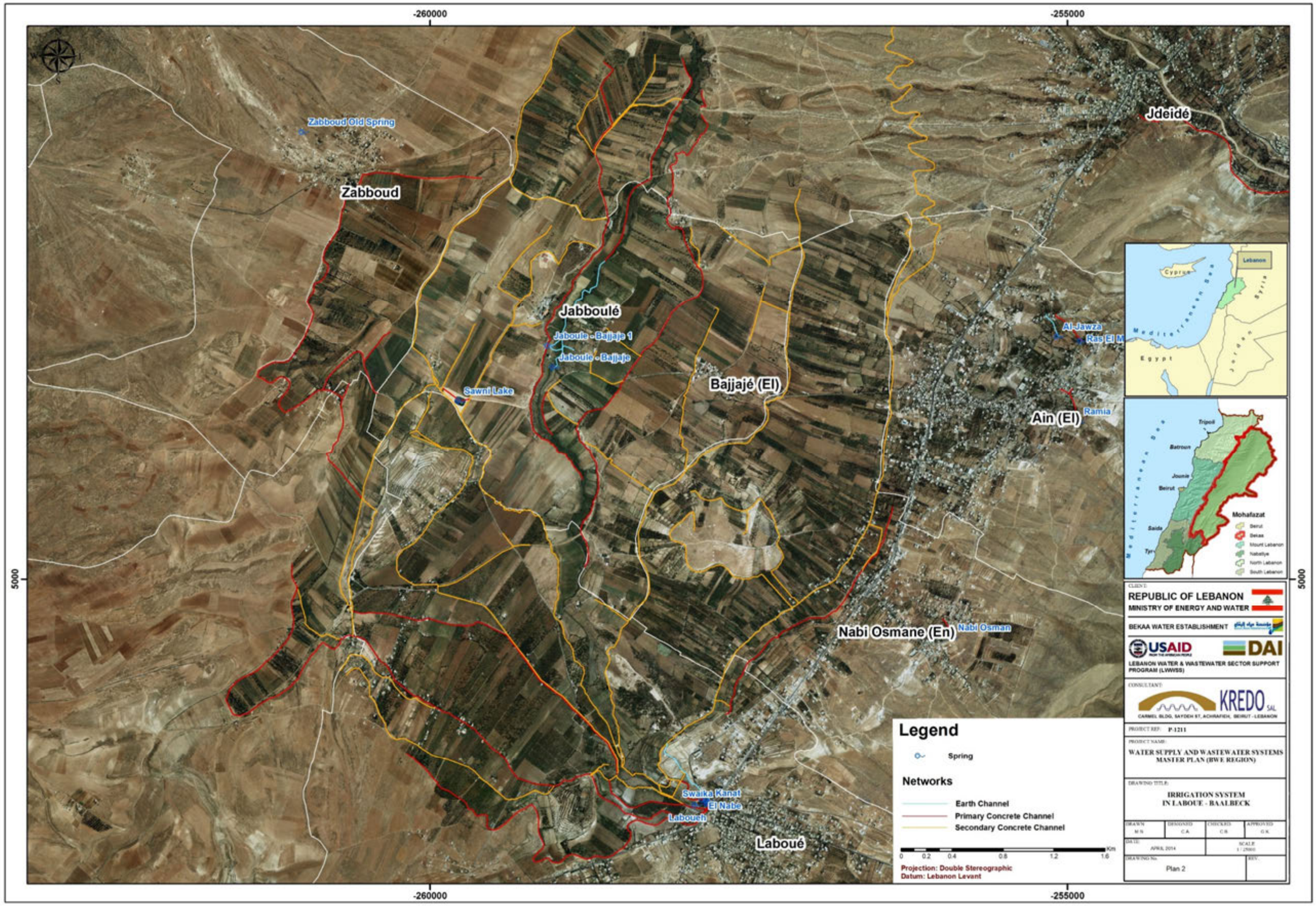
*** All Questionnaires were filled up during February and March 2014

APPENDIX D: IRRIGATION PLANS

Table of Plans

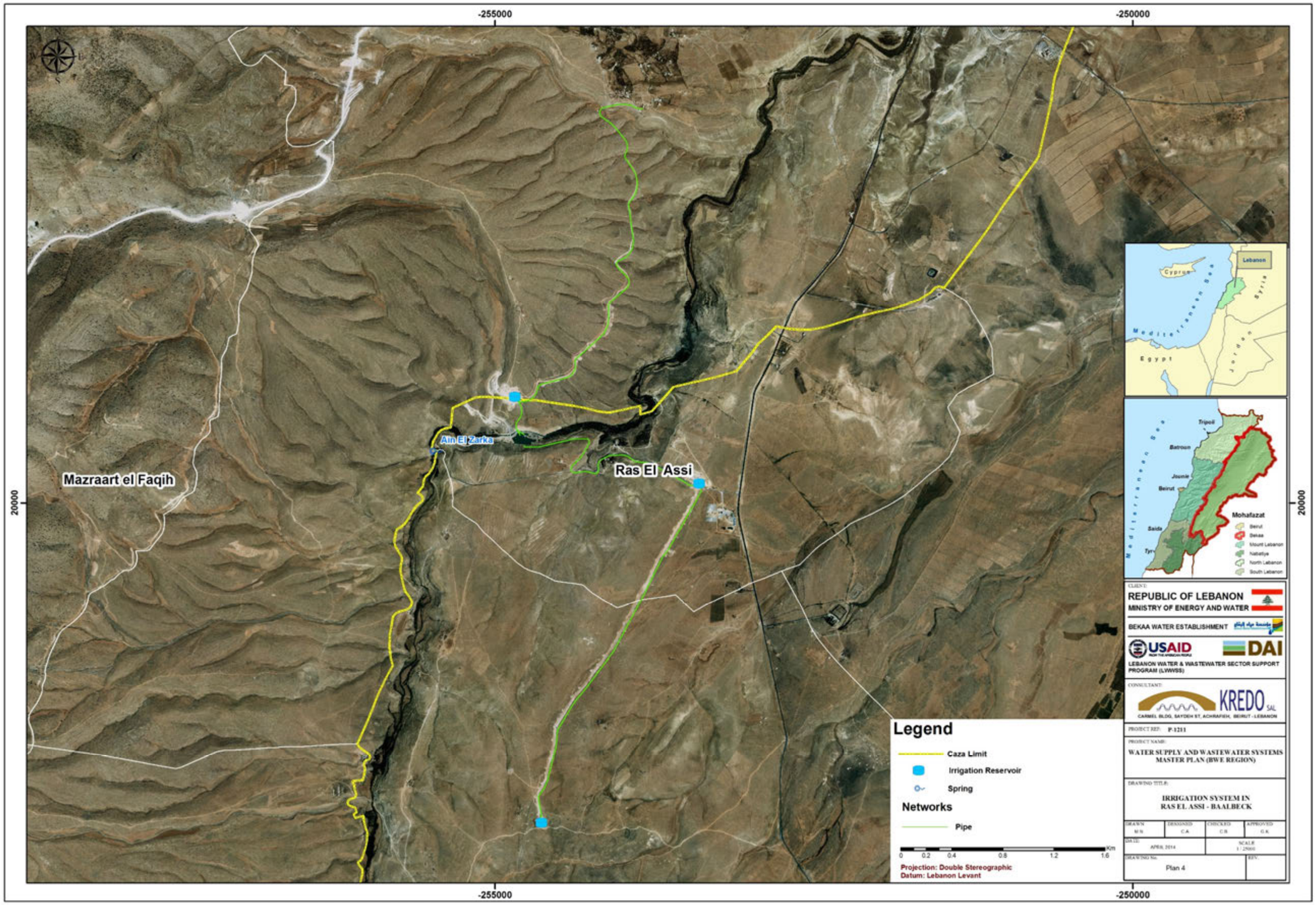


PLAN 1: IRRIGATION SYSTEMS IN NORTHERN BEKAA

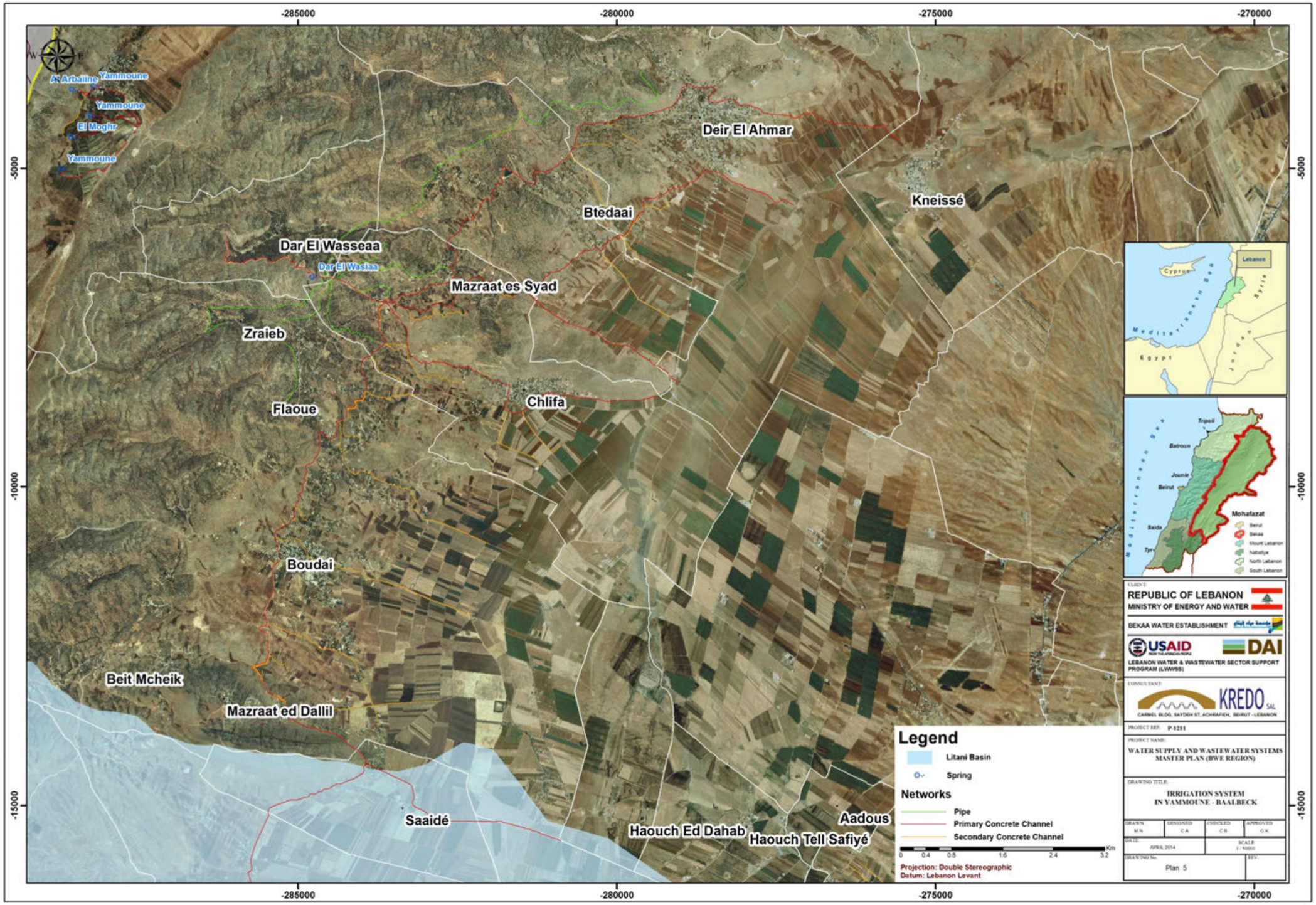


PLAN 2:IRRIGATION SYSTEM IN LABOUE - BAALBECK

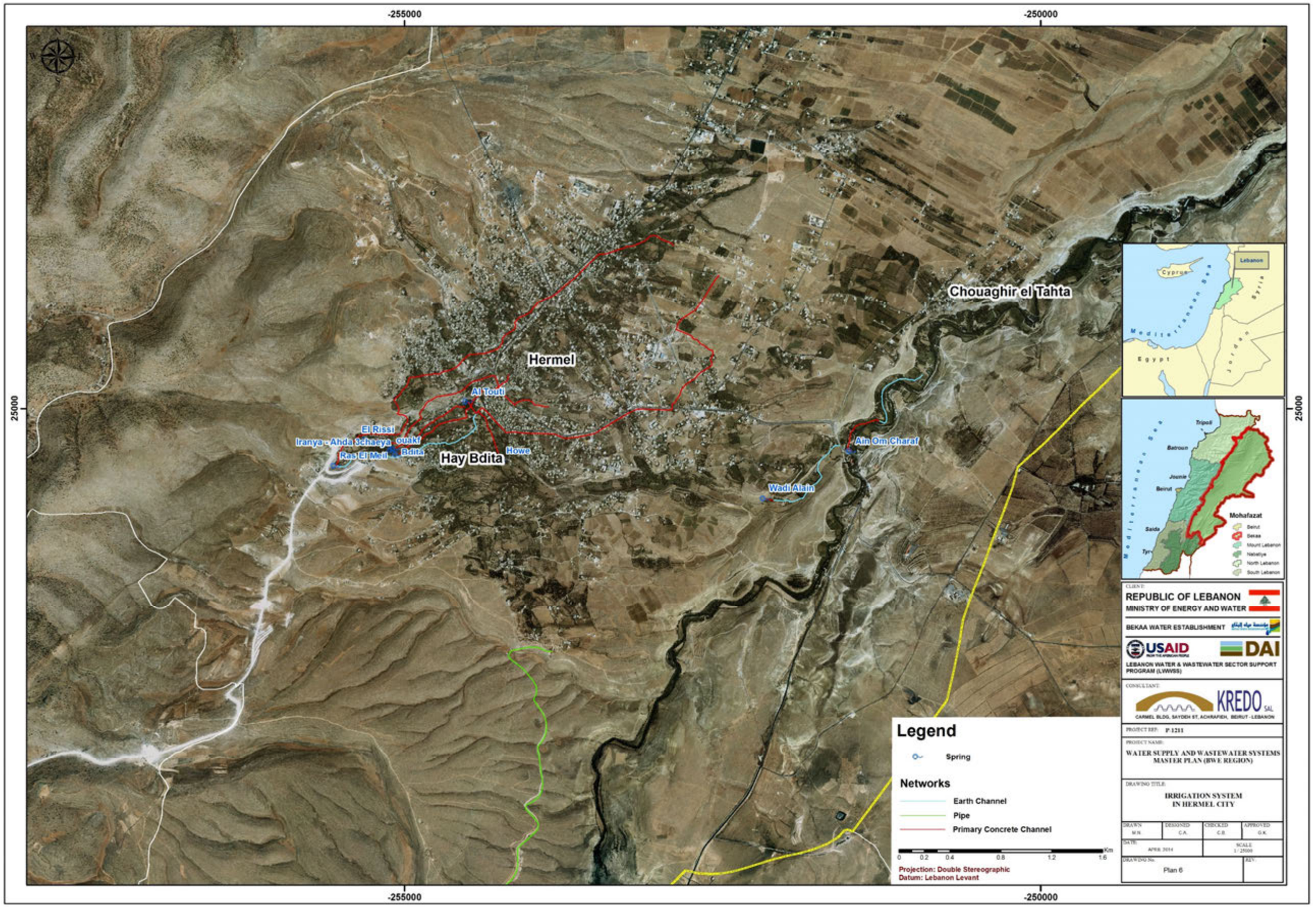
PLAN 3: IRRIGATION SYSTEM IN BAALBECK CITY



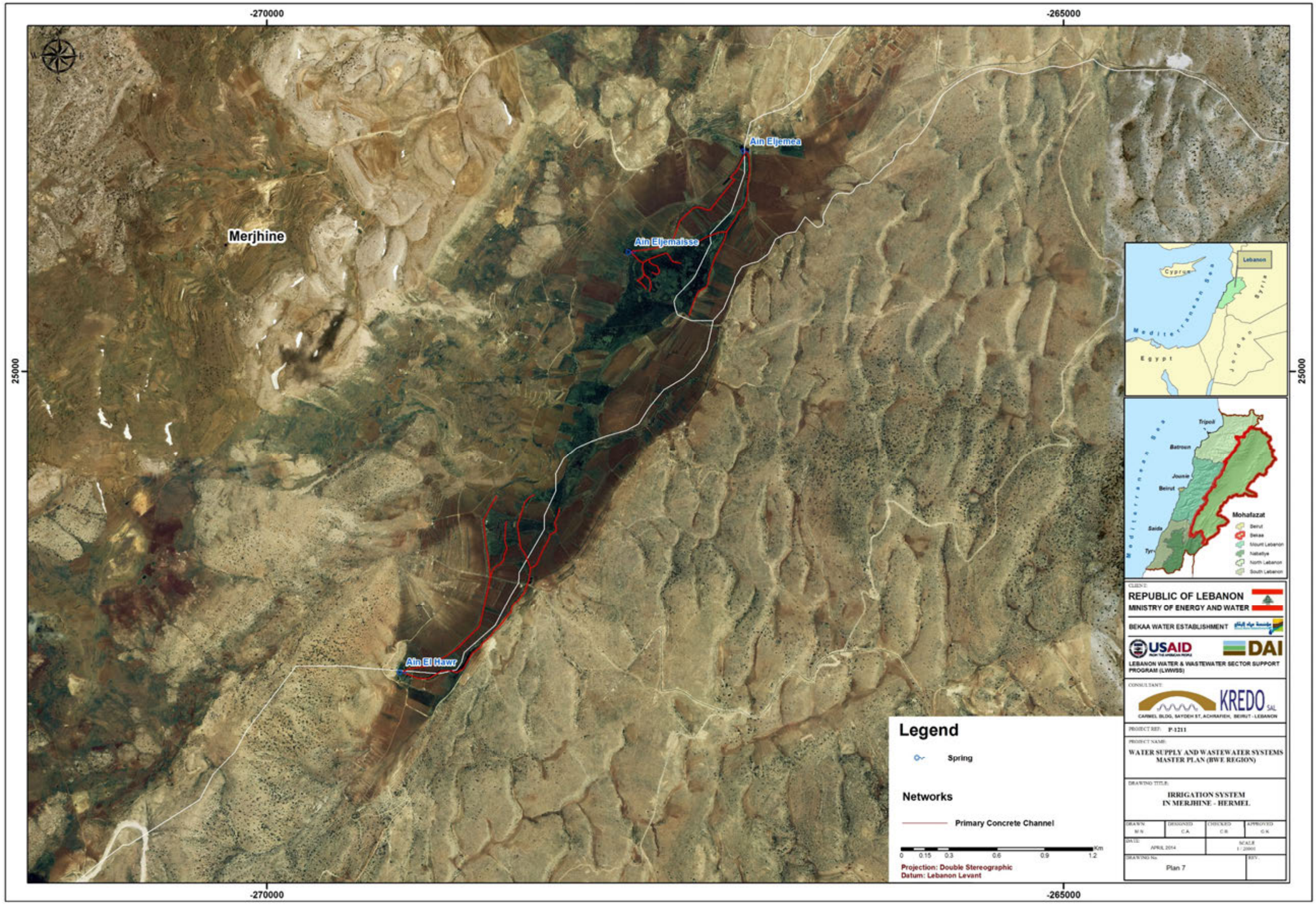
PLAN 4: IRRIGATION SYSTEM IN RAS EL ASSI- BAALBECK



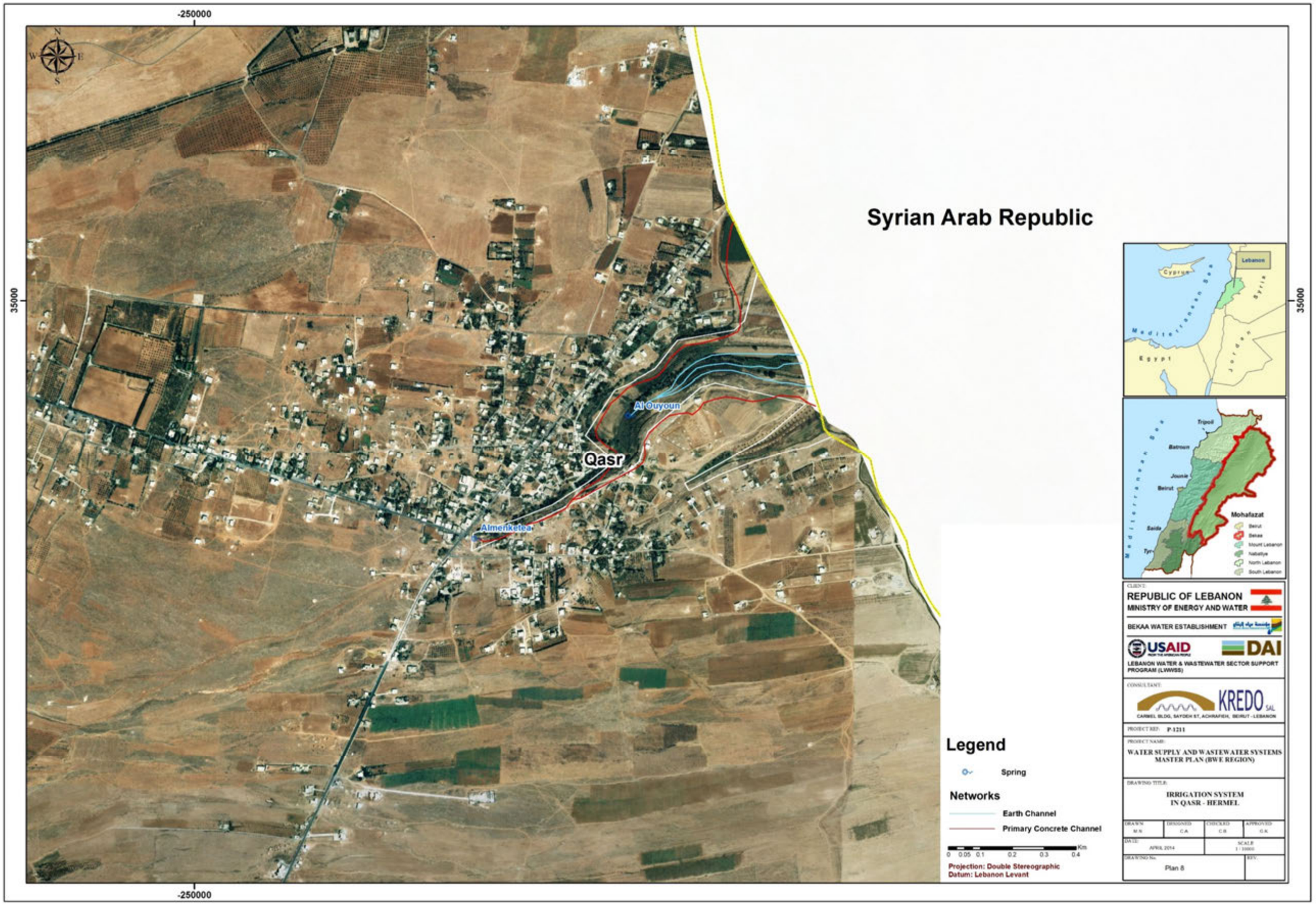
PLAN 5: IRRIGATION SYSTEM IN YAMMOUNE - BAALBECK



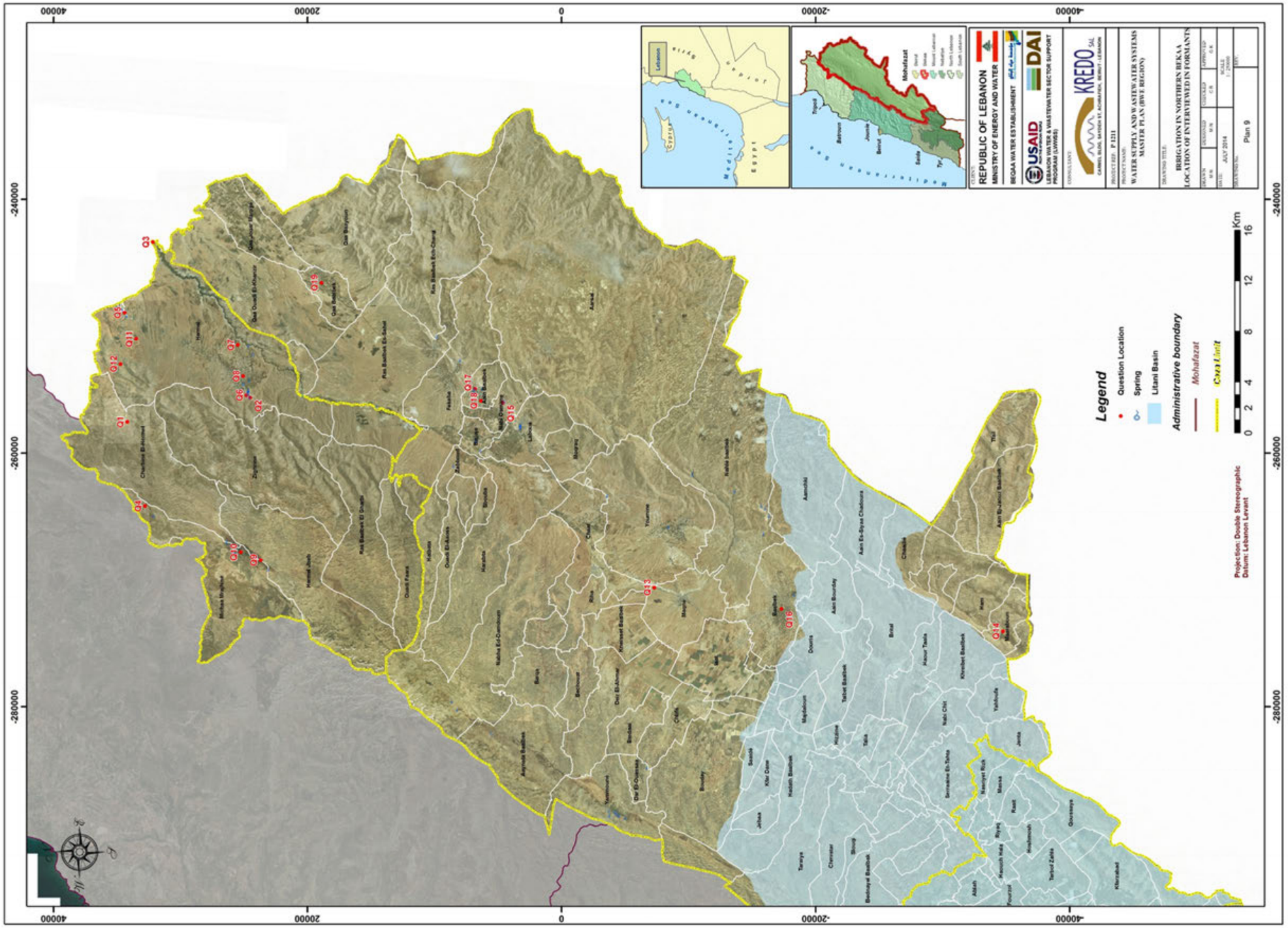
PLAN 6: IRRIGATION SYSTEM IN HERMEL CITY



PLAN 7: IRRIGATION SYSTEM IN MERJHINE - HERMEL



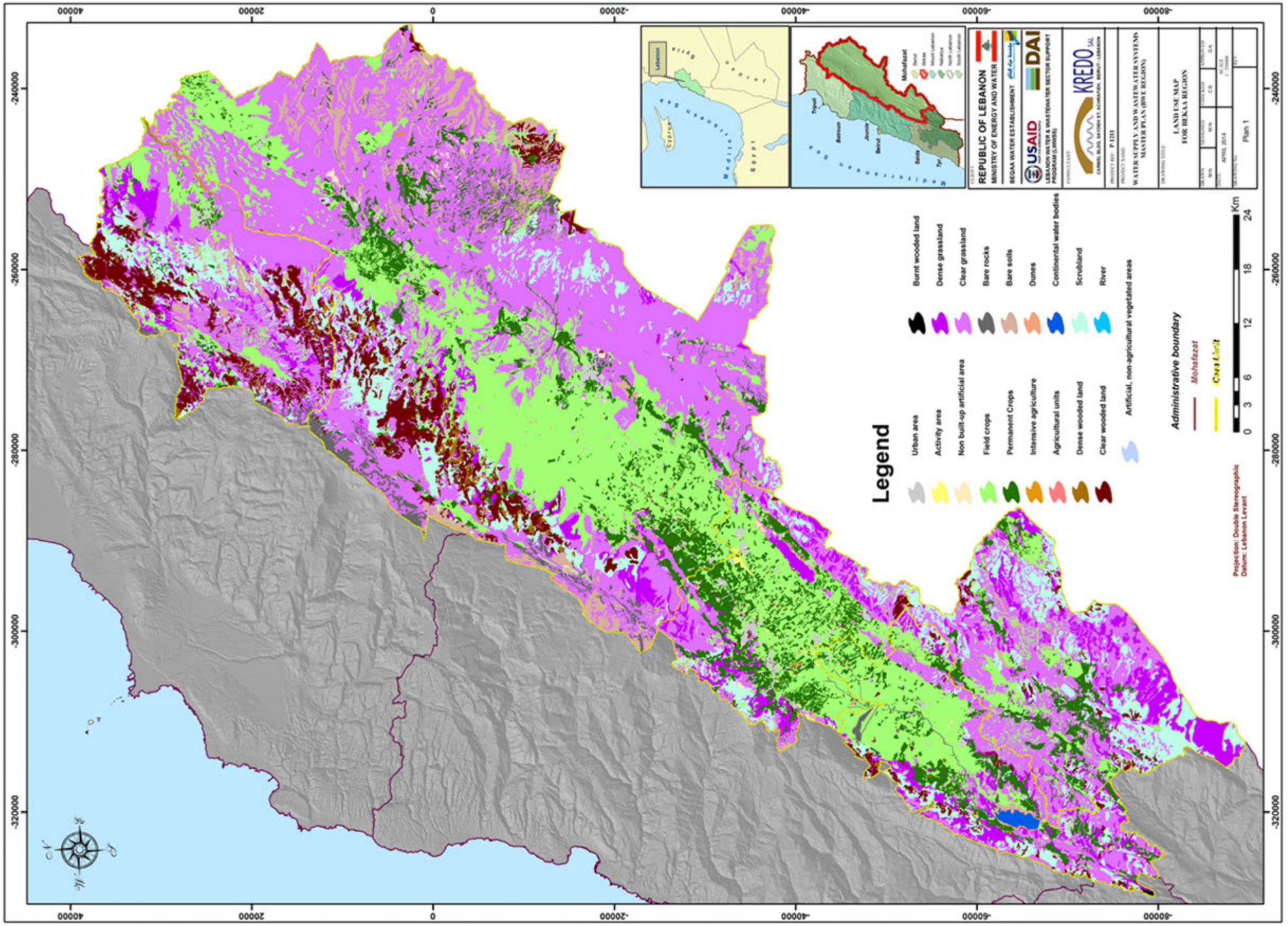
PLAN 8: IRRIGATION SYSTEM IN QASR - HERMEL



PLAN 9: PLAN OF INTERVIEWED IN FORMATS IN CAZAS OF BAALBECK AND HERMEL

APPENDIX E: LAND USE PLAN IN BEKAA REGION

Table of Plans



PLAN 10: LAND USE PLAN FOR BEKAA REGION

APPENDIX F: EXCERPT TABLES FROM AGRICULTURALCENSUS (2010)

CAZA: RACHAYA

IMPORTANCE OF IRRIGATION PER SAU SIZE OF FARMS

Table 2.1 — SAU in dunam

SAU Size of Farms	Total Number of Farms	SAU Total Farms (1)	SAU Total Irrigated (2)	SAU Irrigated % (2/1)	Supplementary Irrigation (3)	SAU Supplementary Irrigation % (3/2)	Complete Irrigation (4)	SAU Complete Irrigation % (4/2)
Without SAU	48	0	0	0	-	0.0	-	0.0
< 1	9	5	2	34.5	1	42.5	1	57.5
from 1 to 2	275	352	72	20.5	39	54.5	33	45.5
from 2 to 5	767	2,347	445	19.0	285	64.1	160	35.9
from 5 to 10	697	4,697	760	16.2	453	59.6	307	40.4
from 10 to 20	611	8,142	1,274	15.6	806	63.3	468	36.7
from 20 to 40	386	10,309	1,385	13.4	717	51.8	667	48.2
from 40 to 60	141	6,727	860	12.8	523	60.9	337	39.1
from 60 to 80	55	3,690	775	21.0	266	34.3	509	65.7
from 80 to 100	33	2,900	256	8.8	37	14.5	219	85.5
from 100 to 150	49	5,631	652	11.6	415	63.6	237	36.4
from 150 to 200	24	4,009	892	22.3	289	32.4	603	67.6
from 200 to 500	22	6,016	1,071	17.8	253	23.6	818	76.4
> 500	6	4,221	1,014	24.0	471	46.4	543	53.6
TOTAL	3,123	59,047	9,458	16.0	4,556	48.2	4,902	51.8

* A slight divergence of order 0.1 % may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: RACHAYA

SAU IRRIGATED PER TOTAL SAU SIZE AND THE IRRIGATION SOURCE 1, IRRIGATION SOURCE 2*

Table 2.7 — SAU in dunam

SAU Size of Farms	Irrigation Source 1						Irrigation Source 2						
	SAU Irrigated Total	River/Spring	Drilled Well	Water reservoir	Hill Lake	Others	SAU Irrigated Total	River/Spring	Drilled Well	Water reservoir	Hill Lake	Others	Not Concerned
Without SAU	-	-	-	-	-	-	-	-	-	-	-	-	-
< 1	2	0	-	1	-	-	2	-	-	-	-	-	2
from 1 to 2	72	28	9	31	1	3	72	-	-	-	-	-	72
from 2 to 5	445	171	58	171	5	41	445	1	4	-	-	-	440
from 5 to 10	760	232	162	261	22	82	760	4	-	15	-	3	738
from 10 to 20	1,274	500	266	384	22	102	1,274	31	44	48	4	-	1,147
from 20 to 40	1,385	428	307	433	62	154	1,385	30	28	32	17	7	1,271
from 40 to 60	860	244	197	393	-	26	860	-	33	-	-	-	827
from 60 to 80	775	116	231	210	206	12	775	-	-	135	-	-	640
from 80 to 100	256	72	135	4	45	-	256	-	-	4	-	-	252
from 100 to 150	652	62	120	303	166	-	652	-	187	-	2	-	463
from 150 to 200	892	3	328	442	120	-	892	-	359	165	-	-	369
from 200 to 500	1,071	350	190	10	521	-	1,071	-	260	-	80	-	731
> 500	1,014	733	-	10	271	-	1,014	-	583	-	-	-	431
Total	9,458	2,939	2,003	2,655	1,441	420	9,458	66	1,498	399	103	10	7,383

* A slight divergence of order 0.1 % may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: RACHAYA

SAU IRRIGATED PER TOTAL SAU SIZE AND THE IRRIGATION MODE 1, IRRIGATION MODE 2 *

Table 2.8 — SAU in dunam

SAU Size of Farms	Mode of irrigation 1				Mode of irrigation 2				
	Total SAU Irrigated	Gravity	Aspersion	Drip	Total SAU Irrigated	Gravity	Aspersion	Drip	Not Concerned
Without SAU	-	-	-	-	-	-	-	-	-
< 1	2	1	1	-	2	-	-	-	2
from 1 to 2	72	67	5	0	72	-	-	-	72
from 2 to 5	445	399	27	20	445	4	-	2	440
from 5 to 10	760	681	49	31	760	5	7	8	740
from 10 to 20	1,274	1,152	24	98	1,274	21	-	16	1,237
from 20 to 40	1,385	1,132	31	222	1,385	53	-	31	1,301
from 40 to 60	860	762	70	28	860	-	-	50	810
from 60 to 80	775	244	62	469	775	-	-	-	775
from 80 to 100	256	162	-	94	256	-	-	11	246
from 100 to 150	652	294	-	358	652	77	-	19	556
from 150 to 200	892	234	151	508	892	510	-	-	383
from 200 to 500	1,071	288	55	728	1,071	260	-	55	756
> 500	1,014	160	-	854	1,014	-	583	-	431
Total	**9,458**	**5,575**	**474**	**3,409**	**9,458**	**930**	**590**	**191**	**7,748**

* A slight divergence of order 0.1% may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: RACHAYA

SAU OF SEASONAL CROPS BY TYPE OF CROP AND SOURCE OF IRRIGATION 1

Table 2.9 — Surface in m²

Type of Crop	Type of crop - English	Total SAU	Which crops are irrigated /Source of water irrigation 1					
			Total	River/Spring	Drilled Well	Water Reservoir	Hill Lake	Others
Blé tendre	Soft Wheat	3,588,500	22,000	-	-	22,000	-	-
Blé dur	Blé dur	10,447,200	793,000	493,000	138,000	162,000	-	-
Foin - Blé	Hay - Wheat	41,000	10,000	-	10,000	-	-	-
Autres Foin	Other hay	-	-	-	-	-	-	-
Mais	Corn	46,650	42,800	20,300	-	2,500	20,000	-
Sorgho	Sorghum	7,000	-	-	-	-	-	-
Mais pour Betail	Corn for cattle	6,000	6,000	-	-	-	-	6,000
Orge	Barley	2,165,500	149,500	-	65,000	84,500	-	-
Avoine	Oat	-	-	-	-	-	-	-
Autres Céréales	Other Cereals	12,000	-	-	-	-	-	-
Haricot sec	Dry bean	20,000	10,000	-	-	-	10,000	-
Haricot vert	Green bean	4,700	3,850	1,000	250	-	1,000	1,600
Fève sèche	Dry bean	99,150	1,200	200	-	500	-	500
Fève verte	Green Bean	57,250	4,000	1,000	-	3,000	-	-
Lentilles sèche	Dry lentils	766,000	15,000	7,000	-	8,000	-	-
Pois chiche	Chickpea	4,505,350	123,000	8,500	42,500	41,000	30,000	1,000
Petit pois sec	Small pea	-	-	-	-	-	-	-
Petit pois vert	Small green peas	-	-	-	-	-	-	-
Autres légumineuses	Other legumes	-	-	-	-	-	-	-
Lupin	Lupine	-	-	-	-	-	-	-
Luzerne	Alfalfa plant	15,000	15,000	15,000	-	-	-	-
Vesces	Vetches	484,000	13,000	-	5,000	8,000	-	-
Autres Cultures fourrageres	Other forages	26,000	-	-	-	-	-	-
Artichaut	Artichoke	-	-	-	-	-	-	-
Choux-fleurs	Cauliflower	171,100	171,100	20,100	65,000	73,500	-	12,500
Choux	Cabbage	166,100	166,100	20,100	60,000	73,500	-	12,500
Endive	Endive	-	-	-	-	-	-	-
Asperge	Asparagus	-	-	-	-	-	-	-
Laitue	Lettuce	1,000	-	-	-	-	-	-
Epinard	Spinach	-	-	-	-	-	-	-
Bette	-	-	-	-	-	-	-	-
Mélochie ou corè	-	-	-	-	-	-	-	-
Chicorée	Chicory	-	-	-	-	-	-	-
Autres Legumes A feuilles	Other leafy vegetables	500	500	-	-	500	-	-
Thym	Thyme	100	100	-	-	-	-	100
Persil	Parsley	850	350	-	-	-	250	100
Menthe	Mint	350	350	-	-	-	250	100
Rocca	Rocca	-	-	-	-	-	-	-
Autres Cultures pour salade	Other Cultural Salads	100	100	-	-	-	-	100
Pepinieres Legumes	Vegetables Plantation	11,000	11,000	7,000	500	500	-	3,000
Tomate	Tomato	96,130	71,380	19,100	7,300	12,380	22,250	10,350
Concombre / cornichons	Cucumber	58,275	42,175	10,500	25,850	1,225	4,000	600
Concombre grecque	Greek cucumber	755,950	60,350	24,200	3,800	17,050	3,750	11,550
Poivron doux	Soft pepper	1,770	920	800	-	20	-	100
Aubergine	Eggplant	12,550	11,250	1,150	250	3,600	5,250	1,000
Courge	Marrow	635,225	619,325	77,650	333,450	172,575	3,000	32,650
Citrouilles	Pumpkins	100	-	-	-	-	-	-
Gombos	-	10,800	800	300	-	500	-	-
Champignon	Mushroom	-	-	-	-	-	-	-
Fraise	Strawberry	-	-	-	-	-	-	-
Melon	Melon	66,600	7,550	300	-	-	7,000	250
Pastèques	Watermelons	39,900	12,900	8,900	-	750	-	3,250
Pommes de terre	Potatoes	225,140	225,140	133,400	40,600	43,500	4,640	3,000
Pommes de terre industriel	-	-	-	-	-	-	-	-
Topinambour	Jerusalem Artichoke	-	-	-	-	-	-	-
Patate douce	Sweet Potatoe	-	-	-	-	-	-	-
Oignons vert	Green onions	-	-	-	-	-	-	-
Oignons	Onions	18,400	17,900	6,300	-	-	11,000	600
Ail	Garlic	11,070	8,070	4,070	-	1,000	2,000	1,000
Carotte	Carrot	100	100	-	-	-	-	100
Radis	Radish	-	-	-	-	-	-	-
Navet	Turnip	-	-	-	-	-	-	-
Autres tubercules	Other roots	-	-	-	-	-	-	-
Canne à sucre	Sugar Cane	-	-	-	-	-	-	-
Betterave sucrìè	Beet	-	-	-	-	-	-	-
Arachide	Peanut	-	-	-	-	-	-	-
Sesame	Sesame	-	-	-	-	-	-	-
Tournesol	Sunflower	300	-	-	-	-	-	-
Tabac	Tobacco	-	-	-	-	-	-	-
Rose de Damas	Damascus Rose	4,010	1,010	1,010	-	-	-	-
Oregan	Oregano	-	-	-	-	-	-	-
Sauge	Sage	50	-	-	-	-	-	-
Lavande	Lavender	-	-	-	-	-	-	-
Autre PAM	Other aromatic plants	-	-	-	-	-	-	-
Rose	Rose	510	10	10	-	-	-	-
Gerberes	Gerbera	-	-	-	-	-	-	-
Oeillet	Carnation	-	-	-	-	-	-	-
Plantes ornementales	Ornamentals	-	-	-	-	-	-	-
Pepinieres fleurs	Flower Plantation	-	-	-	-	-	-	-
Autres Fleurs bulbes oignons	Other bulbous flowers	1,000	1,000	1,000	-	-	-	-
Total		**24,580,280**	**2,637,830**	**881,890**	**797,500**	**732,100**	**124,390**	**101,950**

* SAU = Surface Agricole Utile = Useful Agricultural Surface

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: RACHAYA

SAU OF PERMANENT CROP BY TYPE OF CROP AND SOURCE OF IRRIGATION 1

Table 2.11 — Surface in m²

Type of Crop	Type of crop - English	Total SAU	Which crops are irrigated / Source of water irrigation 1					
			Total	River/Spring	Drilled well	Water reservoir	Hill Lake	Others
Summac	Sumach	34,500	2,600	600	2,000	-	-	-
Caroubes	Carob	1,050	50	50	-	-	-	-
Orange	Orange	200	-	-	-	-	-	-
Mandarine	Tangerine	-	-	-	-	-	-	-
Citron	Lemon	1,850	-	-	-	-	-	-
Pamplemousse ORANGER AMER	Grapefruit Bitter Orange	-	-	-	-	-	-	-
Autres agrumes	Other Citrus	-	-	-	-	-	-	-
Starking	Apples	304,125	191,450	81,950	50,100	54,450	3,000	1,950
Early Red	Apples	82,000	57,000	-	57,000	-	-	-
Ace	Apples	500	-	-	-	-	-	-
Scarlet Spur	Apples	27,000	12,000	-	-	-	12,000	-
Autres Pommes Rouges	Other red apples	299,700	192,160	65,910	27,750	40,700	53,300	4,500
Smoothee	Apples	28,000	7,000	1,000	-	1,000	5,000	-
Golden	Apples	315,720	165,365	69,025	28,350	56,890	4,000	7,100
Early Gold / mufti	Apples	4,800	3,500	-	-	3,500	-	-
Pommes vertes Granny Smith	Green granny smith apples	65,050	53,300	15,500	8,000	29,500	-	300
San Pareille	Apples	53,245	23,100	7,200	9,150	5,050	-	1,700
Fuji	Apples	2,000	2,000	2,000	-	-	-	-
Gala	Apples	57,200	14,000	13,200	800	-	-	-
Autres Pommes Jaunes	Other yellow apples	440,110	174,250	46,700	40,200	32,350	26,500	28,500
Coscia	Apples	29,950	6,500	-	-	6,500	-	-
Louise - Bonne	Apples	-	-	-	-	-	-	-
Passe Crassane	Apples	400	400	-	400	-	-	-
Williams	Apples	-	-	-	-	-	-	-
Comice	Apples	2,000	2,000	-	2,000	-	-	-
Autres Poires	Other pears	225,775	70,675	17,745	20,270	18,860	3,000	10,800
Abricôts	Apricots	145,720	47,550	12,325	10,750	17,085	300	7,090
Pêches	Peaches	221,405	141,770	59,375	65,950	12,635	1,000	2,810
Prunes et prunea	Plums & Prunea	96,880	40,210	9,980	22,050	3,530	1,000	3,650
Cerise Feraaouni	Cherry Feraaouni	1,972,000	623,325	137,100	92,250	363,725	3,100	27,150
Cerise Mkahhal	Cherry Mkahhal	111,900	31,100	1,800	18,900	2,150	-	8,250
Cerise Nouari	Cherry Nouari	523,325	69,475	18,975	3,250	34,100	750	12,400
Cerise Benni	Cherry Benni	246,810	45,200	32,900	2,950	4,250	-	5,100
Cerise Napoleon	Cherry Napoleon	61,160	15,400	5,300	10,000	-	-	100
Autres fruits a noyaux	Other fruits	49,600	20,200	14,000	1,200	5,000	-	-
Raisin de cuve	Grapes	1,571,090	275,700	33,500	49,800	82,400	100,000	10,000
Maghdouchi	Grapes	699,265	93,400	48,750	12,550	30,500	1,500	100
Baitamoui	Grapes	554,260	79,260	27,900	12,050	26,910	300	12,100
Tfeifihi	Grapes	3,573,300	1,157,850	117,450	21,950	167,800	836,000	14,650
Cardinal	Grapes	7,400	2,250	-	250	1,000	-	1,000
Jbaahi / zaitouni	Grapes	158,700	6,600	1,500	-	5,100	-	-
Raisin de table apyrene	Seedless grapes	289,550	110,400	23,000	20,000	10,000	57,000	400
Autres raisins	Other grapes	2,694,450	511,700	210,400	138,650	111,650	45,100	5,900
Amandes vertes	Green almonds	483,500	115,140	32,620	18,850	48,000	-	15,670
Amandes a noix	Almond nuts	959,205	220,005	59,205	53,300	79,300	22,000	6,200
Noix	Nuts	680,445	243,310	69,810	33,550	123,350	10,500	6,100
Chataignes	Chestnuts	51,810	17,910	3,700	5,700	8,310	-	200
Pistaches	Pistachios	3,920	1,570	-	550	520	-	500
Autres Arbres Oleagineux	Other oilseed trees	210	160	50	-	110	-	-
Oliviers	Olives	11,080,662	1,818,995	757,770	336,500	488,125	126,000	110,600
Pins	Pines	323,510	98,450	51,100	15,450	27,200	1,500	3,200
Banane	Banana	-	-	-	-	-	-	-
Figue	Fig	843,900	50,845	21,295	2,950	21,150	750	4,700
Datte	Datte	-	-	-	-	-	-	-
Grenade	Pomegranate	43,915	6,505	1,825	2,000	1,080	300	1,300
Kaki	Khaki	3,050	2,950	200	2,000	150	-	600
Figues de Barbarie	Cactus fruit	5,900	1,800	800	1,000	-	-	-
Jujube	Jujube	3,525	555	155	300	100	-	-
Murier	Mulberry	8,275	1,875	1,705	-	70	-	100
Coings	Quinces	4,170	1,410	310	1,100	-	-	-
Nèfles	Loquats	1,950	850	300	-	250	-	300
Kiwi	Kiwi	1,050	1,050	-	1,050	-	-	-
Avocat	Avocado	500	-	-	-	-	-	-
Anoniers	-	-	-	-	-	-	-	-
Mangues	Mango	-	-	-	-	-	-	-
Fruit de Passion	Passion fruit	-	-	-	-	-	-	-
Ananas	Pineapple	-	-	-	-	-	-	-
Laurier	Laurel	-	-	-	-	-	-	-
Pepinieres Arb. Fruitiers	Seedlings for fruit trees	-	-	-	-	-	-	-
Autres Arbres Fruitiers	Other fruit trees	60,875	8,675	1,125	2,250	1,900	-	3,400
Total		**29,512,362**	**6,840,795**	**2,077,105**	**1,205,120**	**1,926,250**	**1,313,900**	**318,420**

* SAU = Surface Agricole Utile = Useful Agricultural Surface

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: RACHAYA

SAU OF GREENHOUSE CROP BY TYPE OF CROP AND SOURCE OF IRRIGATION 1

Table 2.10 — Surface in m²

Type of crop	Type of crop - English	Total SAU	Which crops are irrigated / Source of water irrigation 1					
			Total	River/Spring	Drilled Well	Water Reservoir	Hill Lake	Others
Haricot sec	Dry bean	-	-	-	-	-	-	-
Haricot vert	Green bean	-	-	-	-	-	-	-
Fève sèche	Dry bean	-	-	-	-	-	-	-
Fève verte	Green bean	-	-	-	-	-	-	-
Lentilles sèche	Dry lentils	-	-	-	-	-	-	-
Pois chiche	Chickpea	-	-	-	-	-	-	-
Petit pois sec	Small pea	-	-	-	-	-	-	-
Petit pois vert	Small green peas	-	-	-	-	-	-	-
Autres légumineuses	Other legumes	-	-	-	-	-	-	-
Lupin	Lupine	-	-	-	-	-	-	-
Luzerne	Alfalfa plant	-	-	-	-	-	-	-
Vesces	Vetches	-	-	-	-	-	-	-
Autres Cultures fourrageres	Other forages	-	-	-	-	-	-	-
Artichaut	Artichoke	-	-	-	-	-	-	-
Choux-fleurs	Cauliflower	-	-	-	-	-	-	-
Choux	Cabbage	1,000	1,000	1,000	-	-	-	-
Endive	Endive	-	-	-	-	-	-	-
Asperge	Asparagus	-	-	-	-	-	-	-
Laitue	Lettuce	1,000	1,000	-	-	-	1,000	-
Epinard	Spinach	1,000	1,000	-	-	-	1,000	-
Bette	-	-	-	-	-	-	-	-
Mélochie ou corè	-	-	-	-	-	-	-	-
Chicorée	Chicory	500	500	-	-	-	500	-
Autres Legumes A feuilles	Other leafy vegetables	-	-	-	-	-	-	-
Thym	Thyme	-	-	-	-	-	-	-
Persil	Parsley	500	500	-	-	-	500	-
Menthe	Mint	500	500	-	-	-	500	-
Rocca	Rocca	-	-	-	-	-	-	-
Autres Cultures pour salade	Other Cultural Salads	1,000	1,000	-	-	-	1,000	-
Pepinieres Legumes	Vegetables Plantation	-	-	-	-	-	-	-
Tomate	Tomato	5,000	5,000	5,000	-	-	-	-
Concombre / cornichons	Cucumber	6,000	6,000	6,000	-	-	-	-
Concombre grecque	Greek cucumber	2,500	2,500	2,500	-	-	-	-
Poivron doux	Soft pepper	-	-	-	-	-	-	-
Aubergine	Eggplant	5,000	5,000	5,000	-	-	-	-
Courge	Marrow	2,500	2,500	2,500	-	-	-	-
Citrouilles	Pumpkins	-	-	-	-	-	-	-
Gombos	-	-	-	-	-	-	-	-
Champignon	Mushroom	-	-	-	-	-	-	-
Fraise	Strawberry	-	-	-	-	-	-	-
Melon	Melon	-	-	-	-	-	-	-
Pastèques	Watermelons	-	-	-	-	-	-	-
Pommes de terre	Potatoes	-	-	-	-	-	-	-
Pommes de terre industriel	-	-	-	-	-	-	-	-
Topinambour	Jerusalem Artichoke	-	-	-	-	-	-	-
Patate douce	Sweet Potatoe	-	-	-	-	-	-	-
Oignons vert	Green onions	500	500	-	-	-	500	-
Oignons	Onions	-	-	-	-	-	-	-
Ail	Garlic	-	-	-	-	-	-	-
Carotte	Carrot	-	-	-	-	-	-	-
Radis	Radish	1,000	1,000	-	-	-	1,000	-
Navet	Turnip	500	500	-	-	-	500	-
Autres tubercules	Other roots	-	-	-	-	-	-	-
Canne à sucre	Sugar Cane	-	-	-	-	-	-	-
Betterave sucrié	Beet	-	-	-	-	-	-	-
Arachide	Peanut	-	-	-	-	-	-	-
Sesame	Sesame	-	-	-	-	-	-	-
Tournesol	Sunflower	-	-	-	-	-	-	-
Tabac	Tobacco	-	-	-	-	-	-	-
Rose de Damas	Damascus Rose	-	-	-	-	-	-	-
Oregan	Oregano	-	-	-	-	-	-	-
Sauge	Sage	-	-	-	-	-	-	-
Lavande	Lavender	-	-	-	-	-	-	-
Autre PAM	Other aromatic plants	-	-	-	-	-	-	-
Rose	Rose	-	-	-	-	-	-	-
Gerberes	Gerbera	-	-	-	-	-	-	-
Oeillet	Carnation	-	-	-	-	-	-	-
Plantes ornementales	Ornamentals	-	-	-	-	-	-	-
Pepinieres fleurs	Flower Plantation	-	-	-	-	-	-	-
Autres Fleurs bulbes oignons	Other bulbous flowers	-	-	-	-	-	-	-
Peche	Peach	-	-	-	-	-	-	-
Banane	Banana	-	-	-	-	-	-	-
Pepinieres arbres fruitiers	Fruit trees plantation	-	-	-	-	-	-	-
Total		**28,500**	**28,500**	**22,000**	**-**	**-**	**6,500**	**-**

* SAU = Surface Agricole Utile = Useful Agricultural Surface

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: RACHAYA

OBSTACLES TO DEVELOPMENT PER SAU SIZE AND NUMBER OF FARMS

Table 8.1

SAU Size (in dunam)	Total Number of farms	Number of farms with obstacles																
		Total	Agricultural Guidance	% Agricultural Guidance (2/1)	Marketing	% Marketing (3/1)	Credit	% Credit (4/1)	Infrastructure	% Infrastructure (5/1)	Cost of production	% Cost of production (6/1)	land Fragmentation	% land Fragmentation (7/1)	Source irrigation	% Source irrigation (8/1)	Other	% other
Without SAU	48	47	18	38.3	4	8.5	4	8.5	1	2.1	5	10.6	-	0.0	2	4.3	13	27.7
< 1	9	9	3	33.3	-	0.0	1	11.1	-	0.0	-	0.0	-	0.0	2	22.2	3	33.3
from 1 to 2	275	274	107	39.1	4	1.5	16	5.8	26	9.5	19	6.9	12	4.4	34	12.4	56	20.4
from 2 to 5	767	766	276	36.0	20	2.6	36	4.7	54	7.0	85	11.1	21	2.7	114	14.9	160	20.9
from 5 to 10	697	694	262	37.8	41	5.9	24	3.5	61	8.8	56	8.1	15	2.2	96	13.8	139	20.0
from 10 to 20	611	610	220	36.1	45	7.4	16	2.6	64	10.5	89	14.6	7	1.1	73	12.0	96	15.7
from 20 to 40	386	386	141	36.5	49	12.7	20	5.2	43	11.1	43	11.1	5	1.3	43	11.1	42	10.9
from 40 to 60	141	140	56	40.0	26	18.6	9	6.4	8	5.7	17	12.1	1	0.7	9	6.4	14	10.0
from 60 to 80	55	55	19	34.5	15	27.3	5	9.1	1	1.8	6	10.9	-	0.0	7	12.7	2	3.6
from 80 to 100	33	33	14	42.4	8	24.2	-	0.0	4	12.1	4	12.1	-	0.0	1	3.0	2	6.1
from 100 to 150	49	49	18	36.7	17	34.7	1	2.0	3	6.1	5	10.2	-	0.0	4	8.2	1	2.0
from 150 to 200	24	24	7	29.2	5	20.8	1	4.2	2	8.3	2	8.3	-	0.0	4	16.7	3	12.5
from 200 to 500	22	22	5	22.7	9	40.9	1	4.5	1	4.5	3	13.6	-	0.0	3	13.6	-	0.0
> 500	6	6	0	0.0	1	16.7	0	0.0	0	0.0	2	33.3	0	0.0	3	50.0	0	0.0
TOTAL	3,123	3,115	1,146	36.8	244	7.8	134	4.3	268	8.6	336	10.8	61	2.0	395	12.7	531	17.0

* A slight diversion of order 0.1 % may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m³

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: RACHAYA

OBSTACLES TO DEVELOPMENT PER SAU SIZE AND NUMBER OF FARMS

Table 8.2

Area in dunam

SAU Size (in dunam)	Total Number of farms	SAU Farms with obstacles																
		SAU Total	Agricultural Guidance	% Agricultural Guidance (2/1)	Marketing	% Marketing (3/1)	Credit	% Credit (4/1)	Infrastructure	% Infrastructure (5/1)	Cost of production	% Cost of production (6/1)	land Fragmentation	% land Fragmentation (7/1)	Source irrigation	% Source irrigation (8/1)	Other	% other
Without SAU	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
< 1	9	5	2	41.5	-	0.0	0	6.0	-	0.0	-	0.0	-	0.0	1	18.8	2	33.7
from 1 to 2	275	351	137	38.9	4	1.1	22	6.1	35	10.0	26	7.5	15	4.1	44	12.5	69	19.7
from 2 to 5	767	2,343	848	36.2	67	2.9	105	4.5	171	7.3	250	10.7	63	2.7	345	14.7	494	21.1
from 5 to 10	697	4,678	1,782	38.1	281	6.0	149	3.2	407	8.7	374	8.0	94	2.0	646	13.8	946	20.2
from 10 to 20	611	8,127	2,998	36.9	593	7.3	226	2.8	843	10.4	1,184	14.6	101	1.2	986	12.1	1,196	14.7
from 20 to 40	386	10,309	3,812	37.0	1,355	13.1	551	5.3	1,119	10.9	1,155	11.2	138	1.3	1,129	10.9	1,050	10.2
from 40 to 60	141	6,675	2,641	39.6	1,238	18.5	465	7.0	374	5.6	829	12.4	50	0.7	449	6.7	631	9.4
from 60 to 80	55	3,690	1,271	34.4	1,031	27.9	345	9.3	60	1.6	391	10.6	-	0.0	473	12.8	120	3.3
from 80 to 100	33	2,900	1,233	42.5	707	24.4	-	0.0	322	11.1	374	12.9	-	0.0	93	3.2	171	5.9
from 100 to 150	49	5,631	2,008	35.6	1,995	35.4	103	1.8	386	6.9	568	10.1	-	0.0	433	7.7	139	2.5
from 150 to 200	24	4,009	1,155	28.8	870	21.7	154	3.8	312	7.8	316	7.9	-	0.0	649	16.2	554	13.8
from 200 to 500	22	6,016	1,277	21.2	2,499	41.5	215	3.6	200	3.3	923	15.3	-	0.0	902	15.0	-	0.0
> 500	6	4,221	0	0.0	620	14.7	0	0.0	0	0.0	1,038	24.6	0	0.0	2,563	60.7	0	0.0
TOTAL	3,123	58,956	19,162	32.5	11,259	19.1	2,334	4.0	4,229	7.2	7,429	12.6	461	0.8	8,711	14.8	5,371	9.1

* A slight diversion of order 0.1% may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: BAALBEK

IMPORTANCE OF IRRIGATION PER SAU SIZE OF FARMS

Table 2.1 — SAU in dunam

SAU Size of Farms	Total Number of Farms	SAU Total Farms (1)	SAU Total Irrigated (2)	SAU Irrigated % (2/1)	Supplementary Irrigation (3)	SAU Supplementary Irrigation % (3/2)	Complete Irrigation (4)	SAU Complete Irrigation % (4/2)
Without SAU	515	0	0	0	-	0.0	-	0.0
< 1	34	21	16	75.1	11	65.2	6	34.8
from 1 to 2	658	834	573	68.7	373	65.2	199	34.8
from 2 to 5	2,722	8,340	4,554	54.6	2,756	60.5	1,798	39.5
from 5 to 10	3,333	22,054	10,801	49.0	6,225	57.6	4,576	42.4
from 10 to 20	3,836	50,313	23,996	47.7	14,161	59.0	9,835	41.0
from 20 to 40	2,894	76,801	36,351	47.3	20,419	56.2	15,932	43.8
from 40 to 60	1,138	53,739	27,023	50.3	14,031	51.9	12,992	48.1
from 60 to 80	557	37,530	20,103	53.6	10,650	53.0	9,453	47.0
from 80 to 100	251	21,998	12,823	58.3	6,607	51.5	6,216	48.5
from 100 to 150	416	49,679	28,901	58.2	14,010	48.5	14,891	51.5
from 150 to 200	163	27,547	15,698	57.0	6,931	44.2	8,766	55.8
from 200 to 500	261	76,937	47,838	62.2	20,587	43.0	27,250	57.0
> 500	72	57,634	35,955	62.4	15,028	41.8	20,927	58.2
TOTAL	**16,850**	**483,428**	**264,633**	**54.7**	**131,791**	**49.8**	**132,843**	**50.2**

* A slight divergence of order 0.1 % may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: BAALBEK

SAU IRRIGATED PER TOTAL SAU SIZE AND THE IRRIGATION SOURCE 1, IRRIGATION

Table 2.7 — SAU in dunam

SAU Size of Farms	Irrigation Source 1						Irrigation Source 2						
	SAU Irrigated Total	River/Spring	Drilled Well	Water reservoir	Hill Lake	Others	SAU Irrigated Total	River/Spring	Drilled Well	Water reservoir	Hill Lake	Others	Not Concerned
Without SAU	-	-	-	-	-	-	-	-	-	-	-	-	-
< 1	16	6	6	4	-	-	16	1	1	1	-	-	13
from 1 to 2	573	260	189	90	-	33	573	2	11	47	2	8	503
from 2 to 5	4,554	2,291	1,740	349	35	139	4,554	73	130	170	46	31	4,104
from 5 to 10	10,801	5,506	4,403	594	213	84	10,801	446	365	407	173	49	9,363
from 10 to 20	23,996	10,869	10,719	1,309	844	255	23,996	1,156	1,346	689	254	39	20,512
from 20 to 40	36,351	13,316	18,549	2,217	1,886	383	36,351	3,860	2,187	1,080	217	58	28,949
from 40 to 60	27,023	8,803	15,522	1,442	1,110	147	27,023	2,863	1,848	828	241	5	21,239
from 60 to 80	20,103	6,028	12,275	913	680	208	20,103	1,908	1,791	899	70	64	15,373
from 80 to 100	12,823	4,158	7,262	670	693	40	12,823	819	1,090	220	251	-	10,443
from 100 to 150	28,901	7,094	18,798	1,733	1,210	66	28,901	3,545	2,148	923	355	148	21,782
from 150 to 200	15,698	4,071	10,126	1,024	466	10	15,698	1,255	1,272	296	514	59	12,303
from 200 to 500	47,838	10,565	33,947	1,114	1,196	1,017	47,838	4,410	4,878	2,192	1,880	-	34,478
> 500	35,955	4,239	29,461	1,150	518	588	35,955	2,855	3,770	-	569	-	28,761
Total	**264,633**	**77,205**	**162,998**	**12,609**	**8,851**	**2,970**	**264,633**	**23,192**	**20,837**	**7,752**	**4,570**	**460**	**207,824**

* A slight divergence of order 0.1 % may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: BAALBEK

SAU IRRIGATED PER TOTAL SAU SIZE AND THE IRRIGATION MODE 1, IRRIGATION MODE 2 *

Table 2.8 — SAU in dunam

SAU Size of Farms	Mode of irrigation 1				Mode of irrigation 2				
	Total SAU Irrigated	Gravity	Aspersion	Drip	Total SAU Irrigated	Gravity	Aspersion	Drip	Not Concerned
Without SAU	-	-	-	-	-	-	-	-	-
< 1	16	10	1	5	16	1	-	-	16
from 1 to 2	573	389	11	173	573	3	8	6	555
from 2 to 5	4,554	3,031	190	1,333	4,554	79	56	154	4,265
from 5 to 10	10,801	7,162	511	3,128	10,801	262	108	435	9,997
from 10 to 20	23,996	14,774	1,669	7,553	23,996	943	485	1,406	21,162
from 20 to 40	36,351	18,021	4,658	13,672	36,351	3,359	680	3,100	29,213
from 40 to 60	27,023	11,403	5,077	10,544	27,023	3,077	961	2,798	20,187
from 60 to 80	20,103	7,736	3,881	8,486	20,103	1,740	705	2,042	15,616
from 80 to 100	12,823	5,493	3,604	3,727	12,823	828	730	1,641	9,625
from 100 to 150	28,901	9,731	8,879	10,290	28,901	3,643	1,945	3,455	19,859
from 150 to 200	15,698	5,423	4,316	5,959	15,698	1,388	1,353	2,158	10,799
from 200 to 500	47,838	12,711	20,823	14,304	47,838	3,590	2,410	8,807	33,031
> 500	35,955	5,916	15,683	14,356	35,955	2,123	2,943	7,013	23,876
Total	**264,633**	**101,800**	**69,303**	**93,530**	**264,633**	**21,035**	**12,384**	**33,016**	**198,199**

* A slight divergence of order 0.1% may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: BAALBEK

SAU OF SEASONAL CROPS BY TYPE OF CROP AND SOURCE OF IRRIGATION 1

Table 2.9 — Surface in m²

Type of Crop	Type of crop - English	Total SAU	Which crops are irrigated /Source of water irrigation 1					
			Total	River/Spring	Drilled Well	Water Reservoir	Hill Lake	Others
Blé tendre	Soft Wheat	11,293,012	6,549,175	2,927,250	3,069,925	146,750	243,200	162,050
Blé dur	Blé dur	23,941,345	11,979,700	3,936,125	6,432,550	687,125	846,450	77,450
Foin - Blé	Hay - Wheat	153,000	117,000	6,000	51,000	-	60,000	-
Autres Foin	Other hay	299,600	280,100	160,000	120,100	-	-	-
Mais	Corn	420,010	413,010	185,560	220,400	7,050	-	-
Sorgho	Sorghum	9,200	9,200	200	9,000	-	-	-
Mais pour Betail	Corn for cattle	275,250	275,250	42,750	182,500	-	50,000	-
Orge	Barley	79,774,947	26,608,350	8,377,250	15,327,000	1,930,100	716,000	258,000
Avoine	Oat	125,200	62,000	62,000	-	-	-	-
Autres Céréales	Other Cereals	119,000	107,000	40,000	67,000	-	-	-
Haricot sec	Dry bean	930,000	910,000	548,500	321,500	19,000	17,000	4,000
Haricot vert	Green bean	3,058,470	3,033,970	563,100	2,207,120	132,250	88,900	42,600
Fève sèche	Dry bean	65,750	63,000	20,000	43,000	-	-	-
Fève verte	Green Bean	3,087,400	3,084,400	465,500	2,608,700	10,200	-	-
Lentilles sèche	Dry lentils	6,479,850	3,298,800	776,800	2,383,500	81,000	52,500	5,000
Pois chiche	Chickpea	6,791,900	2,304,900	567,600	1,312,500	76,800	344,000	4,000
Petit pois sec	Small pea	282,500	272,500	12,000	258,500	2,000	-	-
Petit pois vert	Small green peas	3,041,900	3,035,900	441,900	2,588,300	700	5,000	-
Autres légumineuses	Other legumes	215,010	192,010	148,000	44,010	-	-	-
Lupin	Lupine	500	500	500	-	-	-	-
Luzerne	Alfalfa plant	714,000	689,500	264,500	424,000	-	-	1,000
Vesces	Vetches	576,550	519,750	108,250	410,500	-	-	1,000
Autres Cultures fourrageres	Other forages	665,500	539,500	212,000	219,000	106,000	500	2,000
Artichaut	Artichoke	652,000	652,000	20,000	632,000	-	-	-
Choux-fleurs	Cauliflower	663,000	663,000	49,200	613,800	-	-	-
Choux	Cabbage	1,037,400	1,037,400	56,000	979,650	1,750	-	-
Endive	Endive	-	-	-	-	-	-	-
Asperge	Asparagus	-	-	-	-	-	-	-
Laitue	Lettuce	3,313,150	3,313,150	194,500	2,812,650	34,000	71,000	201,000
Epinard	Spinach	46,500	46,500	15,500	27,000	4,000	-	-
Bette	-	14,100	14,100	1,100	13,000	-	-	-
Mélochie ou corè	-	17,700	17,700	4,600	10,350	1,750	-	1,000
Chicorée	Chicory	15,700	15,700	400	14,050	1,250	-	-
Autres Legumes A feuilles	Other leafy vegetables	128,150	128,150	24,650	100,500	3,000	-	-
Thym	Thyme	42,600	42,600	39,000	3,350	250	-	-
Persil	Parsley	183,060	182,860	37,210	144,800	350	500	-
Menthe	Mint	29,160	14,060	12,610	1,200	250	-	-
Rocca	Rocca	35,950	35,950	22,500	2,200	11,250	-	-
Autres Cultures pour salade	Other Cultural Salads	598,350	598,350	503,350	85,000	-	10,000	-
Pepinieres Legumes	Vegetables Plantation	5,000	5,000	5,000	-	-	-	-
Tomate	Tomato	8,118,220	8,015,420	1,015,130	6,362,010	121,980	178,400	337,900
Concombre / cornichons	Cucumber	6,791,745	6,683,045	798,835	5,447,460	140,600	281,450	14,700
Concombre grecque	Greek cucumber	9,075,665	2,527,165	767,350	1,592,665	66,400	47,250	53,500
Poivron doux	Soft pepper	3,167,255	2,987,255	588,575	2,131,510	135,120	131,500	550
Aubergine	Eggplant	5,561,002	5,522,402	1,077,732	4,296,970	122,600	17,500	7,600
Courge	Marrow	1,509,640	1,488,440	243,680	1,133,460	24,000	76,300	11,000
Citrouilles	Pumpkins	54,405	26,405	5,950	18,855	1,600	-	-
Gombos	-	46,550	46,550	24,850	21,550	150	-	-
Champignon	Mushroom	10,000	10,000	-	10,000	-	-	-
Fraise	Strawberry	432,000	428,000	149,500	260,500	13,000	5,000	-
Melon	Melon	2,194,150	2,171,150	346,000	1,707,500	4,150	112,500	1,000
Pastèques	Watermelons	8,095,800	8,075,100	1,017,500	6,583,400	26,200	317,000	131,000
Pommes de terre	Potatoes	17,664,229	17,550,849	2,116,350	13,413,750	553,870	1,158,240	308,639
Pommes de terre industriel	-	263,500	263,500	500	263,000	-	-	-
Topinambour	Jerusalem Artichoke	-	-	-	-	-	-	-
Patate douce	Sweet Potatoe	377,900	377,900	123,000	243,900	7,000	4,000	-
Oignons vert	Green onions	2,768,800	2,736,800	676,700	1,622,600	83,500	354,000	-
Oignons	Onions	11,664,500	11,453,500	1,282,750	8,841,800	375,550	480,900	472,500
Ail	Garlic	298,750	298,750	90,550	112,300	45,600	50,300	-
Carotte	Carrot	372,100	372,100	24,200	347,750	150	-	-
Radis	Radish	87,245	87,245	31,295	55,450	500	-	-
Navet	Turnip	361,900	361,900	41,700	279,700	40,000	-	500
Autres tubercules	Other roots	25,500	24,000	22,000	2,000	-	-	-
Canne à sucre	Sugar Cane	12,000	2,000	-	2,000	-	-	-
Betterave sucrié	Beet	-	-	-	-	-	-	-
Arachide	Peanut	66,000	58,000	-	53,000	5,000	-	-
Sesame	Sesame	13,000	10,000	-	10,000	-	-	-
Tournesol	Sunflower	13,000	10,000	-	-	10,000	-	-
Tabac	Tobacco	32,060,930	16,469,570	6,371,820	7,153,250	1,588,500	1,227,000	129,000
Rose de Damas	Damascus Rose	482,700	80,800	18,800	58,000	-	-	4,000
Oregan	Oregano	-	-	-	-	-	-	-
Sauge	Sage	4,000	4,000	4,000	-	-	-	-
Lavande	Lavender	5,000	5,000	5,000	-	-	-	-
Autre PAM	Other aromatic plants	1,067,000	1,022,000	686,000	245,000	91,000	-	-
Rose	Rose	784,740	438,740	311,340	111,400	16,000	-	-
Gerberes	Gerbera	-	-	-	-	-	-	-
Oeillet	Carnation	-	-	-	-	-	-	-
Plantes ornementales	Ornamentals	-	-	-	-	-	-	-
Pepinieres fleurs	Flower Plantation	1,000	1,000	-	1,000	-	-	-
Autres Fleurs bulbes oignons	Other bulbous flowers	1,000	1,000	-	1,000	-	-	-
Total		**262,552,940**	**160,721,621**	**38,692,512**	**106,122,435**	**6,729,295**	**6,946,390**	**2,230,989**

* SAU = Surface Agricole Utile = Useful Agricultural Surface

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: BAALBEK

SAU OF GREENHOUSE CROP BY TYPE OF CROP AND SOURCE OF IRRIGATION 1

Table 2.10 — Surface in m²

Type of crop	Type of crop - English	Total SAU	Which crops are irrigated / Source of water irrigation 1					
			Total	River/Spring	Drilled Well	Water Reservoir	Hill Lake	Others
Haricot sec	Dry bean	-	-	-	-	-	-	-
Haricot vert	Green bean	55,750	55,750	8,250	33,500	1,000	13,000	-
Fève sèche	Dry bean	-	-	-	-	-	-	-
Fève verte	Green bean	-	-	-	-	-	-	-
Lentilles sèche	Dry lentils	-	-	-	-	-	-	-
Pois chiche	Chickpea	-	-	-	-	-	-	-
Petit pois sec	Small pea	-	-	-	-	-	-	-
Petit pois vert	Small green peas	6,000	6,000	-	6,000	-	-	-
Autres légumineuses	Other legumes	-	-	-	-	-	-	-
Lupin	Lupine	-	-	-	-	-	-	-
Luzerne	Alfalfa plant	-	-	-	-	-	-	-
Vesces	Vetches	-	-	-	-	-	-	-
Autres Cultures fourrageres	Other forages	-	-	-	-	-	-	-
Artichaut	Artichoke	-	-	-	-	-	-	-
Choux-fleurs	Cauliflower	500	500	500	-	-	-	-
Choux	Cabbage	5,000	5,000	500	1,500	-	-	3,000
Endive	Endive	-	-	-	-	-	-	-
Asperge	Asparagus	4,000	4,000	-	4,000	-	-	-
Laitue	Lettuce	414,770	414,770	26,800	321,970	27,000	32,000	7,000
Epinard	Spinach	250	250	250	-	-	-	-
Bette	-	-	-	-	-	-	-	-
Mélochie ou corè	-	-	-	-	-	-	-	-
Chicorée	Chicory	250	250	250	-	-	-	-
Autres Legumes A feuilles	Other leafy vegetables	500	500	500	-	-	-	-
Thym	Thyme	500	500	300	200	-	-	-
Persil	Parsley	6,100	6,100	700	5,400	-	-	-
Menthe	Mint	2,700	2,700	-	2,700	-	-	-
Rocca	Rocca	450	450	250	200	-	-	-
Autres Cultures pour salade	Other Cultural Salads	1,500	1,500	100	1,400	-	-	-
Pepinieres Legumes	Vegetables Plantation	12,100	12,100	-	12,100	-	-	-
Tomate	Tomato	265,600	265,600	37,750	195,650	13,400	18,000	800
Concombre / cornichons	Cucumber	704,670	704,670	60,850	557,920	40,300	40,000	5,600
Concombre grecque	Greek cucumber	36,500	36,500	-	36,500	-	-	-
Poivron doux	Soft pepper	47,400	47,400	1,200	45,000	1,200	-	-
Aubergine	Eggplant	109,300	109,300	900	108,000	-	-	400
Courge	Marrow	60,500	60,500	-	60,500	-	-	-
Citrouilles	Pumpkins	-	-	-	-	-	-	-
Gombos	-	-	-	-	-	-	-	-
Champignon	Mushroom	-	-	-	-	-	-	-
Fraise	Strawberry	-	-	-	-	-	-	-
Melon	Melon	87,500	87,500	500	87,000	-	-	-
Pastèques	Watermelons	200,000	200,000	500	199,500	-	-	-
Pommes de terre	Potatoes	-	-	-	-	-	-	-
Pommes de terre industriel	-	-	-	-	-	-	-	-
Topinambour	Jerusalem Artichoke	-	-	-	-	-	-	-
Patate douce	Sweet Potatoe	-	-	-	-	-	-	-
Oignons vert	Green onions	1,500	1,500	500	1,000	-	-	-
Oignons	Onions	7,000	7,000	-	7,000	-	-	-
Ail	Garlic	400	400	-	400	-	-	-
Carotte	Carrot	-	-	-	-	-	-	-
Radis	Radish	2,250	2,250	250	2,000	-	-	-
Navet	Turnip	-	-	-	-	-	-	-
Autres tubercules	Other roots	-	-	-	-	-	-	-
Canne à sucre	Sugar Cane	-	-	-	-	-	-	-
Betterave sucrié	Beet	-	-	-	-	-	-	-
Arachide	Peanut	-	-	-	-	-	-	-
Sesame	Sesame	-	-	-	-	-	-	-
Tournesol	Sunflower	-	-	-	-	-	-	-
Tabac	Tobacco	-	-	-	-	-	-	-
Rose de Damas	Damascus Rose	33,500	33,500	17,000	16,500	-	-	-
Oregan	Oregano	-	-	-	-	-	-	-
Sauge	Sage	-	-	-	-	-	-	-
Lavande	Lavender	-	-	-	-	-	-	-
Autre PAM	Other aromatic plants	4,000	4,000	-	4,000	-	-	-
Rose	Rose	10,000	10,000	5,000	5,000	-	-	-
Gerberes	Gerbera	-	-	-	-	-	-	-
Oeillet	Carnation	1,000	1,000	-	1,000	-	-	-
Plantes ornementales	Ornamentals	-	-	-	-	-	-	-
Pepinieres fleurs	Flower Plantation	1,000	1,000	-	1,000	-	-	-
Autres Fleurs bulbes oignons	Other bulbous flowers	5,000	5,000	-	5,000	-	-	-
Peche	Peach	-	-	-	-	-	-	-
Banane	Banana	-	-	-	-	-	-	-
Pepinieres arbres fruitiers	Fruit trees plantation	-	-	-	-	-	-	-
Total		**2,087,490**	**2,087,490**	**162,850**	**1,721,940**	**82,900**	**103,000**	**16,800**

* SAU = Surface Agricole Utile = Useful Agricultural Surface

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: BAALBEK

SAU OF PERMANENT CROP BY TYPE OF CROP AND SOURCE OF IRRIGATION 1

Table 2.11 — Surface in m²

Type of Crop	Type of crop - English	TOTAL SAU	Which crops are irrigated / Source of water irrigation 1					
			Total	River/Spring	Drilled well	water Reservoir	Hill Lake	Others
Summac	Sumach	60,650	4,400	-	4,300	100	-	-
Caroubes	Carob	5,100	5,100	-	5,000	100	-	-
Orange	Orange	1,500	1,500	900	600	-	-	-
Mandarine	Tangerine	18,000	18,000	16,000	2,000	-	-	-
Citron	Lemon	6,280	6,130	1,400	2,960	1,770	-	-
Pamplemousse ORANGER AMER	Grapefruit Bitter Orange	18,500	18,500	8,000	-	-	10,500	-
Autres agrumes	Other Citrus	1,350	1,350	100	200	1,050	-	-
Starking	Apples	2,939,248	2,837,248	1,166,700	1,509,998	80,000	80,550	-
Early Red	Apples	581,460	571,460	127,250	328,460	67,250	42,500	6,000
Ace	Apples	188,050	188,050	59,300	125,750	-	3,000	-
Scarlet Spur	Apples	360,725	355,725	127,600	198,125	19,000	11,000	-
Autres Pommes Rouges	Other red apples	3,658,985	3,254,135	715,850	2,211,335	298,850	16,000	12,100
Smoothee	Apples	375,808	357,608	57,000	294,118	6,490	-	-
Golden	Apples	7,057,305	6,938,705	3,643,265	2,781,340	241,700	270,400	2,000
Early Gold / mufti	Apples	612,150	603,100	358,500	240,000	4,600	-	-
Pommes vertes Granny Smith	Green granny smith apples	577,360	522,900	71,700	424,650	20,550	5,000	1,000
San Pareille	Apples	646,800	643,800	220,800	421,000	-	2,000	-
Fuji	Apples	39,000	7,500	6,500	-	-	1,000	-
Gala	Apples	1,194,670	1,186,170	185,700	988,950	520	11,000	-
Autres Pommes Jaunes	Other yellow apples	5,931,375	5,418,933	3,369,850	1,824,783	219,800	-	4,500
Coscia	Apples	318,510	284,810	248,260	31,050	5,500	-	-
Louise - Bonne	Apples	-	-	-	-	-	-	-
Passe Crassane	Apples	19,680	10,680	10,380	-	300	-	-
Williams	Apples	47,650	38,650	1,000	37,650	-	-	-
Comice	Apples	1,300	1,300	1,300	-	-	-	-
Autres Poires	Other pears	436,642	366,794	107,465	243,389	10,990	3,250	1,700
Abricôts	Apricots	34,229,047	22,504,290	11,101,235	10,443,275	710,830	158,650	90,300
Pêches	Peaches	9,042,493	8,835,113	1,619,900	6,995,683	150,830	45,300	23,400
Prunes et prunea	Plums & Prunea	2,201,506	2,056,764	507,270	1,451,824	95,570	-	2,100
Cerise Feraaouni	Cherry Feraaouni	20,955,406	7,965,431	2,684,835	4,229,821	794,375	208,500	47,900
Cerise Mkahhal	Cherry Mkahhal	1,076,750	671,350	239,250	372,600	20,000	23,500	16,000
Cerise Nouari	Cherry Nouari	4,243,865	1,739,705	654,330	912,450	146,625	14,300	12,000
Cerise Benni	Cherry Benni	6,196,140	1,951,800	1,325,850	456,150	133,000	-	36,800
Cerise Napoleon	Cherry Napoleon	4,105,000	649,400	346,300	286,600	16,500	-	-
Autres fruits a noyaux	Other fruits	352,293	129,763	22,950	80,233	13,330	3,250	10,000
Raisin de cuve	Grapes	6,848,182	3,016,400	519,950	2,057,950	150,000	264,000	24,500
Maghdouchi	Grapes	561,129	271,450	77,950	88,500	26,700	78,300	-
Baitamoui	Grapes	6,231,243	3,700,266	488,649	2,989,587	125,030	94,500	2,500
Tfeifihi	Grapes	14,014,154	7,273,927	1,172,075	5,670,402	329,950	39,500	62,000
Cardinal	Grapes	282,900	267,400	-	265,000	2,400	-	-
Jbaahi / zaitouni	Grapes	1,143,370	488,320	288,750	192,350	5,220	-	2,000
Raisin de table apyrene	Seedless grapes	1,011,080	791,630	76,330	705,950	6,350	-	3,000
Autres raisins	Other grapes	5,198,968	1,793,680	199,180	1,470,050	106,950	16,000	1,500
Amandes vertes	Green almonds	10,831,833	3,092,215	783,205	1,514,675	672,235	59,000	63,100
Amandes a noix	Almond nuts	6,609,098	2,608,132	1,018,375	1,328,407	151,950	85,000	24,400
Noix	Nuts	1,653,312	1,523,920	587,099	800,371	74,750	37,500	24,200
Chataignes	Chestnuts	31,835	12,335	2,310	7,500	1,525	1,000	-
Pistaches	Pistachios	86,475	31,735	610	25,600	5,525	-	-
Autres Arbres Oleagineux	Other oilseed trees	24,120	23,680	16,330	7,100	250	-	-
Oliviers	Olives	23,297,720	15,367,058	4,655,451	9,211,802	978,075	269,350	252,380
Pins	Pines	214,420	169,470	9,660	157,900	910	-	1,000
Banane	Banana	-	-	-	-	-	-	-
Figue	Fig	3,331,372	1,684,260	1,026,080	464,455	119,505	48,550	25,670
Datte	Datte	20,350	7,100	7,000	-	100	-	-
Grenade	Pomegranate	586,575	539,025	227,815	264,400	32,810	6,500	7,500
Kaki	Khaki	150,411	120,731	77,010	40,846	375	-	2,500
Figues de Barbarie	Cactus fruit	28,000	27,800	1,300	24,500	2,000	-	-
Jujube	Jujube	117,643	80,893	21,200	57,393	2,300	-	-
Murier	Mulberry	26,639	19,899	12,825	3,784	2,790	-	500
Coings	Quinces	32,811	31,161	18,081	12,560	520	-	-
Nèfles	Loquats	5,410	4,820	3,100	900	720	-	100
Kiwi	Kiwi	129,250	129,250	900	128,150	200	-	-
Avocat	Avocado	100	100	-	-	100	-	-
Anoniers	-	-	-	-	-	-	-	-
Mangues	Mango	-	-	-	-	-	-	-
Fruit de Passion	Passion fruit	-	-	-	-	-	-	-
Ananas	Pineapple	-	-	-	-	-	-	-
Laurier	Laurel	-	-	-	-	-	-	-
Pepinieres Arb. Fruitiers	Seedlings for fruit trees	64,050	60,050	7,050	50,000	3,000	-	-
Autres Arbres Fruitiers	Other fruit trees	61,920	47,620	1,820	43,800	500	1,000	500
Total		**190,094,968**	**113,330,491**	**40,306,845**	**64,488,226**	**5,862,370**	**1,909,900**	**763,150**

* SAU = Surface Agricole Utile = Useful Agricultural Surface

Source: Agricultural Census Report 2010 (Published by the Ministry of Agriculture 2012)

CAZA: BAALBEK

OBSTACLES TO DEVELOPMENT PER SAU SIZE AND NUMBER OF FARMS

Table 8.1

SAU Size (in dunam)	Total Number of farms	Number of farms with obstacles															
		Total	Agricultural Guidance	% Agricultural Guidance (2/1)	Marketing	% Marketing (3/1)	Credit	% Credit (4/1)	Infrastructure	% Infrastructure (5/1)	Cost of production	% Cost of production (6/1)	land Fragmentation	% land Fragmentation (7/1)	Source irrigation	% Source irrigation (8/1)	Other	% other
Without SAU	515	508	174	34.3	62	12.2	55	10.8	10	2.0	48	9.4	2	0.4	15	3.0	142	28.0
< 1	34	34	17	50.0	1	2.9	3	8.8	3	8.8	2	5.9	1	2.9	5	14.7	2	5.9
from 1 to 2	658	658	250	38.0	93	14.1	103	15.7	21	3.2	55	8.4	6	0.9	80	12.2	50	7.6
from 2 to 5	2,722	2,699	1,021	37.8	413	15.3	352	13.0	128	4.7	250	9.3	25	0.9	350	13.0	160	5.9
from 5 to 10	3,333	3,298	1,417	43.0	454	13.8	411	12.5	171	5.2	266	8.1	49	1.5	383	11.6	147	4.5
from 10 to 20	3,836	3,818	1,624	42.5	544	14.2	490	12.8	219	5.7	352	9.2	44	1.2	385	10.1	160	4.2
from 20 to 40	2,894	2,888	1,225	42.4	450	15.6	417	14.4	130	4.5	228	7.9	32	1.1	313	10.8	93	3.2
from 40 to 60	1,138	1,136	447	39.3	198	17.4	172	15.1	46	4.0	94	8.3	4	0.4	141	12.4	34	3.0
from 60 to 80	557	555	204	36.8	121	21.8	82	14.8	32	5.8	36	6.5	2	0.4	67	12.1	11	2.0
from 80 to 100	251	249	102	41.0	54	21.7	33	13.3	8	3.2	12	4.8	-	0.0	32	12.9	8	3.2
from 100 to 150	416	414	142	34.3	90	21.7	69	16.7	5	1.2	37	8.9	1	0.2	57	13.8	13	3.1
from 150 to 200	163	162	48	29.6	52	32.1	23	14.2	4	2.5	13	8.0	1	0.6	18	11.1	3	1.9
from 200 to 500	261	259	86	33.2	84	32.4	32	12.4	5	1.9	7	2.7	-	0.0	31	12.0	14	5.4
> 500	72	72	15	20.8	27	37.5	3	4.2	1	1.4	12	16.7	0	0.0	10	13.9	4	5.6
TOTAL	16,850	16,750	6,772	40.4	2,643	15.8	2,245	13.4	783	4.7	1,412	8.4	167	1.0	1,887	11.3	841	5.0

* A slight diversion of order 0.1 % may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: BAALBEK

OBSTACLES TO DEVELOPMENT PER SAU SIZE AND NUMBER OF FARMS

Table 8.2

Area in dunam

SAU Size (in dunam)	Total Number of farms	SAU Farms with obstacles															
		SAU Total	Agricultural Guidance	% Agricultural Guidance (2/1)	Marketing	% Marketing (3/1)	Credit	% Credit (4/1)	Infrastructure	% Infrastructure (5/1)	Cost of production	% Cost of production (6/1)	land Fragmentation	% land Fragmentation (7/1)	Source irrigation	% Source irrigation (8/1)	Other	% other
Without SAU	515	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
< 1	34	21	12	56.0	1	2.3	1	6.5	2	7.9	1	3.7	1	2.3	4	17.0	1	4.2
from 1 to 2	658	834	328	39.4	111	13.3	127	15.3	26	3.2	71	8.5	9	1.0	97	11.7	64	7.7
from 2 to 5	2,722	8,270	3,160	38.2	1,249	15.1	1,069	12.9	397	4.8	787	9.5	74	0.9	1,041	12.6	493	6.0
from 5 to 10	3,333	21,839	9,408	43.1	3,040	13.9	2,703	12.4	1,136	5.2	1,765	8.1	337	1.5	2,517	11.5	933	4.3
from 10 to 20	3,836	50,084	21,435	42.8	7,032	14.0	6,382	12.7	2,920	5.8	4,618	9.2	567	1.1	5,053	10.1	2,077	4.1
from 20 to 40	2,894	76,655	32,404	42.3	11,983	15.6	11,120	14.5	3,519	4.6	5,867	7.7	817	1.1	8,455	11.0	2,491	3.2
from 40 to 60	1,138	53,639	20,911	39.0	9,460	17.6	8,128	15.2	2,167	4.0	4,424	8.2	201	0.4	6,760	12.6	1,587	3.0
from 60 to 80	557	37,393	13,708	36.7	8,224	22.0	5,554	14.9	2,134	5.7	2,341	6.3	128	0.3	4,540	12.1	765	2.0
from 80 to 100	251	21,815	8,853	40.6	4,813	22.1	2,877	13.2	704	3.2	1,070	4.9	-	0.0	2,807	12.9	691	3.2
from 100 to 150	416	49,469	16,986	34.3	10,711	21.7	8,168	16.5	613	1.2	4,314	8.7	104	0.2	6,971	14.1	1,601	3.2
from 150 to 200	163	27,397	8,224	30.0	8,665	31.6	3,758	13.7	698	2.5	2,251	8.2	155	0.6	3,097	11.3	551	2.0
from 200 to 500	261	76,486	24,887	32.5	25,961	33.9	9,027	11.8	1,466	1.9	2,131	2.8	-	0.0	8,698	11.4	4,316	5.6
> 500	72	57,634	11,592	20.1	21,541	37.4	2,070	3.6	1,194	2.1	8,151	14.1	0	0.0	10,204	17.7	2,882	5.0
TOTAL	16,850	481,537	171,907	35.7	112,792	23.4	60,983	12.7	16,974	3.5	37,791	7.8	2,393	0.5	60,246	12.5	18,451	3.8

* A slight diversion of order 0.1% may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (Published by the Minisry of Agriculture 2012)

CAZA: EL HERMEL

IMPORTANCE OF IRRIGATION PER SAU SIZE OF FARMS

Table 2.1 — SAU in dunam

SAU Size of Farms	Total Number of Farms	SAU Total Farms (1)	SAU Total Irrigated (2)	SAU Irrigated % (2/1)	Supplementary Irrigation (3)	SAU Supplementary Irrigation % (3/2)	Complete Irrigation (4)	SAU Complete Irrigation % (4/2)
Without SAU	109	0	0	0	-	0.0	-	0.0
< 1	12	7	7	100.0	5	80.1	1	19.9
from 1 to 2	281	349	325	93.1	255	78.7	69	21.3
from 2 to 5	954	2,824	2,107	74.6	1,747	82.9	360	17.1
from 5 to 10	980	6,323	4,024	63.6	3,247	80.7	777	19.3
from 10 to 20	1,149	15,031	7,859	52.3	5,781	73.6	2,078	26.4
from 20 to 40	701	18,380	9,486	51.6	6,663	70.2	2,823	29.8
from 40 to 60	242	11,392	6,233	54.7	4,075	65.4	2,158	34.6
from 60 to 80	114	7,672	4,428	57.7	2,360	53.3	2,068	46.7
from 80 to 100	51	4,397	2,092	47.6	1,048	50.1	1,044	49.9
from 100 to 150	68	8,095	4,980	61.5	2,740	55.0	2,240	45.0
from 150 to 200	20	3,329	1,502	45.1	800	53.3	701	46.7
from 200 to 500	31	8,728	5,059	58.0	2,566	50.7	2,493	49.3
> 500	7	6,293	4,298	68.3	1,748	40.7	2,551	59.3
TOTAL	**4,719**	**92,821**	**52,397**	**56.4**	**33,034**	**63.0**	**19,363**	**37.0**

* A slight divergence of order 0.1 % may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (published by the Ministry of Agriculture 2012)

CAZA : EL HERMEL

SAU IRRIGATED PER TOTAL SAU SIZE AND THE IRRIGATION SOURCE 1, IRRIGATION SOURCE 2*

Table 2.7 — SAU in dunam

SAU Size of Farms	Irrigation Source 1						Irrigation Source 2						
	SAU Irrigated Total	River/Spring	Drilled Well	Water reservoir	Hill Lake	Others	SAU Irrigated Total	River/Spring	Drilled Well	Water reservoir	Hill Lake	Others	Not Concerned
Without SAU	-	-	-	-	-	-	-	-	-	-	-	-	-
< 1	7	3	2	1	-	1	7	0	-	-	-	-	6
from 1 to 2	325	192	96	32	-	4	325	2	2	5	2	-	315
from 2 to 5	2,107	1,266	729	78	2	33	2,107	16	66	48	3	5	1,969
from 5 to 10	4,024	2,106	1,737	127	-	55	4,024	66	263	154	37	27	3,476
from 10 to 20	7,859	4,100	3,330	326	44	59	7,859	158	623	458	83	26	6,511
from 20 to 40	9,486	3,951	4,796	531	63	145	9,486	269	1,103	538	199	43	7,334
from 40 to 60	6,233	2,338	3,469	170	141	115	6,233	286	729	172	19	-	5,027
from 60 to 80	4,428	1,288	2,648	275	207	10	4,428	210	716	209	-	-	3,293
from 80 to 100	2,092	905	1,074	30	83	-	2,092	80	282	72	-	-	1,657
from 100 to 150	4,980	1,700	3,152	18	110	-	4,980	321	374	-	-	-	4,285
from 150 to 200	1,502	478	1,014	10	-	-	1,502	10	257	-	-	-	1,235
from 200 to 500	5,059	896	4,163	-	-	-	5,059	-	523	3	-	-	4,534
> 500	4,298	952	3,346	-	-	-	4,298	875	842	656	-	-	1,926
Total	**52,397**	**20,172**	**29,558**	**1,597**	**650**	**420**	**52,397**	**2,292**	**5,780**	**2,314**	**343**	**101**	**41,568**

* A slight divergence of order 0.1 % may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (published by the Ministry of Agriculture 2012)

CAZA : EL HERMEL

SAU IRRIGATED PER TOTAL SAU SIZE AND THE IRRIGATION MODE 1, IRRIGATION MODE 2 *

Table 2.8 — SAU in dunam

SAU Size of Farms	Mode of irrigation 1				Mode of irrigation 2				
	Total SAU Irrigated	Gravity	Aspersion	Drip	Total SAU Irrigated	Gravity	Aspersion	Drip	Not Concerned
Without SAU	-	-	-	-	-	-	-	-	-
< 1	7	5	-	1	7	-	-	-	7
from 1 to 2	325	281	3	41	325	-	1	1	323
from 2 to 5	2,107	1,720	18	369	2,107	11	7	56	2,033
from 5 to 10	4,024	3,071	38	914	4,024	73	41	335	3,575
from 10 to 20	7,859	5,750	139	1,969	7,859	192	72	732	6,863
from 20 to 40	9,486	6,130	143	3,213	9,486	348	140	1,253	7,745
from 40 to 60	6,233	3,511	201	2,521	6,233	447	102	1,042	4,642
from 60 to 80	4,428	1,812	242	2,374	4,428	253	115	715	3,344
from 80 to 100	2,092	1,172	238	682	2,092	51	-	316	1,724
from 100 to 150	4,980	3,095	130	1,755	4,980	98	-	999	3,884
from 150 to 200	1,502	963	-	538	1,502	-	-	439	1,063
from 200 to 500	5,059	2,651	160	2,248	5,059	-	430	648	3,982
> 500	4,298	2,882	-	1,416	4,298	-	-	1,898	2,401
Total	**52,397**	**33,043**	**1,312**	**18,042**	**52,397**	**1,472**	**908**	**8,432**	**41,585**

* A slight divergence of order 0.1% may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (published by the Ministry of Agriculture 2012)

CAZA: EL HERMEL

SAU OF GREENHOUSE CROP BY TYPE OF CROP AND SOURCE OF IRRIGATION 1

Table 2.10 — Surface in m²

Type of crop	Type of crop - English	Total SAU	Which crops are irrigated / Source of water irrigation 1					
			Total	River/Spring	Drilled Well	Water Reservoir	Hill Lake	Others
Haricot sec	Dry bean	-	-	-	-	-	-	-
Haricot vert	Green bean	-	-	-	-	-	-	-
Fève sèche	Dry bean	-	-	-	-	-	-	-
Fève verte	Green bean	10,000	10,000	10,000	-	-	-	-
Lentilles sèche	Dry lentils	-	-	-	-	-	-	-
Pois chiche	Chickpea	-	-	-	-	-	-	-
Petit pois sec	Small pea	-	-	-	-	-	-	-
Petit pois vert	Small green peas	10,000	10,000	10,000	-	-	-	-
Autres légumineuses	Other legumes	-	-	-	-	-	-	-
Lupin	Lupine	-	-	-	-	-	-	-
Luzerne	Alfalfa plant	-	-	-	-	-	-	-
Vesces	Vetches	-	-	-	-	-	-	-
Autres Cultures fourrageres	Other forages	-	-	-	-	-	-	-
Artichaut	Artichoke	-	-	-	-	-	-	-
Choux-fleurs	Cauliflower	-	-	-	-	-	-	-
Choux	Cabbage	-	-	-	-	-	-	-
Endive	Endive	-	-	-	-	-	-	-
Asperge	Asparagus	-	-	-	-	-	-	-
Laitue	Lettuce	-	-	-	-	-	-	-
Epinard	Spinach	-	-	-	-	-	-	-
Bette	-	-	-	-	-	-	-	-
Mélochie ou corè	-	-	-	-	-	-	-	-
Chicorée	Chicory	-	-	-	-	-	-	-
Autres Legumes A feuilles	Other leafy vegetables	-	-	-	-	-	-	-
Thym	Thyme	-	-	-	-	-	-	-
Persil	Parsley	-	-	-	-	-	-	-
Menthe	Mint	-	-	-	-	-	-	-
Rocca	Rocca	-	-	-	-	-	-	-
Autres Cultures pour salade	Other Cultural Salads	-	-	-	-	-	-	-
Pepinieres Legumes	Vegetables Plantation	21,500	21,500	-	1,500	-	20,000	-
Tomate	Tomato	-	-	-	-	-	-	-
Concombre / cornichons	Cucumber	-	-	-	-	-	-	-
Concombre grecque	Greek cucumber	-	-	-	-	-	-	-
Poivron doux	Soft pepper	-	-	-	-	-	-	-
Aubergine	Eggplant	-	-	-	-	-	-	-
Courge	Marrow	-	-	-	-	-	-	-
Citrouilles	Pumpkins	-	-	-	-	-	-	-
Gombos	-	-	-	-	-	-	-	-
Champignon	Mushroom	-	-	-	-	-	-	-
Fraise	Strawberry	-	-	-	-	-	-	-
Melon	Melon	-	-	-	-	-	-	-
Pastèques	Watermelons	-	-	-	-	-	-	-
Pommes de terre	Potatoes	-	-	-	-	-	-	-
Pommes de terre industriel	-	-	-	-	-	-	-	-
Topinambour	Jerusalem Artichoke	-	-	-	-	-	-	-
Patate douce	Sweet Potatoe	-	-	-	-	-	-	-
Oignons vert	Green onions	-	-	-	-	-	-	-
Oignons	Onions	-	-	-	-	-	-	-
Ail	Garlic	-	-	-	-	-	-	-
Carotte	Carrot	-	-	-	-	-	-	-
Radis	Radish	-	-	-	-	-	-	-
Navet	Turnip	-	-	-	-	-	-	-
Autres tubercules	Other roots	-	-	-	-	-	-	-
Canne à sucre	Sugar Cane	-	-	-	-	-	-	-
Betterave sucrié	Beet	-	-	-	-	-	-	-
Arachide	Peanut	-	-	-	-	-	-	-
Sesame	Sesame	-	-	-	-	-	-	-
Tournesol	Sunflower	-	-	-	-	-	-	-
Tabac	Tobacco	-	-	-	-	-	-	-
Rose de Damas	Damascus Rose	28,000	28,000	23,000	5,000	-	-	-
Oregan	Oregano	-	-	-	-	-	-	-
Sauge	Sage	-	-	-	-	-	-	-
Lavande	Lavender	-	-	-	-	-	-	-
Autre PAM	Other aromatic plants	-	-	-	-	-	-	-
Rose	Rose	20,000	20,000	20,000	-	-	-	-
Gerberes	Gerbera	-	-	-	-	-	-	-
Oeillet	Carnation	-	-	-	-	-	-	-
Plantes ornementales	Ornamentals	-	-	-	-	-	-	-
Pepinieres fleurs	Flower Plantation	10,000	10,000	10,000	-	-	-	-
Autres Fleurs bulbes oignons	Other bulbous flowers	-	-	-	-	-	-	-
Peche	Peach	-	-	-	-	-	-	-
Banane	Banana	-	-	-	-	-	-	-
Pepinieres arbres fruitiers	Fruit trees plantation	-	-	-	-	-	-	-
Total		99,500	99,500	73,000	6,500	-	20,000	-

* SAU = Surface Agricole Utile = Useful Agricultural Surface

Source: Agricultural Census Report 2010 (published by the Ministry of Agriculture 2012)

CAZA: EL HERMEL

SAU OF PERMANENT CROP BY TYPE OF CROP AND SOURCE OF IRRIGATION 1

Table 2.11 — Surface in m²

Type of Crop	Type of crop - English	Total SAU	Which crops are irrigated / Source of water irrigation 1					
			Total	River/Spring	Drilled well	Water reservoir	Hill Lake	Others
Summac	Sumach	8,600	100	-	100	-	-	-
Caroubes	Carob	4,000	4,000	-	4,000	-	-	-
Orange	Orange	47,560	31,060	3,750	15,810	11,000	500	-
Mandarine	Tangerine	1,300	1,300	1,000	-	300	-	-
Citron	Lemon	27,850	27,850	9,400	17,700	250	500	-
Pamplemousse ORANGER AMER	Grapefruit Bitter Orange	200	200	200	-	-	-	-
Autres agrumes	Other Citrus	2,100	2,100	1,600	500	-	-	-
Starking	Apples	622,900	590,900	358,100	188,800	14,000	25,000	5,000
Early Red	Apples	27,500	13,000	6,000	2,000	5,000	-	-
Ace	Apples	34,000	34,000	22,000	12,000	-	-	-
Scarlet Spur	Apples	17,004	14,504	6,000	8,004	500	-	-
Autres Pommes Rouges	Other red apples	1,487,500	955,150	276,750	567,300	54,100	38,000	19,000
Smoothee	Apples	11,300	11,300	4,000	7,300	-	-	-
Golden	Apples	251,050	233,050	113,000	91,050	7,000	22,000	-
Early Gold / mufti	Apples	103,300	103,300	51,000	32,300	-	20,000	-
Pommes vertes Granny Smith	Green granny smith apples	205,100	184,100	17,950	166,000	-	-	150
San Pareille	Apples	115,200	115,200	73,500	40,700	1,000	-	-
Fuji	Apples	-	-	-	-	-	-	-
Gala	Apples	5,500	500	500	-	-	-	-
Autres Pommes Jaunes	Other yellow apples	538,300	333,300	157,000	173,200	2,000	-	1,100
Coscia	Apples	7,980	7,980	100	7,880	-	-	-
Louise - Bonne	Apples	-	-	-	-	-	-	-
Passe Crassane	Apples	200	200	200	-	-	-	-
Williams	Apples	-	-	-	-	-	-	-
Comice	Apples	-	-	-	-	-	-	-
Autres Poires	Other pears	281,950	93,950	42,600	16,100	6,100	24,000	5,150
Abricôts	Apricots	5,240,940	4,125,840	2,248,400	1,814,790	18,450	36,000	8,200
Pêches	Peaches	335,050	315,800	105,500	198,050	2,250	8,000	2,000
Prunes et prunea	Plums & Prunea	219,962	179,212	48,350	123,362	2,500	2,000	3,000
Cerise Feraaouni	Cherry Feraaouni	2,165,450	510,950	230,950	155,800	13,200	72,000	39,000
Cerise Mkahhal	Cherry Mkahhal	290,450	174,450	18,200	74,250	-	68,000	14,000
Cerise Nouari	Cherry Nouari	364,500	251,000	120,000	80,000	48,000	3,000	-
Cerise Benni	Cherry Benni	959,550	269,050	159,700	95,350	14,000	-	-
Cerise Napoleon	Cherry Napoleon	17,000	7,000	-	2,000	5,000	-	-
Autres fruits a noyaux	Other fruits	5,100	3,850	1,600	2,250	-	-	-
Raisin de cuve	Grapes	278,400	276,900	124,200	152,700	-	-	-
Maghdouchi	Grapes	5,000	-	-	-	-	-	-
Baitamoui	Grapes	89,650	88,150	46,600	40,550	-	-	1,000
Tfeifihi	Grapes	320,630	319,630	137,650	177,980	2,600	-	1,400
Cardinal	Grapes	200	200	100	100	-	-	-
Jbaahi / zaitouni	Grapes	6,100	6,100	-	6,100	-	-	-
Raisin de table apyrene	Seedless grapes	5,000	5,000	-	5,000	-	-	-
Autres raisins	Other grapes	298,100	294,100	14,900	279,200	-	-	-
Amandes vertes	Green almonds	6,230,335	2,086,835	668,850	1,141,885	235,400	7,000	33,700
Amandes a noix	Almond nuts	3,410,900	1,105,200	329,700	611,500	133,000	19,000	12,000
Noix	Nuts	2,607,560	2,321,510	1,372,350	686,110	229,950	31,000	2,100
Chataignes	Chestnuts	12,000	4,000	2,000	1,000	1,000	-	-
Pistaches	Pistachios	13,900	4,900	200	4,700	-	-	-
Autres Arbres Oleagineux	Other oilseed trees	-	-	-	-	-	-	-
Oliviers	Olives	18,747,400	17,365,000	6,186,550	10,471,450	459,400	29,000	218,600
Pins	Pines	31,650	23,300	9,300	14,000	-	-	-
Banane	Banana	-	-	-	-	-	-	-
Figue	Fig	352,110	262,560	161,250	87,110	8,700	1,500	4,000
Datte	Datte	2,700	2,700	2,700	-	-	-	-
Grenade	Pomegranate	435,858	428,708	252,250	163,458	11,500	-	1,500
Kaki	Khaki	900	900	200	700	-	-	-
Figues de Barbarie	Cactus fruit	2,900	2,400	200	2,200	-	-	-
Jujube	Jujube	66,700	47,700	36,100	11,500	100	-	-
Murier	Mulberry	18,550	3,050	2,100	950	-	-	-
Coings	Quinces	3,000	3,000	500	2,500	-	-	-
Nèfles	Loquats	6,810	6,810	1,750	4,460	100	500	-
Kiwi	Kiwi	20,050	20,050	20,000	50	-	-	-
Avocat	Avocado	150	150	150	-	-	-	-
Anoniers	-	-	-	-	-	-	-	-
Mangues	Mango	-	-	-	-	-	-	-
Fruit de Passion	Passion fruit	-	-	-	-	-	-	-
Ananas	Pineapple	-	-	-	-	-	-	-
Laurier	Laurel	-	-	-	-	-	-	-
Pepinieres Arb. Fruitiers	Seedlings for fruit trees	3,300	3,300	-	3,300	-	-	-
Autres Arbres Fruitiers	Other fruit trees	41,000	41,000	-	41,000	-	-	-
Total		46,409,249	33,317,349	13,446,950	17,806,099	1,286,400	407,000	370,900

* SAU = Surface Agricole Utile = Useful Agricultural Surface

Source: Agricultural Census Report 2010 (published by the Ministry of Agriculture 2012)

CAZA: EL HERMEL

OBSTACLES TO DEVELOPMENT PER SAU SIZE AND NUMBER OF FARMS

Table 8.1

SAU Size (in dunam)	Total Number of farms	Number of farms with obstacles																
		Total	Agricultural Guidance	% Agricultural Guidance (2/1)	Marketing	% Marketing (3/1)	Credit	% Credit (4/1)	Infrastructure	% Infrastructure (5/1)	Cost of production	% Cost of production (6/1)	land Fragmentation	% land Fragmentation (7/1)	Source irrigation	% Source irrigation (8/1)	Other	% other
Without SAU	109	107	46	43.0	9	8.4	8	7.5	1	0.9	5	4.7	-	0.0	-	0.0	38	35.5
< 1	12	12	8	66.7	-	0.0	2	16.7	-	0.0	1	8.3	-	0.0	-	0.0	1	8.3
from 1 to 2	281	281	158	56.2	24	8.5	27	9.6	14	5.0	18	6.4	2	0.7	28	10.0	10	3.6
from 2 to 5	954	954	466	48.8	138	14.5	119	12.5	43	4.5	54	5.7	12	1.3	81	8.5	41	4.3
from 5 to 10	980	978	507	51.8	150	15.3	118	12.1	36	3.7	48	4.9	10	1.0	76	7.8	33	3.4
from 10 to 20	1,149	1,149	502	43.7	178	15.5	178	15.5	35	3.0	69	6.0	13	1.1	144	12.5	30	2.6
from 20 to 40	701	701	266	37.9	122	17.4	91	13.0	29	4.1	49	7.0	5	0.7	122	17.4	17	2.4
from 40 to 60	242	242	80	33.1	38	15.7	49	20.2	10	4.1	23	9.5	1	0.4	34	14.0	7	2.9
from 60 to 80	114	114	27	23.7	18	15.8	20	17.5	4	3.5	17	14.9	-	0.0	26	22.8	2	1.8
from 80 to 100	51	51	11	21.6	11	21.6	15	29.4	1	2.0	5	9.8	1	2.0	7	13.7	-	0.0
from 100 to 150	68	68	15	22.1	13	19.1	18	26.5	3	4.4	12	17.6	-	0.0	5	7.4	2	2.9
from 150 to 200	20	20	7	35.0	4	20.0	6	30.0	-	0.0	2	10.0	-	0.0	1	5.0	-	0.0
from 200 to 500	31	31	11	35.5	9	29.0	3	9.7	1	3.2	3	9.7	-	0.0	3	9.7	1	3.2
> 500	7	7	2	28.6	2	28.6	3	42.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL	4,719	4,715	2,106	44.7	716	15.2	657	13.9	177	3.8	306	6.5	44	0.9	527	11.2	182	3.9

* A slight diversion of order 0.1 % may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (published by the Ministry of Agriculture 2012)

CAZA: EL HERMEL

OBSTACLES TO DEVELOPMENT PER SAU SIZE AND NUMBER OF FARMS

Table 8.2

Area in dunam

SAU Size (in dunam)	Total Number of farms	SAU Farms with obstacles																
		SAU Total	Agricultural Guidance	% Agricultural Guidance (2/1)	Marketing	% Marketing (3/1)	Credit	% Credit (4/1)	Infrastructure	% Infrastructure (5/1)	Cost of production	% Cost of production (6/1)	land Fragmentation	% land Fragmentation (7/1)	Source irrigation	% Source irrigation (8/1)	Other	% other
Without SAU	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
< 1	12	7	4	62.2	-	0.0	1	17.3	-	0.0	1	10.2	-	0.0	-	0.0	1	10.2
from 1 to 2	281	349	197	56.6	30	8.6	31	8.9	19	5.3	22	6.3	3	0.7	37	10.5	11	3.0
from 2 to 5	954	2,824	1,410	49.9	412	14.6	346	12.2	128	4.5	151	5.4	32	1.1	223	7.9	123	4.3
from 5 to 10	980	6,308	3,269	51.8	960	15.2	759	12.0	241	3.8	308	4.9	70	1.1	499	7.9	201	3.2
from 10 to 20	1,149	15,031	6,597	43.9	2,300	15.3	2,345	15.6	464	3.1	905	6.0	173	1.2	1,862	12.4	386	2.6
from 20 to 40	701	18,380	7,017	38.2	3,214	17.5	2,341	12.7	767	4.2	1,331	7.2	111	0.6	3,215	17.5	384	2.1
from 40 to 60	242	11,392	3,764	33.0	1,831	16.1	2,249	19.7	479	4.2	1,069	9.4	50	0.4	1,610	14.1	340	3.0
from 60 to 80	114	7,672	1,817	23.7	1,222	15.9	1,330	17.3	271	3.5	1,151	15.0	-	0.0	1,758	22.9	124	1.6
from 80 to 100	51	4,397	949	21.6	927	21.1	1,302	29.6	91	2.1	428	9.7	80	1.8	622	14.1	-	0.0
from 100 to 150	68	8,095	1,687	20.8	1,598	19.7	2,133	26.4	378	4.7	1,482	18.3	-	0.0	608	7.5	209	2.6
from 150 to 200	20	3,329	1,205	36.2	670	20.1	967	29.1	-	0.0	330	9.9	-	0.0	157	4.7	-	0.0
from 200 to 500	31	8,728	2,920	33.5	2,523	28.9	803	9.2	222	2.5	1,094	12.5	-	0.0	957	11.0	210	2.4
> 500	7	6,293	2091	33.2	1,702	27.0	2500	39.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL	4,719	92,805	32,927	35.5	17,388	18.7	17,107	18.4	3,060	3.3	8,271	8.9	519	0.6	11,546	12.4	1,989	2.1

* A slight diversion of order 0.1% may exist due to rounding
* SAU = Surface Agricole Utile = Useful Agricultural Surface
* 1 dunam = 1000 m²

Source: Agricultural Census Report 2010 (published by the Ministry of Agriculture 2012)