REACTION
Restoration Actions to Combat Desertification in the Northern Mediterranean

Workshop

Restoration Actions to Combat Desertification in the Northern Mediterranean

Proceedings of the second REACTION workshop
23 - 25 September 2004
Thessaloniki, Greece

Deliverable D4

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Foreword

The second REACTION workshop on "Restoration Projects to Combat Desertification in the Northern Mediterranean" was held in Thessaloniki (Greece) from 23rd to 25th September 2004. The workshop was organised by the Aristotle University of Thessaloniki (AUTh) in collaboration with CEAM Foundation. REACTION Greek team, A. Hatzistathis and P. Ganatsas, and the representative of the Greek Working Group C. Tourlakides, in collaboration with the REACTION co-ordination team, constituted the Organising Committee.

Thirty-nine people participated in the workshop, 13 experts and 22 stakeholders from Portugal, Spain, France, Italy and Greece; one representative of the DG Research of the EC, and UNCCD Focal Points representatives from Greece, Italy and Portugal. Most of the members of the Greek REACTION Working Group and a high number of representatives of the Forest Service and the various stakeholders participated in the workshop.

The workshop consisted of one main plenary session, half-day session for the REACTION co-ordination meeting, and two field trips to restoration project areas in Halkidiki and Thessaloniki. A period of intense interaction and discussion among REACTION partners and National Working Groups preceded the workshop. This process resulted in the final compilation of project data and the evaluation of the selected restoration projects by stakeholders and experts. During the workshop sessions, inventoried restoration projects and preliminary results from project evaluation were presented, reviewed, and discussed. Ramón Vallejo (CEAM Foundation, Spain), Daniel Vallauri (WWF, France), Roberto Scotti (NRD-IATF, Italy) and Petros Ganatsas (AUTH, Greece) presented the inventory of restoration projects in Spain, France, Italy, and Greece, respectively. Major achievements and gaps of old restoration projects in the Mediterranean countries were discussed. Susana Bautista (University of Alicante) presented the updated REACTION web page and database and their potential improvements discussed.

In addition to the major achievement of the workshop –i.e. the review of the restoration activities in Mediterranean Europe– the workshop greatly contributed to dissemination, and exchange of experiences between stakeholders and experts.

Susana Bautista and Ramón Vallejo

Contents

Chapter 1

Overview of REACTION Information System

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1. REACTION objectives and approach

REACTION aims at establishing a database on land restoration to fight desertification by inventorying and evaluating well-documented restoration projects in the Northern Mediterranean, at facilitating access to high quality information to forest managers, policy-makers, and other stakeholders, and at providing restoration guidelines in the light of a critical analysis of contrasted past and innovative techniques.

Core activities for achieving the proposed goals are:

- Project inventory, by collecting and compiling the information available about selected restoration projects.
- Establishment of National Working Groups (NWGs), one per country involved in REACTION, to fully exploit interaction with stakeholders and facilitate both incorporation of local expertise and dissemination.
- Selection of the suitable criteria and methodology for the evaluation of restoration projects and preparation of a common protocol for compiling information and evaluation: the REACTION questionnaire
- To develop a quality assurance system by establishing an external Advisory Panel and an internal programme of quality assurance tasks.
- To implement the REACTION database on Mediterranean restoration projects and deploy an Internet-based facility that allows the users to retrieve and query the data information stored.
- Organisation of national meetings and thematic International workshops to promote expert and stakeholder exchange of information and experiences, technology transfer, and dissemination.
- A major effort on training and capacity building activities such as the organisation of an Advanced Course on innovative approaches on ecological restoration to combat desertification and the elaboration of a Handbook on guidelines to design and implement restoration projects.

2. Scientific achievements

2.1. Conceptual framework for the evaluation of restoration projects

During the first REACTION workshop on Methodologies and Indicators, and the discussion period that followed the workshop, the key elements of the REACTION analytical framework for evaluation of restoration projects, and also the main structure and contents of the REACTION Questionnaire, were defined.

The selected criteria include ecosystem quality attributes, measuring actual quality of restored ecosystems, and comparative functional approach, taking into account the original conditions of the restored sites. Indicators of restoration success include ecological, environmental, socio-economic and cultural attributes. Stand, landscape, and holistic ecosystem perspectives are considered. Overall environmental and technical description of the restored area will be used for assessing the constraints and opportunities of restored sites, attending degree of degradation/conservation, and sensitivity to degradation impacts. Both, original and current objectives should be taken into account, as the objectives defined when the project was conceived may not necessarily match current environmental perspectives and social demands.

Peer review by REACTION Advisory Panel of the evaluation criteria was very positive. The reviewers highlighted that REACTIOM methodology covers a good range of ecological, socio-economic and cultural criteria for restoration success, over an appropriate range of spatial scales (REACTION Second Annual Report, 2005).

2.2. Project Inventory

A suitable number of representative and well-documented restoration projects have been inventoried (see following chapters), including projects implemented in late XIX century, and a preliminary version of the questionnaire for every project was filled out. REACTION Questionnaire has proven to be good tool for compiling comprehensive information on a wide range of quantitative and qualitative data. Since the minimum information required for project evaluation was captured during the compiling process, a preliminary multi-approach evaluation was possible for all the projects inventoried.

Due to the specific type of information commonly available in the different countries, some variation in the amount and quality of the information compiled for the different projects was observed. In addition, for a number of projects some lack of information about current conditions of the restored area was detected. To improve the quality and homogeneity of the information compiled, we established a harmonised programme of field surveys to be developed during 2005.

The set of restoration projects compiled and evaluated focuses on long-term successful restoration projects in the Northern Mediterranean and covers a wide range of restoration projects in terms of dates, technology applied, vegetation type, climate, etc. The main goal of most of the past restoration projects were prevention of soil erosion and flooding.

The inventory of evaluated projects in the Mediterranean countries and the amount and quality of the information compiled are absolutely innovative achievements in the framework of the dissemination and transfer of technology of restoration activities. The inventorying of restoration projects offer managers, experts, and policy-makers major

opportunities for accessing to valuable and useful information on restoration actions, and provide tools for the application of the most successful strategies and technologies. Main conclusions resulting from local meetings with stakeholders and members of the national working groups pointed out the great value of compiling and giving access to the information provided by previous restoration experiences, thus confirming the socio-economic relevance of the progress made by REACTION

2.3. Quality assurance

All partners contributed to quality assurance through the permanent exchange of information, co-ordination visits, and by applying common templates and protocols for the various project tasks. To ensure co-ordination and interaction among partners we establish a REACTION FTP site for data sharing.

Two reviewers from the co-ordination team revised all the questionnaires before database updating to maintain criteria uniformity. To harmonise and facilitate the compilation of information in the questionnaires, we prepared the REACTION Questionnaire Guidelines and FAQs (Bautista, 2004).

Three Advisory-Panel members, D. Tongway (Australian National University, Camberra, AU), D. Lamb (IUCN; University of Queensland, Brisbane, AU) and J. Parrotta (IUFRO; USDA Forest Service, USA) reviewed REACTION evaluation criteria and REACTION Questionnaire, and produced a review report (REACTION Second Annual Report, 2005).

2.4. Workshop on Restoration actions to combat desertification in the Northern Mediterranean

Major objectives of the second REACTION workshop were to review and evaluate compiled restoration projects, at national and regional (Annex IV) levels, in the context of the northern Mediterranean socio-economic and environmental conditions; to identify gaps and achievements; to review the REACTION evaluation protocol and database structure. Representatives of Forest Administrations, forest managers, Focal Points of National Committees for combating Desertification in the Annex-IV countries participated in the workshop, discussed major needs and gaps, and profited from outputs and the suitable scenario for exchanging experiences provided by REACTION workshop.

The following chapters of these proceedings summarise main characteristics of the projects compiled in each country. In general, major achievements of the restoration projects reviewed were the improvement of the landscape, socio-economic and cultural values of the restored sites, and the enhancement of soil conservation and water infiltration. However, ecosystem quality and health of the restored areas was not always as good as desirable. The specific history and conditions of each country and region has to be taken into account in the evaluation of long term reforestation efforts. Participants highlighted the challenge of restoring very degraded areas, even when expected degree of success is rather low.

Presentation of the trial questionnaires compiled by each team evidenced a good level of common understanding and uniform interpretation of data fields meaning and value. Minor interpretation differences were pointed out and discussed. Field trips very well evidenced that restoration actions require a really comprehensive understanding to be adequately evaluated.

2.5. Technology transfer, training, and dissemination

REACTION has created a fully functional structure that ensures exchange and dissemination of information and technology and quality assurance through interaction of partners, Advisory Panel, external Steering Committee of Focal Points, and National Working Groups (Fig. 1.1). All partners contributed to dissemination at national and local scale through the consultation process and seminars in the framework of the National working groups and with other stakeholders related to restoration areas. The second International REACTION workshop has been also a major activity contributing to dissemination. In addition, we presented REACTION outcomes in a number of meetings and conferences (Alloza 2004, Alloza & Vallejo 2004, Alloza et al. 2004, Aronson et al. 2004, Scotti et al. 2004, Vallejo 2004a,b, Vallejo et al. 2004).

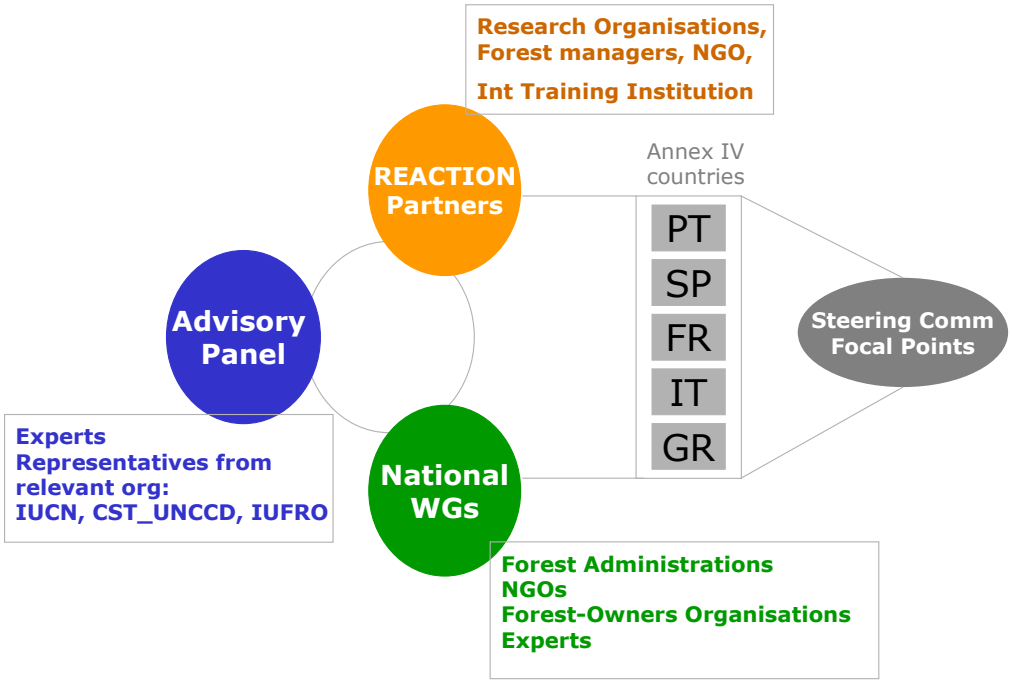

Figure 1.1. Outline of REACTION functional organisation

We updated the REACTION web page and disseminated it through a number of distribution list of ecological and forest societies (e.g. distribution lists of the working groups on restoration of the Spanish Society of Forest Sciences and the Spanish Society of Terrestrial Ecology). A link between the European Mediterranean Disaster Information Network (EU-MEDIN) and REACTION web sites has been established, so the information and major achievements of REACTION project can be accessible through the official portal of EU-MEDIN.

The main contribution of REACTION to dissemination, technology transfer, and capacity building is the REACTION database of restoration projects, which has been designed and implemented in computing facilities to be an on-line and open-access database (see

chapter 7 in these proceedings). In addition, we expect to promote capacity building and dissemination of good restoration practices by (1) organising the ***Symposium "Criteria and Methodologies for Evaluating Restoration Projects"*** in the framework of the 17th Conference of the Society for Ecological Restoration International (SERI) & 4th European Conference on Ecological Restoration, that will be held in Zaragoza, Spain, 12-18 September 2005, (2) organising the ***International advanced Course on "Land restoration to combat desertification: innovative approaches, quality control and project evaluation"***, 19-25 September 2005, IAMZ-CIHEAM; (3) preparing the REACTION Questionnaire in Spanish, French, Portuguese, Italian and Greek; and (4) preparing a ***Handbook on Guidelines for designing and implementing restoration projects*** that incorporates major achievement of REACTON project.

Dissemination activities performed during the first two years of REACTION project have raised the interest in REACTION outputs, and therefore have raised the opportunities for policy implication. Dissemination of REACTION achievements on evaluation methodology, compilation of projects, and database has had a very positive response from stakeholders and experts on the restoration issue. The overall opinion is that REACTION is a valuable tool for filling the acknowledged gap in technology transfer and dissemination of good restoration practices.

3. Conclusions

In sum, REACTION structure ensures, from both bottom-up and top-down approaches, exchange and dissemination of information and technology and quality assurance. REACTION project has created a database/evaluation system that contribute to filling existing gaps in the availability of information on restoration actions, evaluation techniques, transfer of technology, and communication among agencies, regional administrations, and countries. Progress made by REACTION project contributes to disseminate good practices successfully proved in past restoration projects, harmonise criteria and methodology for the evaluation of restoration projects, and facilitate access to high quality information to the various stakeholders.

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Chapter 2

Inventory of evaluated restoration projects in Spain

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Along the late XIX and XX centuries, millions of hectares were afforested or reforested in Spain through large and extensive afforestation programmes (Fig. 2.1) aimed mainly at increasing forest productivity and forest area and creating jobs for local people. Prevention of soil erosion and floods was also a major goal in the Mediterranean Spain.

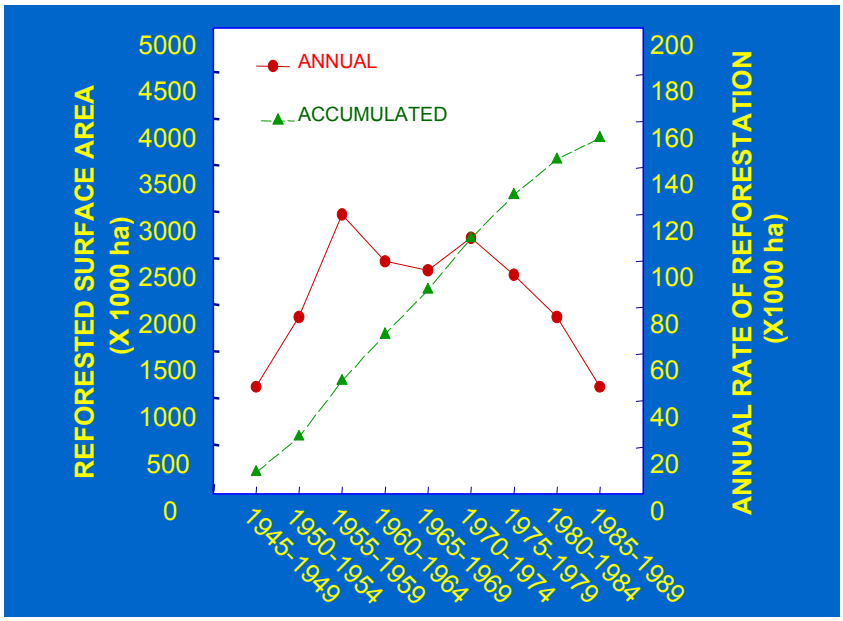

Figure 2.1. Anual rate of reforestation and reforested surface in Spain after the National Plan of Forest Reforestation of 1939.

In the framework of REACTION, we selected and inventoried a final set of 7old restoration projects in Spain (Table 2.1), located within the desertification-prone Mediterranean area (South-Southeast-East), and including projects in Andalucía, Murcia, Aragón, and Valencia regions. The selection criteria was information availability, age (more than 30-years old, dating back even to 1900), degree of representativeness, and degree of success, in terms of achievement -sensu lato- of early goals, and according to the opinion of the project contact.

Difficulties for finding available information on the restoration projects were many. Data acquisition was based on very diverse sources: project proposals, implementation reports, management projects of the restored areas, national forest inventory database, personal interviews, publications, available maps, field assessment, etc. Collaboration of members of National working group was essential for accomplishing this task. Information available for every project was captured in the respective questionnaires and stored in the preliminary version of the REACTION database. However, for most projects there is a need of some field surveys to complete the information about the current ecological conditions of the restored areas.

Table 2.1. REACTION Inventory of Restoration projects in Spain

NAME	LOCATION	BIOCLIMATE	GENERAL OBJECTIVE	SIZE (HA)	DATE (*)	RESTORED ECOSYSTEM
Los Valles	Valencia, E Spain	Semiarid	Erosion and flood control	470	1960	*Pinus halepensis* forest
Pinaroto	Teruel, E-Central Spain	Semiarid	Timber production, increase of forest surface	300	1952	*Pinus sylvestris* forest
Periago	Murcia, SE Spain	Semiarid	Erosion and flood control	1650	1952	*Pinus halepensis* forest
Espuña-1	Murcia, SE Spain	Sub-humid	Erosion and flood control	625	1900	Mixed pine and oak forest
Cárcavo	Murcia, SE Spain	Semiarid	Erosion and flood control	1990	1950	*Pinus halepensis* forest
Ricote	Murcia, SE Spain	Semiarid	Erosion and flood control	890	1905	*Pinus halepensis* forest
Montes de Málaga	Malaga, S Spain	Sub-humid	Erosion and flood control	4760	1930	*Pinus halepensis* forest

According to the data compiled, the main goal of most of the past restoration projects in Mediterranean Spain was erosion and flood control. They were performed in the framework of Hydrologic and Forest Restoration programmes and part of them was designed after major floods in the respective watersheds. The creation of jobs was a complementary objective for most of them. The main structural goal for all the projects was the creation of a pine cover or, in some cases, mixed pine-oak layers.

Since degree of success was part of the criteria for project selection, all the projects were succeeded in terms of achievement of early structural goals. Success in terms of survival was greatly due to post-plantation reinforcements. Functional early goals (flood and erosion control) seem to be achieved as well. However, current quality of the restored sites, according to REACTION indicators, is highly variable. At present, some restored sites (e.g. Sierra Espuña. See Fig. 2.2) are mature, multi-layered mixed pine and oak systems, showing a diverse and potentially resilient understory. In other cases, restored sites are mono-layered pine forests still showing some degree of soil degradation (Fig. 2.3). Site constraints and site management need to be analysed as potential factors underlying differences in quality. All projects enhanced ecosystem services, but none contributed to fix/support/increase rural population.

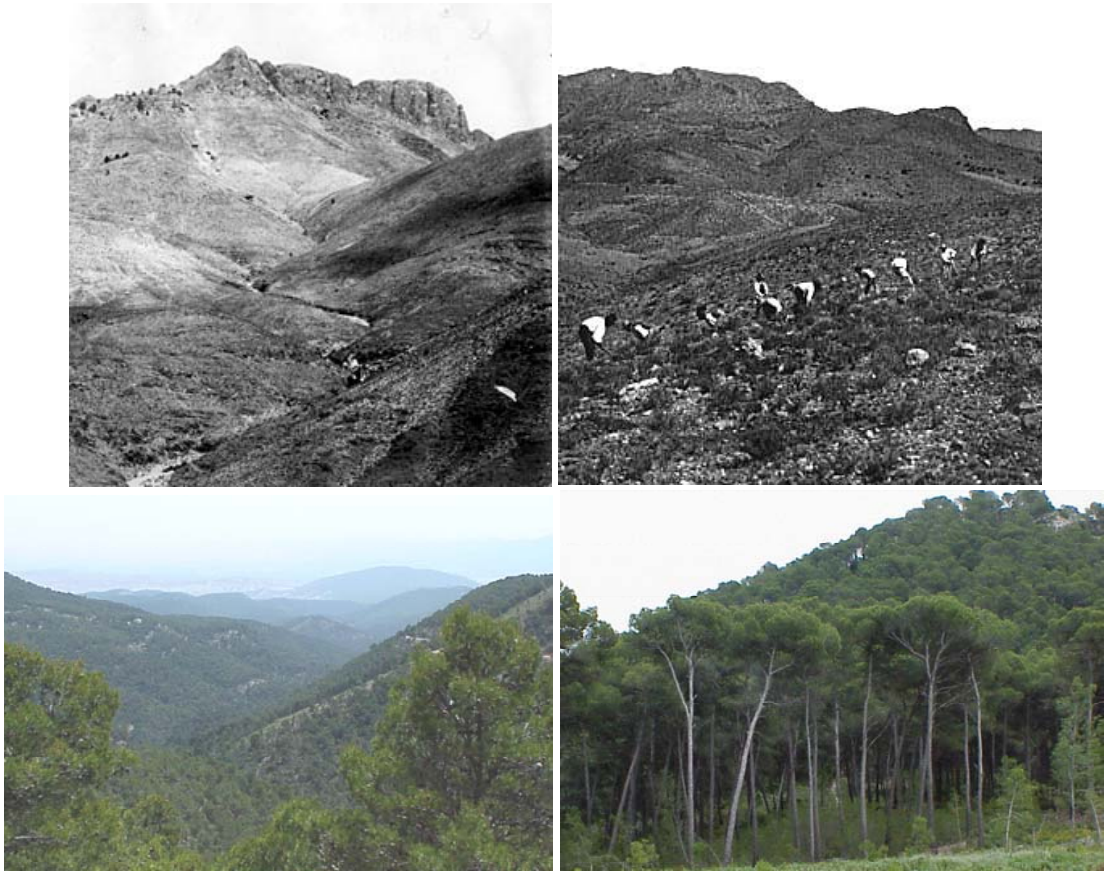

Figure 2.2. Sierra Espuña. Site conditions before and during restoration actions in 1885 (up) and current –2004– conditions (bottom)

Figure 2.3. Periago site. *Pinus halepensis* forest resulted from a past afforestation programme carried out in 1952

Chapter 3

Inventory of evaluated restoration projects in France

D. Vallauri[1], C. Fontaine[2] and J. Aronson[2]

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In southern France, legislation was adopted in 1860, 1864 and 1882 to prevent erosion and flooding and the so-called RTM: (Mountain Land Restoration) programme was initiated. Large reforestation campaigns were undertaken to restore mountains and other denuded lands vulnerable to erosion (Fig. 3.1). Such projects represent the large majority of forest restoration sites and projects available for analysis in the French Mediterranean region.

Figure 3.1. Brusquet basin before the RTM (Restoration Mountain Terrain) project (1877) and more than a century after reforestation actions (1995) (photos from D. Vallauri)

We carried out the inventory of available sites in collaboration with our national working group. We collected the bulk of the baseline information needed to complete the questionnaires for a range of sites covering most of the French Mediterranean region, and most of the bioclimatic zones where forest restoration work has been carried out in the past (Fig. 3.2). To date, 12 restoration projects have been compiled and evaluated (Table 3.1). Seven of the projects (Saignon, Brusquet, Mount Ventoux, and the National Forests of La Vis, La Fage, Rialsesse and Aigoual) were in fact launched as RTM programmes, in the last quarter of the 19th century. The principle species planted in all these sites was the pioneer tree species, the Austrian black pine, *Pinus nigra* spp. *nigra*. Of the other five projects under evaluation, some were conducted to prevent wildfire (Palayson, Montmeyan, Esterel), to regenerate selected species (Palayson, with cork oak, *Quercus suber*), or for post-fire regeneration of a site with high cultural value after fire (Mt. Sainte Victoire, frequently painted by Paul Cézanne). One additional site (Laval) illustrates an effort to encourage natural regeneration (passive restoration).

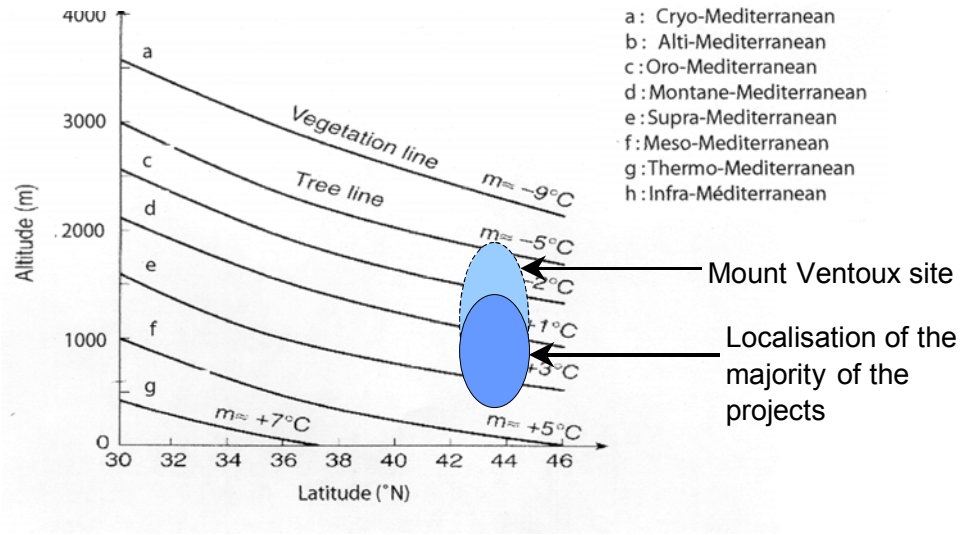

Figure 3.2. Bioclimatic zones of the restoration projects analysed

Table 3.1. REACTION Inventory of Restoration projects in France

NAME	LOCATION	BIOCLIMATE	GENERAL OBJECTIVE	SIZE (HA)	DATE (*)	RESTORED ECOSYSTEM
Saignon	Alpes-de-Haute-Provence, SE France	Sub-humid	Erosion control	380	1860	Mixed pine and deciduous forest
Brusquet	Alpes-de-Haute-Provence, SE France	Sub-humid	Erosion control	108	1870	Pinus nigra and P. sylvestris forest
Laval	Alpes-de-Haute-Provence, SE France	Sub-humid	Natural regeneration (control site)	86	1870	Degraded lands and mixed forest
Esterel	Provence-Alpes-Cote d'Azur SE France	Sub-humid	Post-fire forest recovery, cork production	6000	1950	*Q. suber* and *P. pinaster* forest
Palayson	Provence-Alpes-Cote d'Azur SE France	Sub-humid	Fire Protection, cork production	1136	1970	*Quercus suber* forest
Montmeyan	Provence-Alpes-Cote d'Azur SE France	Sub-humid	Increase diversity	750	1989	*Quercus pubescens* forest
Montagne Ste Victoire	Provence-Alpes-Cote d'Azur SE France	Sub-humid	Post-fire recovery	70	1989	Mixed pine and deciduous forest
Mont Ventoux	Alpes-de-Haute-Provence, SE France	Humid	Erosion control, mountain land restoration	2650	1900	Mixed coniferous-deciduous forest
Aigoual	Languedoc-Rousillon, SE France	Sub-humid	Erosion and flood control	9635	1859	*Fagus silvativa* - *Abies spp.* forest
La Fage	Languedoc-Rousillon, SE France	Sub-humid	Erosion and flood control	570	1956	Mixed coniferous-deciduous forest
La Vis	Languedoc-Rousillon, SE France	Sub-humid	Erosion and flood control	1026	1886	Mixed oak and coniferous forest
Rialsesse	Languedoc-Rousillon, SE France	Sub-humid	Erosion and flood control	2103	1864	Mixed deciduous-coniferous forest

(*) Date of first restoration actions

Evaluation results of the restoration projects analysed are variable and the attitudes of planners, executioners and managers vary concerning these past projects and the way to manage them in the future. Current status and quality is also variable. For most of the RTM projects, early functional goals -erosion and flood control- were achieved. The restoration projects clearly increased forest surface in the area. However, part of them are still even-aged stands, with low values of species richness, regeneration difficulties, and pests (*Viscum album* L.). Other RTM projects such as Aigoual, la Vis, la Fage (1950s), and Rialsesse National Forests; Mount Ventoux (Biosphere reserve, UNESCO - MAB) showed improved structure (mixed forest with majority of broad-leaved species, and varied understorey) and biodiversity. Natural plant dynamics in the control site Laval –passive restoration, no afforestation action– resulted in a multi-layered forest, with trees of varied ages, and no major pests or diseases. But erosion is still active today (61% of degraded lands compared with 20 % in Saignon and 12 % in Brusquet).

Projects conducted to prevent wildfires, Palayson, Montmeyan and Esterel, improved sylvopastoralism and forestry in the area, contributed to fire prevention and increased biodiversity. Agricultural openings in Mt. Sainte-Victoire (olive trees, truffle-inoculated oaks, almond trees and other fruit trees) contributed to fire control, increase of biodiversity, and socio-economic benefits through farming (high quality olive oil). Recent actions aimed to restore the cultural landscape in Sainte-Victoire mountain highlight the different restoration approaches coexisting. Thus ONF, Office National des Forêts, has carried out a number of reforestation actions using conifers (cedars, firs, and pines), while a NGO trial in the area used broad-leaved species such as ash (*Fraxinus excelsior*), Mountain ash (*Sorbus domestica*), downy oak (*Quercus pubescens*), and maples (*Acer sp*.).

Chapter 4

Inventory of evaluated projects in Greece

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We collected data concerning 5 restoration projects in Greece that satisfy the criteria to be included in the restoration database (Table 4.1, Fig. 4.1). However, for two of them there are almost no information available in the Greek Forest Service files, and therefore the collection of data has to be completed during the next year, mostly based on field surveys. The sources of information for the data already collected were technical reports, publications, management plans, historical records, and personal interviews to local people and members of the Greek REACTION Working Group.

Table 4.1. REACTION Inventory of Restoration projects in Greece

NAME	LOCATION	BIOCLIMATE	GENERAL OBJECTIVE	SIZE (HA)	DATE (*)	RESTORED ECOSYSTEM
Dadia forest	Evros-Thrace NE Greece	Sub-humid	Wood production, erosion and flood control	663	1968	Mixed pine and oak forest
Sand dunes Vartholomio	Peloponnisos, S Greece	Sub-humid	Dune stabilisation	1308	1952	Mixed pine forest
Kedrinos	Thessaloniki, N Grece	Sub-humid	Erosion and flood control, landscape improvement	2976	1934	*Pinus brutia* forest
Stratoniki	Halkidiki, NE Greece	Sub-humid	Wood production, erosion and flood control	3476	1966	Mixed coniferous forest
Tarxiarchis	Halkidiki, N Greece	Sub-humid	Wood production, erosion and flood control	640	1963	Mixed pine and broadleaf forest

All the restoration projects analysed were carried out by the forest service, in most cases without using machinery and only in some cases after terracing. They were based on plantations of evergreen conifers (pines). Main goals often include wood production. In many cases, such as in peri-urban forest of Thessaloniki, the forests were established uphill of the cities, in order to protect them from flooding, soil erosion etc. The restored areas generally were protected from grazing. For most projects, post-planting care, especially thinning, and management plan were lacking, and no monitoring was carried out by forest services.

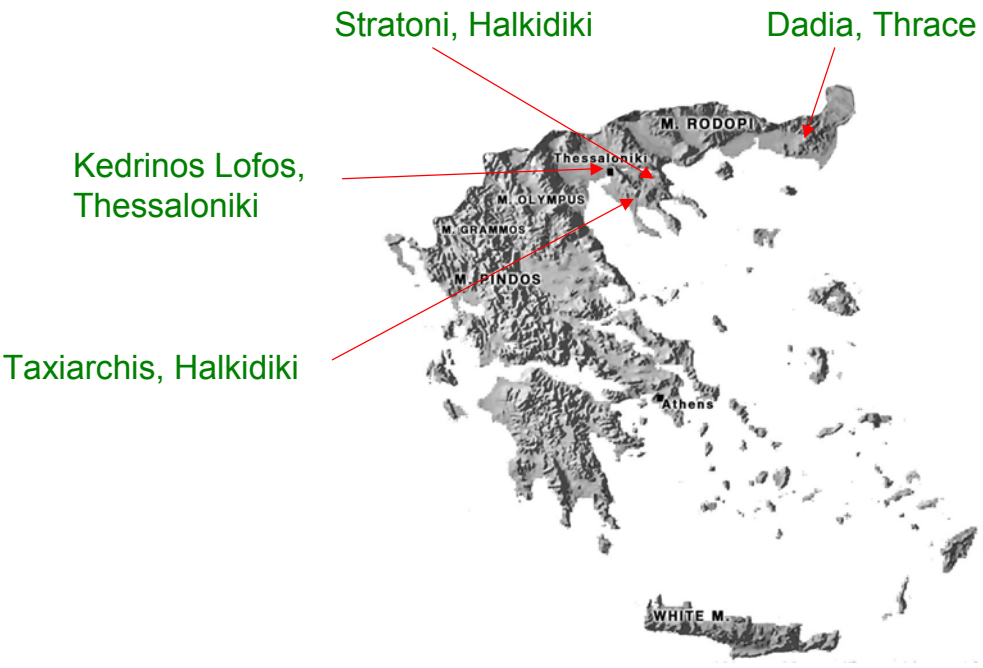

Figure 4.1. Locations of the Greek restoration projects compiled

The two restoration projects that were visited during the workshop field trips, Stratoniki and Kedrinos, represent two contrasting actions either in terms of goals and results. Major goal of Stratoniki project was wood production, while major goal of Kedrinos project was erosion and flood control. Soil conditions were particularly poor in Kedrinos site. Preliminary evaluation showed also contrasting results between these two projects. Thus, Stratoniki site (Fig. 4.2), showed high functional and structural quality and all the project goals were achieved. On the contrary, only part of the goals were achieved in Kedrinos project (Fig. 4.3). At present, ecosystem quality in Kedrinos site is not very high, natural regeneration of the forest is poor, soils are slightly degraded, and a number of pests, mainly bark beetles, affect the area. These contrasting results between the two projects contribute to the debate about the trade-off between restoring very degraded areas and potential success, highlighting the challenge of restoring degraded areas, even when expected degree of success is low.

The restoration actions analysed led to certain indirect socio-economic profits for the restored areas in all cases, mainly due to the enhancement of tourism in the project sites. Improvements in the quality of the landscapes and soil protection from erosion were two common results as well.

Figure 4.2. Stratoni restoration project, Northeastern Halkidiki, at the time of the restoration actions, 1966-1968 (left) and at present, 2004 (right)

Figure 4.3. Kedrinos Lofos project, the peri-urban forest of Thessaloniki

Chapter 5

Inventory of evaluated projects in Portugal

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As a result of consultation and meetings with regional forestry authorities and stakeholders, together with field visits, we selected for evaluation 8 restoration projects (Table 5.1, Fig. 5.1), two in the north-east of Portugal, three in East-Central Portugal, and three in Southern Portugal. The selection process was more difficult than anticipated due to the devastating 2003 fire season and because many potentially suitable older projects lack any type of data, rendering them unsuitable for evaluation. In addition, the 2004 fire season destroyed two of the previously selected projects in Southern Portugal (Herdade de Pêro de Amigos and Herdade da Malhada) before any field assessment could be concluded, which, together with the extensive lack of accurate information available for them, forced their exclusion from REACTION inventory. Data acquisition was based on field assessments, project proposals, personal interviews, available maps and literature. Collaboration of stakeholders was fundamental for accomplishing this task.

Table 5.1. REACTION Inventory of Restoration projects in Portugal

NAME	LOCATION	BIOCLIMATE	GENERAL OBJECTIVE	SIZE (HA)	DATE (*)	RESTORED ECOSYSTEM
Terras da Ordem	Algarve, S Portugal	Semiarid	Erosion and flood control	550	1969	*Pinus pinea* forest
Vila Real de S. António	Algarve, S Portugal	Semiarid	Dune stabilisation	288	1923	*Pinus pinaster* forest
Barão de São João	Algarve, S Portugal	Sub-humid	Erosion and flood control	218	1936	*Pinus pinea* forest
Quinta da Nogueira	Castelo Branco, E-Central Portugal	Sub-humid	Wood production, erosion and flood control	95	1987	*Pinus pinea* and *P. pinaster* forest
Penha Garcia	Castelo Branco, E-Central Portugal	Sub-humid	Wood production, erosion and flood control	225	1988	*Pinus pinea* and *P. pinaster* forest
Couto de Baixo	Castelo Branco, E-Central Portugal	Sub-humid	Wood production, erosion and flood control	222	1988	*Q. suber* and *P. pinaster* forest
Serra do Gajope	Trás-os-Montes, NE Portugal	Sub-humid	Wood production, erosion and flood control	1520	1975	*P. pinaster* and *Pseudotsuga menziesii* forest
Serra da Abelha	Trás-os-Montes, NE Portugal	Sub-humid	Wood production, erosion and flood control	71	1979	*Pinus pinaster* and *Pseudotsuga menziesii* forest

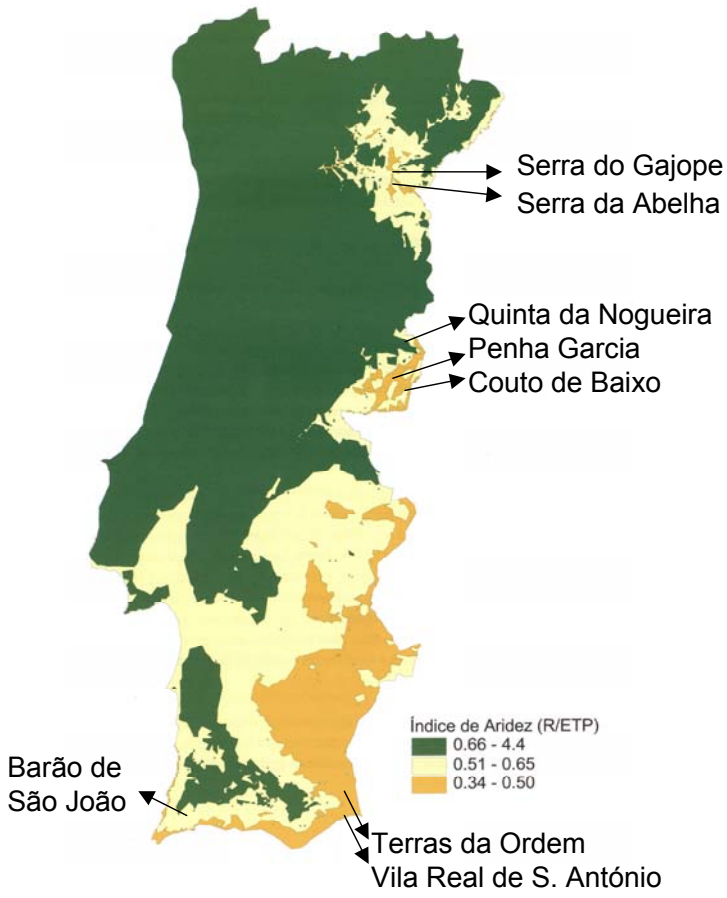

Figure 5.1. Locations of the Portuguese restoration projects compiled

Preliminary evaluation of the projects inventoried showed that most of the restoration actions were succeeded in terms of achievement of functional goals, namely erosion control. Current ecosystem quality greatly varied among projects. Projects in State managed areas appear to be more successful and reliable than projects in private managed areas. Soil protection objectives were quickly achieved as compared to wood production objectives.

Some projects, such as Mata Nacional das dunas de Vila Real de Santo António (Fig. 5.2) contributed to stabilise dunes and to control erosion, and resulted in increased forest cover, biodiversity, and social value. Sustainable forest was kept during the last 80 years. The restored area corresponds to an ecosystem that is approximately natural, that regenerates naturally and its health status is good.

In other cases, such as the Mata Nacional das Terras da Ordem, stand structure and pattern are not fully natural. Actually spontaneous tree cover for that area is the “montado” type (oak woodland). Natural regeneration is scarce because *Pinus pinea* is not fully mature and only regenerates well in sandy soils. Though soil erosion has been reduced and county forest area was increased, overall ecosystem health is not as god as desirable.

Figure 5.2. Mata Nacional das dunas de Vila Real de Santo António

Chapter 6

Inventory of evaluated projects in Italy

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We selected five restoration projects, representing the most interesting ancient/old restoration projects still in place today in Sardinia. To cover the large number of different conditions, selected reforestation projects are spread from north to south Sardinia (Table 6.1). The selection work was quite cumbersome, not having a catalogue or database yet established on this subject. To retrieve information it was necessary to access the archives of the many different institutions that executed reforestation projects, originals need to be accessed to obtain all available details existing on prior site conditions, action implementation techniques, costs, and successive interventions. Other data sources have to be queried for climatic data, geology and pedology. Some field work was required too. A general site inspection was needed to understand if and how much documents are reflected in current site conditions and, eventually, to divide the area in units, evidencing different restoration conditions. Quantitative data concerning the forest stand are generally lacking. A number of plots were measured to collect the main characteristics of the sites.

Table 6.1. REACTION Inventory of Restoration projects in Italy

NAME	LOCATION	BIOCLIMATE	GENERAL OBJECTIVE	SIZE (HA)	DATE (*)	RESTORED ECOSYSTEM
Bottida	Sardinia, Italy	Humid	Erosion and flood control, wood production	60	1965	Mixed coniferous and oak forest
Bono	Sardinia, Italy	Sub-humid	Erosion and flood control, wood production	20	1965	Mixed coniferous and oak forest
Monti	Sardinia, Italy	Humid	Erosion and flood control, cork production	309	1957	*Quercus suber* and *Pinus pinea* forest
Pattada	Sardinia, Italy	Humid	Erosion and flood control	90	1951	Mixed oak and pine forest
Tempio	Sardinia, Italy	Humid	Erosion and flood control, production	320	1930	Mixed pine and deciduous forest

An overview of the restoration efforts in Sardinia according to their main goals showed two major groups of projects: actions developed in the framework of watershed protection programmes, using reforestation with economically valuable conifers (Fig. 6.1), and actions developed in the framework of the famous effort of Sardinia foresters to settle

moving sand dunes. At present, all the REACTION compiled projects belong to the first group.

The application of REACTION methodology to the analysis of restoration projects in Sardinia pointed the following issues (i) operational testing of questionnaire compilation offered the opportunity to appreciate the strong methodological basis behind it and to evaluate REACTION potential beyond its direct scope, (ii) from forestry and foresters point of view, the traditional ecological basis of the discipline can be very well appreciated analysing old reforestation projects through the frame of restoration ecology embedded in the questionnaire, and (iii) within reforestation sites, passive restoration plays important roles contributing to explain success, but the current version of the Questionnaire does not provide enough tools to properly measure the importance of this type of processes.

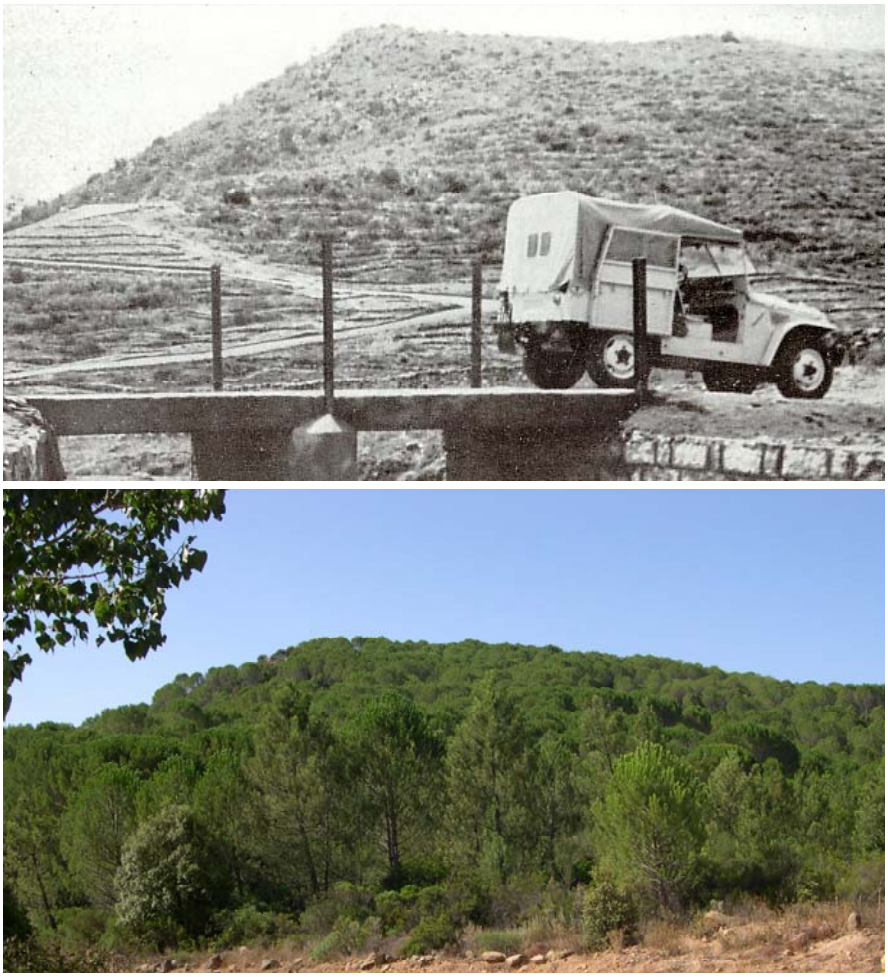

Figure 6.1. Monte Olia (Monti project) in 1960 (up) and at present, 2004 (bottom)

Chapter 7

REACTION Database

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Much of the technological capability related to restoration of degraded lands is under-utilised and not shared due to poor and restricted dissemination of data and experiences, limited co-ordination among the various countries, and lack of detailed databases on restoration actions. Previous valuable initiatives addressing these gaps are a number of existing directories of restoration projects, national-basis databases (e.g. Restoration projects database, Ministry of Environment, Spain; Natural Resource Project Inventory, NRPI, California), and a few world-wide-basis databases (e.g. UNEP-WCMC, FRIS database), which commonly include information on location, goals, ecosystem type, habitat classification, area, restoration method used, financial support, executing agency, and key contacts of the restoration projects.

REACTION database has been designed to be an on-line and open-access database. Major innovations of the REACTION database are the large amount of detailed information compiled on well-documented restoration projects; the evaluation of project results, including structural and functional quality; information on stand and landscape assessment; technical, ecological, and socio-economic perspectives; and regional (Mediterranean) scope.

The Query system of the database allows the search of restoration projects by country, bioclimate type, restored ecosystem, age, size, scope of the project, and objectives (Fig. 7.1). An Internet-based facility has been deployed that allows the users to retrieve and query data information stored on a central server through a customised interface. Preliminary versions available of the questionnaires were captured and stored in the database, and the database query system was successfully tested (Fig. 7.2).

At present, more than 30 restoration projects have been compiled to be stored in the database. The database includes information on past restoration projects, their main environmental characteristics, ecosystem type, restoration techniques used, results achieved at stand and landscape scales, evaluation of success in technical, ecological, and socio-economic terms, financial support and key contacts (Fig. 7.3). It is linked to an interactive map showing the geographical locations of restoration projects.

At present, the database is still under construction, and accessible for partners only. However, according to the great interest demonstrated by end users, results obtained are expected to be highly relevant for managers and policy-makers.

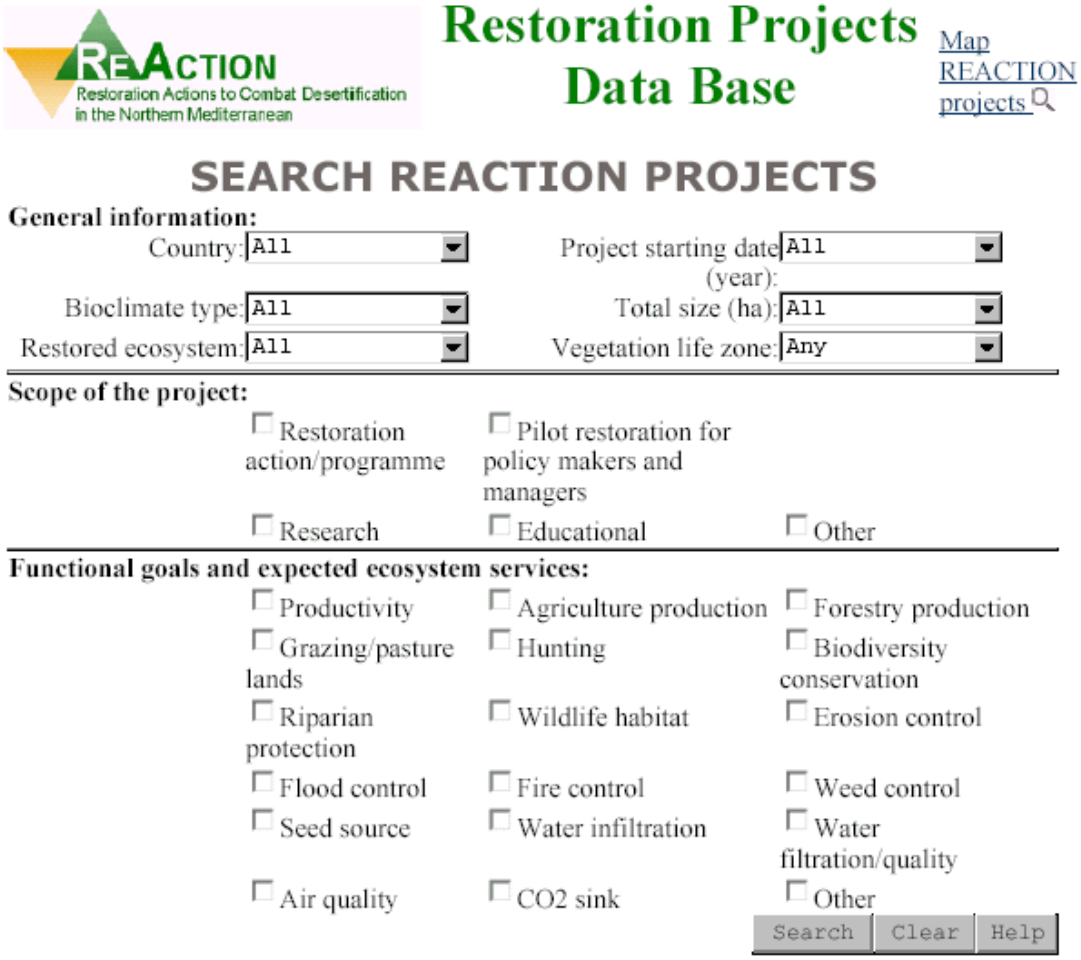

Figure 7.1. Query page of REACTION database on Mediterranean restoration projects.

Results of Search REACTION projects Página 1 de 2

RESULTS OF SEARCH REACTION PROJECTS

Results 1 - 5 of about 11. (Page: 1) Next

Title:	*Restoration proyect of Periago basin*	Country:	*Spain*	Project Code:	*PERIAGO*
Region:	*Murcia*	Date project starting:	*1952*	Total size:	*1650*
Bioclimate type:	*Semiarid Mesomediterranean*	Annual average rainfall:	*322.2*	General objetives:	*Flood and erosion control*
Structure Goals:	*Pinus halepensis forest*	Scope of the project:	*Restoration action/programme*	Functional goals	*Erosion control, Flood control*

View details of the project

Title:	*Forestation Pinaroto mountain*	Country:	*Spain*	Project Code:	*PINOROTO*
Region:	*Aragon*	Date project starting:	*1952*	Total size:	*295*
Bioclimate type:	*Semi-arid*	Annual average rainfall:	*463*	General objetives:	*Productive and forest surface increase*
Structure Goals:	*Pinus sylvestris forest*	Scope of the project:	*Restoration action/programme*	Functional goals	*Forestry production, Erosion control*

View details of the project

Title:	*REPOBLACIÓN PARCIAL DEL MONTE Nº 25, DENOMINADO "SIERRA DE RICOTE"*	Country:	*Spain*	Project Code:	*RICOTE*
Region:	*MURCIA*	Date project starting:	*1905*	Total size:	*890*
Bioclimate type:	*Semiarid*	Annual average rainfall:	*367*	General objetives:	*REPOBLACIÓN, CORRECCIÓN Y CONSERVACIÓN*
Structure Goals:	*Pinus halepensis forest*	Scope of the project:	*Restoration action/programme*	Functional goals	*Productivity, Forestry production, Grazing/pasture lands, Hunting, Erosion control, Flood control*

View details of the project

Figure 7.2. Example of the results page of REACTION database on Mediterranean restoration projects.

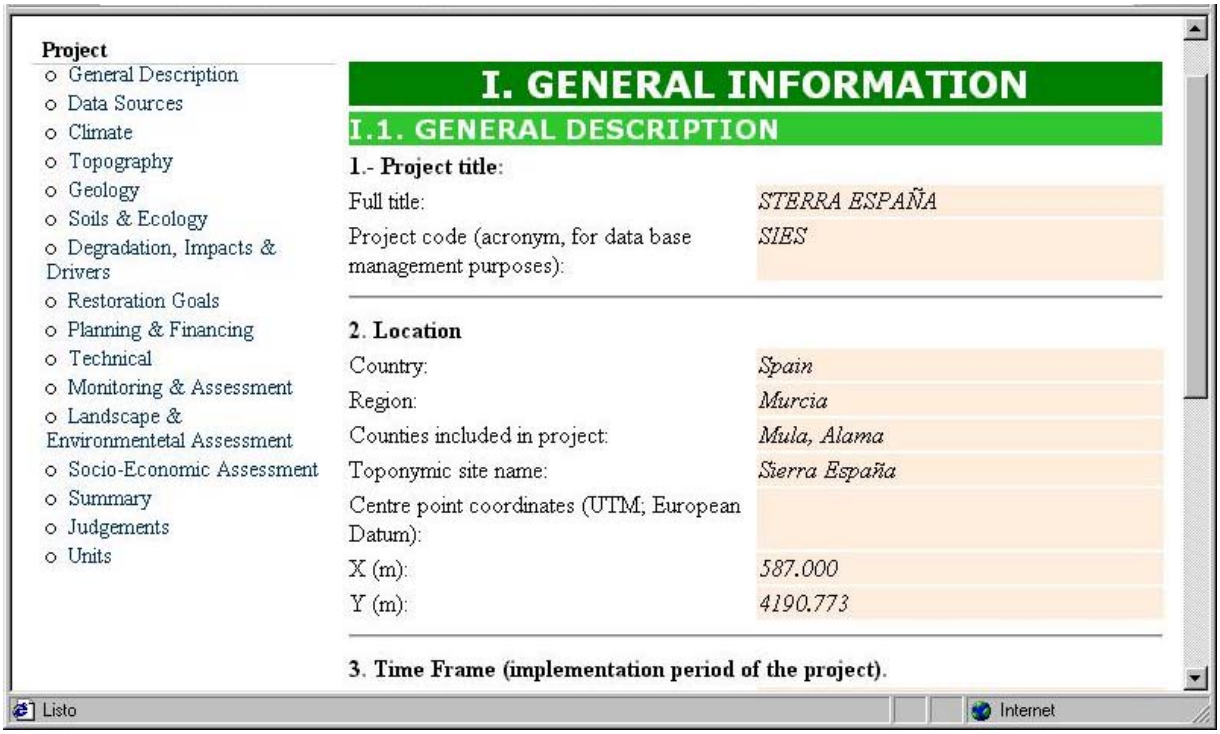

Figure 7.3. Example of one of the results page for one particular project of the REACTION database on Mediterranean restoration projects

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