Setting the Path towards the establishment of a National Natural Park in the region of Akkar-Donnieh- project

ASSESSMENT OF FLORA BIODIVERSITY & FOREST COMPOSITION AND STRUCTURE IN AKKAR-DONNIEH AREA

Final report – Spring, Summer and Autumn 2006

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ABSTRACT

Lebanon located on the Eastern coast of the Mediterranean shorelines, is bordered by Syria in the North and East and Israel in the South and by the Intertidal community on the Western shores. It is mostly mountainous, with 73% of the total area consisting of two mountain ranges; the Mount Lebanon and Anti-Lebanon Chains. The country is recognized as mini-hotspots sheltering high biodiversity richness. The floristic richness estimates 2600 plant species and 4,486 fauna species with a high percentage of endemic plant species (12%) among which 221 are broad endemics and 90 are narrow endemics (Khouzami et al., 1996).

The study area is located in the northern part of Lebanon; in the cazas of Akkar and Donnieh. It is home to a mosaic of patches of all Lebanese forest types. It extends over large areas embracing 4 vegetation zones, these are Eu-mediterranean, Supra-Mediterranean, Montane Mediterranean and Oro-Mediterranean. The region reveals to be critical biodiversity repository as it harbours various forests communities among which Calabrian pine, mixed cedar and fir and juniper, mixed fir and cedar, pure fir, evergreen oak, and Turkey oak relic stand.
Cedar forests and all coniferous forests including fir and juniper are protected by law. Most of the former forests have been declared either as nature reserves or protected forests [Sattout & Abboud, 2007]. The area is home to most of the Lebanese flora thriving at altitudes ranging from 1200 to 2000 meters.

Designated among the national hotspots requiring urgent protection action [Biodiversity Report, UNEP and MOA, 1996], the study area is part of the National Park perimeters designated in the SDATL (Schema Directeur d'Amenagement du territoire du Liban- 2004) by the Council of Development and Reconstruction (CDR). It is known to include stands quite different in their ecosystems and habitats, which are delineated by changes in type and structure of the vegetation as well as differences in the human activities and impacts.

The study was designed to assess the flora and forests composition in the area and to develop guidelines for its management and conservation. Flora and forest composition assessments integrated the development of a plant checklist, the evaluation of diversity indices and forest age structure and composition as well as the production of maps for habitat conservation and management, defining the distribution of forest types and zoning of the vegetation patches. Plant identification and confirmation were made at the Faculty of Art and Sciences, Department of Biology at the American University of Beirut. The data is considered as a baseline data for future monitoring programme. The description of vegetation profile integrated lists of plant species encountered in each region. The participatory exercises were referred to in order to draw a preliminary vocational map. The vegetation

map was developed based on the flora and forest age structure assessment. It was finalized through field validation.

The areas reflect a high biodiversity richness comprising an approximate 420 plant species among which 17 endemics. Diversity indices were very high registering between 17 and 49 species/ 400 m^2 which is relatively high number. It draws a mosaic of Mediterranean Series namely Mediterranean Serie of Quercus calliprinos, Mediterranean Serie of Quercus infectoria, Mediterranean Serie of Pinus brutia-Cupressus sempervirens, Normal Serie of Quercus infectoria, Serie of Quercus cerris, Montane Mediterranean Serie of Juniperus excelsa, Serie of Cedrus libani-Abies cilicica and Oro-Mediterranean Serie of Juniperus excelsa. The study area shows different patches of Mediterranean landscape incrusted in the marked topographical relief. Thus giving a high value to the biological component of the site.

Puzzles of different plant associations and various forest types imprint the area with typical Mediterranean mountainous landscape. Mishmish and Qammoua harbour stands of mixed tree species as well as pure stands of either cedar or fir. Mixed forests show dominance of *Abies cilicica*, *Cedrus libani, Juniperus excelsa* and *J. foetidissima*. The Qammoua region is home to different forest types. The area show stands of *Pinus brutia* at lowest altitude, *Quercus cerris* stands with high importance taking into consideration the occurrence of these stand at national level at middle altitude and the mixed stands of *C. libani*, *A. cilicica* and *J. excelsa* as well as pure stands of *J. foetidissima* and *J. excelsa*. At the lowest altitude of the study area, Qemmamine, Hrar, Jayroun and Qabait host vegetation association with dominance of *Quercus calliprinos*, *Pinus brutia* and *Pistacia palaestina* in Qemmamine, dominance of *Pinus brutia* in Hrar, mixed forest of *Q. calliprinos*, *Phyllirea media* and *P. brutia* in Jayroune. Forest structure revealed a dominance in mature age category.

The area embracing all Lebanese forest types call for an urgent need for its conservation and the sustainable management of its resources. The decisions on land management and natural resource conservation taken in partnership with local communities showed in general a harmony with the categorization developed by MADA team of experts for Mishmish, Hrar, Qabait and Qemmamine. Five categories were defined for further discussions and refinement: Conservation and adaptive management; Remediation; Agro-sylvo-pastoral; Agricultural and Urban Development

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ACRONYM

BA	Basal Area
CDR	Council for Development and Reconstruction
DBH	Diameter at Breast Height
EIA	Environmental Impact Assessment
MOA	Ministry of Agriculture
MOE	Ministry of Environment
SDATL	Schéma Directeur d'Aménagement du Territoire du Liban
SEA	Strategic Environmental Assessment
UNEP	United Nations Environment Programme

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I. MEDITERRANEAN REGION: SNAPSHOTS ON BIOGEOGRAPHIC CHARACTERISTICS

The Mediterranean region is acknowledged as a legacy of many biogeographical processes including immigration, extinction, sorting processes, and regional differentiations [Blondel & Aronson, 1999]. Located at cross-roads of three continents (Europe, Asia and Africa), the region is recognized as the cradle of many civilizations supporting intensive anthropogenic activities. These activities have imprinted the biological and physical environment including species richness, landscape as well as forest structures and composition.

The Mediterranean Basin has been recognized as one of the 18 world hotspots and as a melting pot and meeting ground for species of varying origins [Blondel & Aronson, 1999]. This astonishing biological diversity which is the effect of biogeography, geology, ecology and history and the diversity of regional ecology is immediately perceived in the mosaic effect so typical of Mediterranean landscapes. The whole region has been shown to be a critical habitat of global importance for genetic resources; it comprises a wealth of more than 25 000 plant species, more than 50 % of which are endemic to the region, and a good proportion of which are relicts. Much of the vegetation consists of a mosaic of patches or remains of ancient and more favourable ecological and climatic conditions [Quézel, 1985; Heywood, 1995]. This factor obviously plays a critical role in generating and maintaining species diversity. High mountains are conducive to speciation, and Mediterranean mountains recurrently show up to 42% endemism among higher plants.

Extant faunas and floras of the Mediterranean are a complex mixture of elements deriving from in situ evolution or colonization from adjacent or far-distant regions in various periods in the past. The colonizers constitute the vast majority of present day-species. Although Mediterranean ecosystems can be considered young because of the relatively recent appearance of a Mediterranean climate, they are composed of species originating in almost all known biogeogrpahic realms of the world [Aronson & Blondel, 1999; Medail & Quezel, 1999].

Variations in human land use patterns and site-specific histories of resource management, which often resulted in overexploitation and resource depletion have had a profound impact on living systems throughout the Basin. Both vegetation structure and individual species show a wide array of adaptations to human perturbations that include fire-setting, clear-cutting, heavy browsing and grazing by herds of domestic livestock, and ploughing. The exceptional richness of annual, or even more ephemeral plant species in the Mediterranean flora is also a large extent the result of long-standing human activities [Blondel & Aronson, 1999].

II. LEBANON: ORIGINS AND STATUS OF BIODIVERSITY RICHNESS

The country located on the Eastern coast of the Mediterranean shorelines, is bordered by Syria in the North and East and Israel in the South and by the Intertidal community on the Western shores. It is mostly mountainous, with 73% of the total area consisting of two mountain ranges; the Mount Lebanon and Anti-Lebanon Chain. Lebanese territory presents four distinct morphological units; narrow coastal plain, elevated mountain of Lebanon and western chain, inner Bekaa Valley and eastern mountain chain [Sattout & Abboud, 2007]. It is recognized as mini-hotspots sheltering high biodiversity richness. The noted diversity in Lebanon is mostly the result of the physiography of the landscape and the country's location at crossroads between continents.

The changes in topography over short distance (exceeding 3000 m elevation within 60km horizontal distance) makes the general character of the terrain quite steep and prone to instability. The floristic richness estimates 2600 plant species and 4,486 fauna species with a high percentage of endemic plant species (12%) among which 221 are broad endemics and 90 are narrow endemics (Khouzami et al., 1996). This high rate of endemism is favoured by the isolation effects encountered on the high peaks located on the Western and Eastern Mountain Chain, which include the high summit of Slenfe,Qamoua, Qurnet es Sauda, Ehden, Sanin and Mount Hermon and their peripheries [Sattout, 1999]. The country record two critical biogeographical locations; one in Al-Shouf Cedar Reserve recognized as the southern most limit of *Cedrus libani* A. Rich. and the second is Horsh Ehden Reserve acknowledge as the southern most limit to *Abies cilicica* Boiss. The country is home to the famous cedar forest. Many of the relics cedar stands are isolated and have been facing extinction.

The country represents a melting pot of plant of various biogeographical origins. Prints of Arcto-Tertiary Mesogean flora are part of the Lebanese flora. This latter includes hundreds of Irano-Turanian elements such as Artemisia, Ephedra, Pistacia, Salsola and Suaeda whose centers of diversity and of origin are located in the semi-arid steppes of central Asia. Arboreal elements of the Irano-Turanian flora do survive in patches throughout the country such as the Judas tree and the storax. The physiographic and topographical conditions as well as the climatic parameters have marked the Lebanese Mountain slopes in different vegetation zones. Two major climatic zones have been identified; the Mediterranean zone and the pre-steppe areas [Zohary, 1973; Abi Saleh et al., 1996].

III. STUDY AREA: SCOPES ON BIODIVERSITY ATTRIBUTES

The study area is located in the northern part of Lebanon; in the cazas of Akkar and Donnieh [Fig. 1]. The area revealed to be home to a mosaic of patches of all Lebanese forest types.

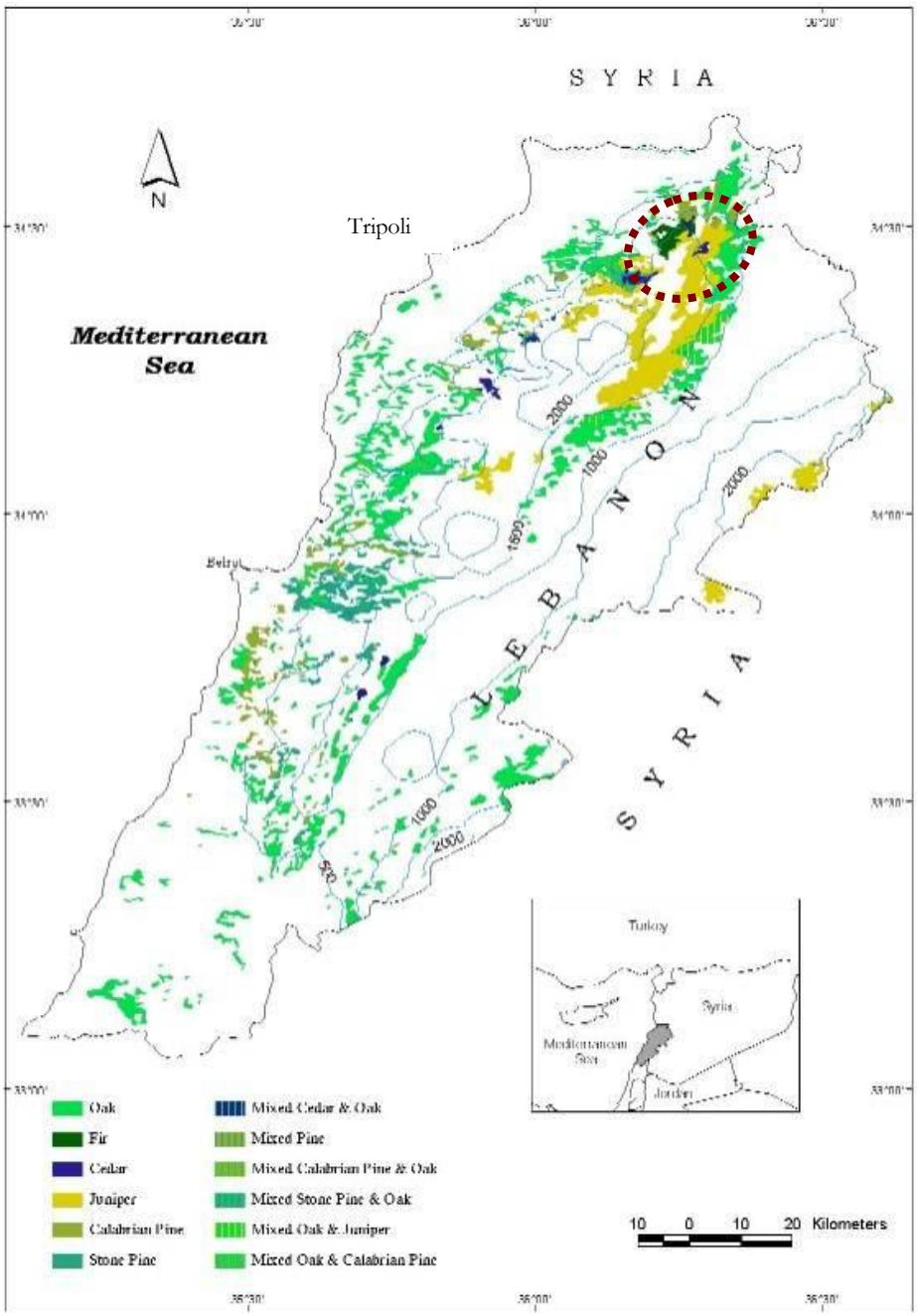

Fig. 1. Distribution of types of Lebanese forest and location of the study area.

The study areas extends over large areas embracing various Mediterranean life zones; Thermo-Mediterranean, Meso-Mediterranan and Supra-Mediterranean [Referring to the regional description by Aronson & Blondel, 1999]. The national classification zones divides the region in 4 vegetation zones, these are Eu-mediterranean, Supra-Mediterranean, Montane Mediterranean and Oro-Mediterranean (Table 1) [Abi Saleh & Safi, 1998].

Table 1. Forest type and Mediterranean life zones of the study area

Region	Altitude (m)	Vegetation zones	Mediterranean life zone
Qammoua	1650	Montane-Mediterranean	Supra-Mediterranean
Jayroune	1000	Supra-Mediterranean	Meso-Mediterranean
Mishmish	1250	Supra- Mediterranean	Meso-Mediterranean
Hrar [Wadi Jhanam]	500	Eu-Mediterranean	Thermo-Mediterranean
Qemmamine	750	Eu-Mediterranean	Thermo-Mediterranean

It is a critical region harbouring various forests communities among which Calabrian pine, mixed cedar and fir and juniper, mixed fir and cedar, pure fir, evergreen oak, and *Quercus cerris* relic stand. Cedar forests and all coniferous forests including fir and juniper are protected by law. Most of the former forests have been declared either nature reserves or protected forests [Sattout & Abboud, 2007]. The area is home to most of the Lebanese flora thriving at altitudes ranging from 1200 to 2000 meters. The area embracing all Lebanese forest types call for an urgent need for its conservation and the sustainable management of its resources.

Designated among the national hotspots requiring urgent protection action [Biodiversity Report, UNEP and MOA, 1996], the study area is part of the National Park perimeters designated in 2004 by the SDATL (Schéma Directeur d'Aménagement du Territoire du Liban) and by the Council of Development and Reconstruction (CDR). It is known to include stands quite different in their ecosystems and habitats, which are delineated by changes in type and structure of the vegetation as well as difference in the human impacts.

I. MATERIALS

- Geographical Positioning System,
- Plant Presses,
- Pens and pad,
- Meter,
- Newspaper,
- Descriptors and survey sheets,
- Camera,
- Flora of Turkey, Flora Palaestina [Feinbhurn], Flora of Palestine, Syria and Lebanon [Post & Dinsmore], Flore de la Syrie et du Liban [Mouterde],
- Ropes of 20 m^2 and iron stakes.

II. SAMPLING STRATEGY

II.1. PLANT CHECKLIST

Permanent quadrats of 20 x 20 meters were visited at one month interval during the spring, summer and autumn starting May 2006. The sampling strategy of the permanent quadrats aimed at measuring diversity indices and building up the plant checklist of the area. The strategy covered all habitat and forest types spread at different altitudes within the study areas. On the other hand, it has targeted the six regions taking into consideration the diversity of vegetation zones and sites' physiography (Table 1).

A survey form was designed to gather data on the location of the quadrat, the habitats types, physiography, disturbances, plant name, density and distribution within the quadrat (Annex 1). Twelve permanent quadrats were sampled (Table 2). The sampling strategy as well as the methodology has been designed in accordance with the allocated time and budget.

Table 2. Number of permanent and non-permanent quadrats in the various region of the study area.

Region*	**Nb of Permanent quadrats**	**Nb of non-permanent quadrats**
Hrar	2	4
Mishmish	3	6
Qammoua(Fneideq–Akkar Attika]	3	17
Qemmamine	2	4
Jayroune	1	1
Qabait	1	1
Total	**12**	**33**

* Following cadastral maps

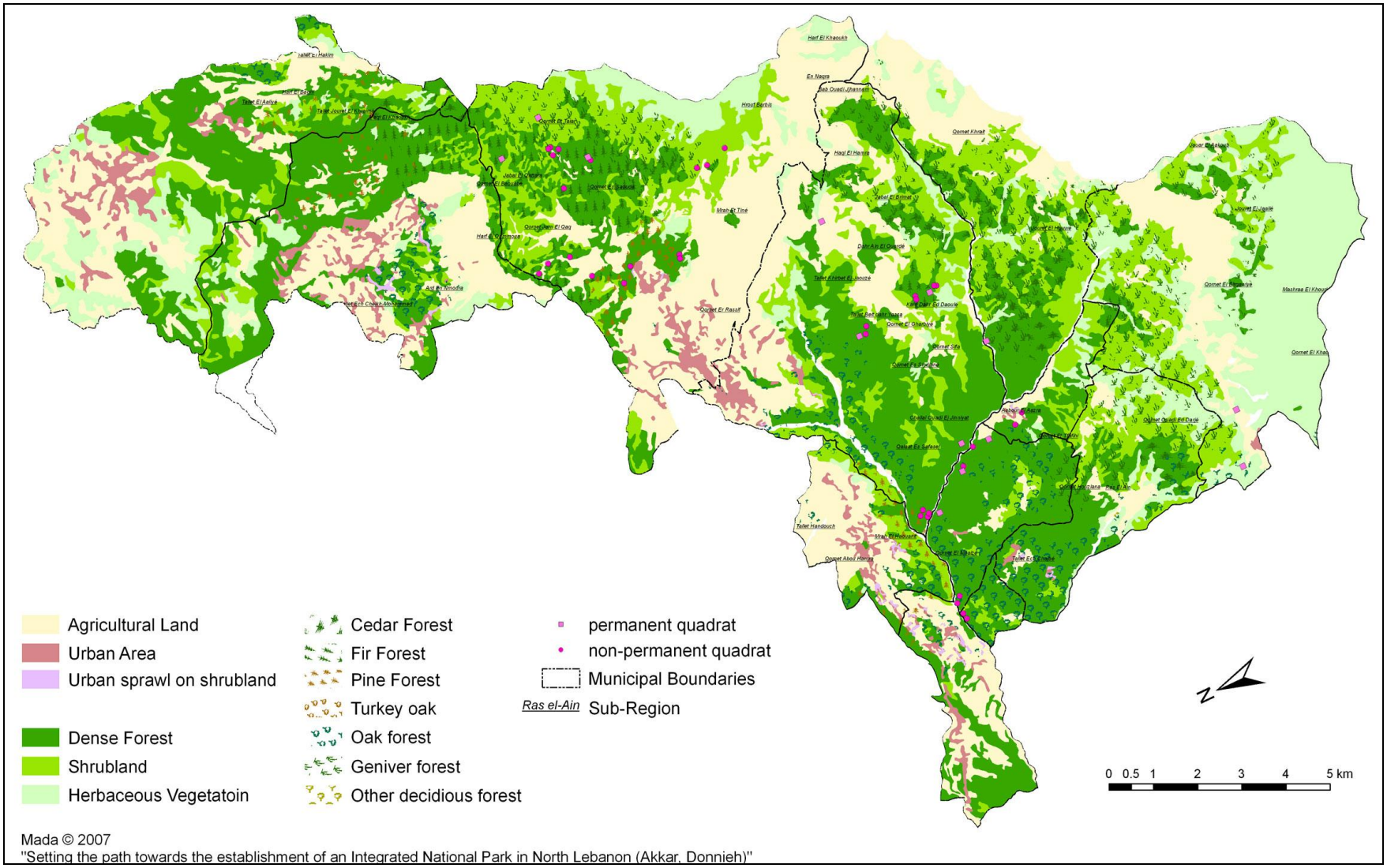

Fig. 2. Land use land cover and distribution of sampling units

II.2. FOREST STRUCTURE & COMPOSITION

The location of the quadrats designated for forest age structure and composition studies relies on random stratified sampling. The quadrats were defined based on parallel transects traversing the different altitudes and/or vegetation types. The random sampling was adopted taking into consideration the topography and accessibility of the sub-regions.

Data collection on the various physical and biotic stand attributes was performed in 20 x 20 meters quadrats. The 400 m^2 quadrat was divided in 4 quadrants where data on associated species was recorded in each quadrant. The latter were recoded in a randomly thrown quadrat of $1m^2$, $4m^2$ and 16 m^2. The observed vegetation and their density cover was recorded.

The survey form was designed to collect data on the location of the quadrat, habitat types, physiography, disturbance factors, diameter at breast height (DBH), basal area (BA), height, shape and status of the trees as well as the plant names, density and distribution (Annex 2). The total number of quadrats sampled for the forest structure and composition is 33 (Table 2). The difference in the number of quadrats within region depended on the surface area of the region as well as the different in site physiography, exposure and vegetation compositions. The DBH and BA were measured for future studies on forest productivity.

II.3. PRODUCTION OF VEGETATION AND VOCATIONAL MAPS

II.3.1. VEGETATION MAP

The vegetation map production relied on combining aerial photograph, land use land cover maps as well as data gathered on forest composition during spring/summer/autumn 2006. Two meetings, between the GIS/Spatial analysis expert and principal investigator, were held in order to validate the delineation and types of the various Mediterranean vegetation's series illustrated in the preliminary map. A field trip to validate the delineation and composition of the vegetation's Series was performed after the identification unclear spots about dominant vegetation as well as existence of the vegetation's Serie.

II.3.2. PRELIMINARY VOCATIONAL MAP

The vocational map was produced in two phases. During the first phase, members of the projects as well as SSC members were convened. The first meetings, convened at two stages, gathered members from Mada, the principal investigator, the GIS/spatial analysis experts as well as the scientific backstoper. These meetings came up with the delineation of the different zones as well as their vocational categories. The preliminary vocational delineation relied on the baseline data gathered on tree forest structure, diversity indices, field observations, predictive objective and subjective frequency of important plant species as well as map on land use and land cover.

The categories identified are the following:

1. Conservation and adaptive management zone
2. Remediation zones
3. Agro-sylvo-pastoral zones
4. Agricultural zones
5. Urban Development zones
6. Landscape and specific features zones
7. Touristic zones
8. Buffer zones

SSC members meetings discussed the proposed categories and code of conducts for management purposes in these zones.

A third meeting was held with head of municipalities to discuss their vision for the forested areas and land in their domain each and expansion of their villages (Fig. 3). The first 5 categories were illustrated on the maps. The remaining categories will be part of the guidelines for management plan.

Fig. 3. Municipalities' participation in decision-making process on habitat conservation and management and land use

The participatory exercise came up with a preliminary vocational map to be fine-tuned further to spring/summer 2007 data collection. Additional meetings will be convened to confirm the various categories and zones delineation. These meetings will gather heads and members of municipalities when the present situation in North will be resolved.

III. MANAGEMENT OF GATHERED DATA: IDENTIFICATION & ANALYSIS

III.1. DEVELOPMENT OF A PLANT CHECKLIST

A plant checklist gathering all collected specimens was developed. Plant identification and confirmation were made at the Faculty of Art and Sciences, Department of Biology at the American University of Beirut. The facilities of the Department were procured through Dr. *Nada Sinno Seoud* [Herbarium Curator]. Plant confirmation was done using the facilities of Post Herbarium. The flora used were Flora of Lebanon [Mouterde 3 volumes and plates], Flora of Palestine, Syria and Sinai [Post & Dinsmore, 1933], Flora Palaesitna [Feinburn], La Botanique redecouverte [Raynal-Roques, 1994],Petite Flore Illustree du Liban [Lys & Ades, 1965]. The botanical names were updated referring to the Med-Checklist (Greuter *et al.*, 1986).

III.2. FOREST STRUCTURE AND COMPOSITION

The forest structure were defined relying on the categorization of the age structure through the definition of intervals for the DBH. The DBH, BA and height were calculated. The data is considered as a baseline data for future monitoring programme. The description of vegetation profile integrated list of plant species encountered in each region.

The diversity richness was measured referring to the alpha diversity, beta diversity and gamma diversity. The difference in vegetation composition between the various habitats and regions were measures through the calculations of the similarity indices. The diversity indices were calculated using SPSS program.

I. PLANT SPECIES RICHNESS

I.1. DIVERSITY INDICES

The areas reflects a high biodiversity richness, the plant checklist illustrates more than 420 plant species (Annex 3) among which 17 endemics. Alpha diversity indices were very high registering between 17 and 49 species/ 40 m2 which is relatively high number (Table 3). This reflects the importance of the region for conservation and protection of specific species. Gamma diversity registered high value in all regions taking into consideration the nature in Lebanon.

Table 3. Diversity indices in the various sub-regions and regions

Region*	Vegetation zone	Diversity indices	
		Alpha	Gamma
Qammoua	Mountain Mediterranean		52
Haref Ain el Hajal		22	
Ain el Safsafeh		20	
Ain el Farouj		17	
Mishmish	Supra-Mediterranean		76
Al Martasieh		36	
Hakel El Keyss		34	
Ain el Safsafeh		22	
Jayroun	Supra-Mediterranean	49	49
Hrar	Thermo-Mediterranean		57
Nabi Keik Eltine		44	
Qornet el Jeneyat		17	
Qemmamine	Eu-Mediterranean		57
Kornet el kharoub		36	
Al Ramlieh		28	

* Referring to cadastral map

Local names of the sub-regions were given by local communities.

The beta diversity values showed difference in the ranges of species richness when comparing two different regions (Table 4). The highest difference in species richness was observed in Mishmish and Qammoua while the lowest range between Jayroun and Qemmamine. This noted difference observed between the region reveal a high dissimilarity in floristic composition even in region sheltering same forest type. This dissimilarity present the region as a medley of various plant associations and it imprints each region with specific attributes.

Table 4. Beta diversity indices between the various regions

Region	Beta
Mishmish/Qammoua	118
Jayroun/Mishmish	116
Quemmamine/Mishmish	111
Hrar/Qammoua	105
Hrar/Mishmish	103
Quemmamine/Qammoua	101
Jayroun/Qammoua	96
Jayroune/Hrar	85
Qemmamine/Hrar	78
Jayroune/Qemmamine	77

I.2. MOSAIC OF VEGETATION PATCHES

The region reflects a mosaic of Mediterranean Series namely Mediterranean Serie of Quercus calliprinos, Mediterranean Serie of Quercus infectoria, Mediterranean Serie of Pinus brutia-Cupressus sempervirens, Normal Serie of Quercus infectoria, Serie of Quercus cerris, Montane Mediterranean Serie of Juniperus excelsa, Serie of Cedrus libani-Abies cilicica and Oro-Mediterranean Serie of Juniperus excelsa (Fig. 3). The study area shows different patches of Mediterranean landscape incrusted in the marked topographical relief. Thus giving a high value to the biological component of the site.

The low percentage of similarity between the region either in permanent quadrats or non-permanent ones reflect a marked difference in vegetation cover between the different regions. The similarity indices ranged from 1.2% to 20.5% (Table 5) in permanent quadrats and 6.6% and 28.5% for non-permanent ones (Table 6). This marked dissimilarity has to be investigated furthermore. The local communities practices within the forest and the anthropological interactions have to be studied more in depth.

Table 5. Similarity in vegetation composition in permanent quadrats in the study area

Region	Jayroune	Qemmamine	Hrar	Mishmish	Qammoua
Jayroune	1	0.154	.205	.033	.20
Qemmamine		1	.188	.090	.038
Hrar			1	.127	.019
Mishmish				1	.041
Qammoua					1

Table 6. Similarity in vegetation composition in non-permanent quadrats in the study area

Region	Qammoua	Hrar	Mishmish	Qemmamine	Jayroune	Qabait
Qammoua	1	.108	.285	.156	.071	.066
Hrar		1	.083	.217	.200	.194
Mishmish			1	.168	.105	.070
Qemmamine				1	.185	.228
Jayroune					1	.319
Qabait						1

II. FOREST STRUCTURE & COMPOSITION

Puzzles of different plant associations and various forest types imprint the area with typical Mediterranean mountainous landscape. Mishmish and Qammoua harbour stands of mixed tree species as well as pure stands of either cedar or fir. Mixed forests show dominance of *Abies cilicica*, *Cedrus libani, Juniperus excelsa* and *J. foetidissima*. The Qammoua region is home to different forest types. The area show stands of *Pinus brutia* at lowest altitude, *Quercus cerris* stands with high importance taking into consideration the occurrence of these stand at national level at middle altitude and the Mixed stands of *C. libani*, *A. cilicica* and *J. excelsa* as well as pure stands of *J. foetidissima* and *J. excelsa*. At the lowest altitude of the study area, Qemmamine, Hrar, Jayourn and Qabait host forests association with dominance of *Quercus calliprinos*, *Pinus brutia* and *Pistacia palaestina* in Qemmamine, dominance of *Pinus brutia* in Hrar, mixed forest of *Q. calliprinos*, *Phyllirea media* and *P. brutia* in Jayroun.

Forest structure revealed a dominance in mature age category in most of the sampled sites. Regeneration process and seedlings recruitment did not figured as measurable parameters for the first year of the data collection. Nevertheless, the monitoring of the regeneration process and seedlings recruitment was integrated within the designed monitoring programme for 2007.

Forest structure was studied in Qammoua, Hrar, Mishmish, Qemmamine and Jayroune.
Qammoua comprise 3 forest communities types:

1. Calabrian pine located at the lowest altitude of the forest area
2. *Quercus cerris* a remnant stand located at lowest altitude with scattered trees of Juniper excelsa and J. oxycedrus
3. Mixed fir, Cedar and Juniper with alternate high dominance of fir and cedar
4. Juniper located at highest altitude in southern part of the forest area. The area showed high degradation state.

Hrar located on the south facing hills of Wadi Jhanam. The forest community is dominated by Calabrian pine with its associated understorey [Annex 4]

Mishmish is mainly composed of mixed tree community of fir, cedar, juniper drupacea, juniper foetidissima, juniper excelsa and juniperus oxycedrus. Storax, maple and *J. oxycedrus* tree species are scattered within the the mixed community mainly slightly differentiated in the different sub-regions by dominance of either *J. excelsa*, or *Cedrus libani* or *Abies cilicica*.

Jayroun forest is mainly dominated by *Quercus calliprinos* mixed with *Phyllirea media* and *Pinus brutia*, other tree species are sparsely mixed with the kermes oak community.

Quemmamine extending on the North eastern slopes is dominated by *Pinus brutia*. The mixed tree community comprises *Quercus calliprinos*, *Pistacea palaestina*, *Quercus infectoria, Arbutus andrachne* and *Styrax officinalis*.

Table 7. Forests cover structure and composition [Measurement in meter]

Region	Dominance [%]	Mean DBH	Mean BA	Mean Height
Qammoua				
J. excelsa	38.75	1.08	1.3	4.7
A. cilicica	21.05	1.8	1.73	10.36
Pinus brutia	18.7	0.74	0.98	6
C. libani	14.37	1.2	1.37	9.5
J. oxycedrus	1.91	0.3	0.57	2.3
J.foetidissima	1.91	0.53	0.76	3
Crataegus monogyna	0.47	-	-	-
Prunus ursina	0.95	0.3	0.37	2.3
Quercus calliprinos	0.95	0.3	0.38	4
Quercus cerris	0.47	0.2	0.3	4.5
Styrax officinalis	0.47	0.1	0.2	6
Quercus cerris stand				
Quercus cerris	98	0.97	1.22	12
Juniperus excelsa	4.2	0.37	0.55	3
Juniperus oxycedrus	2.1	0.27	0.4	2
Mishmish				
Quercus calliprinos	39.13	0.78	0.97	2.9
J. excelsa	27.54	2.2	2.35	6
C. libani	7.27	4.43	3.28	21.11
A. cilicica	7.25	2.03	2.09	9.76
J. foetidissima	5.80	1.5	1.24	4.6
Styrax officinalis	5.80	-	-	-
Acer syriacum	4.35	0.9	0.16	2.36
J. oxycedrus	1.45	0.20	0.30	2

Table 7. Forests cover structure and composition [Measurement in meter] (Cont'd)

Region	Dominance [%]	Mean DBH	Mean BA	Mean Height
Hrar				
Pinus brutia	100	0.36	0.40	7.53
Qemmamine				
Pinus brutia	64.91	0.73	0.90	7.7
Q. calliprinos	13	0.37	0.46	3.3
Pistacla palaestina	7.02	0.51	0.60	7
Quercus infectoria	1.75	-	-	-
Arbutus andrachne	1.75	-	-	-
Styrax officinalis	1.75	-	-	-
Jayroune				
Q. calliprinos	77.34	0.30	0.5	3.78
Phyllirea media	10.94	0.62	1.2	3.4
Pinus brutia	6.25	0.45	0.61	6.8
Pistacea palaestina	3.91	0.47	1.16	3.3
Ceratonia siliqua	1.56	0.74	3.9	4

The forest communities showed a mixture of different age categories for the tree species thriving in this sub-region. The forest harbours a variety of tree species covering the hills with typical plant communities found in the Thermo-Mediterranean life zones and the normal Serie of Quercus infectoria (Fig. 4). The region is mainly dominated by the presence of Kermes oak recording approximately 77.34 %, followed by olive tree while the other species are mixed at an equal frequency within the sub-region.

Table 8. Dominance of tree species, the mean basal area, mean DBH and mean height in Jayroun

Tree species	Dominance	Mean DBH	Mean BA	Mean height
Q. calliprinos	77.34	0.30	0.5	3.78
Phyllirea media	10.94	0.62	1.2	3.4
Pinus brutia	6.25	0.45	0.61	6.8
Pistacea palaestina	3.91	0.47	1.16	3.3
Ceratonia siliqua	1.56	0.74	3.9	4

The presence of all three categories for most of the tree species thriving in the area (Table 9) reveals the existence of a dynamic process within the plant communities. The high dominance of juvenile/young tree of Cyprus oak and the low dominance of mature trees show a high influence of charcoal production and grazing practices performed over the past decades.

Table 9. Dominance of the different age categories of tree species and their corresponding mean BA and height in Jayroune.

Tree species	Categories	Dominance %	Mean Basal Area (cm)	Height (M)
Ceratonia siliqua				
	<30	50	400	3.5
	100-150	50	380	4.5
Phillyrea media				
	<30	14.3	29	3.25
	30-90	64.3	105.2	3.6
	>90	21.4	236.6	3
Pinus brutia				
	<30	37.5	30.3	5.1
	30-90	50	97.3	12.7
	>90	12.5	130	9
Pistachia palaestina				
	<30	40	38	6
	30-90	60	181.6	3.5
Quercus calliprinos				
	<30	68	34.8	3.6
	30-90	31	76.8	4
	>90	1	120	4

II.2. HRAR

The vegetation profile in Hrar is dominated by *Pinus brutia* tree species. Other tree species such as carob, pistachio, false olive tree, evergreen and deciduous oak as well as storax are found scattered. The understorey is typical to the facies of Calabrian pine falling under the Normal Serie of *Quercus infectoria* (Fig. 4). The main species observed in this facies are *Cistus creticum* and *C. salvifolius*, *Fumana arabica*, *Hypericum thymifolium* and *Salvia triloba*.

Hrar is occupied by a pure community of *P. brutia* (Dominance=100% with a mean DBH of 0.36 m, mean BA=0.40 meter and mean height is 7.53 meter). The results recorded the presence of three age categories of *P.brutia* while an equal percentage of non-bearing and bearing trees is observed (Table 10). The results reveal the wood cutting practices which are undertaken in this area which have influenced the dominance of mature trees (2%).

Table 10. Dominance of the different age categories of Calabrian pine and their corresponding mean BA and height in Hrar

Categories	Dominance	Mean Basal Area	Height
<30	44	19.45	3.8
30-90	54	53.3	9.12
>90	2	130	32

The region is shelter to mixed forest of *Pinus brutia*, *Quercus calliprinos* and *Q. infectoria*. Other scattered tree species are encountered in this region such as *Acer syriacum*, *Arbutus andrachne* and *Cercis siliquastrum*. The understorey is mainly formed of *Cistus creticum*, *Cistus angustifolium*, *Helychrisum virgineum*, *Hypericum thymifolium*, *Hypericum perforatum* and *Senecio mouterdeii*.

The forest harbours a variety of tree species imprinting the high peaks and hills in this region with the typical plant communities found in the Supra-Mediterranean life zones. The region is mainly dominated by the presence of Calabrian pine recording 65% of dominant cover (Table 11). The kermes oak and pistachio are found mixed at higher frequency than deciduous oak, storax and strawberry tree.

Table 11. Dominance of tree species, the mean basal area, mean DBH and mean height in Quemmamine

Tree species	Dominance	Mean DBH	Mean BA	Mean height
Pinus brutia	64.91	0.73	0.90	7.7
Q. calliprinos	13	0.37	0.46	3.3
Pistaceae palaestina	7.02	0.51	0.60	7
Quercus infectoria	1.75	-	-	-
Arbutus andrachne	1.75	-	-	-
Styrax officinalis	1.75	-	-	-

The age categories dominating the vegetation community in Qemmamine is young especially those of *Q. calliprinos*, *Pistacia palaestina* and *Styrax officinalis* (Table 12). The absence of different age categories reveal a young forest and call for the investigation on the seedlings recruitment.

The forest age structure reflects the practices including wood cutting for household and for charcoal production. This region should be under conservation from grazing and wood cutting for a certain period in order to draw a long-term plan for its management.

Table 12. Dominance of the different age categories of tree species and their corresponding mean BA and height in Quemmamine.

Tree species	Categories	Dominance	Mean BA	Height
Arbutus andrachne				
	<30	100	20	2
Pinus brutia				
	<30	16.3	36.3	6.4
	30-90	54	78.8	3.5
	>90	29.7	140.6	12.1

Table 12. Dominance of the different age categories of tree species and their corresponding mean BA and height in Quemmamine [Cont'd].

Tree species	Categories	Dominance	Mean BA	Height
Quercus calliprinos				
	<30	68	34.8	3.6
	30-90	31	76.8	4
	>90	1	120	4
Pistacia palaestina				
	<30	50	22.5	3.85
	30-90	50	97.5	10.15
Quercus infectoria				
	<30	50	22	3.28
	30-90	50	66.7	3.1
Styrax officinalis				
	<30	100	24	3.9

II.4. MISHMISH

Mishmish is shelter of a mosaic of 3 Mediterranean series : Normal Serie of *Quercus infectoria*, Montane –Mediterranean Serie of *Juniperus excelsa*, Serie of *Cedrus libani-Abies cilicica* (Fig. 4). The mixed cedar and fir forest is home to *Dorocnimum orientale*, *Rubia tenuifolia*, *Astragalus sofarensis* and *Berberis libanotica* (Annex 2).

The percentage of dominance of the tree species revealed the mixed community types observed in Mishmish (Table 13). Evergreen oak showed a high dominance in some sites of the region (Fig. 4). The other mixed type of community shows a high dominance of juniper (*Juniperus excelsa*) while cedar, fir and juniper (*Juniperus foetidissima*) while storax, maple and juniper (*Juniperus oxycedrus*) are found as scattered individual trees.

Table 13. Dominance of tree species, the mean basal area, mean DBH and mean height in Mishmish

Mishmish	Dominance %	Mean DBH	Mean BA	Mean Height
Quercus calliprinos	39.13	0.78	0.97	2.9
J. excelsa	27.54	2.2	2.35	6
C. libani	7.27	4.43	3.28	21.11
A. cilicica	7.25	2.03	2.09	9.76
J. foetidissima	5.80	1.5	1.24	4.6
Styrax officinalis *Acer syriacum*	5.80 4.35	- 0.9	- 0.16	- 2.36
J. oxycedrus	1.45	0.20	0.30	2

The dominance of mature trees for most of the coniferous species [*Abies cilicica*, *Cedrus libani*, *Juniperus foetidissima* and *J. excelsa*] and the low dominance of juvenile trees of same tree species reflect the impact of grazing and other natural resources harvesting practices undertaken by local communities (Table 14). On the contrary *Quercus calliprinos* is observed with high dominance of juvenile and young trees which reflect the wood cutting practices either for household or for charcoal production which have been taking place in the forest.

The region calls for delineating stands for strict conservation, remediation and agro-sylvo-pastoral activities.

Table 14. Dominance of the different age categories of tree species and their corresponding mean BA and height in Mishmish.

Tree species	Categories	Dominance	Mean Basal Area	Height
Abies cilicica				
	90-150	25	180	9.5
	150-250	25	230	11
	250-350	50	267.5	11.65
Cedrus libani				
	150-250	20	200	22
	>350	80	360	20.86
Juniperus excelsa				
	<30	5.6	25	1.6
	30-90	5.6	120	4.15
	90-150	22.2	162.5	5.18
	150-250	27.8	194	5.70
	250-350	16.6	343.3	5.72
	>350	22.2	403.7	9.9
Juniperus foetidissima				
	<30	25	55	3
	30-90	25	60	3.40
	150-250	25	180	5.40
	150-350	25	200	6.60
Juniperus oxycedrus				
	<30	100	30	30
Malus trilobata				
	30-90	100	60	6
Quercus calliprinos				
	<30	28.57	32.38	3.07
	30-90	39.29	78.09	4.72
	90-150	14.29	135	4.33
	150-250	10.71	185.67	4.75
	250-350	7.14	140	7.5
Styrax officinalis				
	<30	25	45	2.5
	30-90	50	87.5	2.83
	90-150	25	168	3.4

The region is shelter to different Mediterranean Series: Series of *Quercus cerris* at low altitude, Series of *Cedrus libani* - *Abies cilicica*, Natural Series of *Quercus infectoria* [Facies of Pinus brutia] (Fig. 4). The *Quercus cerris* is observed at 4 locations in the country: Kfar zebiane, Ehmej, Fnaideq and Wadi Sirri. The largest surface area is the forest of Fnaideq where the understorey observed formed mainly by a mix of *Acantholimon sp.*, *Astragalus sp.*, *Galium sp.*, *Muscari sp.*, *Cephalanthera sp.*, *Sedum sp.* and *Viola sp.*

The highest dominance value has been recorded by Juniper (*Juniperus excelsa*), fir and Cedar at the high altitude in this forest (Table 15). The high percentage recorded for the Calabrian pine reflects the presence of pure pine stand located at lower altitude. Junipers (*Juniperus oxycedrus* and *J. foetidissima*) are found at lower percentage, these trees are found mixed with the main tree community composed of fir and Cedar.

Table 15. Dominance of tree species, the mean basal area, mean DBH and mean height in Qammoua

Region	Dominance [%]	Mean DBH	Mean BA	Mean Height
Qammoua				
J. excelsa	38.75	1.08	1.3	4.7
A. cilicica	21.05	1.8	1.73	10.36
Pinus brutia	18.7	0.74	0.98	6
C. libani	14.37	1.2	1.37	9.5
J. oxycedrus	1.91	0.3	0.57	2.3
J.foetidissima	1.91	0.53	0.76	3
Crataegus monogyna	0.47	-	-	-
Prunus ursina	0.95	0.3	0.37	2.3
Quercus calliprinos	0.95	0.3	0.38	4
Quercus cerris	0.47	0.2	0.3	4.5
Styrax officinalis	0.47	0.1	0.2	6
Quercus cerris stand				
Quercus cerris	98	0.97	1.22	12
Juniperus excelsa	4.2	0.37	0.55	3
Juniperus oxycedrus	2.1	0.27	0.4	2

Qammoua forest comprises different tree communities types. At lower altitude two forest communities are found with different age categories. The *Q. cerris* stand shows a homogenous age structure (Table 16) recording high dominance of young and mature trees. This reflects the past practices of wood logging in this areas and in Qammoua forest.

Table 16. Dominance of the different age categories of tree species and their corresponding mean basal area and height in Qammoua

Tree species	Categories	Dominance	Mean Basal Area	Height
Abies cilicica				
	30-90	15.9	89	6.65
	90-150	38.6	136.11	9.12
	150-250	29.54	208.46	13.44
	250-350	9.1	254.5	10.17
	>350	6.8	313.3	12.9
Cedrus libani				
	<30	3.33	240	7.2
	30-90	36.66	94.81	7.6
	150-250	33.33	126.9	8.62
	250-350	20	188.333	12.8
	>350	6.66	220	15.85
Juniperus excelsa				
	<30	16.86	35.81	2.83
	30-90	37.35	87.74	4.35
	90-150	18.07	139.86	5.41
	150-250	21.68	203.88	5.33
	250-350	4.82	297.5	6.73
	>350	1.2	450	10
Juniperus foetidissima				
	<30	25	60	2.5
	30-90	75	81.66	3.03
Juniperus oxycedrus				
	<30	60	40	2.05
	30-90	40	75	2.6
Pinus brutia				
	<30	46.15	37.5	2.55
	30-90	23.07	78.88	5.66
	90-150	15.38	152.16	8.41
	150-250	15.38	253.33	14.15
Prunus ursina				
	<30	50	30	2.15
	30-90	50	45	2.5
Quercus calliprinos				
	<30	50	20	3
	30-90	50	56	5.1
Quercus cerris				
	<30	6.38	33	3.36
	30-90	34.04	110.25	10.89
	90-150	57.44	136.25	13.54
	150-250	2.12	160	9.5
Styrax officinalis				
	<30	100	20	6

The low coverage of juvenile trees calls for the strict conservation of these remnant stands and urge the need to integrate the seedlings recruitment in the monitoring programme. The Calabrian pine community comprises different age categories revealing the dynamics taking place in the forests.
Other tree communities mainly formed of Cedar and fir harbor different age categories of both species. The candle shape observed for most of Cedar tree reflect the innate sense of local communities for sustainability.

III. AUTUMN COLLECTION

The autumn collection included the following plant species:
Viola odorata, *Primula vulgaris*, *Hypericum thymifolium* Banks & Sol, *Ruscus aculeatus* L., *Crataegus monogyna*, *Muscari parviflorum* Desf., *Crocus graveolens* Boiss. & Reuter, *Crocus aleppicus* Baker, *Crocus ochraleucus* Boiss. & Bl., *Colchicum steveni* Kunth., *Crocus cancellatus* Herb., *Crocus cancellatus* Herb. forma *damascenus* (Herb.) n. comb, *Crocus cancellatus* forma *cilicicus* (Ky.) n. comb., *Micromeria barbata* Boiss. & Ky., *Micromeria nervosa* (Desf.) Benth., *Origanum* sp., *Quercus calliprinos* Webb., *Dianthus orientalis* Adan. var. *brachyodontus* (Boiss. & Huet.) Bornm., *Silene juncea* Sibth. & Smith. var. *pallida* Boiss., *Bellis perennis* L., *Erodium acaule* (L.) Bech. & Thell., *Achillea* sp., *Parietaria judaica* L., *Centaurea* sp.

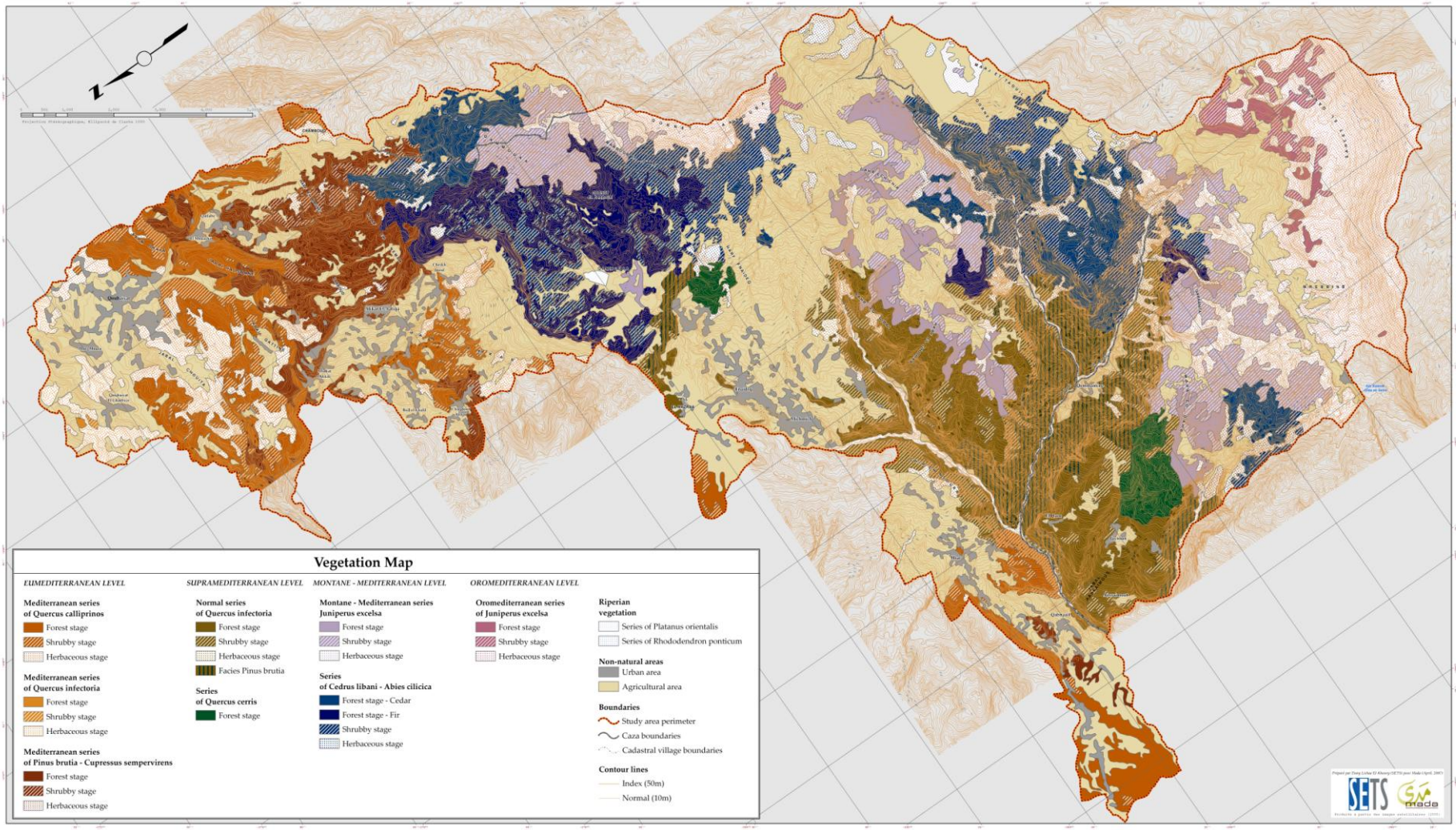

Fig. 4. Vegetation map of the Study area [Important spots]

IV. PRELIMINARY VOCATIONAL MAP: PROPOSED RULES OF CONDUCTS & SERVICES

The decisions on land management and natural resource conservation taken in partnership with local communities showed in general a harmony with the categorization developed by MADA team of experts (Fig. 5) for Mishmish, Hrar, Qabait and Qemmamine.

A preliminary set of rules of conducts are proposed below for each category. These will be discussed at a later stage with municipalities and local and national partners.

1. **Conservation and adaptive management**
    a. Species and habitat management
    b. Hiking and bird watching
    c. Controlled human development in specific site with low sensitivity and high resilience degree

2. **Remediation**
    a. Strict conservation for defined period for natural restoration process and remediation of ecological dynamics and succession
    b. No human activities and development for defined period. Controlled human development is allowed only in site which gained a certain degree of resilience.
    c. Environmental Standards to be adopted for development initiatives

3. **Agro-sylvo-pastoral**
    a. Perform reforestation activities using native tree species with economic potential
    b. Development project must conform with environmental standards (among which EIA and SEA)
    c. Controlled grazing and wood cutting4

4. **Agricultural**
    a. Sustainable agriculture through the promotion of organic farming and products certification
    b. Authorized construction and development projects These activities should abide strictly by the environmental standards (among which EIA and SEA).

5. **Urban Development**
    a. Rules for construction.
    b. Buffer zones will be delimited between forest and villages where construction and development projects are executed.

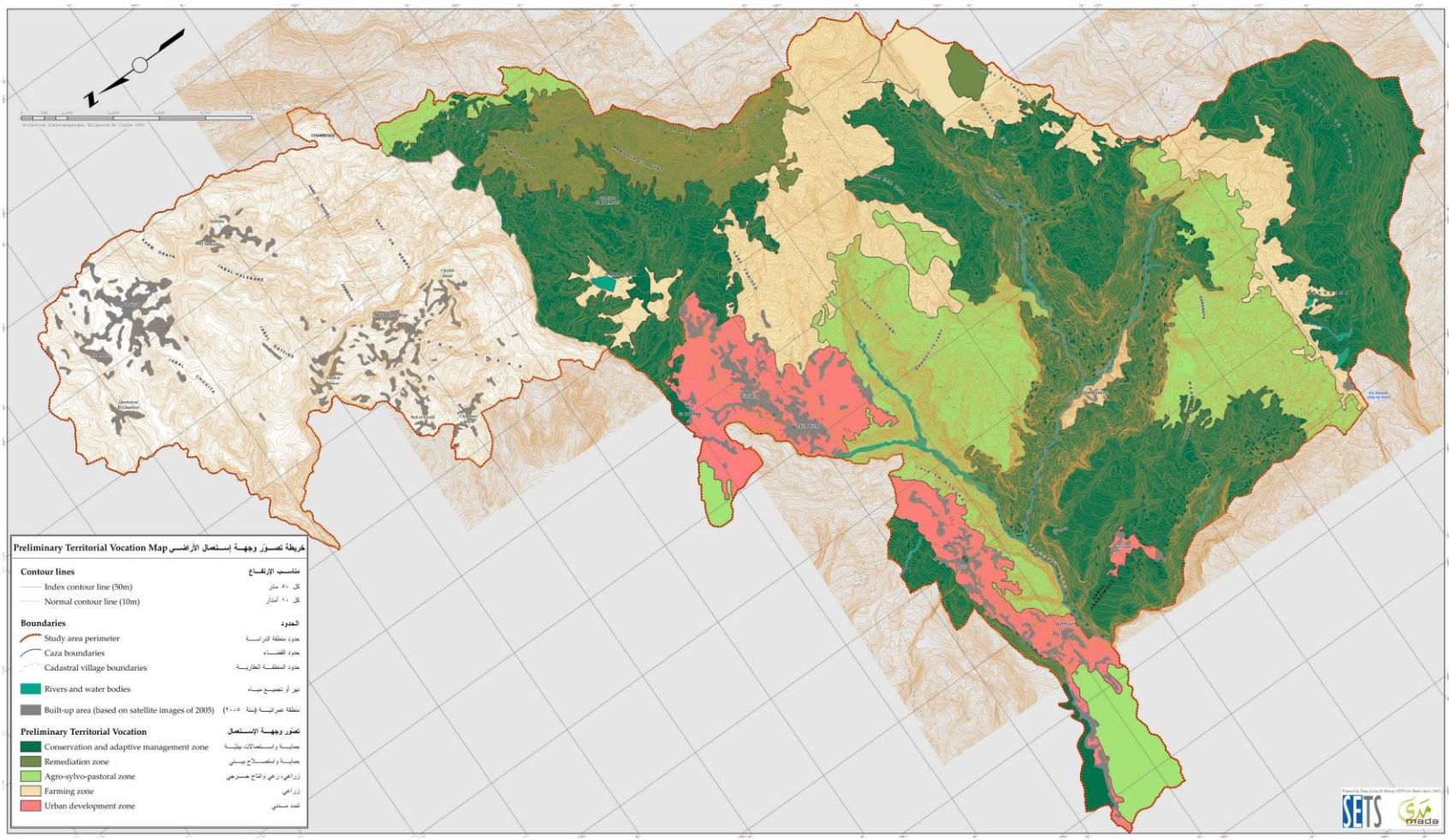

Fig. 5. Habitat conservation and management and Land use categories

V. SNAPSHOTS ON FOREST USES

Participatory appraisals with local communities showed an important relationship created over the decades with forest. The collection of Non-Timber Forest Products (NTFPs) included medicinal and aromatic plants, stumped wood, mushrooms. On the other hand the region has been subject to wide range of disturbances including human activities such as intensive grazing, wood cutting and resin production; and natural disasters such as fire and erosion.

Table 17. Forest type, threats and land uses

Region	Type	Land uses	Threats
Qammoua	Mixed Cedar,fir and Juniper Pure Quercus cedrorum	Forest and agriculture	Grazing Wood cutting/Hunting
Mishmish	Mixed Cedar, fir, juniper	Forest, pasture and agricultural terraces	Grazing/Hunting
Hrar	Dominance of brutian pine	Forest [Charcoal production]	Grazing/wood cutting/fire/Hunting
Qemmamine	Mosaic patches of mixed and pure vegetation	Forest [Charcoal production]	Wood cutting/fire/Hunting
Jayroune	Mixed forest	Forest [Charcoal production]	Wood cutting/fire/Hunting

PARAMETER AND NEW MEASUREMENT TO BE CONSIDERED FOR NEXT YEAR

The database built during the first phase of the project has given a basic background information on the ecological profile of the suty areas in Akkar and Donnieh regions. Even though the implementation of the methodology developed and techniques required have been faced by few gaps in technical skills of the field assistants and local technicians, the knowledge gathered and database acquired have been sufficient enough to launch the 1st year monitoring programme. In the designed programme, the following will be considered:

- Cedar regeneration process will be integrated in the monitoring programme
- New stand will be considered next year monitoring programme for the age structure
- New stands will be considered next year for the completion of the checklist
- The frequency of important plant species must be studied at a later stage
- Predictive maps to define location of rare and endangered plant species
- Spatial analysis to define indicator species

The budget constraints for the development of predictive mapping and performing spatial analysis on the data collected have induced change in the direction of part of the monitoring programme which aimed at the monitoring of selected, rare ad important species.

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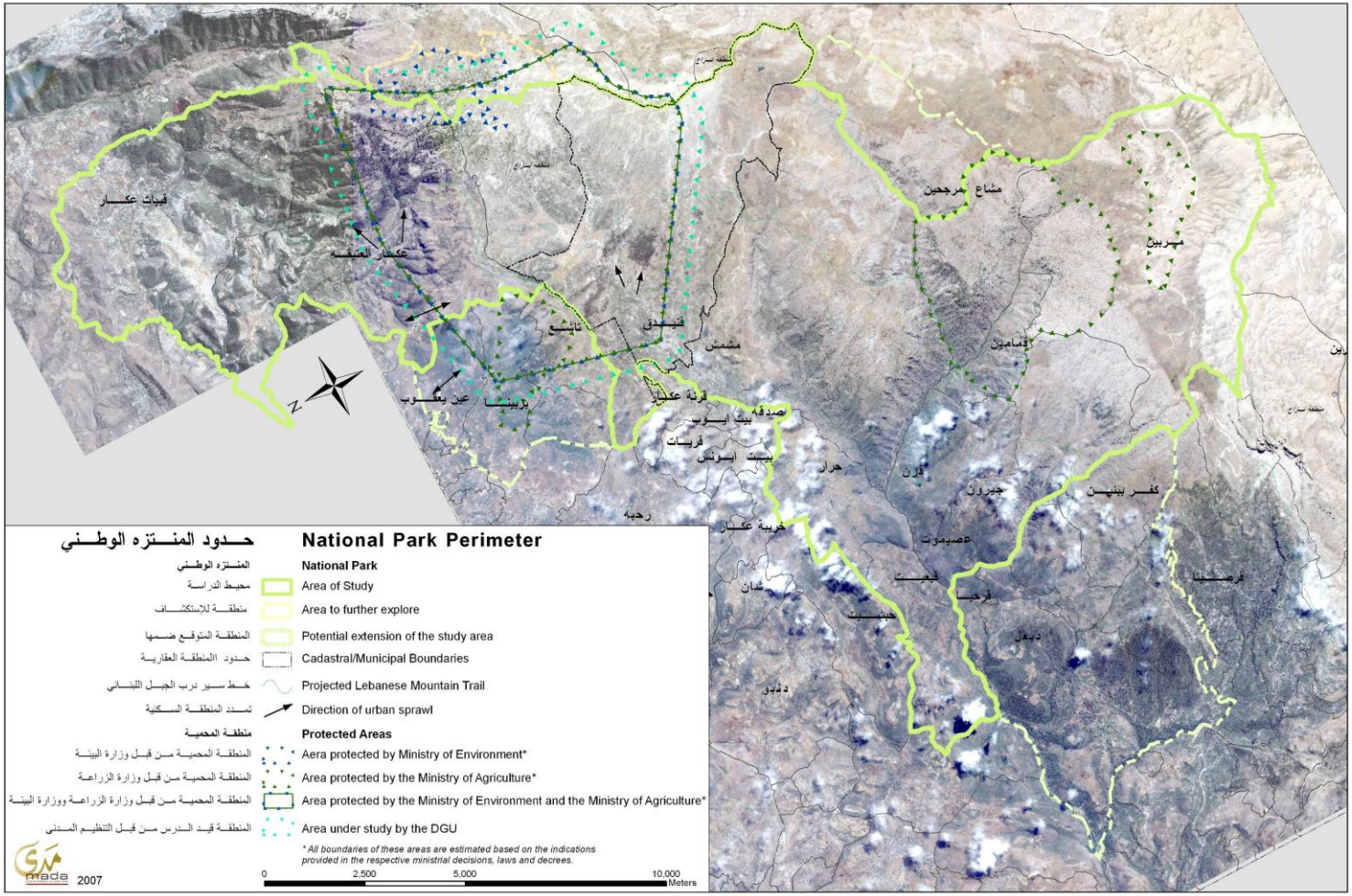
Annex 1. Perimeter of the study area



Annex 2. Survey form for permanent quadrats (Plant checklist and diversity indices)

Date:	**Name:**
Affiliation: Mada NGO	**Address:**
Phone:	**E-mail:**
Sheet Reference:	

SITE DESCRIPTION

Region	☐ Hrar ☐ Qobayet ☐ Qammoua ☐ Qabait ☐ Mishmish ☐ Qemmamine ☐ Jayroune			
Sub-region: **Land ownership**	☐ _____ ☐ Common land ☐ Private ☐ Waqf			
Quadrat Nb. & Code :			**Altitude**	
Longitude	°	’	**Weather**	
Latitude	°	’	**Soil sample NB & Code**	

Habitat Description

Topography			
☐ Valley bottom	☐ Mountain peak	☐ Bedrocks	☐ Hedges
☐ Slopes	☐ Water courses	☐ Cliff rocks	☐ Others
Land Use/land cover			
☐ Dense forest	☐ Open forest	☐ Shrubland	☐ Abandoned lands
☐ Medium veg. cover	☐ Low veg. cover	☐ Agriculture lands	☐ Others
Evidence of disturbances			
☐ Mammals ☐ Grazing	☐ Domestic animals ☐ Ethnobotanical usage	☐ Agro-chemical ☐ Others	☐ Recreational activities

Plant specimens code & Nb	**Flower Color**	**Odor**	**Common name**	**Distribution**	**Notes**
				☐ Patchy ☐ Pure stands ☐ Uniformed/mixed	
				☐ Patchy ☐ Pure stands ☐ Uniformed/mixed	

Surveillance
Observed plant’s invasiveness:
Health: Insects and others
Natural heritage/cultural sites (Caves, Gouffre, etc.)

Annex 3. Survey form for forest structure and composition

Date:	**Name:**
Affiliation:	**Address:**
Phone:	**E-mail:**
Sheet Reference:	**Transect Nb:**
Quadrat Nb:	

SITE DESCRIPTION

Region	□ Hrar □ Qobayat □ Qammoua □ Qabait □ Mishmish □ Qemmamine □ Jayroune □ Other			
Sub-region: **Land ownership**	□ _____ □ Common land □ Private □ Waqf			
Surface of quadrat:			**Altitude**	
Longitude	°	'	**Weather**	
Latitude	°	'	**Soil sample NB & Code**	

HABITAT DESCRIPTION

Topography			
□ Valley	□ Mountain peaks	□ Bedrocks	□ Hedges
□ Slopes	□ Water courses	□ Rock cliffs	□ Others
Land Use/land cover			
□ Dense forest	□ Open forest	□ Scrubland	□ Abandoned lands
□ Medium veg. cover	□ Low veg. cover	□ Agriculture lands	□ Others
Evidence of disturbances			
□ Mammals □ Grazing	□ Domestic animals □ Ethnobotanical usage	□ Agro-chemical □ Others	□ Recreational activities

ASSOCIATION OF VEGETATION PROFILE (QUADRANT 1,2,3, AND 4: CLOCKWISE)

Quadrat	Plant name*	Dominance	Number of Individual plants	Distribution
				□ Patchy □ Pure stands □ Uniformed/mixed
				□ Patchy □ Pure stands □ Uniformed/mixed
				□ Patchy □ Pure stands □ Uniformed/mixed
				□ Patchy □ Pure stands □ Uniformed/mixed

*** Or Code & Nb of specimens**

AGE STRUCTURE

Tree name	Shape	Status	DBH (cm)	Basal Area (cm)	Distance** (m)	Distance	Angle

**** Tree mapping from central point**

ADDITIONAL NOTES:

Observed plant's invasiveness:
Health: Insects and others
Natural heritage/cultural sites (Caves, Gouffre, etc.)

Annex 4. Plants found in the Akkar and Donnieh areas.

Latin name	Common Name		
	English	**French**	**Arabic**
Acanthaceae			
Acantholimon antilibanoticum Mout.	Anti-lebanon prickly thrift	Acantholimon de l'Anti-Liban	Ghumlul al silsila al sharkia
Acantholimon libanoticum Boiss.	Lebanon prickly thrift	Acantholimon du Liban	Ghumlul lubnani
Sapindaceae			
Acer hermoneum Bornm & Schwer	Hermon maple	Erable de l'Hermon	Qayqab haramun
Acer syriacum Boiss & Gaill	Syrian Maple	Erable de Syrie	Qayqab suri
Amaryllidaceae			
Ixiolorion tataricum	Siberia lily/mountain lily	Ixiolire de Tartarie	Zanbaq titiri
Anacardiaceae			
Pistaceae palaestina Boiss	Palestine pistachio	Pistachier de Palestine	Butm
Araceae			
Arum sp.	Arum	Gouet	Luf
Aristolochiaceae			
Aristolochia altissima Desf.	Tall birthwort	Aristoloche elevee	Zarawand shahiq
Aristolochia billardieri Jaub & Spach	Labillardiere's birthwort	Aristoloche de Labillardiere	Zarawand Labillardiere
Aristolochia cordata	-	-	-
Arrhenatherum palaestinum Boiss.	-	-	-
Asteracea			
Achillea millefolium L.	-	-	-
Centaurea iberica Trev.	Iberian knapweed	Centauree d'Iberie	Qanturyun Iberia
Achillea biebersteinii Afan	Bieberstein's milfoil	Achillee de Bieberstein	Zaqzaqah al-usfur
Achillea conferta DC. (Check again)	-	-	-
Achillea falcate L.	Falcate milfoil	Achillee falcifrome	Qaysun
Anthemis blancheana Boiss.	-	-	-
Anthemis chia L.	Chian Chamomile	Anthemis de Chio	Bahar Chios

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Asteracea			
Anthemis cretica L.	Cretan Chamomile	Anthemis de Crete	Bahar Krit
Anthemis sp.			
Anthemis tinctoria L.	Dyer's Chamomile	Oeil de boeuf	Babunij Asfar
Anthemis tinctoria L. var. discoidea (All.) Vahl.	-	-	-
Bellis sylvestris Cyrillo.	Southern daisy	Paquerette sylvestre	Billis haraji
Bellis perennis L.			
Carduus argentatus L.	Silvery plumed-thistle	Chardon argente	Khirfash
Carlina involucrata Poiret.	Involucrate carline-thistle	Carline a involucre	Qunabiyyah,zand al-abd
Carlina involucrata Poiret ssp. Libanotica	-	-	-
Centaurea axilaris var.cana Berget & Wahlenb	-	-	-
Centaurea calciptrapa L.	Red star thistle	Centauree chausse-trape	Murrar
Centaurea cheirolopha (Fenzl.) Wagenitz.	Palmate-pappused knapweed	Centauree a aigrette palmee	Qanturyun kaffi al-qunzu'ah
Centaurea iberica Trev. var. meryonis	-	-	-
Centaurea speciosa Boiss	Showy knapweed	Centauree remarquable	Qantaryun bahi
Centaurea triumfetti All.	Trionfetti's knapweed	Centauree de Trionfetti	Qanturyun trionfetti
Centaurea cyanoides Berg. & Wah.	Syrian cornflower	Centauree faux-bleuet	Shabbah
Chardinia xeranthimoides	-	-	-
Cirsium diacantha Labill.	-	-	-
Cirsium lappaceum (M.B.) Fisch var. hermonis Boiss.	Bur thistle	Cirse fausse bardane	Quswan arqityuni
Cousinia libanotica DC.*	Lebanon cousinia	Cousinie du Liban	Kuzinyah lubnaniyyah
Crepis reuteriana Boiss.	Reuter's hawkweed	Crepide de Reuter	Saraghah Reuter
Crupina crupinastrum (Moris) Vis	False saw-wort	Crupine fausse-crupine	Zahhafah zahhafiyyah

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Asteracea			
Dittrichia sp.	-	-	-
Doronicum orientale Hoffm	Oriental leopard's bane	Doronic d'Orient	Darawnaq sharqi
Echinops polyceras	Many-horned globe thistle	Echinope a nombreuses cornes	Qarqafan muta'addid al-qurun
Echinops viscosus DC.	Viscous globe thistle	Echinope visqueux	Qarqafan lazij
Helichrysum plicatum DC.	Folded everlasting	Imortelle plissee	Khalidah muntawiyah
Helichrysum virgineum DC. *	White everlasting	Immortelle blanche	Khalidah bayda'
Helichrysum plicatum DC. subsp. Plicatum	-	-	-
Helichrysum sanguineum (L.) Kostel	Blood-red everlasting	Immortelle sanguine	Khalidad moudammah
Lactuca serriola L.	Prickly lettuce	Scariole	Khass al-zayt
Lapsana communis L.	Common nipplewort	Lampsane commune	Khafaj sha'i
Onopordum illyricum subsp. cardunculus	-	-	-
Pallenis spinosa (L.) Cass.	Spiny pallenis	Pallenide epineuse	Bakhur maryam
Phagnalon rupestre (L.) DC.	African fleabane	Phagnalon des roches	Sufan al-sukhur
Ptilostemon chamaepeuce (L.) Less	Shrubby ptilostemon	Ptilestemon petit-pin	Sanawbar al-'ard
Reichardia macrophyllum	-	-	-
Rhagadiolus stelaltus (L.) Willd.	Stellate hawkbit	Rhagadiole etoile	Ibrah al-ajuz
Steptorhampus tuberosus (Jacq.) Grossh.**	Tuberous steptorhampus	Steptorhamphe tubereux	Stibturamfus 'usquli
Scorzonera jacquiniana (W. Koch.) Boiss.	-	-	-
Scariola orientalis (Boiss.) Sojak.	Oriental scariola	Scariole D'Orient	-
Scolymus hispanicus L.			
Scorzonera cana (C. A. Meyer) Hoffm.var. alpina (Boiss) Chamberlain	-	-	-

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Asteracea			
Scorzonera capitata	-	-	-
Scorzonera mollis M. Bieb.	Wave-eaved viper's-grass	Scorzonere a nervures saillantes	Rubahlah
Scorzonera rigida Aucher	-	-	-
Senecio mouterdei Arenes*	Mouterde's groundsel	Senecon de Mouterde	Sharunah mouterde
Serratula pusila (Lab.) Dittrich	Dwarf saw-wort	Serratule naine	Warkhah qazimah
Sonchus oleraceus L.	Common sow-thistle	Lait-d'ane	Libbayn
Tanacetum cilicium (Boiss.) Grierson	Cilician tansy	Tanaisie de Cilicie	Tanasitum kilikya
Taraxacum officinale Wigg.	Common dandelion	Pissenlit officinal	Tarakhshaqun makhzani
Tragopogon longirostris L.	Long-beaked goat's beard	Salsifis a long bec	Salsafil tawil al-minqar
Tussilago farfara L.	Cotsfoot	Pas-d'ane	Hashishah al-su'al
Urospermum picroides (L.) F. W. Schmidt	Prickly-cupped goat's-beared	Urosperme fausse-picride	Salis
Xeranthemum inapterum (L.) Mill.	Closed xeranthemum	Xerantheme ferme	Hanwah mughlaqah
Xeranthemum longipapposum Fisch. & Mey.	Long-pappused xeranthemum	Xerantheme a longues aigrettes	Hanwah tawil al-qanazi'
Balanophoraceae			
Cytinus hypocistis L. ssp. Orientalis Wettst	Rape of cistus	Cytinelle hypociste	Dhu'luq al-ladhan
Berberidaceae			
Berberis libanotica Ehren. *	Lebanon barberry	Berberis du Liban	Barbris lubnani
Boraginaceae			
Anchusa strigosa Labill.	Strigose bugloss	Buglosse a poils rudes	Gharghir
Cynoglossum nerbodense Guss.	Monti Nebrodi hound's-tongue	Cynoglosee des Monts Nebrodes	Lisan al-kalb al-nibrudi
Myosotis ramosissima Rochel	Branching forget-me-not	Myosotis rameux	-
Brassicaceae			
Aethionema cordifolium DC.	Lebanon candy tuft	Aethioneme a feuilles de coris	-

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Brassicaceae			
Alyssum murale Waldst & Kit	Wall madwort	Alysson des murailles	-
Clypeola jonthlaspi L.	Disk-cress/buckler mustard	Clypeole jonthlaspi	Turays qursi
Coluteocarpus vesicarius (L.) [R]	Bladder coluteocarpus	Coluteocarpe vesiculeux	-
Erysimum goniocaulon Boiss.	Angle-stemmed erysimum	Erysimum a tige anguleuse	Arisimum zawi al-saq
Erysimum scabrum DC.	Rugged erysimum	Erysimum scabre	Arisimum ahrash
Fibigia clypeata (L.) Medik	Shield fibigia	Fibigie en bouclier	Fibijyah tursiyyah
Fibigia eriocarpa (D.C) Boiss	Woolly-fruited fibigia	Fibigie a fruit laineux	Fibijyah sufiyyah al-thamar
Hesperis kotschyana Fenzl.	Kotschy's dame's-violet	Julienne de Kotschy	Masa'iyyah kotschy
Aubrietia libanotica Boiss. *	Lebanon aubrietia	Aubrietie du Liban	Ubriyityah lubnaniyyah
Thlaspi microstylum Boiss.	Small-styled penny-cress	Tabouret a petit style	Thlasbi saghir al-qalam
Caesalpiniaceae			
Ceratonia siliqua L.	Carob	Carroubier	Kharnub
Cercis siliquastrum L.	Judas tree	Arbre de Judee	Zamzariq
Campanulaceae			
Campanula rapunculus L.	Rampion	Campanule raiponce	Lift barri
Campanula retrorsa Labill	Retrose bellflower	Campanule retrose	Jurays munqaleb
Campanula stricta L.	Upright bellflower	Campanule raide	Jurays qa'im
Michauxia campanuloides L'Her	Rough leaved michauxia	Michauxie fausse-campanule	Mishuksyah juraysiyyah
Podanthum virgatum (Labill.) Boiss.	-	-	-
Specularia pentagonia (L.) A. DC.	-	-	-
Capparaceae			
Capparis spinosa L.	Spiny caper	Caprier epineux	Kabar sha'ik
Caprifoliaceae			
Lonicera nummularifolia Jaub. & Sp.	Nummular-leaved honeysuckle	Chevrefeuille a feuilles nummulaires	Lunisirah naqdiyyah al-waraq

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Caryophyllaceae			
Melandrium album (Mill.) Garcke	-	-	-
Agrostema githago L.	Batard nigella	Nielle de bles	Khurram al-hintah
Alsine globulosa (Labill.) Halacs.	-	-	-
Alsine meyeri Boiss.	-	-	-
Alsine tenuifolia (L.) Crantz.	-	-	-
Arenaria pubescens D'Urv.	Sandwort	Sabline	Ramliyyah
Cerastium anomalum Waldst & Kit	Mouse-ear-chickweed	Ceraiste	Qarna
Cerastium dichotomum L.	Dichotomous Mouse-ear-chickweed	Ceraiste dichotome	Qarna thuna'iyyah al-tasha'ub
Dianthus tripunctatus Sibth. & Sm.	Three-spotted pink	Oeillet a trios taches	Qaranful thulathi al-buqa
Dianthus orientalis Adan. Var. Brachyodontus (Boiss. & Huet.) Borne.	Oeillet d'Orient	Oriental pink	Qaranful sharqi
Queria hispanica L.	-	-	-
Silene aegyptica (L.) F.	Egyptian catchfly	Silene d'Egypte	Bzaz al-kalbah
Silene venosa (Gilib.) Aschers.	-	-	-
Silene italica (L.) Pers.	Italian catchfly	Silene d'Italie	Silinah italiyyah
Silene juncea Sibth. & Smith. var. pallida Boiss.	Rushy catchfly	Silene faux-jonc	Silinah asaliyyah
Amaranthaceae			
Noaea mucronata (Forsk.) Asch	Thorny saltwort	Noea mucronee	Dirr/Shawk el hanash
Noaea mucronata Asch var. Humilis Boiss.	-	-	-
Nonea caspica melanocarpa	Caspian sea nonea	Nonnee de la Caspienne	Nuniyah qazqiniyyah
Cistaceae			
Cistus creticus	Cretan cistus	Ciste de Crete	Ladhan
Fumana arabica (L.) Spach.	Fumitory	Fumeterre	Riz al dajaj

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Cistaceae			
Helianthemum nummularium (L.) Mill.	Common sunrose	Heliantheme commun	Madahin naqdi
Helianthemum nummularium (L.) Mill ssp. vulgare	-	-	-
Helianthemum vulgare	-	-	-
Convolvulaceae			
Convolvulus arvensis L.	Field bindweed	Liseron des champs	Lablab al-huqul
Convolvulus cantabrica L.	Flax-leaved bindweed	Liseron de Biscaye	Lablab qantabri
Crassulaceae			
Cotyledon libanotica Labill.	-	-	-
Sedum album L.	White stonecrop	Orpin blanc	Hayyun abyad
Sedum assyriacum Boiss.	Assyrian stonecrop	Orpin d'Assyrie	Hayyun ashuri
Sedum hispanicum L.	-	-	-
Sedum laconicum Boiss. & Heldr.	Laconian stonecrop	Orpin de Laconie	Hayyun Laconia
Sedum palaestinum Boiss.	Palestine stonecrop	Orpin de Palestine	Hayyun filastini
Sedum teniufolium (Sibth. & Smith) D.C	Slender-leaved stonecrop	Orpin a feuilles tenues	Hayyun nahil al-waraq
Umbillicus intermedius Boiss.	Intermediate navelwort	Ombilic intermediaire	Surrah mutawassitah
Cucurbitaceae			
Bryonia multiflora Boiss. & Heldr.	Many flowered bryony	Bryone multiflore	Fashira kathirah al-zahr
Cupressaceae			
Arceuthos drupacea (Labill.) Ant & Ky	Drupe-bearing arceuthos	Genevrier a fruits charnus	Dafran nawawi
Juniperus excelsa M.B	Oriental savin/Grecian juniper	Genevrier eleve	Lizzab
Juniperus foetidissima Willd.	Fetid juniper	Genevrier fetide	Ara'r natin
Juniperus oxycedrus L.	Prickly juniper	Genevrier oxycedre/cadier	Dafran

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Cyperaceae			
Carex flacca Schreb.	Glaucus sedge	Langue de pie	Su'ada mutarrahhil
Dipsacaceae			
Cephalaria joppica (Spreng.) Beg.	Giant scabious	Cephalaire	Siwan
Morina persica L.	Persian whorlflower	Morine de Perse	Murinah farisiyyah
Scabiosa argentea L.	Silvery scabious	Scabieuse argentee	Jarabiyyah fiddiyyah
Scabiosa ochraleuca L.	-	-	-
Scabiosa palaestina L.	Palestine scabious	Scabieuse de Palestine	Dulab al-hawa
Dioscoreaceae			
Tamus communis L.	Common black-bryony	Tamier commun	Fasharshin sha'i
Ericaceae			
Arbutus andrachne L.	Oriental strawberry-tree	Arbousier d'Orient	Qatlab uthkuli/Ajdarkhan
Euphorbiaceae			
Andrachne telephioides L.	Bastard orpine	Andrachne faux-telephium	Kimash
Euphorbia macroclada Boiss.	Large-branched spruge	Euphorbe a grand rameaux	Farbayun kabir al-suq
Fabaceae			
Astragalus angulosus DC. *	Angular milk-vetch	Astragale anguleux	Astaragalus zawi
Astragalus cruentiflorus Boiss. *	Red-flowered milk-vetch	Astragale a fleurs rouges	Asaraghalus mudamma al-zahr
Astragalus dictyocarpus Boiss. *	Netted-fruited milk-vetch	Astragale a fruits reticules	Astaraghalus shabaki al-thamar
Astragalus gummifer Labill.	Gum milk-vetch	Astragale herisse	Astaraghalus azabb
Astragalus hermoneus Boiss. *	Hermon milk-vetch	Astragale de l'Hermon	Astaraghalus haramun
Astragalus kurnet-es-sauda Eig. *	Qornet-es-sawda milk-vetch	Astragale de Qornet-es-saouda	Astaraghalus al-qurnah al-sawda
Astragalus rousseanus Boiss.	Rousseau's milk-vetch	Astragale de Rousseau	Astaraghalus rousseau
Astragalus schizopterus Boiss. (??)	Cut-winged milk-vetch	Astragale a ailes fendues	Astaraghalus mashquq al-ajnihah
Astragalus sofarensis Thiebaut *	Sawfar milk-vetch	Astragale de Sofar	Astaraghalus sawfar
Calycotome villosa (Poir.) Link	Hairy thorny-broom	Genet epineux	Qundawl wabir

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	French	Arabic
Fabaceae			
Coronilla emeroides Boiss. & Brun.	Scorpion-vetch/false senna	Coronille faux-emerus	Ukaylil amarusi
Coronilla varia L. subsp. libanotica Boiss.	Variegated crown-vetch	Coronilla bigarree	Ukaylil mubarqash
Ervum lenticula (Schreb.) Alef.	-	-	-
Hymenocarpus circinatus L.	Circular medik	Hymenocarpe boucle	-
Lathyrus aphaca L.	Yellow vetchling	Pois de serpent	Hamam al-burj
Lathyrus setifolius L.	-	-	-
Lathyrus variabilis (Boiss. & Ky.)	-	-	-
Lotus corniculatus L. var. alpinus (Scheich) Boiss.	Horned birdsfoot-trefoil	Pied de poule	Qarn al-ghazal
Lotus cytisoides L.	Downy birdsfoot-trefoil	Lotier faux-cyste	Lutus lazzani
Lotus gebelia Vent.	Gebelia birdsfoot-trefoil	Lotier gebelia	Jabbaliyyah
Medicago hispida Gaertn	Bur clover	Luzerne hispide	Fissah qasiyah al-wabar
Medicago lupulina L.	Nonesuch/black medik	Minette	Fissah junjuliyyah
Medicago orbicularis Bartal.	Flat-podded medik	Luzerne orbiculaire	Khubz al rai'
Medicago sativa L.	Alfalfa/lucerne	Luzerne cultivee/alfalfa	Qutat/Barsim hijazi
Ononis natrix L.	Shrubby restharrow	Coquesigrue	Lissayq/littayn
Trifolium arvense L.	Hare's foot trefoil	Patte des lievres	Nafal al-huqul
Trifolium campestre Schreb.	Hop trefoil	Trefle champetre	Nafal haqli
Trifolium clusii	Clusius' clover	Trefle de Clusius	Nafal Clusius
Trifolium clypeatum L.	Helmet clover	Trefle en bouclier	Bzaz al-baqra
Trifolium formosum D'Urv.	Handsome clover	Trefle elegant	Nafal jamil
Trifolium globosum L.	-	-	-
Trifolium lappaceum L.	Bur trefoil	Trefle fausse bardane	Nafal 'arqityuni
Trifolium physodes Stev.	Bladder clover	Trefle vesiculeux	Nafal mathani

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Fabaceae			
Trifolium pilulare Boiss.	Ball cotton clover	Nafal habbani	Nafal habbani
Trifolium purpureum Loisel	Purple clover	Trefle pourpre	Abu dalabish
Trifolium repens L.	White clover	Trefle rampant	Nafal zahif
Trifolium resupinatum L.	Reversed clover	Trefle renverse	Nafal munqalib
Trifolium scabrum L.	Rugged clover	Trefle scabre	Nafal ahrash
Trifolium stellatum L.	Stellate clover	Trefle etoile	Nafal najmi
Trifolium tomentosum L.	Tomentose clover	Trefle tomenteux	Nafal libdi
Fagaceae			
Quercus calliprinos Webb.	Kermes oak	Chene kermes	Sindyan
Quercus cedrorum (Ky) S. DC.	Cedar oak	Chene de cedres	Ballut al-arz
Quercus cerris L.	Turkey oak	Chene chevelu	Likk/'izr/ballut ash'ar
Quercus infectoria Oliv.	Cyprus oak	Chene tinctorial	Mallul, 'afs
Quercus ithaburensis (Decne) Boiss. (??)	Tabor oak	Chene de Thabor	Ballut rumi
Quercus libani Oliv.	-	-	-
Ranunculaceae			
Corydalis rutifolia Sibth & Sim	Rue-leaved corydalis	Corydale a feuilles rue	Qubbariyyah sadhabiyyah al-waraq
Corydalis solida (Ehrh.) Swartz.	Solid corydalis	Corydale solide	Qubbariyyah mali'ah
Gentianaceae			
Centaurium pulchellum (Sw.) Druce	Pretty centaury	Petite centauree gracieuse	Qantaraniyyah
Erodium romanum (Burm. F.) L'Her.	-	-	-
Erodium acaule (L.) Bech. & Tell	Stemless stork's-bill	Bec-de-grue acaule	Jizab lasaqi
Erodium cicutarium (L.) L'Her.	Hemlock stork's-bill	Bec-de-grue commun	Dardar
Geranium libani Davis	Lebanon geranium	Geranium du Liban	Ghurnuqi lubnan
Geranium libanoticum Schenk*	Lebanese geranium	Geranium libanais	Ghurnuqi lubnani
Geranium purpureum Vill.			

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Poaceae			
Avena sterilis L.	Wild oat	Folle avoine	Shufan 'aqim
Aegilops ovata L.	Ovate goat-grass	Egilope ovalke	Sha'ir iblis
Aegilops peregrine (Hack.) Maire & Weiller.	Foreign goat-grass	Egilope voyageur	Dawsar rahhal
Aegilops variabilis Eig.	-	-	-
Brachypodium distachyum (L.) Beauv.	-	-	-
Briza maxima L.	Great quaking-grass	Grande brize	Quffah al-shaykh
Bromus arenarius	-	-	-
Bromus arvensis L.	Field brome	Brome des champs	Alafiyyah
Bromus brachystachys Hornung.	Short-spiked brome	Brome a epi court	Thurghul qasir al-sunbulah
Bromus erectus Huds.	-	-	-
Bromus palaestinus Melderis.	Palestine brome	Brome de Palestine	Thurghul filastini
Bromus rigidus Roth.	Rigid brome	Brome raide	Thurghul qas
Bromus squarrosus L.	Open-awned brome	Brome squarreux	Thurghul qa'im al-nutu'
Bromus sterilis L.	Barren brome	Brome sterile	Thurghul 'aqim
Cynosurus echinatus L.	Rough dog's-tail	Cynosure a piquants	Sahir muqanfadh
Cynosurus effuses Link.	Spreading dog's-tail	Cynosure etale	Sahir munbasit
Dactylis glomerata L.	Rough cock's-foot	Dactyle aglomere	Thayyil 'umran
Festuca ovina L.	-	-	-
Heteranthelium piliferum (Russ.) Hochst.	Hairy heteranthelium	Heteranthele piliforme	Hitiranthilyum wabir
Hordeum bulbosum L.	Bulbous barley	Orge bulbeuse	Sha'ir basali
Lagurus ovatus L.	Ovate hare's-tail	Lagure ovale	Dhayl al-arnab al-baydi
Lolium multiflorum Gaud.	Many-flowered ray-grass	Ivraie vivace	Zuwan mu'ammar
Lycochloa avenacea Sam.	Oat-like lycochloa	Lycochloa fausse-avoine	Dhi'biyyah shufaniyyah
Melica angustifolia Bl. & Boiss.	Narrow-leaved melick	Melique a feuilles etroites	Maliqa dayyiqah al-waraq

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Poaceae			
Melica ciliata L.	Ciliate melick	Melique ciliee	Maliqah muhaddadah
Oryzopsis holciformis (M.B.) Hack.	Large-flowered mountain-rice	Oryzopsis fausse-houlque	Aruzziyah hulqusiyyah
Phleum arenarium L.	Sand timothy	Phleole des sables	Asawiyyah ramliyyah
Phleum montanum C. Koch.	Mountain timothy	Phleole des montagnes	Asawiyyah jabaliyyah
Poa bulbosa L.	Bulbous meadow-grass	Paturin bulbeux	Tiff madghut
Poa persica Trin.	Persian meadow-grass	Paturin de Perse	Tiff farisi
Puccinelia distans (L.) Parl.	-	-	-
Scleropoa rigida (L.) Grisch.	-	-	-
Stipa fontanesii Parl.	Desfontaines' feather grass	Stipe de Desfontaines	Halfa' Desfontianes
Hypericaceae			
Hypericum lanuginosum	Woolly St John's-wort	Millepertius laineux	'Ushbah al-jurh
Hypericum nanum Poiret var. prostratum Boiss.	Dwarf St Jonh's-wort	Millepertius nain	Dadhi qazim
Hypericum perforatum L.	Common St Jonh's-wort	Herbe a mille trous	Hashishah al-qalb
Hypericum thymifolium Banks & Sol	Thyme-leaved St Jonh's-wort	Millepertius a feuille de thym	Dadhi sa'tari al-waraq
Hydrocharitaceae			
Smyrnium olusatrum L.	Common alexanders	Maceron cultive	Karafs barri
Iridaceae			
Iris sp.	Iris	Iris	Sawsan
Romulea nivalis (Boiss & Ky.) Klatt *	Snow romulea	Romulee des neiges	Rumuliyah al-thuluj
Iridaceae			
Gladiolus segetum Ker-Gawler	Field gladiolus	Glaieul des moissons	Urf al-diq
Crocus graveolens Boiss. & Reuter	Heavy scented crocus	Crocus a odeur forte	Za'faran shabaki

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Iridaceae			
Crocus aleppicus Baker	Aleppo crocus	Crocus d'Alep	Za'faran halab
Crocus ochraleucus Boiss. & Bl.	Cream-colored crocus	Crocus blanc jaunatre	Hursannin
Crocus cancellatus Herb. Forma damascenus (Herb.) n. comb.	Netted crocus	Crocus en treillis	Za'faran shabaki
Crocus cancellatus forma cilicicus (Ky.) n. comb.	Netted crocus	Crocus en treillis	Za'faran shabaki
Lamiaceae			
Ajuga tridactylis Ging. Ex Ben.	Three-ingered bugle	Bugle a tríos doigts	'Arsaf thulathi al-'asabi'
Calamintha vulgaris (L.) Druce	Wild basil	Calament commun	Kalamintah mabdhulah
Lamium truncatum Boiss.	Truncate dead-nettle	Lamier tronque	Lamyum maqtum
Marrubium libanoticum L.	Lebanon white-horehound	Marruble du Liban	Farasiyun lubnani
Marrubium vulgare L.	Common white-horehound	Marrube commun	Hashishah al-kalb
Mentha longifolia (L.) Huds.	Horse mint	Menthe a longues feuilles	Na'na' tawil al-waraq
Micromeria sp.	Savory	Micromerie	Shummaysah
Micromeria barbata (Boiss. & Ky.) Boiss.	Bearded savory	Micromerie barbue	Shummaysah multahiyah
Micromeria graeca (L.) Benth.	Greek savory	Micromerie de Grece	Shummaysah yunaniyyah
Micromeria Juliana (L.) Benth.	Linear-leaved savory	Herbe de St Julien	Shummaysah julyaniyyah
Micromeria nervosa (Desf.) Benth.	Nerved savory	Micromerie a nervures saillantes	Shummaysah mu'arraqah
Nepeta cilicica Boiss.	Cilician catmint	Nepeta de Cilicie	Qatram kilikya
Nepeta italica L.	Italian catmint	Nepeta d'Italie	Qatram itali
Origanum libanoticum Boiss.*	Lebanon marjoram	Origan du Liban	Mardaqush lubnani
Origanum syriacum (L.) Koch.	Syrian marjoram	Origan de Syrie	Za'tar/Zuba'
Phlomis brachyodon Boiss.	Short-toothed phlomis	Phlomide a dents courtes	'Ayzarah qasirah al-asnan
Phlomis chrysophyla Boiss.	Golden-leaved phlomis	Phlomide a feuilles jaune or	Ma'sus
Salvia fructicosa Mill.	Shrubby sage	Sauge ligneuse	'Ayzaqan

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Lamiaceae			
Salvia grandiflora Etling.	-	-	-
Salvia hierosolymitana Boiss.	Jerusalem sage	Sauge de Jerusalem	Lisan al-'ijlah
Salvia microstegia Boiss. & Bal.	Fleecy sage	Sauge a petite couverture	Quwaysah saghirah al-ghita'
Salvia sclarea L.	Clary	Sclaree	Kaff al-dubb
Scutellaria brevibracteata Stapf	Short-bracteate skullcap	Scutellaire a bractees courtes	Hurbun qasir al-qunnabat
Scutellaria peregrina	-	-	-
Securigera securidaca (L.) Deg & Doerfl.	Hatchet-vetch	Securigere coronilla	Subbayrah
Sideritis glandulifera Post.	-	-	-
Sideritis perfoliata L.	Perfoliate ironwort	Crapaudine perfoliee	Taranjan
Stachys cretica Sibth. & Sm.	Cretan woundwort	Epiaire de Crete	Qartum krit
Stachys distans Benth.	Distant woundwort	Epiaire distante	Qartum mutaba'id
Stachys palaestina L.	-	-	-
Teucrium flavum L.	-	-	-
Teucrium polium L. var. album Fiori	Poley	Germandree polium	Hashishah al-rih
Teucrium stachyophyllum Davis	Woundwort-leaved germander	Germandree a feuilles d'epiaire	Ja'dah qartumiyyah al-waraq
Teurcium chamaedrys L.	-	-	-
Ziziphora capitata L.	Headed ziziphora	Ziziphore tenue	Zizifurah nahilah
Lilaceae			
Allium chloranthum Boiss.*	Green-flowered garlic	Ail a fleurs verdatres	Thum mukhdarr al-zahr
Allium cassium Boiss.	Cassius garlic	Ail du Cramel	Thum al-karmal
Allium sphaerocephalum L.	-	-	-
Allium subhirsutum L.	-	-	-
Allium ampeloprasum var. Portorii	Wild leek	Carambole	Kurrath al-kurum
Asparagus acutifolius L.	Sharp-leaved asparagus	Asperge a feuilles aigues	Halyun hadd al-waraq

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Lilaceae			
Colchicum decainsei Boiss	Decaisne's meadow saffran	Colchique de Decaisne	Suranjan Decaisne
Colchicum steveni Kunth.	Steven's meadow-saffron	Colchique de Steven	Suranjan Steven
Eremurus spectabilis M.B.	Spectacular foxtail-lily	Eremure remarquable	Dhanaban ra'i'
Fritilaria acmopetala Boiss.	Sharp-petalled fritillary	Fritillaire a petals pointus	'Arar hadd al-batalat
Fritilaria crassifolia Boiss.	Thick-leaved fritillary	Fritillaire a feuilles epaisses	'Arar samik al-waraq
Fritilaria elwesii Boiss.	Elwes' fritillary	Fritillaire d'Elwes	'Arar Elwes
Gagea arvensis (Pers.) Dumort	Field gagea	Gagee des champs	Ghajiyah al-huqul
Gagea peduncularis (Presl) Pasc	Peduncled gagea	Gagee pedonculee	Ghajiyah muzannadah
Hyacinthus orientalis L.	Oriental hyacinth	Jacinthe d'Orient	Khuzam sharqi
Lloydia rubroviridis Boiss. & Ky.	Red and green lloydia	Loidie rouge et vert	Luwidyah
Muscari comosum (L.) Mill.	Tassel hyacinth	Muscari a toupet	Basal al-ziz
Muscari parviflorum Desf.	Autumn grape-hyacinth	Muscari a petites fleurs	Halhal saghir al-zahr
Muscari pinardi Boiss.	Pinard's grape hyacinth	Muscari de Pinard	Halhal Pinard
Ornithogalum billardieri Mout.	Labillardiere's star-of-Bethlehem	Ornithogale de Labillardiere	Sasal labillardiere
Ornithogalum platyphyllum Boiss.	Broad-leaved star-of-Betlehem	Ornithogales a larges feuilles	Sasal arid al-waraq
Ruscus aculeatus L.	Knee-holly	Petit houx	'As barri
Smilax aspera L.	Prickly ivy	Salsepareille	'Amshaq/La'lu'
Tulipa aleppensis Boiss.	Aleppo tulip	Tulipe d'Alep	Tulib halab
Tulipa aucheriana ssp. westii	Aucher's tulip	Tulipe d'Aucher	Tulib Aucher
Linaceae			
Linum aroanium Boiss. (No Valid)	Mount Aroania flax	Lin des Monts Aroania	Kattan 'Aruwani
Linum gallicum L.	-	-	-
Linum mucronatum (No Valid)	Mucronate flax	Lin mucrone	Kattan ruhabi
Moraceae			
Ficus carica L.	Common fig	Figuier de Carie	Tin sha'i

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	French	Arabic
Molluginaceae			
Telephium imperati L.	True orpine	Telephium d'Imperato	Bakhur al-sudan
Oleaceae			
Fraxinus ornus L.	Manna ash	Orne/frene a fleurs	Murran manni
Phillyrea media L.	Intemediate phillyrea	Filaire intermediare	Barzah
Orchidaceae			
Cephalanthera rubra (L.) L. C. Rich.	Red helleborine	Cephalanthere rouge	Sifalantirah hamra
Epipactis latifolia (L.) All.	Broad-leaved epipactis	Epipactide semblable	Abibaktis mumathil
Limodorum abortivum (L.) Sw.	Purple bird's-nest	Limodore avorte	Limudurum khadij
Orchis anatolica Boiss.	Anatolian orchid	Orchis d'Anatolie	Sahlab al-anadul
Orchis italica Poiret	Italian orchid	Orchis d'Italie	Sahlab itali
Orchis morio L.	Green-winged orchid	Orchis buffoon	Sahlab muharrij
Orchis riden Lam.	Monkey orchid	Orchis singe	Sahlab sa'dan
Orchis ridentate Scop.	Three-toothed orchid	Orchis a trios dents	Sahlab thulathi al-asnan
Orobanchaceae			
Orobanche sp.	Broomrape	Orobanche	Ja'fil
Paeoniaceae			
Paeonia kesrouanensis Thieb.	Kesruwan peony	Pivoine de kesrouan	Wadah kisruwan
Papaveraceae			
Papaver syriacum Boiss. & Bl.	Syrian poppy	Pavot de Syrie	Khashkhash suri
Papaver umbonatum Boiss.*	Bossed poppy	Pavot bossu	Khashkhash ahdab
Paronychiaceae			
Herniaria incana Lam.	Hoary rupturewort	Herniaire blanchatre	Nawman mubyadd

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Pinaceae			
Abies cilicica Ant. & Ky.	Cilician fir	Sapin de Cilicie	Tannub kilikya,Shuh
Cedrus libani A. Rich.	Lebanon Cedar	Cedre du Liban	Arz lubnani
Pinus brutia Ten.	Calabrian Pine	Pin de Calabre	Sanawbar barri
Polypodiaceae			
Adiantum capillaris-veneris L.	True maidenhair	Cheveu-de-Venus	Kuzbarah al-bi'r
Athyrium filix-femina (L.) Roth	Lady fern	Fougere femelle	Khinshar unsah
Cheilanthes pteridioides (Reich.) Christ	-	-	-
Pteridium aquilinum L.	Eagle fern	Fougere aigle	Khinshar uqabi
Polygalaceae			
Polygala supine Schreb	Trailing milkwort	Polygale couchee	Mustadirrah muftarishah
Polyganaceae			
Rumex patientia L. ssp. orientalis (Bernh.) Dausch	-	-	-
Primulaceae			
Anagallis arvensis L.	Field pimpernel	Mouron des champs	'Ayn al 'asfour
Cyclamen coum Mill.	Round-leaved cyclamen	Cyclamen de Cos	Sakawka' Cos
Primula vulgaris Huds.	Common primerose	Primevere commune	Zughdah mabdhulah
Primula vulgaris Huds. Var. Rubra Sm.	-	-	-
Ranunculaceae			
Anemone blanda Schott & Ky.	Mountain anemone	Anemone charmante	Shuqqar fatten
Clematis flammula L.	Sweet virgin's-bower	Clematite brulante	'Ansarah
Ranunculus cuneatus Boiss.	Cuneate buttercup	Renoncule en coin	Hawdhan isfini
Ranunculus hierosolymitanus Boiss.	Jerusalem buttercup	Renoncule de Jerusalem	Hawdhan al-quds
Ranunculus scleratus L.	Cursed crowfoot	Renoncule veneneuse	Hawdhan samm

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Resedaceae			
Reseda alba L.	White mignonette	Reseda blanc	Dhayl al-kharuf
Rhamanceae			
Rhamnus alaternus L.	Mediterranean buckthorn	Nerprun alaterne	Sufayra'/'amlis
Rhamnus punctata Boiss.	Dotted buckthorn	Nerprun ponctue	'Ajram
Rosaceae			
Cotoneaster nummularia Fisco. & Mey.	Nummular cotoneaster	Cotoneastre nummulaire	Sarah
Geum urbanum L.	Herb-bennet	Herbe de St Benoit	Jayum al-hawadir
Poterium gaillardoti Boiss.	Gaillardot's burnet	Pimprenelle de Gaillardot	Ballan Gaillardot
Poterium verrucosum Ehrenb.	Mediterranean salad burnet	Pimprenelle verruqueuse	Hashisha al-sa'ah amrad
Prunus prostrate Lab.	Wild cherry	Cerisier couche	Hayhun
Prunus ursina Ky	Bear plum	Prunier des ours	Khawkh al-dubb
Rosa canina L.	Dog rose	Eglantier	Nisrin/Ward al-kilab
Rosa corymbifira	-	-	-
Rosa pulverulenta M. Bieb	-	-	-
Rubus sanctus Schreb.	Palestine blackberry	Ronce sainte	Kbush/'Ullayq muqaddas
Rubus tomentosus Borkh.	Tomentose blackberry	Ronce tomenteuse	'Ullayq libdi
Sorbus aria (L.) Crantz.			
Sorbus flabelifolia	Fan-leaved service-tree	Alouchier	Ghubayra' al-maghs
Rubiaceae			
Asperula breviflora Boiss.	Short-flowered woodruff	Asperules a fleurs courtes	Asbirulah qasirah al-zahr
Asperula libanotica Boiss. *	Lebanon woodruff	Asperule du Liban	Hashishas al-khuri
Asperula stricta Boiss.	Upright woodruff	Asperule raide	'Asbirulah qa'imah
Crucianella herbaceae Forsk.	Herbaceous crosswort	Crucianelle herbacee	Sulaybiyyah 'ushbiyyah
Crucianella latifolia L.	Broad-leaved crosswort	Crucianelle a feuilles larges	Sulaybiyyah 'Aridah al-waraq
Galium canum Req.	White bedstraw	Gaillet blanc	Ghalyum al-'aqra
Galium libanoticum Ehrendorfer *	Lebanon bedstraw	Gaillet du Liban	Ghalyum lubnani

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	French	Arabic
Rubiaceae			
Galium orientale Boiss.	-	-	-
Galium orientale Boiss. var. alpinum Bornm.	-	-	-
Galium verticillatum Danth	Whorled bedstraw	Gaillet verticille	Ghalyum kawkabi
Galium verum L.	Ladies bedstraw	Caille-lait jaune	Qaytum
Rubia aucheri Boiss.	Aucher's madder	Garance d'Aucher	Fuwwah Aucher
Rubia tenuifolia d'Urv. var. elliptical (Boiss)	Slender-leaved madder	Garance a feuilles tenues	Fuwwah nahilah al-waraq
Rubia tinctorum L.	Dyer's madder	Garance des teinturiers	Fuwwah sibaghiyah
Crucianella imbricate Boiss.	Imbricate crosswort	Crucianelle imbriquee	Sulaybiyyah mutarakibah
Santalaceae			
Osyris alba L.	Poet's cassia	Rouvet	Sandal abyad
Saxifragaceae			
Ribes orientale L.	Oriental currant	Groseillier d'Orient	Kishmish sharki
Scrophulariaceae			
Anarrhinum orientale Benth.	Oriental anarrhinum	Anarrhinum d'Orient	Sunbulah al-nasm
Parentucellia latifolia (L.)	Broad-leaved eyebright	Parentucelles a larges feuilles	Barantushilyah 'arida al-waraq
Verbascum libanoticum Murb. & Thieb. *	Lebanon mullein	Molene du Liban	Busir lubnani
Veronica cymbalaria Bodard.	Cymbal speedwell	Veronique cymballaire	Firunikah sanjiyyah
Veronica leiocarpa Boiss.	Smooth-fruited speedwell	Veronique a fruits lisses	Firunikah malsa' al-thamar
Veronica orientalis Miller	Oriental speedwell	Veronique d'Orient	Firunikah sharqiyyah
Veronica polifolia Benth.	Polium-leaved speedwell	Veronique a feuilles de polium	Firunika ja'diyyah al-waraq
Veronica syriaca Roem. & Sch.	Syrian speedwell	Veronique de Syrie	Firunikah suriyyah
Selaginaceae			
Selaginella denticulata (L.) Spreng	Denticulate selaginella	Selaginelle denticulee	Kuf'an daqiq al-tasannun
Styracaceae			
Styrax officinalis L.	Storax	Aliboufier officinal	Lubna/Hawz

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	French	Arabic
Apiaceae			
Bunium pestolazzae Boiss.	Pestalozza's earthnut	Bunium de Pestalozza	'A'akthar Petalozza
Ainsworthia cordata (Jacq.) Boiss.	Cordate ainsworthia	Ainsworthie a fruits rudes	-
Bunium elegans Fenzl. (Freyn)	Elegant earthnut	Bunium elegant	'A'akthar 'aniq
Conium maculatum L.	Poison hemlock	Grande cigue	Shawkaran
Coriandrum sp.	Coriander	Coriandre	Kuzbarah
Daucus broteri Ten.	Brotero's carrot	Carotte de Brotero	Duqus Brotero
Daucus setulosus Guss.)	-	-	-
Eryngium campestre L.	-	-	-
Eryngium creticum Lam.	Cretan eryngo	Panicaut de Crete	Qurs'anna
Eryngium creticum var. spinulosum Post	-	-	-
Eryngium falcatum Laroche	Falcate eryngo	Panicaut falciforme	Shindab minjali
Eryngium glomeratum Lam.	Clustered eryngo	Panicaut agglomere	'Ud al-qusm
Lagoecia cuminoides L.	Bastard cumin	Lagoecie faux-cumin	Qardaman
Lecoquia cretica (Lam.) D.C.	Cretan lecoquia	Lecoquia de Crete	Likukyah krit
Orlaya platycarpos (L.) Koch.	Flat-fruited orlaya	Orlaya a fruits plats	-
Pimpinella peregrina L.	Foreign burnet-saxifrage	Boucage voyageur	Bambinillah rahala
Bupleurum gerardi All.	Gerard's hare's-ear	Buplevre de Gerard	Halablab Gerard
Scaligeria cretica (d'Urv.) Boiss.	Cretan scaligeria	Scaligerie de Crete	Skalijiryah krit
Scandix iberica M.B.	Iberian shepherd's-needle	Scandix d'Iberie	Mushshaytah Iberia
Scandix pecten-veneris L.	Venus-Comb	Scandix peigne de Venus	Musht al-ra'i
Torilis leptophylla var.erythrotricha	Slender-leaved hedge-parsley	Torilide a feuilles semblables	Turilis mutajanis al-waraq
Torilis purpurea (Ten.) Guss	Purple hedge-parsley	Torilide pourpre	Turilis 'urjuwani
Turgenia latifolia (L.) Hoffm.	Broad-leaved bur-parsley	Turgenie a larges feuilles	Turjinyah 'aridah al-waraq

Annex 4. Plants found in the Akkar and Donnieh areas (Cont'd).

Latin name	Common Name		
	English	**French**	**Arabic**
Valerianaceae			
Centranthus longiflorus Stev.	Long-flowered spur-valerian	Centranthes a longues fleurs	'Asayah al-natur
Valeriana dioscoridis Sibth & Sm	Dioscorides valerian	Valeriane de Dioscoride	Asabi' al-ra'i
Valerianella dactylophylla Boiss. & Hohen.	Finger-leaved cornsalad	Maches a feuilles digitees	Sumnah 'isba'iyyah al-waraq
Violaceae			
Viola odorata L.	Sweet violet	Violette odorante	Banafsaj 'atir

* Endemic
** Mediterranean

Annex 5. Ecological profile sheets for the different regions in the study area

Region	Altitude	Longitudes [Min-Max]	Latitudes [Min – Max]
Qammoua	**900-2150**	**36° 9' 52.84" - 36° 14' 23.79"**	**34° 25' 8.87" - 34° 29' 39.82"**

Trees *: Abies cilicica, Cedrus libani, Cratagus monogyna, Juniperus excelsa, Juniperus foetidissima, Juniperus oxycedrus, Pinus brutia, Prunus ursina,Quercus calliprinos,Quercus cerris, Styrax officinalis*

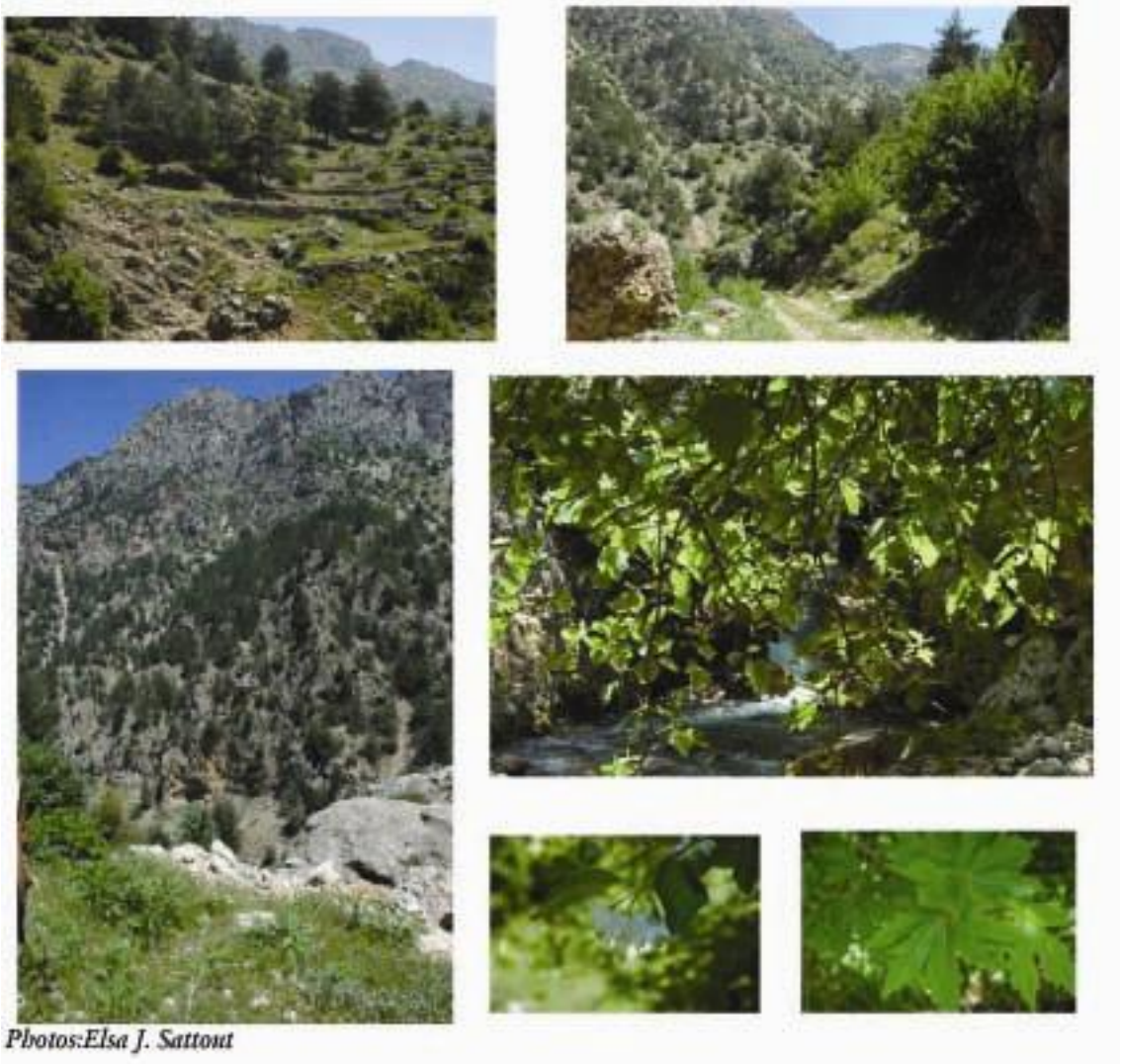
Plants & Shrubs : *Acantholimon antilibanoticum,Acantholimon libanoticum,Achillea micrantha,Adianthus sp., Aegilops sp., Ajuga tridactylis, Allium sp., Alyssum murale,Anthemis sp., Asperula libanotica, Asphodeline sp., Asphodelus sp.,Astragalus ancistocarpus, Astragalus angulosus, Astragalus cruentiflorus, Astragalus dictyocarpus, Astragalus gumifer, Astragalus rousseanus, Astragalus schizopteris, Avena sterilis, Bellis sylvestris, Berberis libanotica, Bunium pestolazzae, Calamintha vulgaris, Campanula rapunculus, Capsella bursa-pastoris, Carex flacca, Carlina involucrata, Centaurium pulchellum, Cephalanthera rubra, Cheiracantha cheirolopha, Chicorium intybus, Cirsium sp., Cistus creticum, Cornilla varia subsp. libanotica, Cotoneaster nummularia, Crepis reuteriana, Cyclamen sp., Cynosurus echinatus, Cynosurus effusus, Dactylis glomerata, Daphne oleoides, Daucus sp., Dianthus tripuntatus, Dittrichia viscosa, Dorocnimum orientale, Echinops sp., Echinops villosum, Epipactis latifolia, Eryngium billardieri, Eryngium campestre, Erysimum goniocaulon, Euphorbia macroclada, Euphorbia biumbellata, Fumana arabica, Galium libanoticum, Galium verum, Gallium libanoticum, Geranium libani, Geranium libanoticum, Gladiolus segetum, Gladiolus sp., Gramineae sp., Helianthemum vulgare, Helychrisum palasii, Lactuca serviola, Lamium sp., Lapsana communis, Lecoquia cretica, Limodorum aboritum, Lotus gebelia, Marrubium vulgare, Melica nagustifolia, Micromeria barabata, Micromeria nervosa, Monotropa sp., Muscari sp., Ononis natrix, Orchis sp., Origanum libanoticum, Origanum syriacum , Orlaya, Ornithogalum sp., Orobancha sp., Papaver sp., Phlomis chrysophyla, Phlomis viscosa, Plantago lanceolada, Polygala supina, Potentilla repens, Poterium gaillardoti, Poterium verrucosum, Primula vulgaris, Prunus ursina, Pteridium aquilinum, Reichardia macrophyllum, Rhaphanus raphanustrum, Ribes orientale, Rosa canina, Rosa micrantha, Rosa pulverulenta, Rosularia sp., Rubia sp., Rubus tomentosus, Rumex sp., Ruta graveolens, Salvia sp., Scabiosa ochraleuca, Sedum assyriacum, Sedum tenuifolium, Senecio mouterdeii,Silene cucubalis, Silene sp., Sonchus oleraceus, Sonchus sp., Sorghum alepense, Stachys distans, Steptorhampus tuberosus, Teucrium flavum, Thlaspi microstylum, Trifolium orphandeum, Trifolium scabrum, Trifolium sp., Trifolium stellatum, Tulipa sp., Umbilicus sp., Verbascum sp., Veronica orientale, Vicia sp., Vicia sativa, Viola odorata.*

Photos :Elsa I.Sattout

Hrar	**650-110**	**36° 6' 7.67" -36° 8' 7.67"**	**34° 26' 48.83" - 34° 28' 11.75"**

Trees : *Pinus brutia, Ceratonia siliqua, Phillyrea media, Pistacia palaestina, Quercus calliprinos, Quercus infectoria, Styrax officinalis.*

Plants *: Aegilops ovata, Ajuga tridactylis,Allium sp., Andrachne telephioides, Anthemis sp.,Anthemis tinctoria,Arbutus andrachne, Asphodelus sp., Brachypodium distachyum,Calycotome villosa, Carlina involucrata, Centuarea sp., Cistus creticum,Cistus salvifolius,Crucianella imbricada,Cystus creticum,Dactylis glomerata, Daucus sp., Echinops vilosa, Fumana arabica, Galium canum Requien, Gramineae sp. ,Hypericum thymifolium, Micromeria graeca, Oryzopsis holciformis, Osyris alba Pallenis spinosa, Ptilostemum chamaepeuce, Reseda alba, Rhamnus alaternus, Rhamnus punctata, Rubia tenuifolia D'Urv., Salvia sp., Salvia triloba, Scutellaria brevibracteata Stapf., Senecio mouterdeii, Smilax aspera, Stachys distans,Teucrium polium, Verbascum sp.*



Photos:Elsa J. Sattout

Region	Altitude	Longitudes [Min-Max]	Latitudes [Min – Max]
Mishmish	**550-1850**	**36° 7' 21.31" – 36° 13' 44.69"**	**34° 24' 51.67" – 34° 28' 29.47"**

Trees : *Abies silicica, Acer syriacum, Acer hermoneum, Acer tauricolum, Arceuthus drupaceae, Cerdus libani, Cercis siliquastrum, Juniperus excelsa, Juniperus foetidissima, Juniperus oxycedrus, Malus trilobata, Quercus calliprinos, Styrax officinalis.*

Plants & Shrubs : *Achillea micrantha, Aegilops sp., Aegilops variabilis, Allium sp., Anthemis sp., Anthemis tinctoria discoidea, Astragalus gummifer, Astragalus sofarensis, Avena sterilis, Berberis libanotica, Bupleurum gerardii, Campanula rapunculus, Campanula sp., Capsella bursa pastoris, Carlina involucrata,Centaurea calcitrapa, Centaurea iberica Trev. var. meryonis, Centaurium pulchellum, Cerastium sp., Conium maculatum, Conopodium majus, Cotoneaster nummularia, Dactylis glomerata, Daucus sp., Dianthus tripunctatus, Dorocnimum orientale, Echinops viscosa, Eryngium billardieri, Eryngium sp., Euphorbia biumbellata, Fibigia sp., Gallium sp., Gallium verum, Geranium libani, Geranium libanoticum, Gladiolus segetum, Gramineae, Hordeum bulbosum, Lactuca seriola, Lamium sp., Lathyrus sessilifolius, Lecoquia cretica, Legousia falcate, Legousia sp., Lonicera nummularifolia, Malus trilobata, Marrubium vulgare, Monotropa sp., Muscari pinardi, Muscari sp., Nepeta cilicica, Onopodrum illyricum subsp. cardunculus, Ornithogalum sp., Paniculum sp., Papaver sp., Phlomis sp., Phlomis viscose, Poa bulbosa, Primula vulgaris, Prunus prostrata, Prunus ursine, Pteridium filis femina, Ranunculus rapunculus, Ribes orientale, Rosa corymbifira, Rosa sp., Rubia sp., Rubia tenuifolia var. elliptica, Rubia tinctorum, Rubus sp., Rubus tomentosa, Silene italica, Silene sp., Smirnum olusatum, Sonchus sp., Sorghum alepense (??), Stachys cretica, Stachys distans, Styrax officinalis, Trifolium sp., Trifolium stellatum, Urtica sp., Verbascum sp., Vicia sp.*

Photos : Elsa J. Sattout

Region	Altitude	Longitudes [Min-Max]	Latitudes [Min – Max]
Qemmamine	**750-1750**	**36° 7' 43.71" – 36° 9' 27.92"**	**34° 23' 32.84" – 34° 25'34.93"**

Trees: *Acer syriacum, Arbutus andrachne, Cercis siliquastrum, Celtis australis, Fraxinus ornus, Juniperus oxycedrus, Pinus brutia, Pistacia palaestina, Prunus ursina, Quercus calliprinos, Quercus infectoria, Styrax officinalis.*

Plants & Shrubs: *Aegilops sp., Ainsworthia cordata, Allium sp.,Anthemis tinctoria var. discoideae, Arisolochia altissima, Aristolochia sp., Arum sp., Asparagus acutifolius, Asperula libanotica, Athryium felis-femina, Avena sterilis, Calycotome villosus, Capsella bursa pastoris, Carlina involucrata, Centaurea calciptrapa, Cistus creticum, Cistus sp., Clematis flamula, Cornus australis, Echinops villosa, Eryngium creticum var. spinulosum, Gallium sp., Geum urbanum, Gramineae, Helianthemum sp., Helycrhisum sanguineum, Hypericum lanuginosum, Hypericum perforatum, Hypericum sp., Hypericum thymifolium, Inula viscosa, Legousia falcata, Melica angustifolia, Mentha longifolia, Micromeria juliana, Ononis natrix,*

Origanum libanoticum, Origanum syriacum, Orlaya platycarpa, Pallenis spinosa, Papaver sp., Phagnalon rupestre, Phillyrea media, Phillyrea media, Pimpinella peregrina, Plantago major, Poa persica, Pteridium aquilinum, Pteridium filis-femina, Rubia aucheri, Rubia sp., Rubus sp., Ruscus aculeatus, Ruta graveolens, Salvia macrostegia, Sambucus ebulus, Scutellaria peregrina, Sedum sp., Senecio mouterdeii, Silene sp.,Smilax aspera, Sonchus sp., Stachys distans, Tamus communis,Tanacetum cilicicum, Teucrium polium, Torilis purpurea, Trifolium sp.

Photos:Elsa J. Sattont

A. VEGETATION PROFILE:JAYROUN

Region	Altitude	Longitudes [Min-Max]	Latitudes [Min – Max]
Jayroun	**650-2000**	**36 5 20.10 - 36 8 32.55**	**34 22 52.83 – 34 26 8.72**

Trees: *Acer syriacum, Arbutus andrachne, Ceratonia siliqua, Phillyrea media, Pinus brutia, Pistacea palaestina,Pistacia palaestina, Laurus nobilis, Phillyrea media, Quercus calliprinos.*

Plants & Shrubs: *Allium sp., Aristolochia altísima, Asparagus acutifolius, Avena sterilis, Calycotome villosa, Centaurea sp., Cistus creticum, Cistus sp., Daucus sp., Eryngium billiarderi, Eryngium sp., Gallium sp., Gramineae, Helycrhisum sanguineum, Hypericum thymifolium, Dittrichia viscosa, Jasminum sp., Lactuca seriola, Lagurus sp., Medicago rigidula, Micromeria juliana, Micromeria sp., Origanum libanoticum, Origanum syriacum, Pallenis spinosa, Phlomis viscosa, Pteridium filis femina, Rhamnus punctata, Rubia sp., Ruscus aculeatus, Ruta graveolens, Salvia sp., Salvia triloba, Smilax aspera, Spartium junceum, Stachys distans, Trifolium purpureum, Trifolium sp., Trifolium stellatum*




Photos:Dominique Choueiter