

# THE RICAMARE WORKSHOP "ON LAND USE CHANGES & COVER AND WATER RESOURCES IN THE MEDITERRANEAN REGION"

## PRESENTATION AND CONCLUSIONS

### PRESENTATION

**I**t is recognized that water is one of the most limiting resources in the Mediterranean region, and that its availability is seriously threatened by global change in its broader sense, that includes the atmospheric, economical, cultural and technological systems. Changes of land use systems and their associated land cover are have been considered as a central process, which is driven by climatic and socio-economic forces, with implications on the water balances and water quality at various scales..

Reviewing the *state of the art* on these topics was adopted as a major task in the RICAMARE agenda. The aims were twofold:

- identifying knowledge gaps and stimulating innovative thinking by linking land-use changes, landscape dynamics and water issues in the Mediterranean region;
- starting the implementation of a Mediterranean Regional Network in the frame of LUCC (IGBP);
- encouraging joint research initiatives in this direction as a way to cope with needs that emerge from global change scenarios.

In a first stage, attention has been focused on drivers and hydrological implications of rangeland changes that are widespread in Mediterranean rangelands, such as: (i) Encroachment and desertion of agriculture, (ii) Changes of livestock management and grazing pressures, (iii) Large scale afforestation programmes.

Rangelands in the broadest sense (forests, shrublands and grasslands) have been selected as target systems because (i) they often buffer the impacts of changes originated in the surrounding agricultural areas, and (ii) they are also often sources of water for the latter.

The backbone of the activity was setting up a network of contributors whose responsibility is to compile a set of reports on the main task topic. Once circulated through the network, the contents of the reports and future initiatives would be discussed at a specific workshop

After the Second RICAMARE Steering Committee meeting in Milano (March 2000), the main focus was defined for the activity, and a call for contributors was launched. The purpose of this call was to identify experts across the Mediterranean who could be interested to co-operate as a network in fulfilling the task objectives.

The network was set up in November 2000. It is open to grow both in further activities and partnership. Up to now it includes 12 countries (Algeria, Egypt, France, Greece, Italy, Lebanon, Morocco, Portugal, Spain, Syria, Tunisia and Turkey) and 4 Mediterranean Organisations/Projects (PAP/MAP/UNEP, ICARDA, MEDALUS, FAO-WAICENT). Further details on the network partnership may be found in Table 1.

The network started to work by compiling three kinds of reports on the main topic: national reviews, case studies and regional project review. In each of them, driving forces and effects of land use (rangelands) change on water resources were specifically considered. A total of 21 reports have been submitted, 15 of them, are national reports or case studies, and are included in this volume, while a further set 4 contributions are concerned with regional or thematic topics and will be published in the next issue of these Letters.

The workshop was held on the 20-21, April, 2001, at the Institut des Regions Arides (IRA) in Medenine, Tunisia. The IRA provided an extremely efficient support, both to the organization and the local facilities, in order to ensure the smooth running of the meeting. The workshop program was organised in two main sessions. The first included oral presentations of the submitted reports by countries, while the second was allocated for discussing the reports, and its main trends, as well as the future prospects to connect the network activity with international bodies concerned with RD activities in global change.

## CONCLUSIONS

The workshop session aimed to discuss the submitted reports and to find out regional trends focused on three questions:

1. Which are the main trends of land use change, particularly of rangeland?
2. Which are their driving forces?
3. Which are their expected effects on water resources?

A joint effort to answer to each of these questions was made for the Mediterranean regions: Maghreb, East Mediterranean and Europe.

### Main trends

From 1950 onwards, the rangeland area in Mediterranean Europe and in the Maghreb experiences contrasting trends. In the former it has been increasing as a result of desertion of agriculture, with subsequent shrubland expansion, afforestation and increase of wildfire occurrence. In the latter it has been decreasing by encroachment of cropping land over marginal areas, with subsequent land degradation and desertification. Eastern Mediterranean countries share both trends, depending of their particular socio-economic condition.

Super-imposed to these broad regional patterns, small scale changes do occur in the three regions that are nevertheless significant, because they tend to blur locally the regional contrasts. In Mediterranean Europe, very aggressive and market-driven agriculture expands over the rangeland boundaries, while in the Maghreb and Eastern Mediterranean, marginal agriculture starts to be abandoned by migration into both cropping intensification in fertile areas and abroad. While free range grazing is decreasing in Mediterranean Europe, sheep over-stocking cases have been reported from Portugal to Greece. All over the Mediterranean countries, coastal urbanisation tends to reduce the rangeland area.

### Driving forces

In the Mediterranean countries, land use changes are mainly driven by socio-economic forces, such as high population growth rates in the Maghreb and Eastern Mediterranean, or market fluctuations and population drainage from rural areas in Southern Europe. In most cases, these forces are channelled through national or regional policies. For example, deleterious environmental externalities of the Common Agricultural Policy (CAP) in Mediterranean Europe, and of the sedentarisation policies in the Maghrebian countries, have been reported.

Climate, by its own, is rarely perceived as a driver of land use change in the Mediterranean. In most cases it works synergetically with the above-mentioned socio-economic forces. One of the most striking examples of this synergy is the loss of adaptive capacity of rural populations to drought by disruption of their traditional cultures. This happened all around the Mediterranean, but today it is a significant factor of change and degradation in the Maghrebian oases.

Rangeland boundaries are often affected by demographic or economic driving forces, that originate from their neighbouring agricultural areas. By this way, strong disturbances may lead to non-linear changes and new stable ecosystem states, which create wide degraded boundaries around rangeland patches. Steppes are one of the rangeland types most threatened by these processes.

### Effects on water resources

The implications of non-agricultural areas on soil and water conservation have been the concern of action plans in the Mediterranean, both at the national and regional level. In particular, the impact of rangeland changes on water resources has shown to be manifold. There seems to be agreement in that the increase of vegetation density leads, one side, to a diminution of the total water resource, and the other side, to a reduction of fast runoff (less within-year variability of base flow and better flood control). While the first effect is well documented, available results are less coincident in the second, particularly when whole catchments are considered. Probably, the trade off between these two effects is one of the main challenges of Mediterranean rangeland management. This is particularly true nowadays, when the hydrological role of rangelands becomes

more significant due the increasing water demand for irrigation and urban purposes. It is recognized however that where huge water deficits develop, no options are available.

On a finer scale, it is well known that hydrological connectivity along hillslopes and even through drainage networks, is very low in drylands. This means that deep percolation and aquifer recharge occur only in localized areas, and both may be dramatically affected by land uses in those areas or their surroundings.

The increasing water demand in drylands leads to deterioration of their resources, both quantitatively and qualitatively. Examples of salinisation of aquifers and soils that finally revert to rangeland use, are widespread in the Mediterranean area. Off site effects of over-exploitation of water resources on downstream rangelands (wetland ecosystems) have been often reported as paradigmatic case histories, such as in La Mancha, in Central Spain.

These facts stress the need of distinguishing the water that drives the ecosystem functioning from that which is free for human use. This distinction is particularly relevant for managing water resources in the Mediterranean region.

## Research and information gaps

In the Mediterranean area, research on the effects of rangeland changes on water resources is often very fragmented and focused on small to medium sized areas. The combination of these approaches with a broader scale concern, including the whole Mediterranean region, would probably allow meeting better the country, regional and global change challenges. To this purpose, the research network started in the frame of this RICAMARE task, can provide a very useful platform.

More specifically, the role of drivers on land use changes, needs to be understood in such a way that medium term predictions can be made. The effects of land use changes on water resources require also a coordinated regional effort. From the workshop discussion, it becomes clear that that water issues are strongly tied to land condition and sustainability of resource use. Therefore, they cannot be approached in isolation from land degradation and desertification. Any way, a specific concern on ephemeral channels, riparian zones, ground water and flash floods was recommended.

The need of co-ordinating the existing field stations working on the effects of land use changes on water balances was also stressed. The three main goals of such stations: consolidating long term data bases, providing support to modelling work and to process research was outlined. Most of the processes involved in this topic are scale dependent. This means that using results from field stations, often requires upscaling. This, in turn, needs innovative thinking to combine, ground work, modelling efforts, and earth observation approaches, ensuring always the spatial and temporal resolution coherence.

Public data on Land use changes and water resources are often disperse among different administrative authorities and not easily available. Setting up a homogeneous information system to fulfill this gap would be appreciated. Given that WAICENT (World Agricultural Information Centre) from FAO and LUCC are both interested in this Ricamare network, it is suggested that they could be invited to collaborate on this topic in the frame of future joint initiatives. ◆

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RI CAMARE Workshop participants in Medenine in front of the "Institut des Régions Arides"